

Investment Analysis & Portfolio Management Unit 1 v3.docx

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 ATLAS SkillTech University

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Unit 1: Introduction to Investments

Learning Objectives

1. Learn the basics of what investments are and how they work.
2. Different types of investment streams and its characteristics.
3. Examine and discuss the risk and return in investment decision-making.
4. Illustrate the importance of financial markets and intermediaries in investment.
5. Analyze investments with these simple tools and tricks.
6. Understand the value of investment risk diversification.
7. Explain how investment decisions are influenced by economic and market factors.
8. Establish the groundwork for making educated investment decisions both personally and professionally.

Content

- 1.0 Introductory Caselet
- 1.1 Fundamentals of Savings & Investments
- 1.2 Difference Between Savings and Investment
- 1.3 Importance of Investments in Wealth Creation
- 1.4 Role of Investments in Economic Growth
- 1.5 Summary
- 1.6 Key Terms
- 1.7 Descriptive Questions
- 1.8 References
- 1.9 Case Study

1.0 Introductory Caselet

“Short-term survival, Medium-term ambitions, & Long-term security”

Rohan, a 28-year-old software professional has been given an incentive of ₹3,00,000. Most of his savings up to now were kept in a regular bank account earning negligible

interest. After taking a financial literacy class, Rohan learned that he needed to make his money “work for him” through investments.

He explored multiple options:

- Provident Fund (PFs) which offered returns that assured, but with limited growth.
- Mutual Funds provided professional management and diversification but had market risk.
- The High risk and high return – Direct Equity investment.
- Gold, the classic comparably safe haven.
- Public Provident Fund (PPF), a long-term, government-backed tax saving form of investment.

Rohan had financial targets to create an education fund in the next 3 years, save for a house down payment over the course of 7 years and prepare for long-term retirement.

Now, he has the task of maximising returns and minimising risks as well as maintaining liquidity in choosing investments.

Critical Thinking Question

If you were Rohan, in what proportion would you invest the ₹3,00,000 among different investment avenues so as to balance his current needs:future goals and a long-term security of funds and why?

1.1 Basics of Savings & Investments

1.1 Investments and Savings in the Economy 1.1.1 Definition of Saving and Investment

• Savings

Savings represent disposable income not consumed. These are often in the form of monies held in a safe, liquid place such as:

o Cash lying at home o Bank saving accounts o Fixed deposit o Recurring deposit 产品之一.

Savings are relatively risk free and liquidity-providing. But they may provide you with limited returns (some of them might not even beat inflation).

Example: Let’s say Priya saves ₹5,000 of her salary in a savings account for emergencies every month.

• Investments

Investment is the act of putting money (savings) into assets for acquiring a return. Investments may be in:

o =Financial assets (stocks, bonds, mutual funds and debentures) o real assets (real estate, gold, art etc.)

Investments are something that exposes an investor to varying levels of risk and return, with the hopes of receiving value (wealth) over a medium or long period.

Illustration: Ramesh invests ₹2,00,000 in mutual funds with the hope to get capital appreciation over 5 years.

To put it another way, if you have savings, the only logical move is to build upon them by investing.

1.1.2 Desired Savings and Investments

In the world of financial planning, savings and investments are both important, but they perform different functions. If saving is about safety and availing of money, investing is the way to achieve long term growth and wealth generation. You cannot answer that question without knowing the goals of each as it applies directly to planning for your unique financial plan, risk profile and time frame.

Objectives of Savings

Savings Savings is that part of the income which is not consumed and saved for future use, and normally deposited in low risk-low return instruments like savings accounts or fixed deposits. Savings are primarily for the purpose of safekeeping and quick availability. It's an important weapon for coping with short-term needs and becoming financially secure.

Safety of Funds:

Protection of the principalThe ultimate goal of saving is to safeguard the capital. People want to be able to hold onto their savings in safe institutions where there is little likelihood of running into losses. In this way, the preserved money delivers in-full and right time when called for- Because It's shielded from market risk.

Liquidity:

Savings is meant to be extremely liquid so that you can access your money quickly and with little impairment of value. Such liquidity is necessary in a crisis, as it ensures that people can remove their money without suffering penalties or delays.

Meeting Short-Term Needs:

Savings are great for covering short-term financial needs. These may include:

@[23_x5_o Daily expenses with the household @[23_x5_o Medical problems

You never know when urgent expenditure will be required – and it's best to do so without having to run up loans or ask credit.

Building a Financial Buffer:

Savings enable people to build a buffer that can be drawn upon in uncertain times, whether due to job loss, illness or economic turndowns. It provides a cushion against financial security and cuts down on this borrowing tendency in tough times.

In a nutshell, the aim of savings are to protect capital with accessibility and preparedness for any unplanned short term financial needs.

Objectives of Investments

Investments are when you put your money into things like stocks, bonds, real estate, or mutual funds with the expectation that that investment will increase in value over time. Investments, as opposed to savings, tend to involve higher risk but also bring the opportunity for greater returns. The objectives of investments are much more in tune with long-term financial planning and wealth building.

Wealth Creation:

Growing your investment capital is one of the main objectives of investing. Investments can grow in value and compound over time, thus enabling people to accumulate wealth and improve their financial situation.

Regular Income:

There are types of investing that result in a regular stream of income. For example:

- o Interest in bonds or other fixed-income securities
- o Dividends on stocks
- o Income from renting a house/trunk space.

This fixed income can serve as a supplement to your regular paycheck, or you may rely on it during retirement.

Achieving Financial Goals:

A typical investment may be designed to work towards one of the following long term goals:

- o Provide for children's schooling
- o Buy a house
- o Saving for your retirement

Whether it's the kids school or university fees, a new home, early retirement or round-the-world travel, by investing in different financial products/vehicles we can save towards these goals.

Beating Inflation:

Inflation makes money lose its purchasing power over time. Investments are expected to maintain and grow the purchasing power of wealth by earning a rate of return that

exceeds inflation. Savings can lose value in an inflationary period, but good investments can bring strength to the wallet.

Risk Diversification:

A good investment portfolio is one that diversifies and controls risk. Rebalancing money among asset classes, sectors or geographies can insulate people from damages inflicted by a bad bet.

Basically investments are about growth, income or security over time. Requiring a longer time horizon and more flexibility to market volatility, these investments can be very rewarding in getting you on track for pointing your money toward wealth building and redemption of financial dreams.

1.1.3 The relationship between Savings and Investments

The relationship between savings and investments is vital for comprehending at the same time cyclic in nature. As to an individual, savings constitute the essential prerequisite for investments; at the same time, from the economic perspective, aggregated savings contribute to the formation of capital required for national development. By understanding this cycle, it is possible to link personal financial decisions with economic outcomes. On an individual level, the linkage between savings and investments forms the basis for the personal financial planning structure. In particular, this process can be divided into the following stages.

First, saving is the process of setting aside a definite percentage of income after current expenses are covered. Thus, savings are the cornerstone of all investments since without savings, there would not be a surplus of funds to invest. Hence, the linkage is apparent. Once it is possible to save a definite and stable percentage, then the investment of those savings takes place. This step allows individual's idle money to generate returns in the forms of interest, dividends, and capital gains. Investments help individuals accumulate wealth, meet future needs, and counteract inflation. A financially wise plan incorporates both savings and investments in the following manner. Without any savings, it would be impossible to meet unforeseen events that call for cash, such as medical emergencies, job loss, or major household repairs. Thus, savings are used for emergency preparedness and short-term financial needs. Investments, in this case, are used for medium- and long-term future needs. When unanticipated expenses have been taken care of, people can afford to undertake calculated financial risks to grow their wealth over time. Thus, on the basis of the abovementioned information, savings and investments are interdependent:

- Savings make investment possible;
- Investments increase the value of savings, and

- An intelligently managed investment plan performs savings.

At a macro level, the equation of saving and investment is also important. Regardless of the economy, household savings become the dominant sector for the generation of capital to finance investment. These savings are then intermediated by financial institutions and converted into investments that fuel economic growth and development.

- Savings form the basis of capital for banks

Banks use the savings placed in their care as an integral part of their capital structure. Banks then lend that money to businesses, entrepreneurs and the government.

- Saving is the nonproductive use of investments.

Markets and Banks: The savings pool is directed by banks and capital markets into investments – infrastructure, industry expansion, technological development or public sector initiatives.

This transfer of funds from saver to investor is essential for economic advancement. The key mechanisms include:

- Capital training:

Investing in tangible assets such as equipment, plants, roads, and homes that can help to expand production capacity and infrastructure.

- Employment generation:

At the end of a day, productive investments generate employment, rise in income and boost consumption that leads to more economic activity.

- Sustainable economic growth:

Conversion of savings into investments is translated into output, standard of living and poverty.

So the bottom line is as follows: you cannot have savings without investment or investment without savings, either on a micro or macro scale. On the one hand, saving are a component for investments at personal level and on the other they are the source of forming capital and thus growth in an economy. A resilient, dynamic economy relies on sound and efficient transfer of private and institutional wealth into productive investments that have long term benefits for society.

“Activity: Daily Life – Savings and Investments”

What are examples of two recent savings and investments on your list? Recognize the purpose driving each decision — to provide safety, liquidity, income or growth. Bring your InForMation to another student and describe how your choices reflect the link

between savings and investments. Discuss ways of balancing short term security versus long term wealth creation.

1.2 DISTINCTION BETWEEN SAVINGS AND INVESTMENT

1.2.1 Key Characteristics of Savings

Safety of Funds

Savings are generally risk-free. Meanwhile, money held in a savings account or as cash at home is safe and not at the mercy of market swings.

Liquidity

High interest on your savings is available immediately. They are very liquid, which is to say, they can be redeemed or spent at any time and with little loss of value.

Low Returns

The interest on savings has become paltry. Such as, interest earned on savings bank account or a fixed deposit is very low and may not even beat inflation.

Short-term Orientation

Savings are generally intended for temporary uses like monthly bills, medical expenses or emergencies.

Purpose

The purpose for which savings are primarily meant is to save capital and fund short-term financial needs.

Illustration: A saver who is setting aside ₹20,000 in a bank account to deal with medical emergencies or any sudden repairs at home.

1.2.2 Key Characteristics of Investment

Risk and Return

Investing comes with some risk. Shares or mutual funds, real estate etc can return very high but also bring in possible losses. More risk, more chance of return.

Growth Potential

Investments are investments; the idea is that you want your money to grow. They grow over time, earning income as either capital appreciation, interest, rent or dividends.

Medium- to Long-term Orientation

Investing usually needs much longer view, say years to decades depending on the specific financial agenda.

Diversification

It is no different with investing, which succeeds through diversification - or spreading investments across asset classes to cut risks and increase the likelihood of consistent returns.

Purpose

The ultimate goal of the investment is to build wealth, secondly generate extra income from it and finally fulfill life long financial goals like retirement planning or education or home purchase etc.

Illustration: Investing in mutual funds and government bonds at the investment value of ₹1,00,000 with a goal to fund child higher education after 10 years.

Did You Know?

“Do you realize that if you can invest say ₹1,00,000 in equity mutual funds then it can grow to more than ₹4,00,000 over the next 15 years at say an average annual return of 10% but if the money is kept in say a savings account then this sum may not get even to just about ₹1,60,000?” Investments are about capturing time and compounding to grow wealth.”

1.2.3 Comparison: Savings versus Investments

The table below outlines some key differences between savings and investments:

Aspect	Savings	Investments
Purpose	Preservation of money and financial safety	Growth of money and achievement of long-term goals
Risk	Very low or negligible	Varies from low to high, depending on the asset type
Return	Low, generally below the inflation rate	Potentially high, often beating inflation
Liquidity	High; funds are easily accessible	Moderate to low; may require time to liquidate

Time Horizon	Short-term, usually a few months to 1–2 years	Medium to long-term, ranging from 3 years to 20+ years
Examples	Cash, savings bank account, fixed deposits	Stocks, bonds, mutual funds, real estate, gold, retirement funds

1.3 Relevance of Investment on Income Generation

1.3.1 The Magic of Compounding: Time Value of Money

The Compound Effect – As a Man Thinketh Something I believe in is one of the most powerful, simple little lessons to do with personal finance and long-term wealth. It is the practice where the returns on an investment are reinvested in such a way that, in future periods, those returns are also subsequently invested and additional earnings are earned not simply on the principal amount but also on prior period's profits. Courtesy of this compound interest loop, wealth grows exponentially over time when complemented by discipline, patience and a long-term investment focus.

Demonstration of the power of compounding Assume an investor invests ₹1,00,000 in a fund that gives annual return of 10%:

- After the end of first year the investment becomes ₹1,10,000.
- In the second year, 10% interest is calculated on ₹1,10,000 which becomes ₹1,21,000.
- It becomes more than ₹2,59,000 by the 10th year.
- At age 30, that money turns into more than ₹17,45,000.

This phenomenal capital growth shows how time plays such a key role in compounding.

The longer it remains invested, the greater the growth.

Warren Buffett: The Embodiment of Compounding in Practice

So the most famous and relatable compounding example is Warren Buffett, an investor arguably considered as the best of all time. Buffett is undoubtedly talented, but his wealth doesn't only come from exceptional investing ability—it comes from time.

- Buffett was buying stocks at 11 and kept it up at least into his 90s.
- More than 90 percent of his net worth was created post-60.
- The secret? Compounding was left to work for seventy-five plus years.

Buffett himself has said:

“My riches have come from a combination of living in America, some lucky genes, and compound interest.”

This illustrates that, as important as it is to pick the right investment vehicle, you also need to start early and stay invested.

The Rule of 72: Approximating Doubling Time

Linked to compounding is another useful concept called the Rule of 72, which gives you a quick way to determine how long it will take for your investment to double, given a constant annual rate of return.

- With a 10% return, money doubles in about 7.2 years.
- At 6%, it would take 12 years.
- At 12 percent, it would double in 6 years.

This rule demonstrates: relatively small difference in interest rate can make a big difference in value of investment tomorrow.

Time Value of Money: The Most Important Concept in Finance

Integrally related to compounding is the concept of the time value of money (TVM). It assumes that 1 rupee today is more valuable than 1 rupee at a later point of time, because it has potential to be invested and earn monies. This is a basic concept in second-year college investment analysis, financial planning and capital budgeting courses.

- ₹1,000 coming to you today has a potential to make you more returns or gains.
- The same ₹1,000 10 years later would have lost value to grow on.

TVM demonstrates the price of postponing our investment decisions. For instance, someone who waits 10 years to invest ₹5,000 a year could reap much less than the person who starts early with the same total amount invested.

Key Takeaways: The Importance of Early and Regular Investment

- Time is more powerful than timing: Efforts to “time the market” are less productive than simply starting early.
- Little is big: Small, regular investments can compound into large sums.
- You pay more than it seems to wait: compounding potential is diminished in every year lost.

In summary, the ability to compound and the time value of money is one of the most compelling reasons to invest as soon as you can and continue at a steady pace. These are the principles not just for becoming rich to be applied per person rather the basis of all long-term financial planning including retirement preparation, children's education and asset building.

1.3.2 Building Long-Term Financial Security

Investing is not just about growing your wealth -- it's also laying the groundwork for financial security that can sustain you and your responsibilities at various points in life. Financial freedom Many define financial freedom as the point at which you can afford to pay for future expenses or unexpected costs without having to live pay cheque to pay cheque. This security stems from a patient practice of long-term investing based on clear financial objectives and sound asset allocation.

Simple saving is often inadequate to achieve important life goals, especially as the purchasing power of money erodes with inflation over time. On the other hand, investments offer the prospect of inflation-adjusted returns and make it easier to match time horizon for different goals. For instance, plans to purchase a home, pay for children's higher education, start a business or retire in comfort are long-term commitments. To achieve these goals, vehicles such as equity mutual funds, Public Provident Fund (PPF), National Pension System (NPS) or diversified portfolios would be best suited.

Consider the following example:

For example, let's assume a 25-year old invests ₹5,000 every month in an equity fund and the amount grows at 12% annually, they would have around ₹85 lakh by age 50. With that kind of money, we could send our kids to college, buy a house or have some cash in retirement. Compound interest and consistent investments over time are the cornerstones of that sort of financial stability.

Additionally, long-term investments can build passive income streams to supplement your spending forever once you stop working for that active income. These income sources may include:

- Yields from stocks and mutual funds
- Income from bonds or fixed deposit interest etc.
- Rental income from real estate

That income lessens salary or pension dependency and is a major driver of financial freedom especially in your later years. By being able to depend on their own investments for income, it brings some peace of mind in the long-run.

Then there is a critical ingredient to wealth which is called, diversification. One type of asset can be very risky. A well diversified investor has a portfolio which includes stock, bonds, real estate and other categories of investments that respond differently to economic factors.

Diversification provides:

- Sobering up the market: A decrease in one asset class could be balanced out by gains in another.
- Stable returns: “By combining high-growth and low-risk investments it reduces the overall volatility of the portfolio.”
- Capital protection: Just in case the markets go belly up, having safer instruments means some of your wealth is safe.

Financial stability over the long-term is also heavily correlated with one’s financial habits and discipline. Not making decisions at a drop of hat, sticking to the averages and visiting one’s portfolio from time to time will continue to contribute toward the strength of assets in the long-term. Setting clear goals -like “retirement corpus by age 60” or “child’s education fund by 18”- keeps investment focus aligned over time.

Finally, financial security is not a point but a process – dynamic and continuing. It demands to be attentive to things like marriage, children, work changes, hiccups in health. By checking in on your investments periodically and adjusting them as much as necessary to remain aligned with your changing needs and goals, you’ll be able to make consistent long-term progress toward financial security.

1.3.3 Investment to hedge against Inflation

Inflation is the secret enemy of money. It simply reduces the real value of savings. ₹1,000 today can become ₹1,600 in ten years at an average rate of 5% p.a. This is because money left idle has a fat chance of getting devalued with time.

Saving accounts and fixed deposits typically give returns between 3–6% which barely beat inflation. So whilst the nominal amount of savings goes up, the real value or purchasing power, goes down.

Now, as we know, investments are a great hedge against inflation. Most asset classes like stocks, real estate and commodities generate returns over time that are greater than inflation. For instance, in normal situations equity markets give an average annual return of 10–12%, and due to the nature of equities) inflation is beaten so that money does not lose its value.

Another avenue to protect against rising prices is investing in inflation-protected securities, like government bonds that are indexed to inflation. Likewise, gold is thought of as a safe investment in times of inflation as it retains its value when the currency's purchasing power declines.

Through an intelligent investment strategy, people can work to ensure that their wealth doesn't just gain in size but retains its real worth as the cost of living increases. This safeguards their quality of life and allows them to pursue long-term goals without money-related worries.

1.4 The role of investment in growth

1.4.1 RATBIT for Investments in Productive Assets

Mobilisation of savings is the act of gathering together (momentum) savings from individuals, households or institutions and channeling them into more productive uses. Saving money is not a financial decision, but rather an economic one: It has real value only insofar as it is productively employed to drive investments, production, infrastructure and R & D. When static, savings make minimal contributions to the national development process; but when activated with efficiency, they serve as investment fuel for economic expansion.

Meaning of Mobilisation of Savings

All segments of the economy -- households, businesses and institutions -- save some of their income for future use. These savings, if simply left as cash or placed in a non circulating but low yield position, are not useful to the economy. But when this saving is channeled into banks or flows through other formal financial outlets, it enters the capital pool of the financial system. Banks, insurance companies, mutual funds, pension funds and non-banking financial companies (NBFCs) are the main institutional investors who gather these funds for providing it to those individuals who need them.

Key points:

- Savings that aren't invested don't do the economy any good

Saving money and then not investing doesn't help with putting people to work, building new roads or expanding industry.

- Savers and users are brought together by the financial intermediaries

Institutions also collect dispersed savings and direct them toward businesses, governments and other sectors that require capital.

How Mobilisation Works

Mobilising savings goes via at least three channels in which money is taken from the public and channelled towards sectors that are in highest demand. These include:

- Banking Sector

Commercial banks are pivotal in that they take the deposits from people and lend them to businesses for expansion, infrastructure or working capital. For instance, the money in fixed deposits or savings accounts is actually lent by banks for things like factory building, new machinery and real estate development.

- Capital Markets

Stock exchanges and bond markets offer a way for individual and institutional investors to purchase securities of companies that are sold by those companies. This enables companies to generate funding for growth, R&D or M&A. Investors receive a return related to dividends and capital gains while companies get long term capital.

- Government Instruments

Governments issue securities, such as bonds and treasury bills, to raise money for public projects. The savings collected here are invested for constructing infrastructure like highways, railways, water supply schemes and for implementing welfare programs.

These institutions convert small isolated pools of savings at a grassroots level into widespread capital that can be used for economic growth.

Importance of Mobilisation

There are several dimensions of economic health and growth to which mobilisation of savings into productive assets is important.

- Prevents wastage of idle funds

Once savings are mobilised, they represent a productive investment not passive hoarding and earn income or returns.

- Pools small savings for big impact

Savings as individuals might be small, but collectively through banks and financial markets, they can serve as a powerful source of funds for industrial and national projects.

- Encourages entrepreneurship and industrial development

The mobilisation of savings allows the emergence of new firms and expansion of existing ones via access to finance, creating employment opportunities and innovation.

- Strengthens financial inclusion

Mobilisation broadens access for underserved people to financial services which encourage them to use the formal economy and save over time.

Example

To understand this, let's take the example of a household that puts ₹1,00,000 in a fixed deposit with a commercial bank. This sum, along with deposits of like nature from thousands of others' households creates a pool. The bank could lend the money to a manufacturing firm looking to construct a new factory, for example. The company takes the loan to purchase land, hire workers and install machinery. Accordingly, jobs are produced, industrial output rises and the economy benefits from higher production as well as consumption. In the interim, the household is earning interest on its deposit — a win-win for both the individual saver and the economy as whole.

1.4.2 Investments and Capital Formation

Capital formation is an essential component of any economy as it represents the growth in accumulation of real, tangible assets -- such as factories and machinery -- that can be used to produce goods and services. It entails the acquisition of physical capital machinery, tools, buildings/transit systems/roads. These are critical to increase a country's ability to produce, innovate and support sustainable economic growth over the long haul.

Fundamentally, capital formation is the conversion of savings and investments into fixed assets that are utilized in productive activities. Without adequate investment, economies cannot expand production, modernize their industries or compete in the world. In other words, it is investments that determine capital formation; the amount of investment leads to the decision regarding which part/sector of a country should produce and which part/sector don't.

Definition of Capital Formation

Capital formation Capital Formation is a process of expanding the stock of capital through the investment as the saving in income producing assets. This includes investments in:

- Physical capital including factories, equipment, machinery and infrastructure ie. transport networks.
- Infrastructure, such as power stations, communication systems and public utilities.
- Human capital, in the form of education, training and health care systems.

Key ideas:

- Enhances the economy's capacity to produce, allowing more output with better efficiency.
- It builds on sustainable growth record, employment creation and higher incomes.

ROLE OF INVESTMENTS IN CAPITAL FORMATION

The act of investment is the process in which capital formation takes place. When people, companies or government invests money in capital goods – physical or human (like factories, machinery and education facilities) they add to the economy's stock of productive resources.

Different dimensions of investment, to the creation of capital, are:

- Industrial Investments

Capital used in factories, plants and machinery specializes production, lowers reliance on imported products as well as aids the industrialization phase. For instance, a steel manufacturer that invests in modern furnaces or automation technology raises its level of output and efficiency.

- Infrastructure Investments

Roads, railways, airports, electricity grids and communication infrastructure aid the smooth functioning of all sectors. Infrastructure is commonly labelled as the “backbone” of economic activity, facilitating the smooth and effective mobility of goods, services and people.

- Human Capital Formation

Educational, skill and health investments improve workforce productivity. A more fit and skilled population can far better accommodate to technological change and engage in higher-value economic pursuits.

- Foreign Investments

FDI ushers in not only capital but also sophisticated technologies, world class management skills and access to the global supply chain. FDI frequently encourages the generation of domestic investment and contributes to an increase in aggregate capital formation.

Effects of formation of Capital in the Economy

The positive effects of capital formation are quite long range, and crucial for economic advancement. The main effects derived are:

- Boosts Productivity and Output

Better tools, machines and infrastructure allow businesses to produce more efficiently and on a larger scale. This results in a higher national income and higher standard of living.

- Encourages Innovation and Modernization

By investing R&D, you also invest in new technology, better products and competitive benefits. More often than not, those are the countries where capital recovery gets due priority, and they become innovation leaders.

- Enhances Global Competitiveness

A nation sitting on a strong capital structure – modern infrastructure, skilled labor and effective industry – can better mix it up in the competitive global economy. Capital creation also encourages other investment and trade relationships to join in.

- Promotes Sustainable Development

Investment in clean energy and green technology and sustainable infrastructure creates a long-term environmental benefit; it makes the economy more resilient.

Example

Take the case of government-sponsored investment in renewables infrastructure -- like that of solar and wind power plants. This investment grows the nation's capacity to produce energy, decreases dependency on fossil fuels and provides jobs in green energy. The stock of productive capital increases with time, energy becomes more available and sustainable, and the economy enjoys lower energy prices because it is cleaner.

1.4.3 Employment and GDP Growth effects

Investment is a key determinant of both employment creation and Gross Domestic Product (GDP) growth. Investments also have a multiplier effect on the economy because investments in industrial projects, infrastructure, technology, service etc trigger economic activities — both directly and indirectly — which lead to creation of jobs. Investment in addition to increases of productive capacity makes higher national production and sustainable increase of its GDP. Positive employment and GDP effects of investment do not only occur immediately, but also in the longer run, which cascades over other variables such as consumption and income levels and through this cascade towards industrial expansion.

Employment Generation through Investment

Investments have a double/triple impact on employment, generating jobs not only from the investment themselves but also in different sequences and sectors of the economy.

- Direct Employment

This is true for the jobs that are created in the industries or companies into which the investment goes. So to take the metaphorical turn, in establishing a factory you need workers to work on the floor but also management, maintenance and administrative staff. This is the most tangible demonstration of job creation.

- Indirect Employment

Investments also generate employment in related industries and value chains. These may include:

- o Raw material and component suppliers
- o Transportation/logistics providers- services adding value to the core activity of the company
- o Staff service suppliers (e.g. machine maintenance, security and catering)

These jobs do not lie inside the company on which there is an initial investment, but are existing jobs that were created thanks to this investment.

- Induced Employment

As the workers, direct and indirect, spend their incomes they create demand in other parts such as retail industry rents, accommodation and food services expenses etc. The additional spending causes more jobs to be created, which is what economists refer to as the multiplier effect.

In this manner one large investment can set off a virtuous cycle that increases employment in much of the economy.

Investment and GDP Growth: The Link through the Expenditure Method

It is measured as the value of all goods and services produced in a country's economy (GDP) using the expenditure method, which can be expressed as:

I am the Investment – a major ingredient in GDP. Investment adds to national income in two ways; first by adding to the stock of physical capital, and second as a consequence of its effects on pushing the level of goods and services produced up. • Increased Production Capacity

And when new money is spent on factories or other investments in the future, those purchases will lift the economy's capacity to produce even more goods and services. This results in higher output, and this directly adds to GDP growth.

- Higher Income and Consumption

With employment and wages shooting up under investment-led growth, household income is on the rise. This higher income leads to more spending (C), which adds to GDP and motivates further investment —a virtuous cycle is established.

- Productivity and Efficiency Gains

Productivity-enhancing investment in new machinery, digital infrastructure and process innovation create capacity to produce more for less labour input which increases profitability for businesses. It does this by raising the national standard of efficiency and competitive capacity.

Broader Economic Impact of Investment

In addition to the short-run impact on employment and output, investments have transformative effects: they change economy's structure and resiliency. These include:

- Development of Industrial and Service Categories

Strategic investments encourage businesses to expand, innovate, and diversify. In the meanwhile, enabling services -IT, finance, logistics- scale with demand.

- Infrastructure Development and Economic Acceleration

Investment in roads, ports, power networks and digital infrastructure shortens transport times, improves connectivity and increases the fluidity of goods and people. This stimulates economic activity in all regions.

- Encouragement of Innovation

Research and development spending encourages technology innovation, new product creation, and superior business processes. This is the key to long-term competitiveness and the creation of high value added sectors.

- Strengthening of International Trade Competitiveness

A developed, well-networked and creative economy is more competitive in the global marketplace. This will bring in more exports, foreign exchange earnings and integration with the world supply chains.

Example

For example, the foreign company may be a multinational corporation building an automotive plant in India. This single investment leads to:

- Direct employment on assembly lines, in engineering, as managers and for maintenance.
- Indirect employment in production of parts, supply of raw materials, packaging, warehousing and logistics.
- Induced jobs in hospitality, retail, housing and public transportation as employees spend money that boosts local economic activity.

Moreover, the power plant stimulates industrial production as well and enhances tax revenue and GDP through value-added productiveness. The greater economic activity leads to improvements in local infrastructure and may also attract more investment into the area.

1.5 Summary

- ❖ Savings is stand for the amount, which is not nothing left and keep in store something.
- ❖ Investment is when one invests their savings into financial or tangible assets in hope of the return.
- ❖ Savings are concentrated on safety, liquidity and short-run needs.
- ❖ Asset allocations are designed for accumulation, growth and long-term financial needs.
- ❖ Savings and investment are closely linked—the one supplies the base from which the other extracts its sustenance.
- ❖ There are major differences between savings and investments with respect to risk, return, liquidity and time frame.
- ❖ Investing: The key to wealth aggregation is by compounding and time value of money.
- ❖ Long term investments offer financial security allowing your to rely on something other than short-term savings. ❖ It is an investment that protects against inflation with returns that exceed increasing prices.
- ❖ At the broader economic level, investment puts it's — shoe leathers on saving in to productive asset, it is contributing to economic growth.
- ❖ Capital investment contributes to the growth of industry, infrastructure and innovation.
- ❖ Inwards investments create jobs, increase household incomes and directly contribute to GDP growth.

1.6 Key Terms

Savings – Income not used for consumption but kept for the future.

Invest The use of money in a particular manner, such as an investment.

Liquidity – The ability of an asset to be converted into cash without detrimentally affecting its price.

Risk - The potential loss in a sum of money due to uncertainties.

Return - Earned profit or gain on an investment over time.

Compound Interest -Interest earned on invested principal and on interest that has already accumulated.

Capital formation – Production of physical capital and financial resources that increase productive capacity.

Inflation – The general increase in the price of goods and services, leading to decreased purchasing power.

1.7 Descriptive Questions

Define savings and investments. What is the relationship between them in personal financial planning?

Explain the major objectives of savings and investments, giving examples where appropriate.

Distinguish between saving and investment in terms of risk, rate of return, liquidity and time.

Describe the effect of compounding and time value concept in creation of wealth.

What does consider a good long term investments for Individuals and families financial future?

Explain how investments are used as an inflation hedge and protect purchasing power.

Describe the nature of investments as a key determinant to mobilise savings and to promote capital formation in an economy.

What are the macroeconomic effects of investments on job creation and GDP growth?

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1.9 Case Study

Investment and Personal Wealth Creation, and Economic Growth

Introduction

Investing is a key feature in inclusive financial planning and development. For individuals, it is a way to generate wealth and long-term financial security, and hedge against inflation. In the economy, investments are found to steer savings into productive assets, create employment and drive GDP growth. Alas most investors are confronted with issues such as misinformation, fear of taking risk and wrong asset allocation. This case study examines the role of investment, challenges faced by individuals and solutions to these problems on both personal and societal levels for prosperity.

Background

Rahul 32, is a working professional who has a steady source of income and saves almost 20% of his monthly income. Until recently, he parked all of his savings in a bank account, placing a premium on safety and liquidity. With compounded inflation and rising life goals like children's education, retirement planning and buying home seemed beyond reach with only savings of money for Rahul.

He tried his hands with mutual funds, government bonds, real estate and stocks. But Rahul was apprehensive considering the risk, lack of understanding and fickle market fear. He also realized how his friends who started investing early were taking advantage of compounding and creating long-term financial wealth.

Issue 1: Awareness and Financial Literacy

A lot of people are afraid to invest because they don't understand financial markets or investment options. It is this ignorance that causes them to rely too much on savings.

Solution: Hold financial literacy programs uniformly and have some easy-to-understand resource available to help people build their confidence by investing.

Problem 2: The tendency to avoid risk with an inefficient allocation of assets

Many people end up avoiding investments because they are afraid of losing money while some others go all in on one asset which carries more risk.

Solution: A well balanced asset allocation plan, that allocates funds to shares, bonds and safe investments would mean you lower your risk but not your returns.

Problem 3: The Inability To Outpace Inflation

Traditional saving methods such as fixed deposits or savings accounts are also low yielding returns (which at times are even worse than the inflation rate reducing your purchasing power).

Solution: Invest in stocks, real estate or inflation-protected securities to make sure that your returns outpace inflation and you can conserve the wealth during those bragging years.

Caselet Activity (MCQ)

Q: What does investing add to simple saving is best explained by which of the following?

- a) Investments guarantee zero risk
- b) Investments yield better returns and beat inflation
- c) The growth factor for savings is always larger than that of investments.
- d) Personal savings builds long term wealth without risky investments.

Answer: b) Investments give higher rate of return and have inflation beating returns.

Explanation: Investments have the potential to produce greater returns and protect your purchasing power compared with savings, so are key in building wealth over time.

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Unit 2: Investment Avenues

Learning Objectives

1. Comprehend about investment avenues and its purpose in financial planning.
2. Describe the various investment opportunities in financial markets.
3. Evaluate the risk and return of investment opportunities.
4. Assess the appropriateness of investments for specific short, medium- and long-term needs.
5. Analyse the traditional and new investment options in terms of safety, liquidity and return.
6. Look at how investing in several tanks lowers the likelihood of total doom.
7. The ability to critically invest by identifying investment choices according to the knowledge of personal financial objectives and level of risk.

Content

- 2.0 Introductory Caselet
- 2.1 Real Assets vs. Financial Assets
- 2.2 Traditional Investments
- 2.3 Alternative Investments
- 2.4 Summary
- 2.5 Key Terms
- 2.6 Descriptive Questions
- 2.7 References
- 2.8 Case Study

2.0 Introductory Caselet

“Investing in the Right Media Sources To Have A Balanced Investment Portfolio”

Ritika, a 29-year-old architect who has been on the job for two years and is finally building monthly savings. To this point, she has kept her money in a savings account,

prioritizing safety and accessibility. But when she attended a financial literacy workshop in her shop, it dawned on () that saving alone won't get her where she wishes to go financially.

Her father suggests conventional choices like fixed deposits and gold, which have for ages been relied on due to their stability and low risk. Her colleagues at work, however, are persuading her to invest in equity mutual funds and stocks, harping on the high returns that could pile up over the years through compounding. When Ritika goes to a financial planner she is introduced to other options of Public Provident Fund (PPF) for retirement corpus, bonds for regular returns and real estate for long-term assets.

Now, Ritika's on a spot. She wants to keep liquidity, in case of emergencies, ensure safety for the medium-term and at the same time leverage growth prospects for her long-term goals like buying a house, travelling abroad and planning for retirement. Every investment option has its own level of risk, return and duration which she must agree to pit against each other before deciding.

Critical Thinking Question

As Ritika how would you structure your investment portfolio by allocating funds in different instruments? Which considerations — from age, to a steady stream of income, to your risk tolerance and financial goals or inflation — would most shape the way you invested your payouts, and why?

2.1 Real and Financial Assets

2.1.1 The Definition and Examples of Real Assets (Real Estate, Gold, Land)

Real assets Real assets are tangible, physical items that gain their value from their intrinsic properties and can either produce income or be appreciated over a period of time. As opposed to financial assets (stocks and bonds), which are claims on future cash flows, real assets can be owned and physically possessed. They are frequently viewed as a form of protection against inflation, in that their value generally climbs when overall prices do, so investors' purchasing power will remain largely intact.

Real assets can be an important component in the preservation of wealth and growth of capital over time. Investors use them to enlarge and protect portfolios and limit exposure while enhancing risk management in uncertain financial markets. Even though these investments usually involve a large upfront investment and also have longer holding periods, they are more stable and less sensitive to day-to-day market movements.

Examples of Real Assets

Real Estate

Real estate is a major and one of the most commonly held categories of real assets. It includes

houses, commercial spaces, industrial units, and rental buildings.

o It offers dual benefits:

- Rental income, which produces regular cash flow.
- Capital appreciation, here property values generally rise with time owing to demand, area development and infrastructure expansion.

o Real estate is long-term holding and needs lots of initial investment.

o Example: Buying a residential apartment for ₹50 lakh and renting it at ₹20,000 per month. Over a decade, the property value will grow to ₹80 lakh or more offering rental income and capital gain.

Gold

Another age-old real asset is gold, which has a history of serving as both store of value and safe-haven investment in times of economic tumult.

o It is liquid, so it is easy to sell or trade compared to land or property. o Gold Traditional Preference – In many societies, particularly in India (where it's worn as jewellery, used to make coins and for investment) gold has long been considered the preferred investment.

o It acts as a hedge against devaluation of currencies and inflation.

o Example: Families that purchased gold jewels for weddings it is not only a wedding purpose and festival also to store the value from one generation to another.

Land

Classic examples of real assets include land, especially agricultural land or undeveloped plots (as opposed to developed property), with long-term value potential.

o Land is limited in quantity and thus it is scarce resource; as a result its value is known to appreciate over time.

o It pays off often well when urbanization sprawls or infrastructure projects boost the developing value of the surroundings.

o For Example, buying a farmland at the outskirts of a city which is about growing may turn to bring good returns in future if this is later zoned for commercial or residential purposes.

Key Characteristics of Real Assets

This type of assets is different from financial instruments in multiple aspects. Knowing what makes them function is important when it comes to investing.

- Tangible and Physically Observable

Real assets are tangible. Investors can check them out, order them for their use or lease. There is a certain level of perceived security and intrinsic value that comes with having something tangible that you do not always get out of financial instruments.

- Require Large Initial Capital Investments

Purchasing real assets can come with hefty barriers to entry, making it difficult for the average Joe investor without financing to get in on the good things. For example if you want to buy real estate or a large lot, there is likely going to require a large payment up front or a mortgage.

- Frequently Illiquid and Slow to Process Transactions

Real estate cannot be easily or rapidly converted into cash. Sales of a house or a piece of land might take weeks, even months because of the legal process and market conditions as well as negotiation.

- Relatively Stable in Value

Given the relative illiquidity, real assets generally display low short-term volatility levels when compared to financial markets. Their value is affected more by factors that take years to develop, such as urbanization, population growth and changes in commodity prices, than what investors think of them day to day.

- Used as Protection Against Inflation

In times of higher inflation, real assets generally maintain or grow in value, providing a built-in hedge against inflation. Real rents on property and real land prices both typically increase with inflation, thus maintaining returns in real term terms.

2.1.2 The notion of Financial Assets (Stocks, Bonds, Mutual Funds) and their Examples

Asset items are licensed as intangible assets and then tested for impairment along with other financial assets. Financial assets are intangible, and unlike real assets like property or gold they do not have a physical existence. Rather, the value of these tokens is driven by underlying contracts, such as the commitment to repay a debt, pay dividends or share ownership in an enterprise. These assets are underpin the functioning of financial markets by enabling the transfer of funds from savers to borrowers, investment, economic expansion and wealth creation.

Personal and institutional portfolios both include financial assets. They also are flexible, liquid and come in numerous iterations to suit investors of all stripes. And they are the backbone of the modern financial system, allowing capital resources to be allocated efficiently.

Examples of Financial Assets

Equities (Shares)

Shares or stocks, also known as equities, indicate partial ownership of a company. When people buy shares, they are buying a share of the company and a right to its assets and profits.

o 2 ways to get return in Equities:

- Dividends, which are regular payments from company earnings.
- Capital appreciation i.e. an increase in the market value of the shares over time.
- o They are generally considered high risk, high reward investments that will go up or down given the mood of the market or perhaps how a company or countries economy is faring.
- o Example: The purchase of Infosys shares offer an opportunity to gain from capital appreciation and dividend income on regular basis in case the company performs well.

Bonds

Bonds are instruments of debt issued by governments, companies or public sector undertakings. When an investor purchases a bond, the investor is making a loan to the issuer and agreeing to receive fixed interest payments for a certain period of time, followed by the return of their principal at maturity.

- o On the other hand, knowing that you can cash in your chips at face value without losing money is reassuring and also preferable to having an equities portfolio.
- o The level of risk and return varies: depending on the creditworthiness of the issuer—government bonds are quite safe, but corporate ones higher returns at a higher risk.
- o Example: if you invest ₹1,00,000 in a 10year GOI bond with an annual coupon of 7%, then the income is ₹7,000 per annum plus repayment of principal in full at maturity.

Mutual Funds

Mutual funds are investment programs that raise money from many investors to invest in a diversified portfolio composed of stocks, bonds or a mix of both.

o Mutual funds, which are managed by professional fund managers can provide investors with diversification and expert management of the markets at relatively little effort.

o There are differences in risk and return of mutual funds according to their types:

- Equity funds (more risk, more return)
- Debt funds (with lower risk and stable return)
- Hybrid funds (mixed risk-return) • Example: A monthly SIP of ₹5,000 in an equity mutual fund for a period of 15–20 years can create substantial wealth on account of the power of compounding and market-linked growth.

Key Characteristics of Financial Assets

There are some important distinctions between financial assets and real ones. Understanding these attributes is how an investor can decide which instruments are best according to their objectives, liquidity requirements and risk tolerance.

- Intangible and Electronic or Paper in Nature

There is no "money in the bank". They are in digital form (as with the demat account) and can be held as legal open proof of ownership or evidence of entitlement to income. That way, they're easy to organize, follow and share.

- Extremely Liquid Compared to Tangible Assets

Nearly all financial instruments, whether publicly traded or not, can be converted to cash easily. This means that investors have the opportunity to easily enter or exit positions, and thus are able to manage their portfolio efficiently.

- Subject to Market Risk and May Be Sensitive to Market Conditions

The price of a financial asset can experience extreme volatility due to a variety of factors such as company performance, interest rates, geopolitical events and investor sentiment. For example, stock prices can be up or down in a single day following earnings reports or economic data.

- Require Lower Initial Capital

Financial assets are also available to small investors, whereas real assets like land and real state can be far more accessible. One can start investing in mutual funds or stocks with ₹500 to ₹1,000, thus it is accessible to a larger percentage of the population.

- Give Access to Different Financial Instruments for All Risk Profiles

The financial markets provide a range of investments from risk-free government bonds and efficient portfolios to high-risk equity options. This enables investors to construct customised portfolios that fit their investment needs, timeframes and tolerance for risk.

2.1.3 Comparative Analysis: Risk, Liquidity and Performance

So let's compare real and financial assets on some important investment parameters.

- Risk

- o Real Assets: Often less volatility but risks of property title disputes and natural disasters or flat prices. Gold is more secure but still has to follow global commodity price swings.

- o Financial Assets: More volatile since there are risks of market, interest rate and credit.

Equities are less safe; bonds and debt instruments are more safe.

- Liquidity

- o Real Assets: Illiquid - Transactions in real estate or land take time, legal formalities and substantial costs. Gold, though, is more liquid than other real assets.

- o Financial Assets: An almost wholly liquid class, with equities and bonds traded in active markets that are capable of being bought/sold immediately. Redemption with mutual funds is also possible within a few days.

- Returns

- o Real Assets: Generally offer moderate and sometimes uneven returns. Real estate throws off rental income and appreciation; gold, for the most part, only value preservation and long-term gains.

- o Financial Assets: Offer greater returns, especially with shares, but are more volatile. Bonds offer stable and consistent returns, while mutual funds strike a balance between safety and growth.

“Activity: Separating Real From Financial Assets,”

Give four examples of investments that you or your family know about (like real estate, precious metals, shares of ownership in companies, etc). Classify each as a real asset or financial asset. Then consider which of the two categories is more liquid and which is more stable in a long run basis. Support your opinion with examples.

2.2 Traditional Investments

2.2.1 Features & Returns of Fixed Deposits (FDs)

Fixed Deposits (FDs) are one of the most common and trusted savings options in India as well as in numerous other countries. Available with banks and non-banking financial companies (NBFCs), an FD is a simple investment product that lets people place a fixed sum of money for a fixed period usually at a fixed interest rate. Both the principal and interest are repaid to the investor according to a predetermined agreement. FDs are of special interest to risk averse investors who prefer capital protection, certainty of return and minimum risk over possibly higher but uncertain returns from market-related instruments.

Definition of Fixed Deposits

Fixed deposit is a time-sensitive investment and the depositor invests an amount given in the bank/NBFC for a fixed period which earns interest at fixed rate. Typically, the interest is higher than that provided by regular savings accounts and the rate is fixed at the time of deposit, despite market changes. Due to their stability and safety, FD schemes are particularly attractive to the retirees and conservative risk-averse investors interested in short-to-median term financial well being.

Detailed Features of Fixed Deposits

There are various characteristics inherent to FDs, making them attractive and convenient for a wide range of investors:

- Tenure Flexibility

Investors have a wide range of tenures to choose from (from 7 days to 10 years) based on their liquidity requirements and investment objectives. Short-term FDs give you quick returns, while long-term FDs are good for goal-based saving, such as education or retirement.

- Fixed Interest Rate

Fixed Deposit interest rate is fixed for the entire deposit tenure period. This is especially beneficial when market interest rates are falling, as the investor still earns the higher contract rate.

- Low Risk and High Safety

FDs are presumed as one of the safe form of investment. In India, scheduled banks are required to insure deposits up to ₹5 lakh by the Deposit Insurance and Credit Guarantee Corporation (DICGC), an additional layer of protection. Also, the banks and NBFCs that provide FDs are regulated by RBI – so there is some level of scrutiny and regulation.

- Withdrawal Rules and Penalties

You can also preclose an FD, but generally this will attract a penalty of 0.5% to 1% over the appropriate interest rate. Certain banks enable partial withdrawal or sweep-in provision for holding the deposit is there and that investors must take note that premature withdrawals sting in terms of effective returns.

- Cumulative vs. Non-Cumulative Options

INVESTORS MAY PICK Interest can be received in a variety of ways:

- o Accumulative FDs: Interest is to be accumulated and paid at the expiration. Great for longterm investors seeking to build their retirement savings.

- o Non-Cumulative FDs: Interest paid on a monthly, quarterly, half-yearly or yearly basis. Great for those who want a income stream eg retirees or casual workers.

- Taxability of Returns

Interest received on Fixed Deposits is entirely taxable as per Income Tax Act. TDS, if the annual interest is more than ₹40,000 (₹50,000 for senior citizens), is 10%. In that case, investors may have to pay tax as per their income tax slab rate.

Returns on Fixed Deposits

The returns for FD are Fixed and knowable, but it depends on the period/deposit tenure you choose, Bank or Financial Institute to whom investment is done and the age category in which depositor comes.

- Typical Interest Rates:

Interest rates offered by most of banks, are in range of 5% to 7% per year, which could depend on tenure and the interest rate cycle.

- Senior Citizen Benefit:

Senior citizens are usually given an additional interest of 0.25% to 0.50%, rendering FDs an ideal choice for retirement planning.

- Inflation Consideration:

FDs are safe, but the returns may not necessarily outperform inflation in all cases, particularly when it's running rampant. For instance, if inflation rate is 6.5% and the FD offers 6%, then real return (inflation-adjusted) is in shortfall.

Illustration

Let's take an example to comprehend FD returns:

- An investor makes an investment of ₹1,00,000 in a 5-year cumulative fixed deposit at annual interest rate of 6% compounded annually.

- Using the compound interest formula:

Did You Know?

“Do you know that in case of a fixed deposit, the interest rate doesn’t change even when the market rates fall during the term? This makes FDs as an appealing option for conservative investors to get assured returns, however the situation is that at some points which may not be in sync with inflation.”

2.2.2 Bonds -Government & Corporate Govt bonds GOI securities Treasury bills State loans Efforts made for expanding govt and corporate bond market in the last couple of years have been summarised below .Govt Securities (G-sec) trading and settlement also now through an electronic order matching _ system on NSE’s Capital Market Segment.

A bond is a form of fixed-income security in which an investor lends money to an entity, which borrows the funds for a defined period of time at a particular interest rate. The bondholder is a lender, not an owner of equity (as is the shareholder). The borrower (issuing the bond) agrees to make interest payments to the investor (the coupon payments) and repay the principal at maturity date. Institutions use bonds to obtain funding with which they can purchase items like infrastructure, expand their business and much more.

Types of Bonds

There are two broad categories of bonds that most investors should be aware of:

- Government Bonds

These bonds being issued by the central, or state governments are backed by sovereign rulers and accordingly are considered to be most secured form of debt securities. Due to their lower risk, they tend to yield less than corporate bonds. For instance, a 10-year government bond with a 7% annual interest provides Regular income and has low risk of default.

- Corporate Bonds

They're made by private (and sometimes public) companies that are trying to raise money for the business. Since they are riskier — a company could fall into default or bankruptcy and be unable to pay its debt — their interest rates are higher. For example: A corporate bond paying an annual interest of 9% gives higher returns than a government bond, however, the investor takes on the risk that the company takes not to be able to pay back their debt.

Key Features of Bonds

There are a few crucial features of bonds that investors need to think about before they invest :

Fixed Income: Investors receive regular, pre-set interest/coupon payments, so bonds are appealing to those looking for consistency.

- **Maturity:** The period of maturity varies from a few months (short-term) to decades (longterm).
- **Appropriateness: (Credit Ratings/Agency)** Companies like CRISIL, S&P or Moody's rate bonds (AAA, AA etc.) to give investors an idea of whether a company is financially stable and how likely it is to default.
- **Liquidity:** Most bonds can be traded in the secondary market, and how easily you can sell a bond depends on demand, supply and the type of bond.
- **Tax treatment:** Interest on bonds is usually taxable. However, some government bonds may provide tax exceptions or reductions that can make them more appealing for individuals in higher tax brackets.

Returns on Bonds

The return rate varies with the type and risk of the bond:

- **Government issued bonds** generally offer lower but very stable returns (5%–7%), perfect for a risk averse investor.
- **Corporate bonds**, on average, return more (8-12%, depending on the credit quality of the company and market conditions).

Illustration

For instance, if an investor invests ₹1,00,000 in a 10-year government bond at the interest rate of 7%, they will get:

- **Yearly Interest:** ₹7,000 (7% of ₹1,00,000) paid out every year.
- **Principal:** ₹1,00,000 after 10 years.

It's this known structure that makes their use very popular with conservative investors as a safe haven investment in their time of need.

2.2.3 Ownership of Equity: (and) Capital Appreciation

Shares or stocks are referred to as equities which signify a unit of ownership in an organization. When you buy shares, you become a co-owner and enjoy a slice of the company's assets and earnings. Whereas bonds are debt, equities are ownership. So the share of shareholders increases and decreases with how the company fares in the

market. They offer massive growth potential and enormous profit like no other asset class – as companies expand and make money, shareholders make a fortune with dividends and capital appreciation.

Key Features of Equities

Lifeagent Equity Differentiators There are a number of unique characteristics and advantages to using equities that set them apart from other investment items:

- **Owning a stake:** Shareholders have voting rights in certain company matters, such as electing directors or approving mergers, which gives them a say in the governance of the company.

Dual Sources of Returns:

o **Dividends:** Some of the company's earnings paid out at regular intervals to shareholders, typically in cash. A company with stable earnings such as FMCG is known to generate constant dividends.

o **Capital Gains:** The gain realized from the sale of stock at a price higher than purchase price. High growth companies (such as technology companies) tend to focus more on capital value.

- **Liquidity:** The shares of the listed are most traded on stock exchange like NSE and BSE in India. This high liquidity enables the investors to easily buy or sell shares as per the market situation.

- **Volatility:** The valuation of equities change often, driven by factors such as company performance, investor sentiment, government policies, interest rate changes and world events. This carries with it risk, but also higher potential returns.

- **Risk Level :** The short term risk associated with equities is higher when compared to traditional investments like FDs, bonds etc. But equities have, over time, been a better long-term wealth creator for investors who can be patient.

- **The Rewards and Risks of Ownership:** Shareholders derive rewards by purchasing a business's stock and watching it grow to become more prosperous, causing stock prices to soar. But during downturns, that leaves shareholders exposed to big losses because equities don't generate returns.

Returns from Equities

Stocks are credited as traditional asset class that have the capability of producing the highest long-term returns. In the past, great markets have returned 10% to 15% in long-term annualized returns. But these returns are not constant or assured since equity performance is driven by market cycles, economic cycles and company fundamentals.

Short-term gyrations can be severe, however long-term investors are typically handsomely rewarded with tremendous capital appreciation.”

Illustration

As just a brief example, one could imagine that someone who invested ₹50,000 in Infosys' shares at some point during the early 2000s would have seen his initial investment grow manifold over the course of next two decades. This indicates how shares can be a vehicle of enormous wealth generation if investments are done with a long-term approach. It is this upside potential that makes investing in shares a favourite option among those who want to grow their wealth over the long-term.

2.3 Alternative Investments

2.3.1 Real Estate Investment Trusts (REITs) & Infrastructure Investment Trusts (InvITs)

Investments in traditional real estate and infrastructure typically require large amounts of capital, long investment horizons and operating complexity. Investment vehicles such as Real Estate Investment Trusts (REITs) and Infrastructure Investment Trusts (InvITs) were brought in to make these asset classes retail investor friendly. Each is a type of collective investment scheme whose money comes from various investors and that invests in income-generating products/assets. These instruments are structured and traded 24/7 from exchange-traded units that enable investors access to real estate and infrastructure returns without having direct ownership or control of physical assets.

Real Estate Investment Trusts (REITs)

REIT is a financial product which was created to invest and manage income generating real estate properties. Rather than buying complete properties (worth in crores of rupees), investors could buy smaller units of a REIT, so as to make real estate available to small investors.

- **Investment Type:** REITs generally own and manage income-producing commercial real estate like office buildings, shopping malls and hotels (although sometimes they also own warehouses).
- **Investor Returns:** Investors receive a return in the form of dividend (from rent) and potential capital gain (appreciation).
- **Liquidity:** Instead of investing in a physical property which is hard to sell on short notice, REITs are listed and can be for the most part bought and sold easily.
- **Accessibility:** Real estate investment trusts democratize real estate investing by enabling people with modest amounts to invest in high quality properties.

Infrastructure Investment Trusts (InvITs)

An InvIT operates similarly to a REIT but is focused on infrastructure assets, which are vital for economic growth. These comprise highways, power generation projects, transmission lines, telecom towers and renewable energy projects.

- **Investment Objective:** InvITs raise money from investors to invest in assets across infrastructure sectors running into generating steady cash flows.

Investor Tally: Investors receive returns in the form of user charges, tolls or power tariffs for a particular project.

- **Role in Development:** Retail and institutional investors are able to participate in infrastructure development — an area that demanded significant capital commitment and had long gestation periods but yielded returns eventually — through InvITs.

Advantages of REITs and InvITs

REITs and InvITs have had several advantages over investments made into real estate or infrastructure directly:

- **Diversification:** By investing in a portfolio of properties or projects, investors reduce the risk that can come with putting money into just one asset.
- **Income Source:** Both products pay out a high proportion of net income as dividends (this is often a requirement under the applicable product regulations) and therefore provide for an income stream.
- **Liquidity:** Because REITs and InvITs are listed on stock exchanges, their units can be easily bought and sold outside of physical assets.
- **Professional Management:** Properties and projects in infrastructure are managed by skilled professionals thereby resulting in increased operational efficiencies and returns.
- **Access:** Minimum investments enable small investors to invest in future large-scale high-value assets.

Example

For example, if an investor buys units of a REIT at ₹500 each on the stock exchange. With this investment, they indirectly own a pool of prime office space. These properties generate rental income from which the investor receives recurring dividends while potentially capitalizing on an increased price of the REIT's unit. This, in turn, enables investors to get exposure to real estate income and upside without buying a property worth several crores or dealing with the management of such properties.

2.3.2 Commodities – Gold Silver Oil

Commodities are standard raw materials or agricultural products that can be traded in large amounts throughout the world. They are central to the economy as they are not only key inputs in production (examples include oil for energy, silver for industrial use) but also as investment vehicles (gold as a safe-haven asset). Unlike equities or bonds, commodities typically have low or negative correlation to all major asset classes (stocks, bonds, and cash) awarding them an important role in portfolio diversification. Commodities are typically added to investors' portfolios as a hedge against inflation, for peace of mind in currency devaluation situations and when investor sentiment is low.

Key Types of Commodities

Out of the plethora of products traded in global markets, gold, silver and oil are the most widely followed and significant:

- Gold:

- o Safe haven asset: In the past, gold has proven itself regal as a means to protect wealth during economic turmoil and financial uncertainty.

- o Its price is not too volatile at the time of falling stock markets and thus considered against it in recessions.

- o The main uses of gold are in jewellery, central bank reserves and investment products (bars, coins and ETFs).

- Silver:

- o Silver does not trade as a pure precious metal; it also trades for industrial use. o It is also utilized in electronics, solar panels and medical devices, not to mention the industries of jewels and investment.

- o This bimetallic nature makes silver prices more volatile than gold, because it's not just trade demand that affects the price of silver but also industrial consumption.

- Oil:

- o Its status as a critical source of fuel is reflected in its high trading rate on the global scale.

- o Its pricing is determined by demand supply fundamentals, OPEC policies, geopolitical tensions (war in oil producing regions), and technology transitions from conventional fossil fuel to renewable sources of energy.

- o The increase in oil prices directly affects inflation, transportation as well as economic growth in all countries.

Investment Options in Commodities

There are a variety of ways to get exposure to commodities, and each has its pluses:

- **Physical:** You can have direct ownership through jewelry, coins or bullion (mostly applicable in case of gold and silver).
- **Matrices for Commodity Exchanges:** Futures and options contracts enable investors to bet on price changes or hedge against risk.
- **Exchange-Traded Funds (ETFs):** ETFs of gold and silver offer investors a more convenient and liquid vehicle to invest in the metal without outright ownership.

Importance of Commodities in Portfolios

Commodities offer investors some advantages that other types of assets just can't:

- **Diversification:** Because commodities often are uncorrelated to stocks and bonds, they can reduce overall portfolio risk.
- **Hedge Against Inflation:** Commodity prices, such as for gold and oil, often go up with inflation, thereby preserving purchasing power.
- **World Sensitivity:** Commodity prices react strongly to global events, and therefore they provide a powerful mirror image of the international economic and political context.

2.3 Fund Structure, Types and Benefits 2.3.3 Mutual Funds – Kinds and Prospects

A mutual fund is a type of investment vehicle consisting of a portfolio of stocks, bonds, or other securities, which is overseen by a professional money manager. The fund is managed by experienced fund managers, who are responsible for investment decisions, performance tracking and rebalancing the portfolio to meet certain targets. Mutual funds are of particular value to the small investor as they provide an opportunity to own a professionally managed, diversified portfolio which would be difficult to create on their own.

Types of Mutual Funds

They also come in various types that are suitable to different investment objective, risk profile:

Equity Funds:

These primarily invest in equity and are suitable for investors who want long term capital growth. As stock markets can be highly volatile in the short term, these funds suit investors who are comfortable with higher risk and a long time-frame of investment.

- Debt Funds:

These in turn invest in fixed income securities like bonds, government securities and debentures. They can be safer than equity funds as well, offering steady streams of income with reduced risk and are appropriate for risk-averse investors or those in need of preserving capital.

- Hybrid Funds:

Hybrid funds try to strike the balance between risk and return by investing in both equity and debt instruments. You should consider them if you're a moderate investor looking for some access to the potential growth that equities offer in tandem with stability of debt.

- Index Funds:

These track the performance of a stock market index (such as the Nifty 50 or Sensex), passively. Because they closely track the index, they have lower management costs and are suitable for investors wishing to gain steady, market-linked returns without taking active stock-picking risks.

- Sector/Thematic Funds:

These are centered around a particular vertical and theme, like IT, health care, banking or alternative energy. They can reap rewards if the sector does well, targeted for outperformance of index funds, but come with higher risk as there is no diversification across industries.

Benefits of Mutual Funds

There are a few special features that make mutual funds one of the investment vehicles for beginners and experienced investors alike.

- Diversification: By pooling money from lots of investors — and spreading that money across many investments — mutual funds reduce the chance that a drop in any single stock or bond can inflict heavy losses on individual shareholders.

- Accessibility: It allows investors to start small by as low as ₹500 a month (in case of SIPs), and is affordable for everyone.

Liquidity: Investors can redeem their units of most open-ended mutual funds whenever they want, so you can have easy access to your funds.

- Professional Management: Fund managers and research teams are able to monitor the markets and make sound decisions, thus diminishing the responsibility of individual investors to keep a close watch themselves.

- **Compounding** - When your investment is for long term someday Indians policy to deal with or face compounding is back with this, I mean when returns will reinvest thus compelled your wealth growth over longer horizon.

Example

Let's say an investor is investing ₹5,000 per month through SIPs in an equity mutual fund. Thanks to market-linked returns and the magic of compounding, this investment could turn into a substantial corpus over 15-20 years. Even with little monthly contributions, it can prosper to a huge sum of money demonstrating why mutual funds are treated as portals for growth over the long term for small investors.

2.3.4 Exchange Traded Funds (ETFs)

ETF stands for Exchange Traded Fund – which is a security that combines aspects of both mutual funds and stocks. Just as with a mutual fund, an ETF gathers investor money into a pool then uses it to buy securities, like stocks, bonds or commodities. By contrast, while they are traded on stock exchanges like individual stocks, ETFs operate much more like mutual funds in their structure; but with a pricing system that allows shares to be bought and sold all through the trading day versus “at one time” referenced once at the end of a trading day. This architecture provides investors with the advantages of both diversification and professional management, as well as the flexibility of intra-day trading. ETFs are increasingly popular around the world and in India as well, providing a cost-effective and transparent way to invest across asset classes.

Key Features of ETFs

ETFs are meant to be flexible and cost-efficient investment instruments. Their major features include:

- **Real-Time Pricing:** Mutual funds are priced once per day at the closing NAV; ETFs generally offer real-time pricing throughout the trading day, and thus may be better suited to active investors.
- **Low Cost:** ETFs generally have much lower expense ratios because they are usually passive in nature (tracking an index or a commodity) rather than active like most mutual funds.

Trading flexibility: ETFs trade like stocks, meaning they can be bought and sold any time during the trading day, which allows for strategies such as intraday trading or stop-loss orders.

- **Passive Style Investing:** The majority of ETFs seek to replicate an index or a commodity making them the perfect pick for those investors who are on the fence, i.e., not too

bullish and not too bearish and would rather take a passive stance than try to outperform in an awfully volatile market space.

Types of ETFs

There are ETFs for just about any type of strategy or investor in mind:

- **Index ETFs:** They mimic the rise or fall of a stock market index, such as the Nifty 50 or Sensex, giving exposure across large parts of the market with minimal effort.
- **Gold ETFs:** These track the price of gold, so investors can get exposure to the precious metal without holding it in physical form. They offer the stability of gold with the liquidity of stock trading.
- **Sector ETFs:** These home in on individual industries, like banks, I.T. or energy. They allow for focused exposure, but have sector-specific risks.

Advantages of ETFs

There are many reasons why ETFs can be more compelling than traditional investment but, whether offered to retail or institutional investors, they have some key advantages:

- **Low barrier to entry and high liquidity:** Because ETFs are traded on exchanges, investors can buy or sell them easily, providing the flexibility needed by people that require fast access to their cash.
- **Transparency:** ETFs' holdings and prices are disclosed daily, so investors can easily see what they own.
- **Cost-Effective Investing** – ETFs have lower expense ratios than actively managed funds, helping investors to keep more of their returns through time.
- **Accessibility:** Small investors can diversify across a range of assets for relatively low sums of money with ETFs.

2.3.5 Private Equity and Venture Capital

Private equity (PE) and venture capital (VC) as well represent alternative asset classes which invest into companies not listed on the public stock market. These are nothing like your regular investments in listed shares or bonds – they effectively entail investing in unlisted companies directly, which tend to require longer-term commitments and higher risk tolerance. Both PE and VC play an important role in advancing the economy by supplying companies with the capital and strategic support required to grow, innovate and create jobs. But despite sharing some similarities, they are optimized for different stages in the life span of a company.

Private Equity (PE)

Mature, private and unlisted companies are said to be a part of private capital (private equity). These are typically established companies that desire new capital for growth, going through change or buyouts. These PE firms take a large percentage of ownership (and sometimes total control) and attempt to increase efficiency, profitability, and value in the long run.

- **Target Market:** Looking for existing companies with running operations, but require capital to expand, modernize or restructure.
- **Investor Base:** Comprises of institutional investors, high-net-worth individuals (HNIs), and private equity funds that are in a position to invest huge amounts for long periods.
- **Illiquidity and Risk:** As the PE investments are in unlisted companies, they can not be sold easily on exchanges and there's no easy liquidity. Great investments are often those that are counterintuitive, risk and all.
- **Objective:** To reorganize companies, expedite growth, expand operations or get them ready for a future public listing.

Venture Capital (VC)

Venture capital is a type of private equity investment with a higher risk but the potential for a higher return; it targets early-stage and startup companies with potential for rapid growth and innovation that lack access to other forms of funding. Unlike PE, which focuses on investing in mature companies, the role of VC is to support new concepts that have the potential to become profitable businesses.

- **Target Companies:** Startups and young companies, frequently in such sectors as technology, biotech, fintech or high growth.
- **Investor Role:** VCs offer more than money - they invest time in providing strategic direction, mentorship and network to ensure that founders succeed.
- **Returns and Risks:** The risk is very high, as many start-ups quickly go bust. But winning bets (such as Flipkart or Paytm in India) can deliver non-linear gains, which is why the VC business can be incredibly lucrative for its investors.
- **Economic Development:** VC is a driver for innovation, entrepreneurship and job creation, and it promotes economic development in the long run.

Differences Between PE Vs. VC

While PE and VC are both direct investments in private companies, they vary by focus and method:

- **Stage of Investment:**

The PE - invests in established, mature companies.

- o VC funds are invested in 'seed' to a fledgling company with potential for growth.
- Objective:
 - o Private equity: Private equity wants to get in or out of a company.
 - o VC focuses on encouraging new concepts and helping them grow from the grassroots.
- Risk and Return Profile:
 - o PE is higher risk but more stable than financing since companies have customers. o VC is extremely risky but there can also be exponential rewards if the startup takes off.
- Investment Horizon: Both expect long term time horizons, often numbering several years to let company growth and exit strategies play out.

Example

- A manufacturing company with high profitability is invested in by private equity to enable expansion into new markets, rationalisation of expenses and increased productivity.
- A venture capital fund could support a tech startup working on artificial intelligence tools, offering not only money but also advice and contacts to help it grow.

2.4 Summary

- ❖ Investment vehicles can be divided into real assets and financial assets.
- ❖ Hard assets are physical investments, such as real estate, gold and land, prized for their stability and their ability to hedge against inflation.
- ❖ Funds refer to equity (stock) and bond mutual funds which are both considered as liquid, diversified investments that have the potential for growth.
- ❖ Fixed assets are more illiquid and less subject to short-run fluctuations, whilst financial assets are highly liquid and volatile.
- ❖ FDs being low-risk fixed-return instrument is apt for risk-averse investors.
- ❖ Bonds are debt, with government bonds being safer and corporate bonds providing a higher return.
- ❖ Equity investments represent shares of ownership in companies and have the potential for capital appreciation, but are subject to market risks.

❖ REITs and InvITs facilitate participation in real estate and infrastructure assets along with sizable liquidity over direct holdings.

❖ Commodities such as gold, silver, and oil are used to defend against inflation and economic turbulence.

❖ Mutual funds are investment vehicles that group investors' money into diversified portfolios, which are managed by pros who figure out the right balance of risk and return.

2.5 Key Terms

Real Assets – Physical assets such as property, land or gold, whose worth is based on their existence.

Financial Assets – Immaterial rights and interests such as stocks, bonds, and mutual funds that represent ownership or debt.

Fixed Deposit (FD) – An amount of money deposited in a bank for a predetermined period and at an agreed interest rate.

Bond – Investors purchase a bond and lend money to corporations or governments for an agreed upon interest rate.

Equity – Piece of company ownership that pays dividends and increases in capital value.

REIT (Real Estate Investment Trust) – An investment instrument that combines money to purchase income producing property.

InvIT (Infrastructure Investment Trust) — An investment structure that enables collective investment in infrastructure projects.

Mutual Fund – An investment that pools money from many individuals to invest in a variety of different securities.

ETFs (Exchange Traded Funds) – Market traded fund tracking an index, commodity or basket of asset.

Venture Capital – Financing offered to promising startups in their early stages of business, in which investors receive shares.

2.6 Descriptive Questions

Define real assets with examples. In what way are liabilities riskier or less liquid than financial assets?

Describe the characteristics and returns of FDs. Why are they deemed safe but lower-yielding investments?

Differentiate between the government bonds and corporate bonds with examples.

What are equities? Explain how they offer both control echelon value and capital gain opportunities.

Discuss the concept of REITs and InvITs. What benefits do they offer compared with real estate or infrastructure investments made directly?

We then talk about commodities like gold, silver and oil as an investment class and inflation hedge.

What are mutual funds? Describe various types of mutual funds and their advantages to the investors.

Define Exchange Traded Funds (ETFs). How are they different than mutual funds/ features & benefits?

Compare and contrast PE vs. VC in the following areas: investment focus, risk, return potential.

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2.8 Case Study

New York, NY Traditionally vs Alternative Investments for Financial Growth

Introduction

Investment opportunities provide individuals with numerous ways to grow their wealth in both conservative, low risk traditional investments (fixed deposits and bonds) to newer alternatives (mutual funds, REITs, venture capital). Such avenues are suitable for varying risk appetites and financial objectives among investors, but a lot of them do struggle to identify the best mix considering factors like risk-versus-return tradeoffs or lack of liquidity or awareness. This case provides a brief overview on the significance of diversification in investment choices, discusses typical issues investors face, and the potential remedies necessary for successful financial planning.

Background

Amit, 35, an IT professional has been saving regularly for last decade. He prefers safety and predictability, which is why the bulk of his savings are in fixed deposits and recurring deposits. But he knows that inflation is eating away at the true value of his money. His financial planner has told him he needs to become more diversified and at least look into stocks, mutual funds and real estate investment trusts (REITs) as part of his overall portfolio. I think Amit thinks twice because he's not sure about the risks, nor the liquidity or how to pair them with his conservative profile. This scenario underscores the predicament of many middle-income savers who have to balance safety with growth.

Problem 1: Dependence on Safe Investments

Most investors' savings lies stuck in fixed deposits or bank saving accounts. Although these are safe, they generally generate returns less than inflation meaning diminishing purchasing capacity.

Solution: Start introducing inflation beating products like stocks, mutual equity funds and REITs in small quantity to make the person comfortable with risk.

MCQ

What are the drawbacks of investing only in FDs? a) High risk

b) Low liquidity

c) Returns below inflation

d) No fixed interest

Answer: c) Returns below inflation

Problem 2: Losing Diversification

Investors usually concentrate on one or two ways, making themselves vulnerable to a concentration risk. A portfolio that confined itself to equities or gold may not have been able to provide protection through economic cycles.

Solution: You need to follow asset allocation by splitting your investments in traditional (FDs, bonds) and alternative avenues (ETFs, commodities, private equity) based on goals and risk appetite.

MCQ

Diversification in investments helps to:

a) Maximize risk

b) Reduce concentration risk

c) Eliminate all risks

d) Guarantee fixed returns

Answer: b) Reduce concentration risk

Issue 3: Confusion about the Liquidity of Investment Avenues

Some investors believe that all investments can easily be converted into cash, and why this is definitely not the case for all we will address in the next section. Real estate is one example: It's an extremely illiquid asset versus equities or ETFs.

Solution: Diversify based on the need for liquidity. "Keep a piece highly liquid, in something like mutual funds or E.T.F.s," while deploying more illiquid strategies like real estate or private equity toward long-term goals.

MCQ

The following is the most liquid investment?

a) Real estate

b) ETFs

c) Land

d) Corporate bonds (unlisted)

Answer: b) ETFs

Conclusion

Each asset has its own characteristics with regards to risk, return and liquidity. The complimentary combination of traditional and alternative investments helps investors to protect their capital, earn income on a consistent basis and accumulate long term wealth. Through diversification, asset allocation and adopting goal-based planning strategies, people like Amit can overcome these challenges and build wealth that works over time.

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Unit 3: Introduction to Portfolio

Learning Objectives

1. Learn the underlying principle of a portfolio and how it helps individuals and companies in investing.
2. Describe the role of Portfolio Management in meeting financial objectives.
3. Recognize Diverse Portfolios Growth, income and balanced portfolios types.
4. Discuss the interrelation of risk and return when making a selection of portfolios.
5. Find out how diversification reduces risk and increases the return on investment.
6. Use basic asset allocation concepts when constructing a portfolio.
7. Consider influences on portfolio decisions, both market conditions and investor preference.
8. Grow your critical thinking and evaluate portfolio performance, to make better investment decisions.

Content

- 3.0 Introductory Caselet
- 3.1 Why Portfolios Matter
- 3.2 Types of Portfolios
- 3.3 Summary
- 3.4 Key Terms
- 3.5 Descriptive Questions
- 3.6 References
- 3.7 Case Study

3.0 Introductory Caselet

“Balancing Risk and Return – The Arjun Way in Investment Decisions”

Arjun, 28 years old Software professional working in Bengaluru, who has just got a performance bonus of ₹5,00,000. So far, he has kept his money in a savings account with minimal interest. He was introduced to the concept of portfolio management after

going to a financial literacy workshop run by his work. He knew he needed to diversify his investing strategy if he wanted to create long-term wealth rather than putting all of his resources into one choice.

Arjun began considering the options:

Growth Mutual Funds o Provide high returns (12–15% per annum advised in the long term). o Are highly risky because of the ups and downs of the stock market.

o Long term wealth creating in vehicles.

Government Bonds

o Reasonably safe and yield continue returns (6–7% annually). o Low risk, though lower returns than Equities.

o Good for capital preservation.

Real Estate Investment

o Purchase a small plot or invest in REIT. o Stable rental income and long-term appreciation are possible to achieve.

o Means a higher level of initial investment and lower liquidity.

Fixed Deposits (FDs) o Guaranteed returns of 5-6%. o Relatively low-risk and very liquid. o Arjun could avoid large losses by being more conservative.

Arjun is at a crossroads. His friend Rohan, also in his late twenties, tells him to be riskier by putting money into equities. Haalaki jab bhi cheaper delivery options their are available users discount code ka istemaal kar ke already cheaply bought products ko cover karne mein madad le. Now his father recommends that he deposit the money in a fixed deposit or long-term government bonds, stressing safety over returns.

Arjun appreciates that he needs to strike his own tradeoff between risk and return, given his age, steady income and long-term financial objectives like buying a home and planning for retirement. He asks how much of a bonus he should put in safe instruments versus growth-oriented investments.

Critical Thinking Question

If you were Arjun, where would you invest your ₹5,00,000 among the investment options for a balanced portfolio? Describe how you make your allocations: e.g. risk tolerance, time horizon, liquidity needs and desired return level.

3.1 Why Portfolios Matter

3.1.1 Notion of Portfolio in Investments

A portfolio is the group of financial and real assets that an individual or institutional investor owns.

Key aspects include:

- **Definition:** A portfolio is a planned allotment of investments (like stocks, bonds, real estate, mutual funds, commodities and cash alternatives).
- **Purpose:** To systematically organize wealth, with potential for growth and protection from risk.
- **Asset Balance:** Assets have a diverse set of purpose.
 - o **Stocks:** Provide High returns however high risk.
 - o **Bonds:** Stability and regular income with less risk.
 - o **Cash and cash equivalents :** For emergency purposes.
- **Dynamic:** Fact is, investments change over time and require re-balancing to stay aligned with new goals and a changing market.
- **Customization:** Each portfolio is customized to the investor's objectives, risk tolerance, and situation.

3.1.2 Advantages of You Holding a Portfolio (Diversification, Risk Management)

We already know that a good investment portfolio does more than generate returns. Combining different types of investments — such as stocks, bonds, mutual funds, real estate or commodities — helps reduce risk and promotes diversification in the investor's portfolio to match financial goals along with willingness to take risk. Here are some of the advantages that you get by maintaining a diversified portfolio:

Diversification

Diversification involves spreading your investments across different asset classes, industries and geographic regions. Less Risk Investing in more than one investment limits the dependence on a single investment's performance and provides insurance against losses as well.

- **Diversifying risk:** When you have both types of assets entering your portfolio, in general any underperformance or out-performance by one asset will often be offset by other. "Say stock markets drop, gold or government bonds may do well, cushioning overall returns.
- **Less Dependency:** Diversification allows for wealth not to be dependent on a single market or industry. Such prevents outright vulnerability to decline in any particular sector.

- Example: An investor with stocks from technology, healthcare and energy companies, as well as government bonds and gold, has less risk of an abrupt decline in any one area.

Risk Management

Another advantage of a portfolio is being able to control risk. Investors can mix high and low risk assets to match their investment objective and attitude to risk.

- This, That and the Other: High-return but high-risk assets like stocks can be matched with low-risk assets like bonds to smooth out returns.
- Tailoring Risk Exposure: Depending on how much risk an investor is willing to take, there are portfolios that can be as conservative (mostly bonds and fixed income), moderate (middle-of-the-road between equity and debt) or aggressive (equity heavy with alternative assets).
- Protecting Wealth: Vehicles such as government bonds or gold provide security to investors in times of market turbulence and may prevent large losses.
- Example: A 30-year-old investor might hold 70 percent in equities and 30 percent in bonds, while a retiree might flip the balance to place more emphasis on stability.

Liquidity and Flexibility

A diversified portfolio also gives you the benefit of liquidity, or investments that can be easily made into cash, and the flexibility to add or reduce positions as markets shift.

- Liquidity: Some assets, such as mutual funds, savings deposits or liquid ETFs, are easily sold when you need some cash over the short term.
- Flexibility: Investors can move money between asset classes to adapt to market and personal finance changes.
- For example, an investor can move his money from high-risk stocks to secure assets like government bonds or fixed deposits during a period of economic slowdown.

Stability of Returns

Diversification lowers volatility of the total returns on portfolio. A multi-asset portfolio provides a softer curve than the jagged one way action on single-asset investments.

- Less Volatility: Because assets react differently to market happenings, a well-diversified portfolio is less likely to have severe high and low points.
- Example: A portfolio with home and international stock as well as bonds can still grow on a steady trajectory even if one region's market drops.

Inflation Hedge

Inflation erodes the value of money over time, but some investments can serve as a hedge.

- **Safeguarding Purchasing Power:** Long-term asset classes (like equities, real estate, and commodities) usually rise in value faster than inflation.
- **Example:** Real estate investments or shares of companies that enjoy pricing power can preserve or increase the value of money in an environment of rising prices.

Did You Know?

“Diversifying investments can treat at least 60% of investment risks more safely than single asset holding. Wide variety also makes sure that as one part of your investment misbehaves the others may offset its loss outright. That principle is risk management, which is why professional investors always diversify among several classes of asset.”

3.1.3 Tailoring Portfolios to Investor Objectives & Risk Tolerance

There is no appropriate portfolio without a goal, and that goal is nothing more than an investor's time horizon and ability to tolerate risk. Investing with objectives and risk tolerance in mind helps maintain investing discipline, reduces emotion during market swings and improves investment methodology in hopes to reach financial goals.

Investor Goals

Investors have different financial goals, and these goals dictate the types of assets they should own and the level of risk that is appropriate.

- Challenges in the next 2–3 years:

These objectives demand liquidity and low risk because the funds might be kept for a short period of time.

o For example: Vacation saving, emergency fund, a new vehicle purchase.

o Favoured investment options: Fixed deposits, savings account, debt mutual funds, liquid mutual funds.

o Emergency Fund Computation:

A common rule of thumb is to have an emergency fund equal to 3-6 months of essential living expenses. For example:

- If basic monthly expenses = ₹50,000.
- Emergency fund needed = ₹50,000 × 6 = ₹3,00,000

This amount should ideally be invested in the most liquid, least risky instruments such as savings accounts or liquid mutual funds.

- Medium-term goals (3–7 years):

These objectives permit moderate risk, but require some stability.

- o Examples: A child's education, house down payment or wedding planning.

- o Preferred Investments: Balanced funds, bonds, RDs, hybrid funds.

- o Example Allocation: 40% in equity mutual funds (for growth), 60% in bonds or balanced funds to secure stability and moderate potential growth.

- Long-term goals (7+ years):

Such goals can afford to take on more risk, since they have a longer time frame.

- o Examples: Planning for retirement, saving for wealth enhancement, children's college education or setting up business at a later stage.

- o Favorite investment areas: Stock, mutual funds, NPS and Real Estate.
- Types of Investment – II Mutual Funds are an Excellent Option for beginners
- The world's most profitable companies include Apple, Netflix and Google.
- o E.g. 70% into equities (direct stocks + mutual funds), 20% into real estate, 10% in debt for stability.

Risk Appetite

Risk appetite is the investor's readiness and ability to accept changes in the value of an investment. Financial and psychological issues are involved.

- Conservative Investors:

- o Attributes: Value safety and preservation of capital above higher returns.
- o Profile Example: 70% in fixed deposits, 20% bonds and 10% government securities.

- o Example: A retired person with a dependant pension Income could invest in 90% of the funds in fixed deposits and only balance or very small portion on equity mutual funds.

- Moderate Investors:

- o Traits: Strive to be both protected and proactive.

- o Sample Portfolio: 50% stocks, 30% bonds, 20% mutual funds or hybrid funds.

- o Example: A mid-career professional with established income and limited financial obligations.

- Aggressive Investors:

- o Profile: Tolerant of high risk in return for a possibility of greater rewards.
- o Portfolio Example: 80% equities and growth funds, 10% alternative investments (e.g., REITs or startups), 10% bonds.
- o Example: An investor, who is in their early to mid 20s with little fiscal obligations and high earning potential.

Factors Determining Risk Appetite

Risk tolerance is not static and varies with the individual as well as with financial circumstances.

- Age: Younger investors typically have a long time horizon and can afford to lose value in the market and often are better suited for high-risk investments.
- Stable Income: Steady and predictable income enables investors to assume added risk. If you have variable or uncertain income, make safe investments a priority so that you'll keep plenty of cash in hand.
- Financial Obligations: Having dependents, loans or cash outlays, may limit one's risk taking capacity.
- Psychological Comfort: Even the wealthy category of investors may loathsome need some form of assurance that they are in control.
- Investor Understanding: Less financial literacy usually leads to a more cautious investment strategy, since investors will not know how the market work.
- Wealth/Base Assets: It is only when an investor has a substantial existing asset base that they can afford to allocate significant proportions of their wealth to high risk investments.
- Time Horizon of Each Goal: The longer the time horizon for a goal, generally speaking the more risk there can be.
- Availability of an Emergency Buffer: Having a strong emergency fund enables the balance of the portfolio to be more aggressive.

Importance of Alignment

Portfolios need to be adjusted to match investors' objectives and risk tolerance in order to succeed over the long run.

- Stress Relief- an imbalanced portfolio can cause anxiety and drive to emotional decisions when the market is gyrating.
- Discipline: An appropriately diversified portfolio is consistent with one's long-term financial goals and individual risk tolerance, which enhances the ability to stay invested through market cycles.

- Meeting money-related goals: The goal-based approach leaves the guess work out regarding how much to invest, where to invest and when should you rebalance.

An Example of Portfolio Alignment in Action

Let us say there's a 35 year old person, his essential month expense is ₹60000 He does not want to take any risk on his income His two primary goals: buying house in 5 years and retirement planning in 25 years, that's all.

- Emergency Fund: $₹60,000 \times 6 = ₹3,60,000$ parked in liquid funds or bank a/c.
- Medium-term Goal (House Down Payment in 5 Years): 40% bonds/recurring deposits, 60% balanced mutual funds.
- Long-Term Goal (Retirement in 25 years): 70% in equities and equity mutual funds, 20% in NPS/real estate, 10% in bonds.

This systematic method ensures that funds are available as and when required and provides for long-term growth against inflation.

“Activity: Identifying Investment Choices”

Name three types of investments you know about (e.g. stock, bond, or savings deposit). Write down briefly what you think are the risks and benefits of each. Discuss with a partner or in class how the various options can be combined to create an investment portfolio.

3.2 Types of Portfolios

3.2.1 Aggressive Portfolios - High Growth, High Risk Our first type of portfolio that we consider is the aggressive one: 15% Initial Portfolio; shorts to 45% initial; see Table 2c on page F-12 in up markets and longs to max from top third of universe based returns ranked by SSIF-60 run over the past month for last quarter in down markets, but maintains a floor(floor=20%, ceiling=median(55%S&P500,75% SP500), cap=cash).

Growth portfolios are intended for investors seeking capital appreciation. They depend so much on racy, high-returning, high-volatility assets like shares, growth stocks (small cap companies in particular) and emerging markets. The idea is to become very rich over time, but expect individual crushing bear markets along the way.

- Key Features
 - o Investments in equities (70-90%) are high.
 - o Minimum of investment to fixed income with low risk (10-20%).
 - o Focus on growth sectors i.e. technology, pharmaceutical or start-up sector.
 - o Volatile (for all intents and purposes) in the short term but with huge future potential.
- Investor Profile
 - o Younger investors with a long time horizon for investing.

- o People who have money to lose short term.
- o Gamblers who put returns before riding the waves.
- Sample Allocation
 - o 80% in shares of equity mutual funds and individual stock.
 - o 15% in corporate bonds or other debt issues.
 - o 5% liquidity cash equivalents.

3.2.2 Stable/Defensive – Stability & Capital Preservation

Defensive is a strategy to conserve capital, not one that seeks high returns. With an emphasis on safety, liquidity, a predictable income stream and low volatility, they are ideal for risk-averse investors or those with short-term financial planning needs. These portfolios are constructed in a way to perform consistently even when there is recession in the economy, with an objective that at least the capital of the investor remains intact.

Key Characteristics

- High Allocation to Safe Assets:

Defensive portfolios allocate much more in government bonds, treasury bills and fixed deposits to provide security and guaranteed returns.

- Steady Income from Equities:

A basket of blue-chip dividend plays offers stable income and relative safety.

- Low Volatility:

The portfolio restricts high-risk stocks or creaky speculative investments in favor of more predictable assets.

- Capital Preservation as Primary Goal:

Slow and steady, rather than rapid growth, is the focus.

Investor Profile

Defensive portfolios are suitable for:

- Near or Current Retirees: These are individuals who depend on investment yields to fund living expenses and cannot afford meaningful capital losses.
- Conservative Investors: May opt for security over rapid growth.
- Shootout investors: Investors who have a defined specific purpose in mind, such as paying for a wedding or making a down payment on a house or other big item, are often seeking to accumulate money as quickly and safely as possible.

Cash Equivalents – Clear Avenues

A defensive portfolio also holds cash and cash equivalents to stay liquid, cover unforeseen expenditures etc.

These are highly liquid, very low risk and virtually act as a ‘shock absorber’ in times of market stress.

- **Savings Accounts** : Easy access to money with minimal risk.
- **Liquid Mutual Funds** -Invest predominantly in money market instruments and offers redemption within 24 hrs.
- **Treasury Bills (T-Bills)** -A government security with a maturity of less than a year, generally providing safety for parking funds in the very short term.
- **Ultra-Short-Term Debt Funds**: A little more popping power than savings accounts but just as safe and liquid.
- **Fixed Deposits with Sweep-in Facility**: Allows auto transfer of excess funds to fixed deposits and vice-versa for maximum liquidity!
- **Money Market Funds**: Investments pooled together in low-risk short-term instruments such as commercial papers and certificates of deposit.

Example Allocation

The following is an example of a possible asset allocation for a defensive portfolio to include cash equivalents:

Asset Class	Allocation	Description / Role in Portfolio
Government Bonds & Fixed-Income Instruments	55–65%	Includes government bonds, treasury bills, and high-grade corporate bonds for stability and predictable income.
Blue-Chip Dividend-Paying Equities	20–25%	Provides steady dividend income with lower volatility than mid-cap or small-cap stocks.
Cash Equivalents / Liquid Assets	10–20%	Savings accounts, liquid mutual funds, T-Bills, ultra-shortterm debt funds for emergency needs or quick reallocation.

Example in Practice

On that note, for a 60 year old retiree who has ₹50 lakhs looking to invest you could possibly construct a defensive portfolio like this:

- 60% (₹30 lakhs) in government bonds and high-rated fixed deposits.
- ₹12.5 lakhs (25%) in blue-chip stocks that pay dividends (large established companies e.g Hindustan Unilever, Infosys).
- ₹7.5 lakhs (15%) in cash equivalents (these are spread over savings account, liquid mutual funds and TBills for ease of access)

This keeps money coming in, maintains capital intact and allows for maximum liquidity to meet emergencies.

3.2.3 Stable, Balanced Portfolios of Stocks and Bonds

Balanced portfolios are a compromise between aggressive and defensive styles. They consist of growth-oriented investment and capital-preserving instruments to moderate returns and maintain liquidity.

controlled risk. Such a portfolio is best suited for investors who seek a fair exchange of safety versus growth without favoring one too much over the other.

Key Characteristics

- **Balanced Distribution:** Roughly equal distribution between stocks and bonds to spread out risk.
- **Growth Potential + Capital Preservation:** The equity side is potential for appreciation while the fixed-income portion offers stability and a predictable income stream.
- **Moderate Volatility:** Substantially lower movement than aggressive portfolios, but offers above average earnings compared to defensive ones.
- **2-Pronged; Income & Growth:** It aims to offer both an income stream and capital growth over the investment period.

Investor Profile

Balanced portfolios are suitable for:

- **Middle-Aged Investors:** People who are saving for long-term goals, like your kids' higher education or retirement, while still wanting some degree of stability.
- **Moderate Risk Tolerance:** People who can handle some ups and downs but can't take all the volatility in an aggressive portfolio.
- **Goal-Oriented Planners:** Those who seek consistent growth and some inflation protection.

Inflation Hedge (Updated)

Real estate used to be in the inflation hedge, but for a balanced portfolio, it's nicer that we separate real estate from equities.

to deploy liquidity and low-risk inflation hedges. These include:

- **Gold ETFs or Sovereign Gold Bonds (SGBs):** These offer investors an opportunity to invest in the gold price without having to hold it physically.
- **Commodities Funds:** Hedge inflation risk by diversifying into other commodities like silver or energy.
- **TIPS: Inflation-Indexed Bonds (IIBs)** sold by the government of India that return principal and interest linked to inflation while maintaining purchasing power.

Example Allocation

Here is an example of that breakdown registered a balanced portfolio (minus real estate and with current replacement inflation hedge assets):

Asset Class	Allocation	Role in Portfolio
Equities (Large-Cap and Mid-Cap)	50%	Growth potential and capital appreciation over the medium to long term.
Bonds and Fixed Deposits	40%	Stability, predictable income, and lower volatility.
Gold / Inflation-Hedging Assets	10%	Hedge against inflation using Gold ETFs, Sovereign Gold Bonds, or Inflation-Indexed Bonds.

Example in Practice

For instance, let's consider the case of a moderate risk-taking 40-year-old investor with ₹10 lakhs available for investment and seeking to build a balanced portfolio.

- ₹5 lakhs (50%) in equities – large-cap mutual funds and mid-cap equity funds.
- ₹4 lakhs (40%) to good quality bonds, FDs and government securities.
- ₹1 lakh (10%) in gold ETFs or Sovereign Gold Bonds as an inflation hedge.

This mix offers upside for growing, cash-like protection from loss and a buffer against inflation while managing volatility relatively well.

3.2.4 Thematic Portfolios – Sector/Theme-Specific

Thematic portfolios generally focus on an investment theme, sector or global trend. They let investors profit from the growth of specific industries they feel very certain about. Unlike some portfolios, they do not provide wide diversification that could reduce the risk of its theme but they may payoff handsomely if its theme wins a following.

- Key Characteristics

- o Investments that concentrate on one or a few sectors, such as clean tech, medical, technology or infrastructure.

RELATED INFORMATION ABOUT THE INERGI FUND
Tides Canada created the Inergi Fund in 2013, establishing it as an investment vehicle within Tides Canada focusing on investing into mission-driven businesses.

- o Based on the effectiveness of a particular ‘topic’.
- o High risk emerges from the low amount of diversification in different industries.
- o Appealing when the chosen sector is experiencing high growth.

- Investor Profile
- o Deep sector or thematic knowledge investors
- o Large, single-stock conviction investors
- o Those with a desire for high level of return, seeking returns higher than the ordinary.

- o Investors seeking to enhance a core holding of broad stock market exposure by adding sector investments.

- Example Allocation
- o 100% renewable energy funds, electric vehicle companies and green bonds.
- o Or 70% technology company, 30% supply chain or supportive industries (semiconductor manufacturing).

3.3 Summary

- ❖ A portfolio is a combination of investments, including stocks, bonds, real estate and other assets chosen to meet the financial needs of an investor.

- ❖ Portfolios provide the opportunity of risk-return trade-off by diversifying various asset classes with different attributes.

- ❖ An aggressive portfolio is a high growth portfolio, primarily equities and high-risk assets for investors with long time horizon and higher risk tolerance.

- ❖ A defensive portfolio concentrates on stability, preserving capital and income by investing in safer securities such as bonds and blue chip dividend-paying stocks.

- ❖ A balanced portfolio combines growth and safety to deliver moderate risk and reward, combining stocks, bonds and alternative assets.
- ❖ A thematic portfolio focuses on one or more specific sectors or themes, such as technology or renewable energy, which can and does have higher risk than a more diversified portfolio.
- ❖ Diversification is the major advantage of portfolio, as it minimizes risk by dividing investment between assets. ❖ Portfolios should be guided by investor objectives, whether short-term requirements, medium term desires or long-term wealth building.
- ❖ The type of portfolio that is selected depends heavily on the investor's level of risk tolerance.
- ❖ Portfolios evolve and, to "fit one's current risk-tolerance and market environment", need rebalance.
- ❖ Managing the portfolio effectively will reinforce financial health and asset growth while promoting a long-term disciplined investment strategy.

3.4 Key Terms

Portfolio -An investor's holdings of shares, bonds and any other investment type such as cash.

Diversification – The idea of spreading your investments into different assets to decrease risk.

Risk Appetite – The amount of financial risk that an investor is capable and willing to accept.

Growth Portfolio- A high risk/reward portfolio with a predominant focus on equities/growths.

Defensive Portfolio – An investment portfolio that is constructed with low-risk assets or asset classes, to protect contributed capital and achieve steady returns.

Balanced Portfolio – A portfolio of equities and fixed income that attempts to balance risk and return.

Theme portfolio – This is where an investment strategy revolves around sectors, industries or global trends.

Asset Allocation – Allocating investments in various categories of assets.

Rebalancing – The practice of readjusting the portfolio occasionally to account for veering away from the desired asset allocation.

Preservation of capital – An investment strategy that seeks to return the principal amount to the investor, regardless of whether they receive a high interest rate.

3.5 Descriptive Questions

Describe the role of a portfolio in investment. How does it aid investors in reaching their financial targets?

Explain the significance of diversification in portfolio administration. How does it reduce risk?

Distinguish between aggressive, defensive, balanced and thematic portfolios giving appropriate examples.

How can an investor's risk tolerance affect the composition of his or her portfolio? Explain with scenarios.

What are the pros and cons of running a motif' strategy portfolio?

Explain the importance of asset allocation and rebalancing in portfolio management.

Why is it necessary to organize an investment portfolio so that it reflects short and long-term financial goals?

Consider how market environment can affect various kinds of portfolio. Provide relevant illustrations.

3.6 References

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3.7 Case Study

Creating the Perfect Portfolio for Your Investor Type

At its center, investment planning is more about portfolio management. The objective is to not only maximize returns, but also correspond an investor's risk profile and investment objectives. Investors have to decide between aggressive, defensive, balanced and thematic portfolios. The steps to be followed for making a choice in this regard requires evaluation of the trade-offs between risk- and return-trade off, liquidity and long run financial goals. This case study demonstrates how investors can formulate appropriate portfolios while considering their own investment needs, revealing challenges and providing resolution with the help of real-life examples.

Background

Each investor has a different age, level of income, earning capacity, responsibility and financial goals.

- A young professional might desire aggressive growth, a retiree the preservation of capital.
- Some investors are attracted to particular sectors or themes — including technology, health care and renewable energy — which sends them toward thematic portfolios.

Here are some top challenges for investors:

- Figuring out the right balance of assets to reflect appetite for risk.
- When growth and safety collide in uncertain markets.
- Rebalancing periodically to stay on course with new goals.
- Diversifying concentration risk in a single asset class or theme.

Healthy portfolio management helps outline a clear strategy whereby your capital is spread across multiple investments, risks are minimised and return rates feed into the future.

Problem 1: Choosing An Aggressive Portfolio Say your cousin is young and he can afford to take on some risk in his portfolio.

Investors who want to get rich quickly may select aggressive equity portfolios. Though short-term losses can be caused by high volatility.

- Solution: Diversify within equities (large cap, mid cap, global funds) and have a small percentage in bonds or cash to reduce the risk.

MCQ:

What is the primary risk of an aggressive line-up?

- a) Low returns
- b) High volatility
- c) Lack of liquidity
- d) No diversification

Answer: b) High volatility

Problem Definition 2: The Stability Question of the Defensive Portfolio

Defensive is the choice of retirees and conservative investors. The problem is yields low enough to not beat inflation.

- Solution: A mix of risk-free instruments such as government bonds and fixed deposits along with inflationhedging assets like Gold ETFs, Sovereign Gold Bonds (SGBs), or inflation-indexed bonds to maintain purchasing power would do.

MCQ:

Defensive portfolios are best for:

- a) Retirees
- b) Young professionals
- c) High-risk investors
- d) Traders

Answer: a) Retirees

Problem #3: The Need for Both Growth and Safety

Many middle-aged investors need growth, but cannot stomach high risk. Balancing a portfolio is hard when the markets are moving.

- Solution: Embrace a 50:40:10 strategy (50 percent equities, 40 percent bonds, 10 percent alternative assets like gold or inflation-linked funds). Regularly rebalance to keep the desired ratio.

MCQ:

Balanced portfolios are characterized by:

- a) High equity exposure only
- b) Growth and safety in same proportion
- c) 100% government bonds
- d) Only sector-based funds

Answer: b) Balanced between growth and safety

Issue 4: Thematic Portfolios and the Risk of Becoming Heavily Concentrated

Thematic portfolios are for those who want to invest in sectors or investment themes.

But you should be careful not to overweight one sector with such a strategy if that industry disappoints.

- Solution: Use thematic portfolios as only a small portion of the total investment (10–20%) while continuing to have a diversified core portfolio to manage risk.

Illustration – Thematic Portfolios in India amidst COVID-19:

COVID-19 pandemic period (2020–2021) In India, the thematic portfolios in IT and Pharma sectors did well than the broader market:

- IT While: Digital services, cloud computing and cybersecurity companies were in huge demand as business moved online. IT, including Infosys, TCS, HCL Technologies were another category of schemes that generated good returns.
- Pharma Industry: Pharmaceutical and healthcare sector as a whole gained from higher demand in medicines, vaccines, vet care etc. Funds dedicated to Sun Pharma, Dr Reddy's Laboratories and Cipla did well.

These thematic portfolios produced extraordinary near-term returns, but they came with the risk of sector concentration — if these sectors had underperformed, investors would have met significant losses.

MCQ:

The risk in thematic portfolios is placed by and large because of:

- a) Over-diversification
- b) Sector concentration
- c) High liquidity
- d) Capital preservation

Answer: b) Sector concentration

Conclusion

Managing the Portfolio: Balancing risk, reward and investor objectives:

- Aggressive portfolios suit risk-takers.
- Defensive portfolios suit conservative investors.
- Balanced portfolios are appropriate for investors who want growth with a dose of stability.
- Thematic portfolios work for investors with deep knowledge of certain sectors.

More notes... Dyaman explained how maligning markets with themes can be solved by maintaining strategically invested core allocations and then tactfully changing risk themes—like what IT and Pharma did in or due to Covid-19.

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Unit 4: Portfolio Designing & Portfolio Management

Learning Objectives

Learn about basics of portfolio design and its significance in investing planning.

1. Describe the portfolio management process, including asset selection, allocation and monitoring.
2. Distinguish among different types of portfolios and their appropriateness for investors with varying risk tolerance, approaches to accumulation, and goals.
3. Discuss the role the diversification and asset allocation play in reducing risk and increasing returns.
4. Assess why portfolio strategies should be consistent with investor objectives, time horizons and market conditions.
5. Gain the skill to build sample portfolios for aggressive, bearish, balanced and thematic investment style.
6. Discuss the importance of rebalancing and regular reviews on the performance of well-managed portfolios.
7. “Implement Portfolio Theory rules in real-world situations (How to invest money as an intelligent investor)”
Description In this course, you will learn how to form quantitative decision making models for Professional & Personal Investment Decisions.

Content

- 4.0 Introductory Caselet
- 4.1 Steps in Portfolio Construction
- 4.2 Portfolio Management Approaches
- 4.3 Summary
- 4.4 Key Terms
- 4.5 Descriptive Questions
- 4.6 References

4.7 Case Study

4.0 Introductory Caselet

‘Riya’s Dilemma – Designing the Right Portfolio’

Riya, 35 years old and a marketing professional just inherited ₹10,00,000 from her granddad. She is looking to invest this money responsibly for the future. “At the same time I don’t want to hamper tax savings by putting too much into debt funds Riya’s goals include building a retirement corpus, saving for her 10-year-old son’s education and keeping some money liquid”for emergencies.

She went to a financial planner and learned about the design and management of portfolios. Instead of throwing all of her money into one option, the advisor explained that she needed to craft a portfolio tailored to her goals and risk tolerance.

Riya, found some investment options as follows:

- Equities (40%): For long-term growth and to build wealth.
- Bonds & Fixed Deposits (30%): For stability and regular income.
- Gold & Real Estate (20%) : For safeguard against inflation.
- Liquid Funds (10%): Seeks liquidity for exigencies and contingencies916iom #3ICICI Prudential Balanced Advantage Fund Regular-Growth.

The plan seemed organized but Riya was still bewildered. She was considering whether to add to her stock exposure for more gain or stay defensive to protect capital. She also understood that managing this portfolio would involve regular review and rebalancing, something that unsettled her.

Critical Thinking Question

If you were Riya, how would you structure and manage this portfolio to achieve growth, safety and liquidity? Explain your selections in regards to her objectives, age, and financial obligations.

4.1 Steps in Portfolio Construction

4.1.1 Identifying Investor Objectives

At the heart of portfolio building, determining what the investor wants to accomplish is key.

- Types of objectives:

o Short-term targets: A trip, a gadget, an expense as seed capital. o Mid-term goals: Education for children, buying a house, starting a business. o Needs and wants: o Long-run goals: (retirement funds creation of a legacy.

- Key considerations:

o Your objectives should be quantifiable and specific (e.g., Im) Save ₹20 lakh for my child's education in 10 years).

o They need to fit with what the investor does, is responsible for and wants in future.

o Specific objectives eliminate impulsive decisions and provide you with a practice of disciplined investing.

4.1.2 Risk Tolerance and Time Horizon Evaluation

Once goals have been set out, then investors need to think about how much risk is acceptable and for how long they are prepared to stay invested.

- Risk tolerance:

o Conservative: Extremely safe capital; no exposure to risky assets. o Middle of the road: I don't mind a little risk, but let's keep them in check. o Aggressive: Will tolerate much risk for higher returns.

- Time horizon:

o Short term (1-3 years): Liquidity and safety assets are needed like deposits or debt funds. o Medium-term (3-7 years) – Could contain both equity and debt.

o Long-term(7+ years): Higher amount of equity exposure is preferable as time available to recover from market risk.

- Factors affecting this stage:

o Age of the investor. o Stability and economic source. o Family responsibilities.

o Psychological comfort with market fluctuations.

4.1.3 Asset Allocation Strategy

Asset allocation is frequently referred to as the centerpiece of portfolio construction, because it dictates how riches are apportioned among different asset types. It's a position supported by decades of academic research, which has demonstrated that the decisions to allocate among and across asset classes explain more of your portfolio performance over time than security selection does. A carefully planned allocation can also help manage risk, return and liquidity to achieve an investor's objectives.

Common Asset Classes

A portfolio is usually a combination of the following:

- Stocks: Individual shares or equity mutual funds or index funds for long-term growth.
- Fixed Income: Bonds, government securities, fixed deposits and corporate debentures for stability as well as regular income.
- Real Estate: Physical property or REIT stock to generate capital gains and rental income.
- Commodities: Gold, silver, oil and others for diversification and inflation protection.
- Cash/Savings: Saving accounts vs. Short term T-bill, Liquid fund for high liquidity needs/ emergencies.

Types of Asset Allocation Strategies

Of course, there are different ways investors can mix up their investments according to their objectives, tolerances and expectations.

Dynamic Asset Allocation (Variable Rebalanced Through Value Added)

The strategy sets target weights for each asset class based on an investor's risk tolerance and time horizon. The portfolio will be rebalanced at the target weight on a periodic basis.

- Example: A young investor's portfolio could have 70 percent in equities, 20 percent in bonds and 10 percent commodities. A retiree may choose 40% equities, 50% bonds, and cash equivalents at 10%.
- Key Feature: the long-term commitment and discipline; not impacted by short-term market swings.
- When to Use: For long-term investors with a (relatively) stable risk tolerance.

Tactical Asset Allocation (Short-Term Adjustments)

Tactical allocation is making short-term detours from the strategic mix to benefit from market conditions or economic value changes.

- Example: If one believes equities will outperform over the next 12 months, an investor might temporarily raise the allocation to stocks from 60% to 70%, and lower bonds from 40% to 30%.
- Key Feature: Aims to benefit from market trends or misprice; more active than a strategic allocation.
- When to Use: For the mildly active investor who keeps a cautious eye on markets and who can shift periodically.

Dynamic Asset Allocation (Continuous Adjustments)

In this approach, the investor continuously shifts his asset allocation pattern according to the performance of the market, economic condition and changes in his risk profile. Premium content ISR_TOOLBAR Dynamic allocation has its advantages; a fund will passively make clients' exposure to rising asset classes greater, while cutting their exposure to laggards.

- Example: Dynamic equity funds in India switch between equity and debt depending on where the valuations chart — go overweight on equity when markets are bullish and move to debt during bearish times.
- Key Feature: Extremely flexible and forward-thinking, consults with models or fund managers for allocation decisions.
- When to Use: For those who like a professional, automated or rules-based approach to investing.

Core-Satellite Allocation

According to this technique the portfolio is classified in:

- A base chunk (roughly 60 to 80 percent) in a diversified, low-cost, stable asset class (such as index funds or bonds).
- A satellite portion (20–40%) targeting higher risk or thematic investments that can drive excess returns.
- Example: 70% in index equity funds and government bonds (core); 30% in sectoral/thematic funds or international equities (satellite).
- Key Feature: Stability combined with potential for growth; permits you to take a flier without disturbing your core portfolio.
- When to use: Investors who want a steady core but also want exposure to niche opportunities.

Glide Path or Life-Cycle Allocation

This is the plan where asset allocation moves automatically according to how much an investor is coming of age or stage of life, as in a strategy that slowly reduces equity exposure as someone heads toward retirement.

- Example: A life-cycle fund might be 80% equity and 20% bonds when the person is age 30, then gradually change to 30% equity and 70% bonds by age 60.
- Key Feature: Rebalances automatically toward safety as retirement approaches.

- **When to Use:** Retirement-minded investors or those looking for a hands-off allocation strategy.

Risk-Based Allocation

This is a risk contribution allocation of assets, not capital. Each asset class is sized to have an equally large effect on portfolio risk.

- **Example:** Rather than having 60% allocated to equities and 40% to bonds, weights are adjusted so that both equities and bonds make equal contributions to portfolio volatility.
- **Use When:** You're a refined investor who calculates portfolio volatility or employs professional management.

Guiding Principle

- **Youthful Investors:** Are allowed to have a larger percentage in stocks because of youthful time frames and higher levels of risk tolerance.
- **More Experienced Investors/ Retirees:** Bonds, fixed income and cash equivalents to provide safety and generate some income.
- **Systematic rebalancing:** No matter what plan you pick, periodically bringing your portfolio back to its target allocation is necessary in order to keep risk levels in check.

Illustrative Example of Strategies

Strategy Type	Equity Allocation	Bond Allocation	Commodity/Gold	Cash/Other	Suitable For
Strategic Allocation	60%	30%	10%	–	Long-term investors
Tactical Allocation	70% (temporarily)	20%	10%	–	Active investors
Dynamic Allocation	Varies (based on market)	Varies			Automated fund models

Core-Satellite	70% Core (index + bonds)	20% Satellite (sectoral funds)	Varies	Varies	Moderate investors
			10% Gold	–	

Glide Path Allocation	Starts 80% equity at 30 yrs → 30% equity at 60 yrs	Remainder bonds/cash	Small % Gold	–	Retirement planning

4.1.4 Security Selection

Once the house has been built, then comes the task of selecting specific securities in each class.

- Equity selection:

- o Large-cap stocks for stability.
- o Shares of mid- and small-cap companies for growth.
- o Sector-focused or thematic funds for concentrated exposure to growth areas.

- Fixed income selection:

- o Government bonds for safety.
- o Corporate bonds for a higher-yield, higher-risk allocation.
- o Municipal bonds for tax benefit.

- Criteria for selection:

- o Expected rate of return.
- o Risk rating and credit quality.
- o Liquidity of the investment.
- o Tax implications.
- o Historical and projected performance.

4.1.5 Portfolio Diversification

Diversification is one of the fundamental principles of a modern portfolio theory. It helps you not have all your eggs in one basket!

- Forms of diversification:

- o Within asset classes (equity, fixed income, real estate, commodities).
- o Among asset classes (individual sectors, industries and companies).

- o Geographically (within domestic and international markets).

- Benefits:

- o Mitigates underperformance from one investment.
- o Makes for more even returns to reduce variance.
- o Shelters you from market swings and bad junk you never saw coming.

- Example: Instead of investing ₹10 lakh only in technology stocks, an investor could spread it among IT, FMCG, banking, healthcare and other bonds.

4.1.6 Monitoring and Rebalancing

The portfolios aren't static – they need to evolve as market conditions and your own goals change. Over time, as a result of changes in market value, the original asset allocation and risk characteristics of a portfolio can change. Monitoring & re-balancing to keep your portfolio on track with the targets set for you.

Monitoring

Review is the process of ensuring that this remains on course.

- Tracking Portfolio Performance Against Benchmarks:

Benchmark the performance of your portfolio against those of suitable market indices (like the Nifty 50 for equity, Crisil Bond Index for debt).

- o Example: If your equity mutual fund lags in performance to its benchmark for 3-4% over a period of few quarters, it can be an indication that reallocation or replacement of the fund is necessary.

- Identifying Underperforming Assets:

Regular reviews can help you unearth investments that are underperforming or no longer in sync with your objectives.

- o Example: A thematic IT fund hot bought in 2020 may begin to underperform after 2022 as the demand equalizes.

- Checking Goal Alignment:

Revisit the portfolio to confirm that it continues to reflect your financial objectives, risk tolerance and time frame.

- o Example: You are targeting retirement 15 years down the road but have put too much in relatively low-yield debt securities and may be giving up long-term growth.

Rebalancing

Rebalancing is returning an asset or portfolio to prior, original, calibrated levels; the change of its allocation (specifically the of the time between investments) relative to reference measures.

- Basic Example:

So if you have a 60% weight to equities in your portfolio, and equity has rallied hugely and now makes up 70%, your process is to sell some of that equity investment, move it into bonds, so that the weighting goes back down below 65% or 60%.

- Benefits of Rebalancing:

- o Maintains the desired risk-return balance.

- o Promotes the age-old adage of “buying low and selling high,” by selling overvalued assets and acquiring undervalued.

Rebalancing and Real World Market Trends You could demonstrate what I mean with some real-world trends:

- Equity Bull Market (2020–2021):

Stock markets around the world soared in the wake of initial COVID-19 lockdowns on huge stimulus programs. A portfolio's 60/40 split between stocks and bonds may have morphed into 75/25. Now, it would mean selling some stocks now that they're high and putting the proceeds in bonds or cash equivalents.

- Bond Yield Surge (2022–2023):

As central banks raised interest rates, bond yields surged, which meant that the price of existing bonds fell. If your portfolio was weighted toward bonds, you might rebalance in favor of stocks or short-duration bond funds to mitigate interest-rate risk.

- Commodity Boom (2021–2022):

Gold and other commodities flew during inflation. Otherwise, if your commodity allocation got out of whack with your target (say it grew from 10 percent to 18 percent), then rebalancing would entail selling off a little gold and reinvesting in underweighted asset classes like stocks or bonds.

- Sector Rotation (IT to Pharma):

Funds began rotating into healthcare after a stint of IT outperformance during COVID-19,

pharma, and energy. Monitoring would indicate that the theme-rich, IT-heavy portfolio needs pruning and adding to pharma or diversified equity to maintain balance.

Frequency of Monitoring and Rebalancing

- **Periodic:** Annually or semiannual--mutual funds often stipulate periodic redemptions in an effort to maintain a semblance of discipline and avoid emotional decision-making.
- **Event-Driven:** After significant market moves or personal life changes (a new job, an inheritance, retirement). For example, if stocks have had a 25% runup or there has been a huge drop in bond yields, it may be appropriate to rebalance.

4.2 Portfolio Management Approaches

4.2.1 Active Portfolio Management – Characteristics, Pros & Cons

Active Portfolio An active portfolio refers to a strategy of investing in such that fund managers within this type of investment plan make decisions based on the performance and valuation of their investments as against a predefined benchmark index. The idea is to generate alpha — returns that exceed what the market provides. While passive management is discussed in the context of an index, active portfolio management requires research-based (as opposed to mechanical) decisions, continuous review and dynamic changes — that is to say investing with both opportunity taking and risk management.

Features of Active Portfolio Management

Active portfolio management is high in research and very market orientated. Fund managers are always sifting for the best information — economic statistics, trends in sectors and performance numbers for individual stocks — that will help them make good choices about what to buy. Here the portfolio is not seen as a concrete result, but as something constantly changing and to which one should adjust as soon as the market changes.

- **Detailed Research and Analysis:**

Active management heavily relies on skin-deep research in companies, industries and macro-economic themes. The managers dissect financial statements, competitive positioning and market sentiment to identify undervalued or high-growth prospects before they are widely known in the market.

- **Frequent Buying and Selling:**

Active managers are always rebalancing their portfolios (i.e., taking advantage of short-term mispricing).

or market volatility. That could involve increasing exposure to sectors with strong momentum or cutting exposure to those facing headwinds.

- Stock Picking:

Central to active management is selecting individual securities that you anticipate will do well. Managers, for example, might identify some breakthrough technology at a midcap company that they think will be transformative in its own industry and invest far more capital there than a passive fund would.

- Sector Rotation:

Managers tactically allocate across industries depending on economic cycle. For example, performance can benefit from a shift out of cyclical sectors like consumer durables into defensives such as healthcare in a downturn.

- Market Timing:

Active portfolio managers attempt to time markets — buying before a rally, selling before a decline. This allows them to take advantage of those short-term moves that passives are inattentive to.

- Continuous Monitoring:

Active management styles are not static techniques, they demand continuous monitoring. The managers keep a close watch on how their portfolios are performing in light of news events and market indicators, and they can make quick changes. This broad discretion potentially permits custodians to store investor funds in them even if they have proven violent.

Pros of Active Portfolio Management

There are a number of benefits to investors, such as increased growth on their portfolios, flexibility and the ability to maneuver with changing markets. Its active approach provides investors the opportunity to benefit from market inefficiencies, take advantage of new opportunities and potentially outperform a passive benchmark.

- Potential for Higher Returns:

Talented managers can beat the market by finding overlooked securities, or emerging trends. For instance, an active manager who invested in pharmaceutical firms early in the COVID-19 pandemic could have done much better than the broader market.

- Flexibility to Adjust Quickly:

Active managers can thought that what to carry from sectors or regions or asset classes in response to

fluctuating conditions—preserving capital during down cycles and participating in opportunities during upturns. This adaptivity is the primary advantage over passive approaches.

- Use of Advanced Strategies:

Active managers typically use hedging, derivatives and arbitrage to reduce risk and increase returns. For instance they might use put options to hedge long positions on stocks in volatile markets, or take advantage of pricing differences between similar securities.

- Professional Expertise:

The Investment Manager(s) and/or relevant analysts who have day-to-day responsibility for the management of a portfolio are generally experienced investment managers, investigators, and risk tolerant professionals with local market knowledge. This oversight can be particularly valuable when it comes to investors who do not have time or the expertise to manage investments themselves.

- Customization:

Active management offers the ability to customize portfolios to meet particular investor objectives, levels of risk tolerance and preferences – like omitting certain industries or increasing exposure to preferred themes. That level of customization is hard in a passive fund.

Cons of Active Portfolio Management

Active management has its benefits, but it also has some significant downsides. Expenses, risks and the difficulty of consistently outperforming the market make it less appropriate for all investors.

- Higher Costs:

High levels of trading, research and oversight Professionals often dig deeply into analysts work, while frequent trading will cause higher expensive ratio and manage fees than passive fund. These costs can erode returns over time.

- Tax Implications:

Being discretionary buys and sells frequently means generating more short-term capital gains, which generally receive a less favorable tax treatment. This can lower an investor's net return versus buying and holding.

- Dependence on Manager Skill:

There can be no assurance that active portfolio management will be successful, and such success can depend in large part on the skill of the manager. Bad choices, misinterpretation of market developments, or just a feeling of overconfidence can cause underperformance.

Rising Volatility, Risk of Underperformance:

Since active managers often take concentrated or frequently changing positions, the portfolios can be more volatile. What's more, the data reveals that many active managers underperform their benchmarks over time — particularly after fees.

- Market Unpredictability:

There are only so many pages of analysis, and even that can't predict the market perfectly. Black swan type of events including political crises, pandemics and government policy changes can potentially throw a wrench in our well-thought-out plans and result in losses.

4.2.2 Passive Portfolio Management – Characteristics, Pros and Cons

Passive portfolio management is an investing strategy that mirrors a market index rather than attempts to outperform it. This is based on the premise of efficient market hypothesis (EMH) which says that to begin with financial markets have already read all available information which makes it difficult for anyone to consistently beat the markets. Rather than trying to find mispriced securities or the right time to enter and exit the market, passive management is committed to long-term wealth creation by participating in low-cost, broadly diversified index investing.

Features of Passive Portfolio Management

Simple, cheap, and long term While the simplicity and low cost both speak in favor of passive portfolio management. It does not require rapid trading, risky bets, or extensive research as does active management. Instead, the investors buy index funds or exchange traded funds (ETFs) which reflect the constituents of benchmark indices like NIFTY 50, Sensex, or S&P 500.

Key aspects include:

- Index Funds or ETFs Investments:

Passive portfolios predominantly rely on instruments such as index funds or ETFs that track benchmark indices. For instance, an investor may purchase a NIFTY 50 index fund to provide exposure to the top 50 Indian companies by market capitalization. This gives automatic diversification across multiple sectors without having to pick stocks.

- Very Low Trading Activity:

Passive strategies involve minimal trading. Changes occur only when the base index

crises or during rebalancing. Reducing transaction costs and tax liability make the ETF more suited for long-term investors.

- Focus on Long-Term Wealth Creation:

Passive investing doesn't pay attention to short-term price action. "We're trying to accumulate wealth over time by owning diversified investments and experiencing the growth of those markets, reinvested dividends and compounding," he said.

- Transparent and Rules-Based Approach:

Passive investing has a transparent, rule-based approach. The holdings of index funds and ETFs are transparent and predictable, giving investors more confidence in the strategy, which is easy to understand.

Crisis management: Disaster recovery Jump to media player Four months on from the Sri Lanka bombings, one family is rebuilding their guest house business and trying to encourage tourism.

Pros of Passive Portfolio Management

Passive investing has gained tremendous popularity everywhere due to its low fees, simplicity and predictable results. It's especially attractive to investors who lack the time, expertise or inclination to actively manage their portfolios.

Major advantages include:

- Low Costs:

Because passive funds don't require expensive teams of researchers or trade frequently, their expense ratios are much lower than those for actively managed funds. Over time, this competitive advantage on price differential grows and adds value to net yield returns.

- Returns That Keep Step With the Index:

Passive funds attempt to replicate the return of an index, so investors know they will get the market's return minus some modest fees. That predictability is also wonderful for financial planning, as it damps down the level of uncertainty that active strategies often introduce.

- Tax Efficiency:

Passive funds also generate fewer taxable capital gains, because they trade less. This is particularly beneficial to higher tax bracket investors who are trying to limit taxes from turnover.

Ease of Understanding and Transparency:

Passive portfolios are straightforward. Let's not forget that investors know exactly what it is they own, because the fund mirrors the constituents of the index. That transparency allows novices and people who don't want to take big risks to play the stockmarket without a great deal of analysis.

- Broad Diversification:

One index fund can offer exposure to dozens or even hundreds of individual companies, spreading risk across sectors, industries and sometimes geographies. For instance, the S&P 500 index fund offers exposure to the U.S.'s top 500 companies and a NIFTY 50 index fund grants you access to the best companies in India.

Cons of Passive Portfolio Management

The simplicity and the savings are about the closest thing we have to a sure bet, but passive investing isn't for everyone: It is constrained by some fairly severe limitations that might not align with a particular investor's goals or risk tolerance.

Key drawbacks include:

- Limited Flexibility:

Passive portfolios lack the ability to respond quickly to market opportunities or declines. If, say, an investor wants to lighten up on a certain sector during a crisis or load up on a hot industry, passive funds can't make those kinds of moves independently of the index.

- No Outperformance:

Passive funds, by definition, will never outperform their benchmark index. Those looking for alpha or a quick buck may not find passive investing fulfilling. Returns will always trail the index a tad because of expense ratios, however low.

- Investment in Underperforming or Overvalued Stocks:

Since the passive funds mimic an index with no judgment, they include all its members — including some that may be overpriced or underperforming. For example, during stock market bubbles the fund is nevertheless loaded-up with overpriced stocks at high weights.

- Based on vulnerability in bull markets To S&P 500 and Skilled Active Managers:

At the extremes of bull markets, Even with competitive active managers there may be some advantage from identifying successful high growth stocks relative to passives who are necessarily as diversified, potentially missing out upticks.

No Defensive Measures:

Passive funds are not able to rotate into cash, bonds or hedges when markets get choppy. They don't redeploy capital into defensive assets no matter what and that means they take large short-term losses in bear markets.

4.2.3 Hybrid Approaches (Core–Satellite Strategy)

Hybrid forms of portfolio management seek to combine the best aspects of passive and active investing. Rather than having to pick between the stability of passive management and the performance opportunity presented by active, they invest in something that's a combo. The core–satellite approach is the most popular hybrid, because you give clients a disciplined, low-cost cornerstone (the core), yet also create an outlet for seeking higher-return or thematic opportunities (the satellite).

Features of the Core–Satellite Strategy

The fundamental nature of the hybrid approach is its hierarchy: a stable “core” and a movable “satellite.” The core is the anchor of the portfolio with steady returns, whilst satellite actively seek growth opportunities. This produces a balanced architecture that is cheap and stable, like the passives, yet also flexible as the actives, and capable of alpha generation.

Key features include:

- Core Portion in Passive Funds:

Of the portfolio as a whole, 60–80% is usually invested in passive funds that replicate benchmark indices (like NIFTY 50, S&P 500 and Sensex) through index mutual funds or exchange-traded funds(ETFs). This core provides diversification, stability and low management but forms the long-term anchor of the portfolio.

- Satellite Component in an Active Strategy:

The fund's portfolio is otherwise actively managed, with the active selection accounting for 20 to 40%. These could range from high growth equity funds, to sectoral/thematic funds, alternative assets such as Gold ETFs or international equity to name a few. The satellite part is designed to generate alpha by uncovering opportunities markets miss when it comes to passive investing.

Balance Between Stability and Flexibility:

The portfolio remains less volatile with a larger passive core, and therefore more predictable. Furthermore, the existing satellite gives room to move into new themes, sectors or geographies. For instance, when these segments exhibit strong growth potential the satellite can move into them or new technologies/healthcare.

- Moderate Monitoring Requirement:

The hybrid solution is less day-to-day maintenance than a purely active portfolio, because the core is almost constant. But the satellite portion still needs monitoring to ensure it's in line with investor goals and market conditions.

This combination of active and passive investment in the hybrid vehicle makes this structure particularly attractive for investors who want the discipline of a quasi-passive approach but also is not willing to lose out completely to place an alpha bet in search for market returns.

Pros of the Core–Satellite Strategy

The hybrid method has become popular worldwide because it maintains a low-cost stability while offering potential for growth, which makes it attractive to many investors. Advantages of NFP fall under the following categories:

- **Reduced Portfolio Risk:**

With most of the portfolio in diversified, low-cost passive funds, you get less risk and volatility overall. If the satellite part misses, despite under-performing its core, it is still in decent solid mode.

- **Potential for Alpha:**

Investors in the satellite portion can capture high-growth possibilities or niche sectors. For example, an investor can have 70% of their funds invested in a NIFTY 50 index fund and another 30% to be deployed in an actively managed renewable-energy fund. That gives them the opportunity to earn returns that are higher than the benchmark's.

- **Cost Efficiency:**

Because most of the assets are held in passive funds with low expense ratios, total portfolio costs are less than for a fully active strategy. The de minimis active portion lowers research, transaction and management fees but still leaves room for upside.

Flexibility and Adaptability:

Investors can overweight the satellite piece toward sectors or themes that they believe will outperform while maintaining a disciplined core. That could mean adding some international equities, smallcap funds or commodities at the right time without putting the entire portfolio at risk.

- **Tactical Opportunities With Long-Term Discipline:**

The core part keeps you out of trouble over the years by parking money in broad market indices, and satellite provides room for tactical bets at less extreme time frames. The two sides of the coin represent flexibility in investors' financial goals.

In this way, blending risk and return in the core–satellite structure allows its adherents to have their cake (discipline) and eat it too (flexibility).

Cons of the Core–Satellite Strategy

Despite positive advantages, hybrid approach also presents constraints and challenges. The limitations come from the fact that two alternatives are merged plus the rule of thumb whenever you have an active part in your satellite, things go to piece.

- Requires Expertise to Design:

With their core and satellite ratio, investors need to get this just right. This involves determining their risk tolerance, time frame and financial goals. Some examples: An early career person might have a 60/40% core/satellite; a retiree, 80/20%.

- Active Portion Contains More Risk:

The core may be stable, but satellites still have actively managed assets that can be volatile.

Choice of bad sector or timing of entry/exit can lead to losses that pull down overall performance.

- Not Cheaper Than Purely Passive Portfolios The criticism implicit in this item's title is misleading, analysts at Brown Brothers Harriman said.

The satellite portion in particular brings with it management costs, research charges and potentially higher trading costs than those associated with a pure passive portfolio. The costs can eat into the net return differential in a long-term scenario.

- A Hair More Complicated to Manage:

Two moving parts have to be tracked in the hybrid simulator; the passive core and the active satellite.

For newbies or traders who want a bit more of a hands-free.

strategy. If you don't conduct good due diligence, you may wind up with a satellite allocation that gets too large and changes the risk of your portfolio.

- Danger of Over-Confidence in active selections:

Investors may overestimate their capacity to pick the good sectors, or managers. If the satellite's active bets tend to underperform, then at some point the hybrid portfolio ends up looking a lot like (or sometimes worse than) a low-cost passive portfolio — only with higher costs.

Ultimately, the core–satellite approach has potential for an ideal credit-to-core allocation but it is also not something to be thrown together carelessly or drift away from.

“Activity: Comparing Portfolio Approaches”

Form three groups in class. Allocate either of the three portfolio management strategies: Active, Passive & Hybrid to each team. Each class should outline its traits, one positive and one negative. Ten minutes later, share findings with the class and discuss which method is most suitable for various types of investors.

4.3 Summary

- ❖ Portfolio management strategies are diverse according to the investor’s goal, risk tolerance and capital.
- ❖ Active portfolio management attempts to achieve returns that exceed the market through research, stock selection, and market timing as well as trading.
- ❖ Active strategies have the potential of generating higher returns but come with higher costs, more risks and dealing with managers’ fiduciary skills.
- ❖ Passive portfolio management seeks to mimic market performance through the use of index funds or ETFs, generally with low costs and minimal trading.
- ❖ Passive approach offers predictability and tax efficiency but do not deliver excess return over the benchmark.
- ❖ Tacticians When it comes to the art vs. science argument, the best mutual fund strategies are hybrids, containing elements of passive stability and active growth opportunity - for example: the core-satellite strategy.
- ❖ The satellite portion allows flexibility and potential for returns.

Be it hybrid or not, they also reduce the risk of their cargo yet are cost efficient, but need good planning and monitoring.

- ❖ Each method has its pros and cons, the choice will vary with investors objectives and situations.
- ❖ A well-thought portfolio approach implies enhanced consistency among expected returns, market conditions and investment preferences.

4.4 Key Terms

Active Portfolio Management – A strategy of attempting to outperform the market by selecting securities, or by timing market movements.

Passive Portfolio Management – An investment style in which the objective is to mimic the performance of an index using index funds or ETFs.

Hybrid Approach (Core-Satellite Strategy): The core is managed passively, whereas the satellite is managed actively.

Alpha – Investopedia’s definition of Alpha is: the amount by which a fund or investment outperforms its benchmark index.

Benchmark Index – A traditional market index (i.e. NIFTY 50, S&P 500) that is used to measure performance of a portfolio.

Market Timing – Investing and trading based on predictions of market direction.

Index Funds - Mutual funds that are structured to duplicate the performance of a certain market index.

Exchange-Traded Fund (ETF) - A type of security that involves a collection of securities—such as stocks—that tracks an underlying index, though can be traded like a stock.

Core-Satellite Investing—An investing style that uses a portion of the assets as the main or core portfolio that is generally more defensive and less volatile, then takes the remaining portion (satellite) to achieve higher growth.

4.5 Descriptive Questions

Describe what active portfolio management means. What are its principal characteristics, merits, and demerits?

Describe what is meant by passive portfolio management. What’s the difference | How does it compare with active management?

What is the core-satellite approach to portfolio management? Illustrate with an example.

Distinguish among active, passive, and hybrid portfolio management strategies.

Explain how market efficiency affects the decision to use active or passive management of a portfolio.

What aspects of costs and fees are important when deciding between a portfolio management orientation?

Under what conditions would an investor favor a passive approach to investing instead of an active one? Provide examples.

Assess the contribution of hybrid strategies for stability and growth in portfolios.

What impact does an investor's risk tolerance and time horizon have on selecting a strategy for managing the portfolio?

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4.7 Case Study

“Selecting the Right Portfolio Management Approach”

Introduction

Portfolio management is an essential component of financial planning, which involves selecting and overseeing investments to achieve a person’s financial objectives. Most of the time, investors have to consider active vs. passive vs. hybrid management whilst thinking about how they should manage a portfolio. Each of these has its own characteristics, advantages, and limitations. This in-depth example looks at difficulties investors have when deciding which approach is the best, and practical exercises to resolve them.

Background

Arjun and Meera both in their early thirties with stable sources of income and were friends. Arjun is a believer in active management who wants to beat the market by selecting stocks and timing investments. Meera takes a passive approach, investing in index funds that track the NIFTY 50, focusing on low costs and steady growth. Their advisor then exposes them to a hybrid strategy (core-satellite) which attempts to marry passive stability and active opportunity.

They face questions such as:

- Do you agree on a higher risk of active management for potentially extra returns?
- Is a passive strategy too circumscribed, especially in an up market?
- Can a hybrid system find the right mix?

Problem 1: Costs and Risks of Active Management

Arjun finds active managed funds charge higher fees and occasionally perform worse than benchmarks.

Solution Investors have to balance the prospect of higher returns against greater costs and risks. They only need to pick active management when they can invest with able managers and can handle volatility.

MCQ:

What is the primary drawback to active portfolio management?

- a) Low cost
- b) High fees and risks
- c) Lack of flexibility
- d) No diversification

Answer: b) Charges and risk

Definition 2: Passive Management Constraints

Meera discovers that her passive portfolio – while having a low-cost (and low fees) appeal – doesn't outperform the market and features under-performing stocks instead of from the said index.

Solution: Passive management is appropriate for reliable long-term growth, but investors need to be prepared for returns that match the market and not exceed it.

MCQ:

Passive portfolio management aims to:

- a) Beat the market
- b) Match the market
- c) Avoid the market
- d) Eliminate risks

Answer: b) Match the market

Problem Definition 3: Hybrid Strategy Balancing

Their adviser describes the core-satellite approach, in which the core is managed passively and a smaller "satellite" portion is actively managed. This is one way to get the balance of stability and growth. Solution: The use of hybrid models allow investors to benefit from passive-investment low cost, and at the same time control for branch profitability with active strategies.

MCQ:

In a core-satellite approach, the "core" typically consists of:

- a) Active investments
- b) Passive investments
- c) Derivative trades
- d) Real estate holdings

Answer: b) Passive investments

Conclusion

Active, passive and hybrid methods all have their straightforward benefits and drawbacks. There are growth opportunities in active management — but risks and costs that are high, too. Passive management adds stability and low cost, but no outperformance in the markets. Hybrid tactics integrate two of the best of both worlds, and are more flexible and balanced. The decision will hinge on an investor's risk appetite, financial aspirations and market sentiment.

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Unit 5: Risk & Return

Learning Objectives

1. Learn basic principles of risk and return when investing in securities.
2. Define various risks like systematic risk, unsystematic risk, credit risk and liquidity risk.
3. Discuss the association between risk and return, and its effect on investment decisions.
4. Discover how to quantify risk, such as standard deviation, beta, and value-at-risk.
5. Estimate expected return using models such as the Capital Asset Pricing Model (CAPM).
6. Understand how diversification can mitigate risk while preserving returns.
7. Analyze the risk-return characteristics of different types of assets, including stocks, bonds or real estate.
8. Utilize risk-return trade-off in order to structure financial investment plans that meet the goals of investors.

Content

- 5.0 Introductory Caselet
- 5.1 Types of Risk
- 5.2 Specific Categories of Risk
- 5.3 Risk-Return Trade-Off
- 5.4 Summary
- 5.5 Key Terms
- 5.6 Descriptive Questions
- 5.7 References
- 5.8 Case Study

5.0 Introductory Caselet

“Vikram’s Investment Choice – Managing Risk and Returns”

Vikram works in Pune as a 32-year-old IT professional and has been doing well in terms of career growth. He has a steady monthly income, minimal financial obligations, and even some emergency savings. Accordingly, he got a bonus of ₹4,00,000 this year from his company. Much too eager to make wise choices, he visits a financial adviser to get his options.

The adviser tells Vikram that an investment can be seen from two angles; risk and return. The higher the potential return, the higher the risk; by contrast, a safe investment is more likely to offer lower returns. Vikram has three options:

Fixed Deposits (FDs) o Returns: Around 6% per annum. o Features: Insurance and secure; no or little risk on principal.

o Downside: Does not beat inflation over time.

Equity Mutual Funds o Returns: Up to 12–15% annually in the long run. o Attributes: High-growth potential; suitable for wealth generation.

o Drawback: Extremely unstable on the short term; hard to take money out (possible capital loss if you do).

Corporate Bonds o 8-9% per year average. o Features: moderate risk with relatively steady returns compared to equities.

o Downside: Credit risk of default by the issuer.

Vikram now faces a dilemma. If he invests the entire amount in FDs, he will be able to protect capital but earn low returns. He could amass wealth more quickly if he opts for equities, but he faces the prospect of short-term losses. If he chooses corporate bonds, in order to receive any reasonable return on his money they still won’t be particularly safe.

"It is his inherent risk-return trade-off that his profile should be based on," adds the advisor.

- Age (32, young enough to be able to bounce back from losses).
- Financial well-being (income, less debts).
- Goals (wanting to get richer in the long term, but also desiring some security).

Vikram figures portfolio allocation may be the answer — with something safe, something moderately growing and maybe something high-growth, instead of one or the other.

Critical Thinking Question

How would you distribute the ₹4,00,000 of Vikram in fixed deposit and equity mutual funds and corporate bonds to get the right balance between return and risk? What would help you make a decision, and how would your allocation look if you had different financial goals or risk tolerance?

5.1 Types of Risk

5.1.1 Definition of Systematic Risk | Examples of Systematic Risk

Definition

- Systematic risk, also known as market risk, is the kind of risk that touches all corners of the market or economy.
- It's driven by outside forces that no amount of brilliance on the part of individual investors or companies can mitigate.
- You can't diversify this risk away, because it affects all sectors and every asset class.
- Investors do have to bear systematic risk as part of investing in financial markets and get compensated for it in the return.

Examples of Systematic Risk

- Economic Risk: In the event of a recession, total corporate profits decline as stock prices in general fall.
- Inflation Risk: Rapid inflation can erode the buying power of money and returns on investments.
- Interest Rate Risk: When interest rates are on the rise, prices of bonds will decline, and this can also have adverse effects on equity valuations.
- Political and Policy Risk: Political or policy changes pertaining to taxation, trade relations, or government regulation may impact market performance.
- International Events: Wars, pandemics, oil price shocks or international financial crises affect all divisions in the same way.

Key Point: Because systematic risk cannot be eliminated, investors bear it by weighting their asset allocation with proportionate risks—being compensated with higher expected returns for assuming greater market risk.

5.1.2 Unsystematic Risk – Definition & Examples The portion of risk that can be eliminated (diversified) from the total system of risk with a combination of many risky investments is known as unsystematic, or non-systemic, risk.

Definition

Unsystematic risk – this is also called specific, idiosyncratic or diversifiable risk and it represents the individual company, industry or sector risk. Not comparable to systematic risk (which is non-diversifiable and is applicable to the entire market), unsystematic risk emerges from internal or controllable variables and consequently can be lowered by diversification. Investors can greatly reduce this type of risk by maintaining a well-diversified portfolio that includes securities from different companies, industries and asset classes.

Key characteristics:

- Connected to individual companies or industries, rather than the market as a whole.
- The result of internal factors, including management decisions, financial policies or operational problems.
- Spreading risk across companies, industries and asset classes can serve to mitigate or dampen it.

Examples of Unsystematic Risk

There are a number of types of unsystematic risk, depending on various aspects of the company's operations and financial makeup. The following is the list of main types along with few examples:

Company-Specific Risk

This risk comes from the situation specific to a company, its management quality, business history or unpredictable events.

- Fraud or Scandal:

Instances are too numerous to mention, but it can include accounting fraud (Enron, Satyam), incorrect reporting of earnings or failure in corporate governance. Such episodes undermine investor confidence and sink stock prices.

- Poor Management Decisions:

Losses can also be caused by strategic errors such as unsuccessful mergers, too aggressive an expansion, or launching the wrong products.

- Strikes or Labor Disputes:

Sustained labour conflict or strikes can interrupt production and add to financial costs.

Industry-Specific Risk

These are risks that affect entire industries, not the entire economy. It is the over-weighting of risk, to which an investor that's highly overweighted in a single sector is more vulnerable.

- Industry Downturns:

For example, if the automotive industry slows down because of strengthening input costs or weakening consumer demand, it could lead to losses for auto-related stocks and suppliers.

- Regulatory Changes or Bans:

Industry levels of profitability can be reduced by government policies directed at particular sectors - either environmental restrictions on mining, or an increase in taxes on tobacco.

Business Risk

Business risk is when the company's business model, strategy, or industry position is inferior to its competitors.

- Example:

A merchant unable to cater to the e-commerce trend can lose market share to online rivals.

Likewise, a technology company that doesn't innovate is flirting with obsolescence.

Financial Risk

Types of financial risk The financial risk arises due to the capital structure and firm's financial policy.

- High Debt Levels:

Borrowing too much can ultimately result in defaults on payments, particularly as interest rates increase and income falls.

- Poor Liquidity Management:

Insufficient liquidity or mismanagement of working capital can result in insolvency even if the company has a healthy bottom line.

Credit Risk

Credit risk refers to the risk that a company or its counterparties will fail to meet obligations related to loans, bonds or other forms of debt.

- Example:

A company with a high volume of borrowings "could fail to make interest payments or be downgraded," leading its bond prices to fall and credit rating to drop, Sanderson says. That risk is borne by investors who own the company's bonds or its shares directly.

- Another Angle:

Even companies with solid operations can be undermined by their clients' inability to pay invoices, which can produce a cash-flow crunch.

Operational Risk

Operational risk is the loss resulting from inadequate or failed internal processes, people and systems or from external events. That can include technological glitches, fraud, mismanagement or supply-chain disruption.

- Examples:

- o A breach exposing customer data could result in fines, lawsuits and reputation damage.

- o Breakdowns in the supply chains (eg 2020–21 global chip shortage) can disrupt output for auto and electronics manufacturers.

- o Bank systems not performing resulting in transaction error or compliance violations.

- Why It Matters:

Operational risk is related to profitability, reputation and compliance—which makes it especially important in sectors such as banking, manufacturing and tech.

Key Point: Managing Unsystematic Risk

There are several lines of defense against unsystematic risk, the first is diversification. By spreading your chips around in multiple companies, sectors and asset classes, you can make sure that a loss in one area doesn't wipe out the whole return. Losses in one sector of the economy (such as oil and gas) might be gains in another (like health care or technology). This allows unsystematic to be controlled much more than systematic.

Did You Know?

"Unsystematic risk (...) which is also known as specific risk (...), can to a very large extent be diversified away. Research indicate that by combining 20-25 selected stocks, company or industry specific risk are often reduced substantially. While systematic risk is one the entire market has to deal with, unsystematic risk can be managed with smart investment choices."

5.1.3 Measuring and Managing Risks

Risk is ever-present in the investment world and comprehending this risk is critical for active portfolio management. Risk as a measure of risk Risk is the evaluation of volatility in investor's portfolios, so that he can take certain steps to handle probable losses. What follows is an in-depth explanation of how standard market risks can be quantified and controlled, both with traditional and modern tools.

Measuring Risks

Conditioning on a variety of statistical measures, investors measure their risk exposures. These are tools to compare investments, determine volatility and measure the risk-adjusted returns.

Standard Deviation (Volatility Measure)

- **Definition:** The standard deviation is a gauge of how much the returns of an investment vary from its mean return over time.
- **Use:** The higher the standard deviation, the greater the variability (and therefore risk) and conversely a lower standard deviation point to returns that are more stable.

Illustration: If Fund A has a standard deviation of annual returns of 5% and Fund B's is 12%, for example, Fund B would be “riskier” because its return varies more.

- **Key Point:** Standard deviation measures total risk, a combination of systematic and unsystematic risk.

Beta (β) (Market Risk Measure)

- **Definition:** Beta is a measure of how much a security's (or other portfolio) returns go up or down in response to the overall market rising or falling. It measures systematic risk only.
- **Interpretation:**
 - o $\beta > 1 \rightarrow$ More risky than the market. (If the market is up 10 percent, the security may be up 12 percent.)
 - o $\beta < 1 \rightarrow$ Less volatile than the market. (If the market rises 10%, that security might surge only 6%.)
 - o $\beta = 1 \rightarrow$ Moves with the market.
- **Example:** If a stock has a beta of 1.3, it means that the stock is 30% more volatile than the market index.
- **Key Point:** Investors can employ beta to ramp up or tamp down risk in a portfolio according to their taste — putting more high-beta names in for frothy growth, more low-beta names for ballast.

Value at Risk (VaR)

- **What is it:** Value at Risk estimates the potential maximum loss in a given time period for a specified confidence (or probability) level.
- **Use:** It's usually said as “There is a 5% chance the portfolio loses more than ₹X in a month.”
- **Example:** A VaR of ₹1,00,000 at 95% confidence over one month means there is a 5% probability that losses will exceed ₹1,00,000 in that time.

- Key Point: VaR is useful for risk planning and stress testing, but can not predict extreme “black swan” events.

Sharpe Ratio (Risk-Adjusted Return)

- Interpretation: The Sharpe ratio measures the excess return (or risk premium) per unit of total risk. It pits the return of the investment over and above the risk-free rate against how wildly its value swings.
- Formula: $(\text{Portfolio Return} - \text{Risk-Free Rate}) / \text{Standard Deviation}$ Formula of SML To calculate the beta, it is multiplied by market return and the result must be divided by variance¹.
- For example, if a portfolio returns 12%, the risk-free rate is 6% and the standard deviation is 8%, then Sharpe = $(12-6)/8 = 0.75$.
- Key Point: The higher the Sharpe Ratio, the better performing a strategy is on a risk-adjusted basis.

Treynor's Ratio (Systematic Risk-Adjusted Return)

- Defined as: Treynor's Ratio is a measure of an investment's returns in excess of the risk-free rate per unit of risk. It quantifies the amount of excess return over that which is guaranteed by the risk free rate per unit of systematic risk.
- Formula – $(\text{Portfolio Return} - \text{Risk-Free Rate}) / \text{Beta}$
- Use: Appropriate for well-diversified portfolios (where nonsystematic risk is low).
- Example: A portfolio earning 14% in which the risk-free rate equals 6% and Beta=1.2 leads to Treynor's Ratio = $(14-6)/1.2 = 6.67$.
- Key Point: Useful when you're comparing portfolios or funds that have varying degrees of exposure to the market.

Jensen's Alpha (Calculated from Portfolio Manager Performance)

- Description: Jensen's Alpha is the most widely used measure of an investment manager's risk adjusted performance representing the average return on a portfolio that exceeds what would be predicted by the capital asset pricing model (CAPM) given the same amount of risk. It illustrates how much of the return is a result of the manager's skill rather than market shifts.
- Formula: $\text{Alpha} = \text{Actual Portfolio Return} - [\text{Risk-Free Rate} + \text{Beta} \times (\text{Market Return} - \text{Risk-FREE RATE})]$ When Would I Use Each?

Free Rate)]

- Example: If a portfolio returns 15% when CAPM forecasts 12%, the Jensen's Alpha is +3%, indicating that the manager provided value.

Key Point: If the alpha is positive this demonstrates outperformance due to skill, and if it is negative this shows underperformance based on the risk of the portfolio.

Managing Risks

Because no risk can be eliminated altogether, investors employ a variety of techniques to reduce and manage it. As I say all the time, risk management is making sure that your portfolio stays consistent with what you can afford to have at stake based on an investor's time horizon and its goals.

Diversification

- Definition : Putting investment eggs in multiple baskets, or spreading investments across various industries and even asset classes — say stocks and bonds — with a view to minimize risk by not having too much exposure to any one area.
- Example: Instead of investing money in only IT stocks, the portfolio can have equity of sector wise such as IT, FMCG, banking and healthcare. This reduces unsystematic risk since potential losses in one industry may be counterbalanced with potential gains in another.

Asset Allocation

- Definition: Determining the optimal mix of stocks, bonds, real estate and cash based on an investor's profile.
- Example: The younger you are, the more you may hold in equities for long-term growth; the older you become, the more inclined you may be toward bonds and fixed income to manage risk. By allocating your assets, risk is balanced with return expectations. 3.

Hedging

- Definition: The use of various financial instruments to insulate against low-side risk.
- Example: An investor that has a big stake in a company's shares can purchase a put option to protect themselves from potential losses if the stock drops. Locking in prices for commodities or currencies is another use of futures contracts.

Insurance and Safe Assets

- Definition: Keeping safe, low-risk or guaranteed products to ensure the safety of capital in a market downturn.
- Examples: Government bonds, treasury bills or insurance products such as annuities offer stability and predictable income to make up for the market's peaks and valleys.

Monitoring and Rebalancing

Meaning: Regularly watching how your investments are doing and modifying them to keep a certain level of risk.

- Example: When a portfolio's equity allocation increases, to say 70% or 80%, from market gains in the past year, you sell some of its stock and use that money to reinvest elsewhere in fixed income.

“Task: Description of Systematic and Unsystematic Risks”

Give two examples of systematic and unsystematic risk each. In groups of three discuss how diversification does eliminate unsystematic risk, but doesn't eliminate systematic risk. Provide an example of one real event when the two risk factors affected investment yield.

5.2 Specific Categories of Risk

5.2.1 Business Risk

Definition

- Business risk is the possibility that a company's operations, management or competitive environment will hinder its profitability or cause it to lose money.
- It is linked to a company's day-to-day operations and how well it deals with adversity.

Causes of Business Risk

- Inefficient or poor management decisions.
- Inability to innovate or respond to evolving consumer tastes.
- Competition is intensifying, putting pressure on revenue.
- Breaks in the supply chain or shortage of raw material.
- Company operations being impacted by legal or regulatory issues.

Examples

- An uncool smartphone company losing market share because superior technology comes from somewhere else.

A losing retail chain suffering from bad real estate decisions.

A food company issuing a recall because of quality concerns.

Business Risk is Company Specific Key Point Business risk is specific to the company. Investors can protect themselves by diversifying their holdings across companies and industries.

5.2.2 Financial Risk

Definition

- Financial risk is the risk that a company won't be able to meet its debt obligations or operate efficiently.
- It is highly correlated with the capital structure.
- Companies that are over-leveraged are at greater risk of financial peril.

Causes of Financial Risk

- Excessive leverage (overborrowing).
- Poor cash flow management.
- The challenge of timing market when new cash needs to be raised.
- Surging interest rates suddenly making debt more difficult to repay.

Examples

- A company failing to pay its bondholders.
- A company failing because of too much reliance on borrowing.
- Downgrade in credit rating which would cause a loss of investor confidence.

Investors can mitigate financial risk by digging into a company's balance sheet, debt-equity ratio, liquidity position and credit ratings before investing.

5.2.3 Market Risk

Definition

Market risk is the potential for loss due to changes in the broad market that affects all securities, regardless of their individual character.

- It is a systematic risk — one that cannot be diversified away.

Causes of Market Risk

- Economic contractions like recessions or depressions.
- Political uncertainty, elections or policy changes.
- Worldwide phenomena like wars, pandemics or oil price shocks.
- Interest rate oscillations that depress the value of both stocks and bonds. Examples
- The 2008 Global Financial Crisis and so much of the stock market crashing.
- 2020 drop in global equity markets driven by COVID-19 pandemic.

- Central banks raising borrowing costs, which drag bond prices south.

Key Point: It is not possible to remove market risk, but we can manage it through:

- Asset allocation (stocks, bonds, real estate and so on).
- Hedging tools (futures, options).
- Having a long-term investment horizon to weather volatility.

5.2.4 Inflation Risk

Definition

- Inflation risk, also known as purchasing power risk, is the risk that rising prices will erode the real value of money and of investment returns.
- Higher inflation may still be a negative even if nominal returns are positive due to an investment.

Causes of Inflation Risk

- Gradual rise in the price of goods and services.

Soft policy on inflation - not inspiring confidence.

Global commodity price surges (oil, metals, food).

Examples

- An investor receives 6% interest income from fixed deposits, but is experiencing inflation of 7%, which produces a negative real return of -1%.
- People who are living off a fixed-income investment lose purchasing power when inflation climbs.
- Long-term fixed-coupon bonds will not do as well in a high inflation environment.

Important Note: Inflation risk can be effectively averted by investing in:

- Stocks (outperform inflation over the long term).
- Real estate (values of properties rise with inflation).
- Inflation-adjusted bonds and commodities such as gold, which protect purchasing power.

5.3 Risk-Return Trade-Off

5.3.1 Concept of Risk-Return Relationship

- The concept: Risk-return relationship states that the higher is the potential return of any investment, the higher risk will be associated with it. The higher risk investors are forced to take on, the more meat they want as a payoff.

- Key Concept: Less risky investments (such as government bonds) have a lower but predictable return, while riskier assets (like stocks or derivatives) offer potentially higher returns with greater unpredictability.

- Example:

- o Savings account → Very low risk, 3-4% interest return.
 - o Corporate bonds → Moderate to high risk, 8–9% return.

- o Stocks → High risk, 12-15% or more return over the long term.

- Application: Investors need to select investments on the basis of risk tolerance, so that expected returns fit their goals and loss tolerance.

5.3.2 The Higher the Risk, the Higher the Return Basis

- Definition: This is the principle that investors who accept more risk will be rewarded with higher potential returns, and on the other end of the spectrum, those with lower risk tolerances receive lower but less risky returns.

- Why It Works:

- o Risky choices are less certain (e.g., stock prices more volatile, businesses more likely to fail).

- o To be attractive to investors, returns from this type of investment would have to be higher.

Examples:

- o Stockmarket investments are more volatile than bank deposits but have outperformed long term historically.

- o VC investment in start-ups is a high-risk, high return approach.

- Implication for Investors: “Every investor has to weigh the returns they want and are hoping to get with their risk tolerance,” Mr. Nichter said.

5.3.3 The Trade-Off in Risk and Return with Diversification

- Definition: Diversification Described in the Elsewhere But Also Here space, diversification can be defined as a way to spread out your investments across different assets, industries and geographies to help mitigate risk while still potentially capturing returns.

- How It Works:

o Company or industry risk (unsystematic risk) can be eliminated through diversification.

o Systemic risk (system, market-wide) cannot be “insured” against; but it can indeed be managed through asset allocation.

- Methods of Diversification:

Through types of content (business podcast, blogs). o Within asset categories (in large cap, mid cap, international equities).

o Geographically (Potential and Global Mark provide the target locations).

- Example: Instead of putting ₹5,00,000 in one’s stock of a company, the investor spreads it around IT, FMCG and banking and bonds. Even if IT disappoints, losses may be offset in other sectors.

- Key Benefit: Reduces risk and preserves capital by dampening volatility and shielding from single-stock exposure.

5.4 Summary

- ❖ Risk-Return relationship: It is an important investing principle which states that higher is the risk, higher are expected to be the returns.

- ❖ Relationship between risk and return, where a higher degree of uncertainty entails that investors need to be compensated with a higher return.

- ❖ Safer investments such as government bonds or fixed deposits may offer lower returns but consistent ones, while risky instruments like equities and derivatives tend to offer higher but volatile ones.

The higher risk, higher return is the basis for investment decisions whereby investors match themselves with the reward they expect.

- ❖ Conservative investors, in general, choose low-risk/low-return strategies whereas aggressive ones look for high-risk/high return investments.

- ❖ Diversification is an essential component of risk-return balance, as it spreads investments among classes of assets, categories and geographies.

- ❖ Diversification eliminates unsystematic risk (company or sector-specific) but not systematic risk, which will always exist.

- ❖ Appropriate asset allocation and diversification help investors to pursue consistent returns with the management of downside risk.

❖ Risk-Reward Optimization Process to align portfolios with investor objectives, risk tolerance and time horizon.

5.5 Key Terms

Risk-Return Trade-off – The idea that increased return potential goes hand-in-hand with greater risk.

Systematic Risk – The market/whole entity risk due to causes from the outside that cannot be diversified away.

Unsystematic Risk - Business or industry risk of a particular investment that can be eliminated through diversification.

Standard Deviation – The amount of the variation in investment returns.

Beta (β) – A measure of a security's sensitivity to the market.

Diversification – The practice of allocating investments among several assets in order to minimize risk.

Inflation Risk – The risk that inflation will erode the value of investment returns.

Market Risk - The risk of loss from general market movements.

Risk Appetite – The amount of risk a trader or investor is willing to be exposed in exchange for potential returns.

5.6 Descriptive Questions

Illustrate the risk-return trade off with appropriate examples from various asset classes.

Distinguish between systematic risk as and unsystematic risk. What should investors do with each variety?

Talk about the higher the risk, the higher the return idea. How is this relevant to investment decisions?

Why is diversification useful for balancing risk and return? Illustrate with an example.

Explain alternative ways to quantify investment risk, such as standard deviation, beta and Value at Risk (VaR).

What is inflation risk? What can investors do to safeguard their portfolios from it?

Discuss about business risk and Financial risk with example.

How does the investment time horizon and risk tolerance of an investor impact his/her selection of investments?

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5.8 Case Study

The Risk-Return Trade-Off in Investment Portfolio Selection

Introduction

Savers have long struggled with trade-offs between risk and return. Investments tend to fall into one or the other categories: low return, high stability investments; high return, highly volatile investments. Knowing how to strike this balance is a key aspect of optimal portfolio construction and accumulation. This case discusses popular risk-return trade-offs in investment and suggests ways to manage such decisions.

Background

Rahul, an engineer aged 30 years got bonus of ₹5,00,000. He's interested in making an investment for wealth creation but is unsure of the level of risk he should take. His options include:

- Fixed Deposits (FDs): Safe but low on return.
- Corporate Bonds: Medium risk, medium return Investments.

- Equity Mutual Funds: High risk, high rate of return.

Rahul knows his decision would be a function of his risk appetite, financial goals and investment horizon. He's one of many investors grappling with how to balance guarding his capital with growing his wealth.

Problem Formulation 1: over-conservatism risk

Rahul thinks of investing all money in FDs for safety; however, inflation is likely to eat into the returns effectively meaning negative real return. Solution: Invest part only in safe instruments like FDs and the other on inflation-beating returns.

MCQ:

What is the biggest drawback of putting all your money in FDs?

- a) High volatility
 - b) Low liquidity
 - c) Negative real returns because of inflation
 - d) Lack of diversification
- (c) Negative real returns on account of inflation

Problem Two: Equity Markets are Volatile

Rahul is drawn towards investing in equity mutual funds because of the higher returns it offers, but is scared of stock market movements. Solution: Invest systematically through SIPs and diversify portfolio across sectors to mitigate volatility.

MCQ:

How Rahul can mitigate the effect of volatility in Equity market?

- a) Avoid equities completely
- b) Pour all your money in one single sector
- c) Use SIPs and diversify
- d) Hold only fixed deposits

Answer: c) SIP and Diversify

Problem Statement 3: Diversifying and Balancing Your Portfolio Now, that you know the investment avenue which would be perfect for you in opening your pooled investment here is another key understanding.

Rahul knows that too many of one kind of investment could leave him subject to concentrated risk.

Answer: Go for a mixed allocation model (say 40% in equities 40% in debt) Set the rules it optimizes on risk and reward.

MCQ:

What is the major advantage of diversification?

- a) Eliminates systematic risk
- b) Increases volatility
- c) Reduces company-specific risk
- d) Guarantees high returns

Answer: c) Reduces company-specific risk

Conclusion

You can never get away from the risk-return trade-off when it comes to investing. Through an understanding of the nature of risks, by diversifying across asset categories and by basing decisions on personal goals; investors like Rahul can find a balance between safety and growth. The discipline of approach is what creates longterm wealth -and manages risk at the same time.

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Unit 6: Risk–Return Measures (Part I)

Learning Objectives

1. Grasp the basic principle of risks and returns in decisions about money.
2. Describe types of risks associated with investment instruments.
3. Illustrate the relation between risk and return on the basis of theory and application.
4. Acquire more understanding about basic return measures such as arithmetic mean, geometric mean and holding period return.
5. Discover Standard Risk Measures such as Variance, Std Deviation and Coefficient of variation
6. Explain the impact of risk–return trade-offs on investment decisions.
7. Use risk–return statistics to assess the performance of securities and portfolios.
8. Acquire the skills to analyse and compare the risk–return profiles of alternative investments.

Content

- 6.0 Introductory Caselet
- 6.1 Holding Period Return (HPR)
- 6.2 Expected Return
- 6.3 Standard Deviation
- 6.4 Summary
- 6.5 Key Terms
- 6.6 Descriptive Questions
- 6.7 References
- 6.8 Case Study

6.0 Introductory Caselet

“Balancing Risk and Return: An Investor’s Challenge”

Ravi, a 32-year-old software professional, has recently got a yearly bonus of ₹5 lakhs. He knew that if he left the money in his savings account, it was just going to languish there, earning little interest and giving him meager returns.

Once they did some research, Ravi narrowed it down to three choices:

Government Bonds – Safe and secure, low risk investment that earns you around 6% per year.

Blue-Chip Shares – Medium risk with a return of 12-14% per annum.

Start-Up Stocks – Very high risk, opportunity for very high returns (c.25%) but risk of losing substantial capital.

Ravi is interested in the kind of sky-high return potential that comes with early-stage stock, but he's equally worried that his hard-won bonus could go right back out the door. He understands the risk–return trade-off but has difficulty determining how much money to invest in each alternative.

Ravi's confusion is illustrative of the importance of separating measures of return (such as average return) and those of risk (like standard deviation and coefficient of variation). In considering the alternatives, he concludes that of the options available, only selecting one might not be best for him and diversification would seem to be the solution to trade-off between risk and return.

Critical Thinking Question

If you were Ravi, how would you distribute the amount of ₹5 lakhs across every three options considering risk–return trade-off and diversification? Justify your decision with reasoning.

6.1 Holding Period Return (HPR)

6.1.1 Concept, formula and Physical Significance of HPR

Concept of HPR

- Holding Period Return (HPR) is used to calculate the return on an investment over a given time period.
- It measures both:
 - o Capital gain or loss (the asset's price change).
 - o Income earned (dividends, coupons, interest).
- HPR is versatile as it can be used for:
 - o Days, months or years of holding.

- Any sort of note or obligation (stock, security, mutual fund, etc.).

There is no adjustment of returns into a per year basis (as annualized does), HPR is just the rate of return for the holding period.

Formula of HPR

$$\text{HPR} = [(P_1 - P_0) + D] / P_0 \times 100$$

Where:

- P_0 = Initial cost of the investment
- P_1 = Price (or value) of the investment at the holding period's termination
- D = Income generated over the holding period (dividends, interest etc.)

Significance of HPR

- Assists investors in calculating the return earning potential on an investment during its effective holding period.
- Helpful when making returns-based comparisons between investments with different investment horizons.
- A complete index that accounts for both price change and income.
- Allows for comparisons of annualized returns (eg, annual HPR or CAGR) to be made.
- Must supplies for portfolio performance examination and risk–return estimation.

6.1.2 Determining the Holding Periods Return For reference, how we mathematically computed HPR in equation 6-h is as follows: $\forall (019) rzy t omdat t zzyi yA) (= \text{Section 6.2}$ Assumptions The issue of understanding on the bases of our analysis will be a major focus for this chapter.

Holding Period Return (HPR) is a rate of return that another investment would have to earn in the same time period with the same initial investment, in order to match the performance of this one. This includes gains/losses on capital transactions and income received (like dividends or interest).

Formula for HPR:

$$\text{HPR (\%)} = [(P_1 - P_0) + D] \div P_0 \times 100.$$

Where:

- P_0 = Initial purchase price
- P_1 = Price at the end of holding period

- D = Income Distributions to be received throughout the period (such as distributions or interest)

Example 1: Investment on Stock with Dividend

- Cost of one share initially (P_0) = ₹200
- Price after one year (P_1) = ₹240
- Dividend received (D) = ₹10

$$\text{HPR} = [(240 - 200) + 10] \div 200 \times 100$$

$$\text{HPR} = 50 \div 200 \times 100 = 25\%$$

→ The investor made a 25 percent rate of return during his holding period.

Example 2: Bond Purchase with Interest it Generates

- Purchase Price: (P_0) = Rs.1000
- Price at 2nd year (P_1) = ₹1,050
- Interest income (D) = ₹100

$$\text{HPR} = [(1050 - 1000) + 100] \div 1000 \times 100$$

$$\text{HPR} = 150 \div 1000 \times 100 = 15\%$$

→ The investor received a 15% two-year return.

Example 3: Negative Return Case

• P_0 = Initial purchase price = Rs.500 • Tolerance range before selling that stock (TR BSS) = 10% of P_0 • Earn percentage rate given by the investor (ER GBI) = 8 % per annum # Number of transactions in a year, $n=12$ per month Periodicity value for EFS FMB i.e. $j=30$ days per period EFS FMB becomes $\left(1 + \frac{\text{TR BSS}}{100}\right)^{\left(\frac{365}{30}\right) - 1} \times \left(\frac{\text{ER GBI}}{100}\right)$ The values are as follows: $(\text{EFS FMB } \$) = [(1 + (10 \div 100))^{\left(\frac{365}{30}\right) - 1} \times ((8 \div 100))] = \$7666...$

- Price after 6 months (P_1) = ₹450
- Dividend received (D) = ₹0

$$\text{HPR} = [(450 - 500) + 0] \div 500 \times 100$$

$$\text{HPR} = (-50) \div 500 \times 100 = -10\%$$

→ 10% money was lost during this holding period.

Examples

Case 4: Investment with Bonus Shares and Dividend

- Cost at the time of purchasing or initial cost (P_0) = ₹1,000
- Price after 2 years (P_1) = ₹1400
- Dividend received = ₹80
- Bonus shares allotment (1:5) → 1 bonus shares allotted for every 5 held
- Consider that only 5 ordinary shares were held

Value of bonus shares = $(1 \div 5) \times 5 \times ₹1,400 \div 5 = ₹280$

Total gain = $(1,400 - 1,000) + 80 + 280 = ₹760$

HPR = $760 \div 1,000 \times 100 = 76\%$

→ The holding-period return is 76% over two years.

Example 5: Mutual fund with NAV and Dividends

- First NAV (Net Asset Value) = ₹30
- Final NAV 18 months later = ₹36
- Total dividends received during the period = ₹4 per unit

HPR = $[(36 - 30) + 4] \div 30 \times 100$

HPR = $10 \div 30 \times 100 = 33.33\%$

→ Investor made 33.33% ROI in a Year and Half For me.

Example 6 (Advanced): SIP in Mutual Fund

- Total investment: ₹10,000 in 10 months (₹1,000 per month)
- Total units bought = 340 units
- After 10 months, final NAV = ₹32. encoder-alist – is Set this list as header of the output tsv file.
- No dividends received

Answer: c) Final price = $340 \times 32 = ₹10,880$

HPR = $(10,880 - 10,000) \div 10,000 \times 100 = 8.8\%$ → Notice that the SIP investment earned an annualized return of — months over a time period of months.

Example 7: Stock with Capital Loss and Dividend

- Purchase price (P_0) = ₹850
- Price after 1 year (P_1) = ₹780
- Dividend received = ₹30

$$\text{HPR} = [(780 - 850) + 30] \div 850 \times 100$$

$$\text{HPR} = (-40)/850 \times 100 = -4.71\%$$

→ The investor had a return of -4.71% , effectively a loss despite the dividend.

6.2 Expected Return

6.2.1 Definition and Formula

Definition

- Expected return is the mean of a distribution of an asset's returns that an investor expects to receive from the asset over time.
- It's not a zero-sum game; it's probabilistic for what could be likely outcomes.
- It's a popular measure in:

o Capital budgeting o Portfolio theory o Risk-return analysis

Key Features

- Incorporates uncertainty through probabilities.
- Offers a "weighted average" of returns.
- Helps in the comparison of assets with different levels of risk.

Formula (single asset with multiple outcomes)

$$\text{ER} = \sum (P_i \times R_i) \text{ Where:}$$

- ER = Expected Return
- P_i = Probability of the i -th outcome ($0 \leq P_i \leq 1$)
- R_i = Return for the i -th outcome
- $\sum P_i = 1$ (sum of probabilities must be equal to 1)

6.2.2 Single Asset Expected Return Now we need to calculate the expected return on a single asset.

Step-by-Step Approach

Calculating the Expected Return (ER) For a Single Asset Here is how you do it: 1.

Write down all potential returns (R_i) which the asset can produce upon certain scenarios or in any market circumstances.

Associate a probability (P_i) to each return. The total probability should be 1.

Then for each return, multiply by its corresponding probability:

$$P_i \times R_i$$

Sum all these products to obtain the anticipated return:

$$ER = \sum (P_i \times R_i)$$

Example 1: Basic Scenario-Based Return

A stock has the following investment returns if the market performs:

- Boom: The probability for this = 0.25, the potential return = 20%
- No change: Average return for probability = 0.5% and say, a 12% return on no change.
- Economic downturn: Probability = 0.25, Return = -5%.

Calculation:

$$ER = (0.25 \times 20) + (0.50 \times 12) + (0.25 \times -5)$$

$$ER = 5 + 6 + (-1.25)$$

$$ER = 9.75\%$$

Interpretation:

In the long run, according to these probabilities, the investor anticipates a return of 9.75%.

Numericals

Example 2: Asset with Four Economic Outcomes A asset has the following expected returns:

- Strong Exuberance: Probability = 0.10, Return = 25%
- Moderate Growth : Probability = 0.30, Return = 15%
- Formal Market: Probability = 0.40, Return = 10%
- Decline = 0.20; Loss = -8%

Calculation:

$$ER = (0.10 \times 25) + (0.30 \times 15) + (0.40 \times 10) + (0.20 \times -8)$$

$$ER = 2.5 + 4.5 + 4.0 + (-1.6)$$

$$ER = 9.4\%$$

Example 3: Investment in Share with Differing Possibilities of Outcomes Assuming share has the following possibilities for annual returns.

- Very Bullish: Probability = 0.15, Return = 35%
- Bullish: Chance = 0.25, Return = 22%
- Neutral: Prob 0.30 Return 8%
- Bearish: Probability = 0.20, Return = -10%
- Very Bearish: Probability = 0.10, Return = -25% Calculations:

$$ER = (0.15 \times 35) + (0.25 \times 22) + (0.30 \times 8) + (0.20 \times -10) + (0.10 \times -25)$$

$$ER = 5.25 + 5.5 + 2.4 + (-2.0) + (-2.5)$$

$$ER = 8.65\%$$

Mutual Fund Return Based on Manager Performance

The annual return of a mutual fund is contingent on the performance of its fund manager:

- Good Management: Probability = 0.20, Return = 18%
- { "Good Management": { "Probability": 0.40, "Return": 12% } },

Average Management: Probability = 0.30, Return = 7%

- Incompetent Management: Probability = 0.10, Return = -4% Calculation:

$$ER = (0.20 \times 18) + (0.40 \times 12) + (0.30 \times 7) + (0.10 \times -4)$$

$$ER = 3.6 + 4.8 + 2.1 + (-0.4)$$

$$ER = 10.1\%$$

Example 5: IPO-Tech-Stock Driven by Sentiment in Markets

A tech stock might return the following if it's a feel good markets.

- Very Positive Sentiment: P = 0.10, 40%
- Good: (Probability = 0.30, Return = 20%)
- Neutral: Odds = 0.40 Return = 5%
- Negative: Probability = 0.15, Return = -12%
- : Chance = 0.05, Return = -30%

Calculation:

$$ER = (0.10 \times 40) + (0.30 \times 20) + (0.40 \times 5) + (0.15 \times -12) + (-1.8) + (-1.5) = 4 + 6 + 2 + (-1.8) + (-1.5) = 8.7\%$$

ER = 8.7%

Did You Know?

Are you aware that computing the expected return of a single asset is akin to computing an average, but weighted for probabilities? This implies that, the more likely an outcome, the more it influences the result. Investors apply this technique to make investment decisions under uncertainty, weighing risk against potential return.”

6.2.3 Portfolio Expected Return

Concept

- A portfolio is a collection of more than one investment held by an investor.
- The expected return for a portfolio is simply the weighted average of the expected returns of all individual assets.
- Each assets weight is the ratio of the total capital assigned to that asset.
- The value of diversification: Investors can now dial up or down return assumptions as well as device single asset exposure.

Formula:

$$ER_p = \sum (W_j \times ER_j)$$

Where:

- ER_p = Expected Return on the portfolio
- W_j = Weight of asset j in the portfolio = (Investment in asset j) ÷ (Total investment)
- ER_j = Expected return on asset j

Example: Portfolio of Three Assets by example and derive the optimum for a portfolio that consists of more than two assets.

Total Investment = ₹1,00,000

- Asset A: ₹ 40,000 (Expected Return = 10%)
- Asset B: ₹ 30,000 (Expected Return = 14%)
- Asset C: ₹30,000 (Rate of Return = 18%)

Step 1: Calculate Weights

- $W_a = 40,000 / 100,000 = 0.40$
- $W_b = 30,000 \div 100,000 = 0.30$

- $W_c = 30,000/100,000 = 0.30$

Step 2: Apply the Formula

$$ER_p = (0.40 + 0) \times 10 + (1/3) \times 14 + ((2/\sqrt{\{n\}\{p\}}) - 1/\sqrt{\{n\}\{T\}}) \times \text{Anti } \alpha\text{-factor} \times L^0 =$$

$\sqrt{E\{m\alpha\}}$ Where Anti α -factor $n=4$ and $\sqrt{L^0}=8 \rightarrow ER_p = (0.40 + 0) 10 + (1/3) \times 14 + ((2/15) - 1/9) 100$

$B.L^0 = E[\alpha \sqrt{181}]$, Error: Reference source not found]

$= 179eca8785bda108$ ## $E[\alpha, n, t]$ are considered above and can be compared in Figure~dk117768e7eee".

$$ER_p = 4 + 4.2 + 5.4 = 13.6\%$$

Numericals

Example 1: Portfolio of Four Assets with Unequal Allocations

Total Investment = ₹2,00,000

Asset A: ₹50,000 (9% Return expected)

Asset B: ₹60,000 (Expected Rate of Return = 12%)

- Asset C: ₹40,000 (Rate of Return = 15%)

- Asset D: ₹50,000 (Expected Return = 11%)

Step 1: Calculate Weights

- $W_a = 50,000 / 2,00,000 = 0.25$

- $W_b = 60,000 / 2,00,000 = 0.30$

- $W_c = 40,000 / 2,00,000 = 0.20$ • $W_d = 50,000 / 2,00,000 = 0.25$

Step 2: Apply the Formula

$$ER_p = (0.25 \times 9) + (0.30 \times 12) + (0.20 \times 15) + (0.25 \times 11)$$

$$ER_p = 2.25 + 3.6 + 3.0 + 2.75 = 11.6\%$$

Example 2: Portfolio With the Addition of a Riskless

Asset.parentsIt_models_basicconcepts.do 8/29/2005 Example 2: Portfolio With the Addition of a Riskless Asset Zugriff am.

Total Investment = ₹1,50,000

- Asset A (Equity Fund): Rs. 60,000 (Expected Return = 16%)

- Asset B (Bond Fund): ₹60,000 (Expected Return = 9%) • Asset C (Fixed Deposit): ₹30,000 (Expected Return = 6%) Weights:

- $W_a = 60,000 / 1,50,000 = 0.40$

• $W_{\beta} = 60,000 \div 1,50,000 = 0.40$ • $W_c = 30,000 \div 1,50,000 =$ Expected Return:

$$ER_p = (0.40 \times 16) + (0.40 \times 9) + (0.20 \times 6)$$

$$ER_p = 6.4 + 3.6 + 1.2 = 11.2\%$$

Example 3: High-Risk, High-Return Portfolio

Total Investment = ₹3,00,000

• Asset A (Start-up Equity): ₹ 1,20,000 (Estimated Return = 25 %)

• Asset B (Tech Stock): ₹1,00,000 (Expected Return = 18%) • Asset C (International Fund): ₹80,000 (Expected Return = 22%) Weights:

• $W_a = 1,20,000 / 3,00,000 \approx 0.40$

• $W_{\beta} = 1,00,000 \div 3,00,000 \approx 0.333$

• $W_c = 80,000 / 3,00,000 \approx 0.267$ Expected Return:

$$ER_p = (0.40 \times 25) + (0.333 \times 18) + (0.267 \times 22)$$

$$ER_p = 10 + 5.994 + 5.874 = 21.87\%$$

Example 4: Portfolio Diversified with Small Holdings

Total Investment = ₹5,00,000

• Asset A (Large Cap): ₹1,50,000 (10 % expected rate of return)

• Asset B (Mid Cap): ₹1,00,000 (Expected Return = 15%)

• Asset C (Debt Fund) – ₹50,000 (Expected Return = 7%)

• Asset D (Gold ETF): ₹50,000 (Expected Return = 6%) • Asset E: (Real Estate) : ₹1,50,000 (Expected Return = 11 %) Weights:

• $W_a = 0.30$

• $W_{\beta} = 0.20$

• $W_c = 0.10$

$W_d = 0.10$

$W_e = 0.30$

Expected Return:

$$ER_p = (0.30 \times 12) + (0.20 \times 15) + (0.10 \times 7) + (0.10 \times 6) + (0.30 \times 11)$$

$$= 3.6 + 3 + 0.7 + 0.6 + 3.3 = 11.2\%$$

Example 5: Portfolio with scale-balanced Asset distribution and Decimal Returns

Total Investment = ₹80,000

- Asset A: ₹ 20,000 (Requisite Returns = 7.5%)
- Asset B: ₹25,000 (Expected Return = 13.2%)
- Asset C: ₹15,000 (Expected Return = 10.4%)
- Asset D: Rupees 20,000 (Expected return =6.8%) Weights :
- $W_a = 20,000 \div 80,000 = 0.25$
- $W_b = 25,000/80,000$ $W_b = 0.3125$
- $W_c = 15,000 / 80,000 = 0.1875$
- $W_d = 20,000 \div 80,000 = 0.25$ Expected return:

$$ER_p = (0.25 \times 7.5) + (0.3125 \times 13.2) + (0.1875 \times 10.4) + (0.25 \times 6.8) \\ ER_p = 1,875 + 4,125 + 1,950 + 1,700 = 9,650\%$$

“Activity-“Estimate Expected Return of Investments”

Three assets will be provided to students with different chances of yields in different states of the world. They have to multiply the expected return of each asset by their percentage, add it up and obtain the portfolio's expected return. Explain the impact of diversification on expected return.

6.3 Standard Deviation

6.3.1 Meaning of Standard Deviation as a Risk Measure Definition:

The standard deviation (σ) quantifies how far returns lie from their mean or average return.

It measures the extent of uncertainty or risk about the range of possible returns.

Role in Risk Analysis:

- If returns are spread out over a wide range $\rightarrow$ the investment is risky.
- If the returns most likely are close to the expected return there is less risk than if the likely returns vary widely around the expected return.
- If returns differ broadly both higher and lower than the expected return $\rightarrow$ Higher risk investment.
- Standard deviation is a materialized number of volatility measures, which includes upside and downside.

Importance in Investment Decision-Making:

- Is a risk proxy in financial analysis and portfolio management.
- "Investors rely on it to tell them if a given asset's return matches the higher risk that they must bear when holding the risky assets."
- Core concepts of Modern Portfolio Theory (MPT) which focuses on the return-risk relationship.

Formula:

$$\sigma = \sqrt{[\sum P_i \times (R_i - ER)^2]}$$

Where:

- σ = standard deviation of returns
- R_i = Return in outcome i

ER = Expected return

P_i = Probability of outcome i

Numerical Examples

Example 1: Four- State Stock Model

Scenario

Very Bullish

Bullish

Neutral

Recession

Probability (P_i)

0.10

0.30

0.40

0.20

Return (R_i)

30%

20%

10%

-5%

Step 1: Determine the Expected Return (ER)

$$ER = (0.10 \times 30) + (0.30 \times 20) + (0.40 \times 10) + (0.20 \times -5)$$

$$ER = 3 + 6 + 4 - 1 = 12\%$$

Step 2: We Find the Variance and Standard Deviation

$$\bullet (30 - 12)^2 \times 0.10 = 324 \times 0.10 = 32.4$$

$$\bullet (20 - 12)^2 \times 0.30 = 64 \times 0.30 = 19.2$$

$$\bullet (10 - 12)^2 \times 0.40 = 4 \times 0.40 = 1.6$$

$$\bullet (-5 - 12)^2 \times 0.20 = 289 \times 0.20 = 57.8$$

$$\text{Var}(x^2) = 32.42 + 19.22 + 1.62 + 57.82 \quad \sigma_{x^2} = \sqrt{111.0} = 10.54\%$$

Example 2: Moderate-risk Profile of Mutual Fund

Market Condition

Growth

Stable

Decline

Probability (Pi)

0.25

0.50

0.25

Return (Ri)

16%

10%

4%

Step 1: Expected Return (ER)

$$ER = (0.25 \times 16) + (0.50 \times 10) + (0.25 \times 4)$$

$$ER = 4 + 5 + 1 = 10\%$$

2 Variance and Standard Deviation

$$\bullet (16 - 10)^2 \times 0.25 = 36 \times 0.25 = 9.0$$

$$\bullet (10 - 10)^2 \times 0.50 = 0 \times 0.50 = 0.0$$

$$\bullet (4 - 10)^2 \times 0.25 = (-6)^2 \times 0.25 = 36 \times 0.25 = 9.0$$

$$\text{Variance} = 9.0 + 0.0 + 9.0 = 18.0 \quad \sigma = \sqrt{18.0} = 4.24\%$$

Example 3: Risky Investment in a Tech Start-Up

Scenario

Massive Success

Moderate Success

Break Even

Minor Loss

Total Failure

Probability (Pi)

0.05

0.25

0.40

0.20

0.10

Return (Ri)

120%

40%

0%

-20%

-100%

Step 1: Expected Return (ER)

$$ER = (0.05 \times 120) + (0.25 \times 40) + (0.40 \times 0) + (0.20 \times -20) + (0.10 \times -100)$$

$$ER = 6 + 10 + 0 - 4 - 10 = 2\%$$

Step 2: Variance

$$\bullet (120 - 2)^2 \times 0.05 = 13,924 \times 0.05 = 696.2$$

$$\bullet (40 - 2)^2 \times 0.25 = 1,444 \times 0.25 = 361.0$$

$$po (0 - 2)^2 \times 0.40 = 4 \times 0.40 = 1.6$$

$$\bullet (-20 - 2)^2 \times 0.20 = 484 \times 0.20 = 96.8$$

$$\bullet (-100 - 2)^2 \times 0.10 = 10404 \times 0.10 = 1040.4$$

$$\text{Variance} = 696.2 + 361.0 + 1.6 + 96.8 + 1,040.4 = 2,196 \quad \sigma = \sqrt{2,196} = 46.86\%$$

Example 4: Government Bond Fund That is Stable

Scenario

Inflation Falls

No Change

Inflation Rises

Probability (Pi)

0.30

0.50

0.20

Return (Ri)

6.5%

6.0%

5.5%

Step 1: ER

$$ER = (0.30 \times 6.5) + (0.50 \times 6.0) + (0.20 \times 5.5)$$

$$ER = 1.95 + 3.0 + 1.1 = 6.05\%$$

Step 2: Variance

$$\bullet (6.5 - 6.05)^2 \times 0.30 = 0.2025 \times 0.30 = 0.0608$$

$$\bullet (6.0 - 6.05)^2 \times 0.50 = 0.0025 \times 0.50 = 0.0013$$

$$\bullet (5.50 - 6.05)^2 \times 0.20 = 0.3025 \times 0.20 = 0.0605$$

$$\text{VARIANCE} = 0.0608 + 0.0013 + 0.0605 = 0.1226 \quad \sigma = \sqrt{(GVs2')} = \sqrt{0.1226} = 11\% \text{v} (\%)$$

6.3.2 Procedure for Standard Deviation Calculation

One important measure of risk, or volatility, in financial returns is the standard deviation (sounds fancier than “spread”!). It is a measure of how much the returns of an

asset deviate from the mean or expected return. The greater the standard deviation, the higher level of uncertainty and variation in return.

How to Calculate Standard Deviation of Returns Step by Step

List the possible returns (R_i)

Gather estimates of return for different economic environments (i.e., bull, normal, bear).

Assign probabilities (P_i)

Every combination description must be assigned a probability. The sum over all and must be equal to

Calculate expected return (ER)

$$ER = \sum (P_i \times R_i)$$

Find deviations from expected return

For each case, calculate ($R_i - ER$)

Square the deviations

This cancels the minus signs and gives weight to large deviations.

Take the squared deviation for each event Time its probability The resulting value is whether wide squared deviation.

2.)Sum all squared deviations(weighted) to get the variance

$$\text{Variance} = \sum [P_i \times (R_i - ER)^2]$$

Take the square root of the variance.

$$\text{Standard Deviation } (\sigma) = \sqrt{\text{Variance}}$$

Example: The Standard Deviation of Stock Returns

The potential returns of a stock are:

Scenario

Boom

Normal

Recession

Probability (P_i)

0.3

0.4

0.3

Return (R_i)

20%

12%

-4%

(c) Calculate Expected Return (ER) Step 1: Compute Expected Return (ER)

$$ER = (0.3 \times 20) + (0.4 \times 12) + (0.3 \times -4)$$

$$ER = 6 + 4.8 - 1.2 = 9.6\%$$

Step 2: Calculate Variance

- Boom: $(20 - 9.6)^2 \times 0.3 = (10.4)^2 \times 0.3 = 108.16 \times 0.3 = 32.45$

- Normal: $(12 - 9.6)^2 \times 0.4 = (2.4)^2 \times 0.4 = 5.76 \times 0.4 = 2.30$

- Recession: $(-4 - 9.6)^2 \times 0.3 = (-13.6)^2 \times 0.3 = 184.96 \times 0.3 = 55.494$

$$\text{Variance} = 32.45 + \overline{(\frac{1}{n} \sum (x_i - \bar{x})^2)} = (24 - 31.5)^2 + (28.5 - 30.8)^2 + (35 - 50)^2 = 90.24$$

Step 3: Find the standard deviation $\sigma = \sqrt{90.24} = 9.50\%$

Numerical Examples

Example 1: Asset with four Return Scenarios

Scenario

Strong Growth

Moderate Growth

Stable Market

Probability (P_i)

0.2

0.3

0.4

Return (R_i)

25%

15%

10%

Scenario

Decline

Probability (Pi)

0.1

Return (Ri)

-5%

Step 1: Expected Return (ER)

$$ER = (0.2 \times 25) + (0.3 \times 15) + (0.4 \times 10) + (0.1 \times -5)$$

$$ER = 5 + 4.5 + 4 - 0.5 = 13.0\%$$

Step 2: Variance

$$\bullet (25 - 13)^2 \times 0.2 = 144 \times 0.2 = 28.8$$

$$\bullet (15 - 13)^2 \times 0.3 = 4 \times 0.3 = 1.2$$

$$\bullet (10 - 13)^2 \times 0.4 = 9 \times 0.4 = 3.6$$

$$(-5 - 13)^2 \times 0.1 = 324 \times 0.1 = 32.4 \text{ ※分散} = 28.8 + 1.2 + 3.6 + 32.4 = 66 \text{ ※ } \sigma = \sqrt{66} = 8.152\%$$

Example 2: High Volatility Asset

Scenario

Very Bullish

Bullish

Neutral

Bearish

Crash

Probability (Pi)

0.15

0.25

0.30

0.20

0.10

Return (R_i)

40%

20%

5%

-10%

-25%

Step 1: Expected Return (ER)

$$ER = (0,15 \times 40) + (0,25 \times 20) + (0,30 \times 5) + (0,20 \times -10) + (0,10 \times -25)$$

$$ER = 6 + 5 + 1.5 - 2 - 2.5 = 8.0\%$$

Step 2: Variance

- $(40 - 8)^2 \times 0.15 = 1024 \times 0.15 = 153.6$
 - $(20 - 8)^2 \times 0.25 = 144 \times 0.25 = 36.0$
 - $(5 - 8)^2 \times 0.30 = (-3)^2 \times 0.30 = 9 \times 0.30 = 2.7$
 - $(-10 - 8)^2 \times 0.20 = 324 \times 0.20 = 64.8$
 - $(-25 - 8)^2 \times 0.10 = 1089 \times 0.10 = 108.9$
- Variance = $153.6 + 36.0 + 2.7 + 64.8 + 108.9 = 366.0$
 $\sigma = \sqrt{366.0} = 19.13\%$

Example 3: Defensive Low-Variance Stock

Scenario

Bull Market

Normal Market

Bear Market

Probability (P_i)

0.2

0.6

0.2

Return (R_i)

9%

7%

5%

Step 1: Expected Return (ER)

$$ER = (0.2 \times 9) + (0.6 \times 7) + (0.2 \times 5)$$

$$ER = 1.8 + 4.2 + 1.0 = 7.0\%$$

Step 2: Variance

$$\bullet (9 - 7)^2 \times 0.2 = 4 \times 0.2 = 0.8$$

$$(7 - 7)^2 \times 0.6 = 0 \times 0.6 = 0. \text{ period}$$

$$\bullet (5 - 7)^2 \times 0.2 = 4 \times 0.2 = 0.8$$

$$\text{Variance} = 0.8 + 0.0 + 0.8 = 1.6 \sigma = \sqrt{1.6} = 1.26\%$$

6.3.3 The meaning of Standard Deviation in Investment

Interpretation σ (Standard Deviation) :

- Low σ , (small deviations from ER) o Returns are strongly concentrated around the expected return.

- o Indicates stability and predictability.

- o Example: Government bonds or bluechip firms.

- High σ (large deviations from ER) o Returns are highly variable. o Tells you when something is unclear and slightly riskier.

- o Example: Beginnings of a company or very speculative stocks.

Practical Insights

- Two assets, one with a high σ and the other low but have same expected return:

- o Investors tend to favor the one with the smaller σ because it involves less risk.

- It provides a way for investors to measure risk rather than having to rely on intuition.

- It is an important input for performance metrics such as the Sharpe Ratio (return over volatility).

Limitations

- Returns are assumed to be normally distributed.

- Treats upside and downside deviations symmetrically, even though investors typically worry a lot more about losses.
- Best used in conjunction with other risk measurements like Coefficient of Variation (CV) and Beta.

6.4 Summary

- ❖ Investments have risk and return, which should be considered in conjunction for good decisions.
- ❖ HPR Handbook: The holding period return (HPR) is the unit of measurement used to estimate the total net profit over a given length of time for an investment or financial transaction.
- ❖ HPR can be greater than 1, less than 1, or equal to zero depending on price changes and income earned.
- ❖ The ER is the probability weighted average of all potential returns.
- ❖ ER is a prospective performance measure, which assists investors in evaluating the potential for profits.
- ❖ ER is calculated for a single asset by using probabilities of several possible returns.
- ❖ In a portfolio, ER is the return in an average sense of individual assets.
- ❖ Portfolio diversification gives investors the ability to balance returns and reduce aggregate risk.
- ❖ Standard Deviation (σ) is a well known financial risk statistical measurement.
- ❖ Standard deviation indicates how far apart actual returns are from the expected return.
- ❖ Low σ stable and predictable returns, whereas high σ will reflect higher volatility and risk.
- ❖ Comparison of standard deviations can be used to select between assets with similar expected inflated returns but differing degree of risk.
- ❖ All these measures serve as basis for analysing and controlling investment under risk.

6.5 Key Terms

Risk – Chance that actual returns differs from expected returns.

Return are the percentage of profits or losses on an investment.

Holding Period Return (HPR) – Return realised over the period holding an investment.

Expected Return (ER) - The weighted average of returns from an investment where individual returns are weighted by their respective probability of occurrence.

Portfolio – A set of mixed assets have together purchased by an investor.

Standard Deviation (σ) – A quantification of the dispersion or volatility of returns around the mean.

Variance – The mean of the squared deviation from expected return, which is used to determine standard deviation.

Diversification – Investing in different types of assets to spread risk.

CV (Coefficient of Variation) – A measure of relative risk obtained by dividing standard deviation by expected return.

6.6 Descriptive Questions

Define holding period YIELD? How is that number calculated and what is its significance in investment analysis?

Give examples and explain why HPR can lead to positive, negative and zero results.

Define Expected Return. How does it differ from realized return? Give an illustrative relationship computation for a single asset.

How do you calculate the expected return of a portfolio? Illustrate with a three-asset example.

Explain the significance of probability distribution in deriving the measurement criteria for expected rate of return.

What is the meaning of Standard deviation in finance? Describe how it is used as an indicator of investment risk.

Describe the process for calculating standard deviation of investment returns.

A stock will have various returns in the boom, normal and recession conditions. Describe how to calculate the expected return and standard deviation of this investment?

Explain the difference between low and high standard deviation providing appropriate investment examples.

Discuss the interrelationship between risk and return. Why should investors constantly have to weigh and consider both when making investment decisions?

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6.8 Case Study

Risk and Return in Portfolio Selection.

Introduction

All investment decisions require a balance between risk and return. Before committing money to a project, investors should assess if the potential returns justify the risk of an investment. On the one hand, safer investments like government bonds could provide less return with little risk; on the other, riskier investments such as equity shares or start-up ventures could yield higher returns with more uncertainty. This clinical story considers how investors decide between two different investments that offers varying risk versus return balance.

Background

Rahul, 35 year old professional has recently inherited ₹10 lakhs. He wants to invest the money so that his family's financial future is secure, but he doesn't know how to toe the line between safety and growth. He talks to a financial advisor and comes up with three possibilities:

Government Bonds – Safe, fixed interest at 6% per annum.

Mutual Funds – Medium risk, around 12% return on investment per annum.

Equity shares of Start-up – High risk, possibility 20% returns or more, with loss possible.

Rahul knows the mean return of the options is what he will get back, though this can vary. In assessing risk, he looks at standard deviation of prior returns. Government bonds have low standard deviation, mutual funds have medium variation and start-up stocks high.

Problem 1: The trade-off between being safe and growing up

Rahul doesn't know whether to keep safety on top or go for better returns. He will be misled if a decision rule based on expected return is all he gets, because returns vary.

Solution) Rahul should consider both the expected returns and standard deviation to evaluate the risk-adjusted attractiveness of each investment. Having a balanced distribution between funds, bonds and stock allows to ensure both safety and growth.

Problem Statement 2: Portfolio Diversification

Rahul wants to know whether diversifying across his various investment options can help limit risk while not sacrificing too much return.

Answer: To reduce the risk of overall portfolio Rahul may diversify his investment into few assets. For instance, with the allocation of 50% to bonds and 50% to equity, the return expectation can be reduced to 13%, which is less volatile than having all in equities. Diversification reduces risk while preserving attractive returns.

Problem 3: Reading Between the Lines on Risk-Return Trade-off

Rahul knows that there is no free lunch on a trade and high returns are generally allied to high risks. But, he is unable to decipher which possible combination fits best with his financial goals and risk appetite.

Solution: The financial planner suggests to employ the Coefficient of Variation (CV) which demonstrates the risk for a single unit of return. This will enable Rahul to know which option gives the best risk-adjusted return.

Critical Thinking Question

If you were Rahul, how would you divvy up the ₹10 lakhs across bonds, mutual funds and stocks? Explain your reasons by referring to expected return, standard deviation and diversification.

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Unit 7: Risk–Return Measures (Part II)

Learning Objectives

1. Learn the higher-order theories of risk and return in financial decisions.
2. Consider alternative risk metrics like standard deviation, beta, and coefficient of variation.
3. Considering the relationship between systematic and unsystematic risk in portfolio management.
4. Use CAPM to compute the expected return.
5. Explain how you would interpret Sharpe Ratio, Treynor Ratio and Jensen's Alpha for performance measurement.
6. Compare different risk–return measures to evaluate investment options appropriately.
7. Learn how to apply performance measures on a risk-adjusted basis to guide real investing decisions.
8. What are the shortcomings of risk–return measures in a highly dynamic financial market?

Content

- 7.0 Introductory Caselet
- 7.1 Sharpe Ratio
- 7.2 Treynor Ratio
- 7.3 Jensen's Alpha
- 7.4 Beta
- 7.5 Summary
- 7.6 Key Terms
- 7.7 Descriptive Questions
- 7.8 References
- 7.9 Case Study

7.0 Introductory Caselet

“Risk and Return – The Investor’s dilemma”

Mr. Arjun Sharma, 35-year IT professional got a bonus of ₹10 lakhs recently. With long term goals such as children education, retirement planning etc in perspective he wants to invest the amount across different financial instruments.

Three choices are offered to him by his financial advisor:

Government Bonds – These provide you with low risk while giving out guaranteed 6% annually.

Blue-Chip Equity Stocks – Good candidates for an expected return rate of 12% per year because volatility, though higher (8%), or lesser.

Diversified Mutual Fund – Expected to give approximately 10% returns with moderate standard deviation (5%), being based somewhere around @1.

Arjun knows that higher returns tend to coincide with high risks, but he is not sure how to take a middle of the road approach. His advisor exposes him to risk – return measures such as the Sharpe Ratio, Treynor Ratio and Jensen’s Alpha, showing that it is possible to assess whether the returns from an investment are commensurate with how much risk was incurred.

Arjun then reviews the analysis and notices that though equities has higher expected returns, it subjects him to market risks. Both could keep him stable, but neither one may allow him to meet his long-term wealth goals. The mutual fund seems a compromise, but ultimately he will make the decision according to his risk appetite and financial goals.

Critical Thinking Questions

If you were Arjun, how would you use risk–return measures (such as Sharpe, Treynor, and Jensen’s Alpha) to calculate the three investment proposals?

What should be the priority for Arjun considering his long term goals in mind, safety (Bonds) or growth (Equities/MFs)? Why?

In what way does diversification in Arjun’s case lead to reduction in unsystematic risk?

How does Arjun’s risk preferences affect the decision to invest or not?

7.1 Sharpe Ratio

7.1.1 Sharpe Ratio: Definition and Formula

Definition:

Sharpe Ratio is a popular measure in finance to analyze the risk adjusted performance of an investment or portfolio. It shows how much excess return an investor earns for every unit of total risk he takes.

This makes it more convenient to compare between various investments, even of different volatility.

In other words, the Sharpe Ratio answers the question:

“Is the reward from investing in another risk company worth the extra risk relative to a riskless alternative?”

- A higher Sharpe Ratio represents better risk-adjusted performance.
- A low Sharpe Ratio can also indicate that an investment is not well-rewarded for the level of risk it assumes, "or may suffer from poor investment results induced by volatility."

Why It Matters:

- Compare two portfolios that pay a 15% return and a 10% return, respectively: Earning extra for the higher level of uncertainty — if in fact shocks are predictable based on publicly available information — is not worth it even to pension funds with an infinite investment horizon.
- The Sharpe Ratio addresses this problem by dividing the returns by the standard deviation (volatility) of returns.
- Consider these for that year-end tax return and tax audit or to analyze your mutual fund investment.

Formula:

Sharpe Ratio (S) = $(R_p - R_f) \div \sigma_p$ S - The sharpe ratio R_p - The portfolio return R_f - Risk-free rate of interest σ_p - Standard deviation of the portfolio's excess return

- R_p = Return of the portfolio
- R_f = Rate at which you can fend with no risk
- σ_p = Portfolio's return standard deviation

Explanation of Terms:

- $R_p - R_f$: The risk premium (also known as the excess return), which is how much more return the portfolio achieves over some risk-free asset (like government treasury bills).
- σ_p : Overall risk or volatility in portfolio returns. The higher the σ_p , the more returns are spread out and less predictable.

- The Sharpe Ratio calculates the amount of additional return for an investor as they assume one unit of risk.

Numerical Examples:

If a portfolio has an average annual return of 12% ($R_p=0.12$) the risk-free rate is 2% ($R_f = 0.02$), and the standard deviation of portfolio returns is 10% ($\sigma_p = 0.10$).

$$\text{Sharpe Ratio} = (0.12 - 0.02) / 0.10 = 0.10 / 0.10 = 1.0$$

→ This implies that the portfolio generates 1 unit of excess return per 1 unit of risk.

Another portfolio has an expected return of 15% ($R_p = 0.15$), its risk-free rate is 2% ($R_f = 0.02$), while the volatility is at 20% ($\sigma_p = 0.20$).
TEST4 OPTIONAL: Closer look at the constraint weights We have discussed that the constraint

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$$\text{Sharpe Ratio} = (0.15 - 0.02) / 0.20 = 0.13 / 0.20 = 0.65$$

→ Even though the return is improved (15% vs 12%), the risk-adjusted performance is worse than that of the first portfolio because volatility is considerably higher.
Large Caps = An index used to describe important companies in a specific equity market.

A dexirious bond portfolio has a consistent rate of return and offers 7% per annum ($R_p = 0.07$) in both the scenarios, with risk free rates equal to 2% everywhere ($R_f = 0.02$), and a standard deviation consistently for worlds at about only 4% ($\sigma_p = 0.04$).

$$\text{Sharpe Ratio} = (0.07 - 0.02) / 0.04 = 0.05 / 0.04 = 1.25$$

→ While absolute returns fall short of stocks, this portfolio delivers the best risk-adjusted performance.

7.1.2 Interpretation of Sharpe Ratio

Interpretation: The Sharpe Ratio value should be interpreted to ascertain whether investment is worthwhile in the presence of risk.

Positive Sharpe Ratio:

- o IF the return on your portfolio (R_p) is higher than risk-free rate (R_f).
- o Shows that the investor is receiving a reward for assuming more risk.

Negative Sharpe Ratio:

- o Occurs when $R_p < R_f$.
- o That is, in the spot markets that I just described, risk-free securities beat the portfolio. In this situation, the investment is not a go.

Comparative Values:

o Sharpe Ratio < 1 : This means that the portfolio is giving low reward for the risk assumed.

o $1 \leq \text{Sharpe Ratio} < 2$: Acceptable portfolios, performance is consistent with reasonable allowance for risk.

o $2 \leq \text{Sharpe Ratio} < 3$: Portfolio is very good on risk-adjusted basis.

o Sharpe Ratio ≥ 3 : Portfolio performance is superb, albeit this is very rare in reality.

Investor's Use:

o The Sharpe Ratio helps investors to determine if many returns offered to them are actually attractive after risk is factored in.

o For example, a portfolio with 12% returns and Sharpe Ratio of 1.8 could be more appealing than a portfolio with 15% returns but Sharpe Ratio of 0.9 as the second portfolio is not producing additional return for the added risk.

7.1.3 Application in Portfolio Comparison

The Sharpe Ratio is popular in practice for investment decision making. It is especially helpful comparing portfolios and fund managers, as well as for building the most efficient investment strategy.

Portfolio-to-Portfolio Comparison:

o Investors frequently have to decide between several investment opportunities. Thus the Sharpe Ratio allows for comparison on a level playing field, however disparate absolute return may be.

o Example: Corporate bond portfolio yielding 8% and with a Sharpe Ratio of 1.2 might be more attractive than an equity portfolio paying 14%, but with Sharpe Ratio of just 0.7

Performance Evaluation of Fund Managers:

o Managers are frequently evaluated not simply on returns, but also how efficiently they produce those results.

o A higher Sharpe Ratio indicates that the manager has provided a more consistent and superior level of risk-adjusted returns.

o Managers with high Sharpe Ratios are favored by investors as it indicates their ability to manage risk and returns.

Optimal Portfolio Construction:

o Investors in the modern portfolio theory attempt to maximize the Sharpe Ratio, when choosing an efficient portfolio.

o By changing the investment balance (between stock, bond, mutual funds etc....) investors can try to form a portfolio that offers the greatest expected return for each degree of risk.

Cross-Asset and Strategy Comparison:

o Sharpe Ratio aren't restricted to equity portfolios. It can be on bonds, commodities, hedge funds, mutual funds or even stock algorithmic trading strategies.

o It is a unifying tool for comparison of various investment options and thus can be used as a common column for decision-making.

Risk-Based Decision Support:

o It is also investor friendly for risk averse investors as it helps them stay away from investments with good returns that are the product of high volatility rather than efficient risks.

7.2 Treynor Ratio

7.2.1 What is Treynor Ratio & Treynor Ratio Formula Definition:

The Treynor Ratio is a portfolio performance metric that determines how much excess return was generated for each unit of systematic risk. Differing from the Sharpe Ratio (which measures total risk, σ), rely only on market-related (systematic) risk, as measured by beta (β).

This issue is particularly important for highly diversified portfolios, where the unsystematic risk can be considered to be small.

The idea is to find out if the portfolio is increasingly being rewarded for the level of market risk it's taking.

Formula:

$$\text{Treynor Ratio (T)} = (R_p - R_f) \div \beta_p$$

Where:

- R_p = the average rate of return on portfolio
- R_f = Risk free rate of return
- β_p = Beta of the portfolio (this is your systematic risk)

Key Points on Formula:

- Excess Return ($R_p - R_f$): This is the return earned in excess of the risk-free rate.

- Beta (β_p): Indicates how responsive the portfolio is to changes in the market.
- $\beta = 1 \rightarrow$ Moves in parallel with the market
- $\beta > 1 \rightarrow$ Thunders more than market/more volatile than market

The Treynor Ratio informs us how much excess return we receive per unit of systematic risk.

Numerical Examples

Example 1: Simple Treynor Ratio Calculation

- Portfolio Return (R_p) = 14%
- Risk-Free Rate (R_f) = 6%
- Portfolio Beta (β_p) = 1.2

$$\text{Treynor Ratio} = (14 - 6) \div 1.2 = 8 \div 1.2 = 6.67$$

Interpretation:

The portfolio generated excess return of 6.67% per unit of market risk. This is a pretty strong risk-adjusted showing.

Example 2: Comparing Two Portfolios

Metric

Return (R_p)

Risk-Free Rate (R_f)

Beta (β_p)

Portfolio A

12%

5%

1.0

Portfolio B

16%

5%

1.8

$$\text{Treynor A} = (12 - 5) / 1.0 = 7.00$$

$$\text{Treynor B} = (16 - 5) \div 1.8 = 11 \div 1.8 \approx 6.11$$

Interpretation:

Although portfolio B has higher return, this portfolio also has significantly more systematic risk. As regards risk adjusted performance, portfolio A has higher Treynor Ratio and is also more efficient than the other.

Example 3: Mutual Fund Evaluation

- Return of Mutual Fund (R_p) = 10.5%
- Risk-Free Rate (R_f) = 4%
- Beta (β_p) = 0.9

$$\text{Treynor Ratio} = (10.5 - 4) \div 0.9 = 6.5 \div 0.9 \approx 7.22$$

Interpretation:

This fund provides the 7.22% extra return for each unit of market risk and is a good performance on comparable funds with respect to Treynor Ratio.

Example 4: Market-Level Risk in the Portfolio

- $R_p = 11\%$
- $R_f = 3\%$
- $\beta_p = 1.0$

$$\text{Treynor Ratio} = (11 - 3) / 1.0 = 8.0$$

Interpretation:

This is a portfolio with the same beta as the market, but that is earning 8% more than the risk-free rate of return and so can be considered very efficient in terms of market related risk.

Example 5: Low Beta and Low Return Jiyang M3 (B + R-, by low β and contrarian) For the variety of sectors, this method would not only supply positive returns, but also furnish sector neutral portfolios with those who are high- β to sell even more higher- β stocks.

- $R_p = 7\%$
- $R_f = 5\%$
- $\beta_p = 0.5$

$$\text{Treynor Ratio} = (7 - 5) \div 0.5 = 2 \div 0.5 = 4.0$$

Interpretation:

Low beta (0.5) is not as sexy, but still decent risk-adjusted return. A Treynor Ratio of 4.0 is considered a moderately efficient fund.

7.2.2 Comparison of Treynor and Sharpe Ratios

Both the The Treynor Ratio and Sharpe Ratio are popular performance measures, but each one is used in different contexts based on risk and structure of the portfolio.

Risk Type Considered:

- o Sharpe Ratio: Based on standard deviation (σ_p), amount to total risk (systematic=market-related and unsystematic=firm-specific).
- o Treynor Ratio: Utilizes the beta (β_p), it indicates only the systematic risk which cannot be diversified away.

Portfolio Relevance:

- o The Sharpe Ratio is applicable to all types of portfolios, especially those that are not sufficiently diversified, since it accounts for total risk.
- o Treynor Ratio works well on such well diversified portfolios as it takes into account of the portfolio return in excessive of what can be gained from a risk free investment and divides it by its Beta. That is, since there is no unsystematic risk thus there can hardly be any unsystematic error when using this, only the systematic forward looking part becomes important.

Investor Question Answered:

- o Sharpe Ratio: “What am I getting in return for the risk I’m taking?”
- o Treynor Ratio: “How much extra return am I making for each unit of risk that is market related?”

Numerical Implication:

- o With high total volatility but low sensitivity to the market, a portfolio will have a low Sharpe Ratio and highs Treynor Ratio.
- o Oppositely, a portfolio with high sensitivity to market fluctuations (high beta) will yield a low Treynor Ratio, even if its Sharpe ratio of the investment is satisfactory.

Interpretation Range:

- o For each of the ratios, the higher its value indicates better risk-adjusted performance.
- o Although, Treynor Ratios cannot be taken alone in the case of non diversified portfolios as they are not taking into account for unsystematic risk.

7.2.3 Application in Risk-Adjusted Performance

Investors, analysts and fund managers can use the Treynor Ratio in a variety of ways.

Comparing Diversified Portfolios:

- o Because investors hold diversified portfolios, unsystematic risk gets reduced to around zero. The Treynor Ratio now becomes an effective tool to compare these portfolios on the basis of systematic risk alone.
- o For instance, two equity mutual funds that are offered the same return but have differing betas may appear similar in their worth on a stand-alone basis (note this average return of each fund), but analyzing both using the Treynor ratio will show which one is offering more return for every unit of market risk.

Evaluating Fund Managers:

- o Treynor Ratio is also used to measure the performance of fund managers. A manager with a good Treynor Ratio is making good returns despite the fact metrics that would make you look as if were over exposed by other ratios.
- o This covers the fallacy of implicitly attributing superior returns to skill when they could be a result of taking more risk.

Portfolio Benchmarking:

- o You can measure your portfolio with a benchmark such as the market index. If the Treynor Ratio of a portfolio is above that for the market index, this means it has outperformed with respect to systematic risk.

Asset Allocation Decisions:

- o Treynor Ratios may assist when making decisions on between asset classes. For example, if corporate bonds and stocks produce the same return but stocks have a higher beta, then the Treynor Ratio may favor bonds if they provide better returns per unit of systematic risk.

Risk-Return Trade-offs in Volatile Markets:

- o Systematic risk is extremely important in periods of market chaos. (To put those unpredictable moves in perspective, the Treynor Ratio can help investors evaluate whether they are receiving enough return to make those kinds of movements worthwhile, risk-wise.)

Strategic Portfolio Construction:

- o For those investors looking to build efficient portfolios, the Treynor Ratio can be employed in order to screen out securities/funds whose returns fail to adequately reward market risk. This helps ensure that portfolio construction is based on sound principles of efficient risk-adjusted performance.

Did You Know?

“The Treynor Ratio is particularly useful for comparing well-diversified portfolios since it only looks at market-related (systematic) risk. It does not incorporate the firm-specific risk, which is something that is different compared to the Sharpe Ratio. It is an attraction for professional fund managers, who use it to benchmark their own portfolios against a market index for risk-adjusted performance.”

7.3 Jensen's Alpha

7.3.1 Jensen's Alpha - Definition and Formula Definition:

Writing (α) out as Jensen's Alpha, measures the return of a portfolio over and above the predicted return from its CAPM estimation. It tells you the share of your portfolio's performance that you can trace to the fund manager's active investment decisions, not just riding along with market risk.

Jensen's Alpha answers the question:

“Was the portfolio over or under its risk-adjusted benchmark?”

- If the alpha is a positive number, it means that the security has performed better (gained more) than its market group.
- A negative alpha indicates underperformance (value destruction).

Formula:

$$\alpha_p = R_p - [R_f + \beta_p \times (R_m - R_f)] \text{ Donnde:}$$

- α_p = Jensen's Alpha of the Portfolio
- R_p = Actual return on the portfolio
- R_f = Risk free return
- β_p = Beta of the portfolio (systematic risk)
- R_m = Market portfolio return

Explanation of Formula Terms:

- $R_f + \beta_p \times (R_m - R_f)$: This is the expected return according to CAPM based on the market return and portfolio's beta.
- R_p : The realised return of the portfolio.
- α_p : Actual versus expected return. It exhibits extra performance caused by manager skill (or lack of it).

Numerical Examples

Example 1: Simple Calculation of Jensen's Alpha

- Portfolio return (R_p) = 14%
- Risk-free rate (R_f) = 5%
- Market return (R_m) = 11%
- Portfolio beta (β_p) = 1.1

Step 1: Determine expected return based on CAPM

Disorder Return = $R_f + \beta_p \times (R_m - R_f)$ PQ7-1: $\ln(1+R) = 0$ This calculation expresses the disorder return explicitly in terms of the market's and fair games' expected returns.

$$= 5 + 1.1 \times (11 - 5)$$

$$= 5 + 1.1 \times 6 = 5 + 6.6 = 11.6\% \text{ Step 2: Jensen's Alpha } \alpha_p = R_p - \text{Expected Return} = 14 - 11.6 = 2.4\%$$

Interpretation:

CAPM benchmark, which was exceeded by the portfolio with 2.4%, evidencing strong active management.

Example 2: Underperforming Portfolio

- $R_p = 9\%$
- $R_f = 4\%$
- $R_m = 10\%$
- $\beta_p = 1.2$

$$\text{Expected Return} = 4 + 1.2 \times (10 - 4) = 4 + 7.2 = 11.2\% \alpha_p = 9 - 11.2 = -2.2\%$$

Interpretation:

The portfolio lagged by 2.2%, which means that active management was not done well, in relation to market risk assumed.

Example 3: Portfolio and Market-Level Risk

- $R_p = 12\%$
- $R_f = 5\%$
- $R_m = 12\%$
- $\beta_p = 1.0$

$$\text{Expected return} = 5 + 1.0 \times (12 - 5) = 5 + 7 = 12\% \alpha_p = 12 - 12 = 0\%$$

Interpretation:

This portfolio demanded precisely the return CAPM forecasted. No amount value was added or lost.

Example 4: High-Return Low-Beta Portfolio

- $R_p = 11\%$
- $R_f = 3\%$
- $R_m = 9\%$
- $\beta_p = 0.7$

Expected Return = $3 + 0.7 \times (9 - 3) = 3 + 4.2 = 7.2\%$ $\alpha_p = 11 - 7.2 = 3.8\%$

Interpretation:

The portfolio has done quite well in risk-adjusted terms — a Jensen's Alpha of 3.8% reflects excellent active management.

Example 5: Mutual Fund Analysis

- $R_p = 13.5\%$
- $R_f = 6\%$
- $R_m = 15\%$
- $\beta_p = 1.3$

Expected Return = $6 + 1.3 (15 - 6) = 6 + 11.7 = 17.7\%$ $\alpha_p = 13.5 - 17.7 = -4.2\%$

Interpretation:

The fund underperformed the market-adjusted return by a wide margin. Its negative alpha of -4.2% suggests ineffective management, despite its high beta.

7.3.2 Interpreting Positive and Negative Alpha

The value of Jensen's Alpha can be positive, negative, or zero. Each perspective has a different connotation when considering the performance of portfolios.

Positive Alpha ($\alpha_p > 0$):

- o Portfolio outperforms its CAPM-predicted return. o Implies that the manager has added value via stock picking, market timing or other forms of active management.
- o Example: CAPM tells you in 10% return, but portfolio only yielded 13%. Alpha = +3%.

o Interpretation: The portfolio return was 3% higher than it should have been, given its risk.

Negative Alpha ($\alpha < 0$):

o Poor performance of the portfolio relative to its CAPM expectations. o Implies bad management decisions, poor diversification or exposure to uncompensated risks.

o Example: CAPM called for 12% outcome is 9% from portfolio. Alpha = -3%.

o Conclusion: The manager didn't generate the performance in line with the risk of the portfolio.

Zero Alpha ($\alpha = 0$):

Portfolio exactly follows the CAPM predictions.

o Performs no further value add or reduce.

o This is not uncommon for passive index funds, which seek instead to track benchmark returns.

7.3.3 Portfolio Assessment Applying Jensen's Alpha

Jensen's Alpha is widely applied in finance to analyze and compare portfolios, managers and investment strategies.

Managerial Skill Assessment:

o Positive alpha indicates in excess of market performance as generated by skilled managers.

If alpha remains consistently negative, this is a sign of inefficiency or poor decisions.

o Example: If two managers have the exact same raw return, then the manager with the higher alpha is delivering his return in a more risk adjusted way.

Comparison Across Funds:

o Active Funds are generally measured against benchmarks by investors. o If a fund has positive alpha consistently, it implies that the fund is outperforming benchmark after considering risk.

o A lower positive alpha will have investors rotate in to passive funds and vice versa for a negative alpha.

Risk-Adjusted Benchmarking:

o Alpha is a better measure than absolute returns due to the risk incurred.

o For instance, two funds having 12% each may be alike but if one has higher beta, it must have more expected return. It is only alpha that tells us the actual difference in performance.

Decision-Making Tool:

o Investors use alpha to make determination if they should maintain investment in a portfolio or manager. o Continuous positive alpha may indicate that remaining invested might be to ones' advantage, while continuous negative alpha may not justify holding (or reallocating).

Performance Attribution:

o Alpha helps separate the component of returns that is explained by market exposure to the one that may be attributed to manager's skills.

o This distinction is important when judging if a funds performance is duplicatable or simply the result of overall market movements.

Application in Active vs. Passive:

o Actives are evaluated by their ability to generate alpha. o Passive funds that only replicate indices are likely to have alpha close to zero.

So alpha helps investors justify when it is worth paying higher fees for active management.

7.4 Beta

7.4.1 Concept of Beta in CAPM

Definition:

In CAPM, Beta (β) measures the relationship between a security's return (or portfolio) and the return of

of the market as a whole. It's a mathematical gauge of how more or less a security's return tends to wag in response to market movements.

- If $\beta = 1$ → The asset return responds to market's moves exactly.
- If $\beta > 1$ → Security is volatiler than market. So if $\beta = 1.5$, the security will be relatively likely to move by 1.5% for every change of 1% in the market — so an intrinsic value determined using a return with a beta of 0.015 is expected to earn you more than if it's based on one with a beta of 1.0, at least theoretically (which doesn't mean it will).
- If $\beta = 0.006 \div 0.012 = 0.50$

Interpretation:

It does not force and security to be extremely correlated with the market, but it simply has a low beta so the stock is less responsive to changing market conditions. The security moves 0.5% for every 1% of market movement.

Example 3: Variance = Covariance

- $\text{Cov}(R_s, R_m) = 0.009$
- $\text{Var}(R_m) = 0.009 \quad \beta = 0.009 \div 0.009 = 1.00$

Interpretation:

The security's returns track the market perfectly. This is called market-neutral beta.

Example 4: Regression (Slope) Interpretation

Let's say that we regress stock returns on market returns and get the following:

- Regression equation $R_s = 2\% + 1.1 \times R_m$ Here, the slope = 1.1, which is the beta of the security.

Interpretation:

This stock has market sensitivity 10% higher than the market. It is a bit aggressive in terms of risk.

Example 5: Negative Beta

- $\text{Cov}(R_s, R_m) = -0.004$
- $\text{Var}(R_m) = 0.008 \quad \beta = -0.004 \div 0.008 = -0.50$ Interpretation:

A negative beta indicates that the asset moves opposite to the market. These securities can also be used for hedging or diversification (like gold or defensive funds)

Did You Know?

"Beta, which is developed mathematically from covariance and variance, isn't just a financial term; it's also statistical. It does much the same thing, but instead of helping us understand how a stock moves with the market, we find out how a stock co-moves with the market. Interestingly, beta is also described as the slope of a regression line between stock returns and market returns."

7.4.3 Role of Beta in Systematic Risk Estimation

Beta is crucial for determining and measuring systematic or market risk — the risk that is inextricable from the market as a whole, but which you can't diversify away.

Indicator of Market Risk Exposure:

- o Beta: It quantifies how much a portfolio is exposed to movements in the market.
- o A stock with high beta (e.g., a technology stock) has high systematic risk, and one with low beta (e.g., a utility company) has low risk.

Expectation Return in CAPM:

- o CAPM uses the market beta to determine the risk premium that an investor should demand for market risk exposure.
- o Higher beta means higher return which is expected to cover for the added systematic risk.

Portfolio Diversification:

- o Mixed assets of high-beta and low-beta security may help in diversifying total portfolio risk.
- o For example, one can lower volatility with the addition of low-beta stock to a high-beta portfolio without sacrificing too much return.

Risk Classification:

- o Securities are often classified using Beta:
 - Aggressive stocks: $\beta > 1$ (high volatility, higher risk and a greater potential for return).
 - This corresponds to be on the defensive stocks: $\beta > 1$, defensive ($\beta < 1$) or neutral ($\beta \approx 1$). Discuss investment suitability.

7.5 Summary

- ❖ Sydney, M., "Measures of Open Permittivity and Scattering Due to Holes in a Finite Ground Plane," Applied Computational Electromanetics Society Conf.
- ❖ Sharpe Ratio calculates the excess return relative to risk (as measured by standard deviation).
- ❖ The higher the Sharpe Ratio, then better are returns on risk adjusted basis.
- ❖ Treynor Ratio (TR)= excess return per unit of systematic risk = with beta as the denominator.

- ❖ Treynor Ratio is more applicable to well diversified portfolios for which the non-diversifiable risk will be very low.
- ❖ Jensen's Alpha measures the spread between realised returns and those predicted by the capital asset pricing model (CAPM).
- ❖ Positive alpha represents outperformance and negative alpha represents underperformance.
- ❖ Beta (β) measures securities' exposure to market variations and captures systematic risk.
- ❖ if $\beta > 1$ is high systematic risk (or aggressive stock), if $\beta < 1$ is low systematic risk (defensive stock).
- ❖ Beta: Beta is estimated through the method of covariance between stock and market returns by market variance.
- ❖ In summary, Sharpe, Treynor and Jensen's Alpha have complimentary views on performance.
- ❖ The standards help investors compare investments, evaluate investment professionals and make risk adjusted decisions.

7.6 Key Terms

Sharpe Ratio: The amount of excess return generated per unit of total risk, based on standard deviation.

Treynor Ratio – Ratio of excess return to beta (systematic risk).

Jensen's Alpha -It is the return on portfolio that is in excess of the estimated return using CAPM.

Beta (β) – A measure indicating how much a security has moved relative to the overall market.

Systematic Risk- Market risk that we cannot diversify away.

Non-systematic Risk – Corporate-specific risk that can be eliminated by diversification.

Risk-Free Rate (R_f) – Return on an imagined risk free investment like the T-Bill.

Market Risk Premium - The additional return which investors demand for bearing market risk, computed as ($R_m - R_f$).

Standard Deviation (σ) – A statistical measure that shows a security's total level of risk.

7.7 Descriptive Questions

What is "Sharpe Ratio" can you explain it? How is it measured, and what does it tell investors about performance in a portfolio?

Distinguish between Sharpe Ratio and TreynorRatio. When one is preferred over the other?

Define Jensen's Alpha. What purpose does it serve in evaluating the performance of portfolio managers?

Explain the meaning of positive, negative and zero Jensen's Alpha with examples.

What is Beta? Describe the derivation of Beta and what role it plays in CAPM.

Explain the distinction of systematic and unsystematic risk. How does diversification affect each?

Show how investors use risk–return measures to compare various investments.

Explain how Sharpe Ratio, Treynor Ratio, Jensen's Alpha and Beta presents a complete picture of portfolio performance?

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7.9 Case Study

Assessing the Trade-offs between Risk and Return in Portfolio Selection

Introduction

Making an investment is always a risk versus return decision. An investor cannot just pursue high returns without thinking about the risks that come with low prices. Risk–return measures such as the Sharpe Ratio, Treynor Ratio, Jensen’s Alpha and Beta offer a systematic approach to assess if the investment or portfolio is getting adequately compensated for risk taken. The objective of this case study is to illustrate how those measures should influence portfolio decisions in practice.

Background

40-year-old entrepreneur Mr. Ramesh Verma has saved ₹20 lakhs. He wants to park this returning cash for long term growth with risk managed prudently. His financial adviser offers him a choice of three investment alternatives:

Portfolio A (Government Bonds): It is low risk with 6% return and almost free volatility Interpret G58.

Portfolio B (Equity Mutual Fund): Returns 12% that are probable, risk is moderate in nature and beta will be nearly equal to 1.1.

Portfolio C (Aggressive Equity Portfolio): Target return of 18% (only) with high volatility and beta=1.8.

The adviser says that while the higher returns certainly look appealing, risk adjusted performance should be evaluated to know if it is the right pick. This includes the Sharpe Ratio (reward per unit of total risk), Treynor Ratio (reward per unit of market risk), Jensen’s Alpha (performance relative to CAPM) and Beta (sensitivity to market direction).

Problem 1: Understanding Total Risk and Market Risk

Should Ramesh use the Sharpe Ratio or the Treynor Ratio? Since

Portfolio A has very little volatility but also very poor returns and portfolio C enjoys a high return but with a large variation, to compare them what we need is the right measure of risk.

Answer: For a well diversified portfolio, the TREYNOR ratio is better as it takes into account systematic risk. With less diversified portfolios, Sharpe ratio becomes a better measure of performance.

Problem 2: Measuring the Skill of a Fund Manager

Ramesh wants to find out if Portfolio B's performance is attributable to market activity or manager skill.

Solution Compute Jensen's α to see whether the portfolio has consistently realized a return higher than what was predicted by the CAPM. A positive α would indicate that the manager is creating value above and beyond market exposure.

Issue 3: Estimating Market Sensitivity We hypothesize that market sensitivity is an important Read more.

Ramesh prefers to avoid risks and wants to see how much the portfolios swing with the markets. **Solution:** Beta is put in charge. Portfolio A has an almost zero beta and reacts the least to changes in market whereas Portfolio C, with a beta of 1.8 would be responding nearly twice as much as the market.

Conclusion

Using risk–return measures, Ramesh finds that Portfolio B provides a trade-off between return and risk. A and C A is safe but it does not help to achieve long term goals, while C is attractive but risky. Ramesh is able to take a better and informed decision by looking into Sharpe Ratio, Treynor Ratio, Jensen's Alpha, and Beta thereby matching his investments with his investment objective and risk profile.

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Unit 8: Portfolio Theories (Part I)

Learning Objectives

1. Learn the basic principles and terminology of portfolio theory and its relation to investment decisions.
2. Describe the correlation of risk and capital with a portfolio investment.
3. Discuss the assumptions and limitations of classical portfolio theories.
4. Consider the extent to which diversification reduces risk and enhances portfolio performance.
5. Discuss covariance and correlation in the context of portfolio design.
6. Use portfolio selection theory based on Markowitz's mean-variance model.
7. Discuss the advantages of efficient frontier for investment portfolio optimization.
8. Consider the relationship among risk, return and diversification in portfolio management.
9. Explain the implications of portfolio theory for individual and institutional investors.

Content

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- 8.3 Derivation of CAPM
- 8.4 Security Market Line (SML)
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8.0 Introductory Caselet

“Risks and Returns – Maintaining the Right Balance: The Case of Riya’s Portfolio”

Riya, 32 Married with two kids Marketing professional Just got promoted and huge raise. Now, with the rest of her savings, she wants to invest in the stock market. She knows that concentrating all her assets in one stock can be risky, so she decides to study portfolio diversification.

Riya studies different investment options:

- Government Securities with low risk and low returns.
- Blue chip Stocks for medium risk and stable returns.
- Tech Startups that implies a high risk with very high returns.

She reads about the concept of the efficient frontier and concludes that by holding different types of assets, she can earn better risk-return combinations. But she’s not so sure how valuable each category should be. She wants to get the most she can, but she’s also afraid of taking risks with the money she saved.

Her question: Should she create a conservative portfolio that prioritizes safety or an aggressive one, which could provide higher returns but would be more volatile?

Critical Thinking Questions

If you were Riya’s advisor, how would you assist her in managing the trade-offs between risk and return as she constructs her portfolio?

How will investing in a mixture of assets help to lower her portfolio risk?

What are some of the things to look at (age, income, financial goals, risk tolerance) before finally making an investment decision?

8.1 Introduction to CAPM

8.1.1 Introduction to CAPM What is CAPM?

The basics: the Capital Asset Pricing Model The granddaddy of all related concepts is the Capital Asset Pricing Model (CAPM), a corner stone in modern finance that formally relates risk to expected returns on assets -- like stocks. Used to calculate a risk-adjusted return for an investment (i.e., the rate of return on an investment, based on its systematic risk).

CAPM is based on Modern Portfolio Theory (MPT) originated by Harry Markowitz, in which diversification was used as a tool to avoid and reduce risk. Whereas MPT was concerned with the construction of a portfolio, CAPM is an extension of the theory that answers this question:

“Based on a given asset’s level of risk, how large a return can investors expect?”

CAPM postulates that investors need to be compensated for two things:

Risk-free rate (the interest rate)

Risk assumed~(as proxied by beta)

CAPM Formula:

$$E(R_i) = R_f + \beta_i \times [E(R_m) - R_f]$$

Where:

- $E(R_i)$ = The expected rate of return on asset i.
- R_f = Risk free discount factor
- β_i = Beta of a security (sensitivity of the asset to market risk)
- $E(R_m)$ = the expected market portfolio return

$(E(R_m) - R_f)$ = Market Risk Premium (a premium for the risk associated with investing in risky assets rather than risk-free assets)

Explanation of Components:

Risk-Free Rate (R_f):

- Is the yield on a totally risk-free obligation, such as treasury bills or sovereigns.
- Time value of money—investors require at least this rate for delaying consumption.

Beta (β_i):

- The sensitivity of the asset's return to changes in the overall market.
- It is a systematic measure of risk, so it only captures risk that cannot be diversified away.

Interpretations:

o $\beta = 1 \rightarrow$ Asset matches the market
o $\beta > 1 \rightarrow$ Asset more risky than the market (aggressive)
o $\beta < 1 \rightarrow$ Asset less risky than the market (defensive)
o $\beta = 0 \rightarrow$ Asset uncorrelated with the market movements (e.g., treasury bills)

Expected Market Return ($E(R_m)$):

- Expected return on a well-diversified portfolio of all investable assets.

Market Risk Premium ($E(R_m) - R_f$):

- The extra return that investors require from the market compared to a yield on US Treasuries free of risk.

- Serve as compensation for being exposed to systematic risk.

Interpretation and Implications of CAPM:

- CAPM line (also referred to as Security Market Line, SML) plots the anticipated return against beta. All properly valued assets must be on the SML.
- Higher beta → Higher expected return demanded by investors. This reflects the risk–return tradeoff.
- CAPM is built on the premise that investors have already completely diversified away all unsystematic risk (entity-specific risk). Hence, we need to price the assets only with respect to (market) systematic risk.
- Overvalued assets trade below the SML (receiving less return for their risk) and undervalued trades above the SML (receiving more return for their risk).

Why is the CAPM Theoretical in Finance?

- Describes the situation in which a security's market price does not accurately reflect its underlying investment value.
- Assists in calculating the cost of equity for capital budgeting and valuation.
- Provides the theoretical underpinnings for risk-adjusted performance measures such as Jensen's alpha and the Treynor Ratios.

Did You Know?

"The Capital Asset Pricing Model (CAPM), put forward in the '60s, forever changed the field of finance by tying risk to return via one simple equation. And the Nobel Prize in 1990 went to its creator, William Sharpe. "CAPM's naïve beta-based proxy is still ubiquitous in modern portfolio management.

8.1.2 Significance of CAPM in the context of Portfolio Management

Valuation of Securities

The Capital Asset Pricing Model (CAPM) is a key model to ascertain whether a security is being valued properly according to the risk. Through offering an expected return derived from the asset's systematic risk, CAPM makes it feasible for investors to compare this theoretical return against returns that are current or foreseen in the market related with that specific security.

This benchmark variable can be used as guidance for investment decisions.

- When the realized return of a security is higher than the CAPM-based expected return, then we say that the stock is underpriced. That means the security is priced to

return more than it should given its risk, which makes equilibrium here an attractive buy.

- At the other extreme, if an asset earns a return less than its CAPM expected return, we regard it as being overvalued - there's a disconnect between risk and expected return.

This valuation method helps investors find under- or overpriced securities, and thereby allows for them to make better trading decisions. It makes certain that funds are directed into investments that provide an adequate return relative to the level of risk required. This approach is also consistent with the wider concept of market efficiency where prices embody all known information. CAPM therefore acts as a reference model that allows both professional and individual investors to make relative value judgments in equity markets, providing the framework for disciplined investment strategies.

Quantifying Risk-Return Trade-Off

One of the major contributions to portfolio management by Capital Asset Pricing Model (CAPM) is that it can measure the trade-off between risk and return. CAPM assumes a linear relationship between the expected return on an asset and its exposure to systematic risk (the portion of total risk that is nondiversifiable, such as market-macro-economic forces) which is proxied by beta.

This is the relationship that provides investors a rhythm of what return they should expect for undertaking added risk. It addresses a basic investment question: How much return should an investor earn for taking on a given level of risk?

Key implications include:

- Investors can judge whether a risk-adjusted return on an asset matches up with market sentiment.
- “Securities that have high systematic risk should provide a higher expected return to make them attractive.
- CAPM provides a way to differentiate between the risk that is capable of being diversified (unsystematic) and that which must be held by everyone who participates in the market (systematic).

Investors use this measure to compare the risk/return relationship between various stocks, bonds or other financial instruments. It also helps to make rational decisions, because one can compare portfolios not only based on the return alone, but also taking into account the risks that were taken. This is why the CAPM is crucial in helping to ascertain whether the portfolio selection efficient and on providing an explanation to investment strategy by considering risk.

Diversification Guidance

CAPM is at the center of informing investors about how they should think about diversification and constructing a portfolio. One of the underlying assumptions of the model is that unsystematic risk, or idiosyncratic (or firm specific) risk can be diversified away. All that's left is systematic risk -- which cuts across the entire market and can't be diversified away.

This is a critical implications for portfolio management, of course:

- **Control for Unsystematic Risk:** Investors should create portfolios that have little unsystematic risk so that only systematic risk, on average, drives expected returns.
- **Efficient Portfolios - Diversified portfolios** are more efficient and provide the highest level of return for a given amount of risk.

Accents emphasising the beta can curb such single asset volatility-based strategies, and favour a broader diversification as it is promoted by CAPM, where sheer presence in the market takes precedence over the individual asset risk. This advice is used in choosing and blending up assets to minimize the portfolio's return from one unlucky stock. Finally, CAPM emphasises the benefits of broad diversification to manage risk while without forgoing return in support of modern portfolio theory.

Estimating Cost of Equity

In corporate finance, CAPM is frequently employed to calculate the cost of equity in a firm (i.e. the return that shareholders anticipate for capitalizing on the business). This estimate is an essential element of analysing investment projects, valuing firms and planning financial strategy.

Applications include:

- **Cash Flows:** A firm discounts future cash flows at the cost of capital when analyzing new investments. The CAPM offers a common approach for estimating the equity part of that cost.
- **WACC Calculations:** CAPM also flows right into a WACC model, which incorporates the cost of debt and the cost of equity. Sound WACC estimates are a must for taking decisions.
- **Valuation:** In DCF models, the cost of equity calculated with CAPM enables analysts evaluate intrinsic value.

Its objectivity and ease of use contribute to making it a popular tool among financial analysts as well as corporate finance professionals. As it is tied to market information (risk-free rate, equity market return, firm specific beta), it constitutes a transparent and theoretically founded method. This makes decision-making between projects and

industries more robust, improving investor confidence in a company's financial planning.

Performance Measurement

In the active investment management, CAPM is an important benchmark for measuring portfolio performance. When portfolio managers calculate the return they expect for assuming systematic risk, they can determine if the actual return is higher than that warranted by the market risk accepted.

The key concept here is:

- Alpha: The actual return with the CAPM expected return subtracted out. A positive alpha suggests outperformance while a negative alpha indicates underperformance.

This approach supports:

- Ex-manager Performance: Investors can measure if fund managers are creating value in excess of passive market participation.
- Risk-Adjusted Comparisons: Portfolio with similar risk characteristics can be compared on a level playing field so you're not rewarding outperformance based on just taking more risks.

Using CAPM-based performance measures is especially valuable for distinguishing skill from luck in investment management. They offer a disciplined, quantitative framework for assessing the efficacy of investment strategies through time. Within the context of institutionally managed accounts, CAPM is frequently incorporated in a broader performance attribution discipline that enables stakeholders to determine whether returns earned were commensurate with fees paid active managers.

Decision-Making in Capital Allocation

The CAPM is also crucial in the decision of how much capital should be allocated to risky and riskless assets. By providing a view of the optimal trade-off between return and risk, it helps investors and institutions decide how to allocate capital among asset classes.

Important features include:

- Efficient Frontier Indication: Aids in determining the combination of assets at which point the curve will be on an efficient frontier that provides highest possible return for a given level of risk.
- Capital Market Line (CML): By including the risk free rate in our analysis, the CAPM gives us a way to find out our best mix of risk-free and risky assets.

This direction is critical as it helps build the portfolio that stuck to an investor's risk profile and investment goals. Risk-averse investors might prefer a higher weight for the risk-free asset, whereas aggressive investors may want to lean towards a portfolio with a greater possibility of that higher average return. CAPM makes these choices endogenous by relating them to a unified risk-return structure.

In reality, the model allows strategic as well as tactical allocation. Institutional investors, such as pension funds, use CAPM to have a long-term investment strategy which matches their liabilities and market conditions depending on the fund. Due to the mixed integer programming model's assumptions its use as a base structure is justified, while more sophisticated models are created for detailed capital allocation strategies.

8.1.3 The CAPM vs Other Return Models

Although the CAPM is a seminal model for requiring expected returns in finance, it has its drawbacks. Over time, additional models have proliferated to address some of CAPM's simplifying assumptions and enhance the precision and explanatory power of return forecasts. Comparative with Alternative Models The comparisons presented below demonstrate differences between CAPM and important alternative models.

CAPM vs Arbitrage Pricing Theory (APT) CAPM equation is based on only one factor, which is the market risk.

It is one of the simplest and most widely used models for estimating cost of equity, as all it requires is a measurement of an asset's beta (which can be easily obtained from any commercial source) to determine the expected rate of return. It presumes that this one kind of systematic risk is all there is to differences in asset returns. This simplicity of CAPM nevertheless makes it user-friendly and easy to understand but it can also be accused of ignoring the real world intricacies of financial markets.

APT, introduced by Stephen Ross, is a multifactor model that allows for dependency of asset returns on more than one economic and financial factors. These may be information on inflation rate, growth of GDP, modification in interest rates and exchange rates as well as commodity prices such that of oil.

Key Differences:

- CAPM needs only the risk premium of the market and beta for estimating returns.
- APT can be more general by encompassing multiple macroeconomic factors, however it requires selection and estimation of these factors for particular application which could be very complicated and data exhausting (Bodie et al. 9190 page 5 paragraph 3 part ii).

Example:

For example, consider a company whose stock price is significantly affected by the price of oil, such as an airline. Considering only the general market risk of an airline, CAPM would look like this. In contrast with this, if APT were to include oil price volatility as a particular risk factor in its modeling framework it may yield a better return forecast for the stock.

CAPM versus Dividend Discount Model (DDM)

The Dividend Discount Model - DDM is a valuation theory that prices a stock based on the theory that its worth is equivalent to the sum of all of its future dividend payments and stock price at the present value. It suggests dividends are expected to grow at a constant rate and investors value the income from dividends directly.

CAPM, meanwhile, computes expected return as a function of how volatile the stock is relative to the overall market. It doesn't need any dividend history, nor is it limited to stocks that actually pay them.

Key Differences:

- DDM is only applicable for companies that have a uniform/applied dividend payout policy.
- CAPM can apply to all securities whether it is of growth type reinvesting its profit or shares that do not pay any dividends.

Example:

DDM can be a consistent measure to get the intrinsic value of a matured utility company with substantially constant dividend payout. However, DDM does not apply to a technology startup that invests its profits in growth and does not pay dividends. Analysts would still be able to use CAPM to estimate the required return from market related risk parameters.

CAPM vs Fama-French Three-Factor Model

The Fama and French (1993) Three-Factor model was made to improve about the CAPM by including two more risk elements to clarify ammunition on stock profits. Whereas the CAPM is based on market risk (beta) only, the Fama-French model considers:

- Size risk: Smaller companies outperform larger ones over the long term.
- Value risk: Companies with high and low ratios of their book values¹ to market value (value stocks versus growth stocks) have return differentials that are not entirely justified by the level of risk they present.

Key Differences:

- Small-cap and value stocks: CAPM could be underestimating risk.
- Fama-French gives a finer-grained basis by considering size, value effects along with the market risk.

Example:

Let us say you have a huge multinational with low book-to-market and also one, small independent manufacturer with high book-to market. CAPM would yield the same beta for both if they react similarly to market changes. But Fama-French would control for the small and value stocks' tendency to earn higher returns, allowing any linkages in performance that CAPM might overlook.

CAPM vs Multi-Factor Models

Multi-factor models are generalisations of the APT and the Fama-French framework across more variables than those that drove up asset returns. These may include:

- Momentum: The tendency for stocks that have outperformed recently to keep doing so.
- Liquidity risk: Compensation for holding assets that might not be easily traded at any moment during a trading session.
- Industry or sector risk: Some industries can be more vulnerable to changes in regulations or technology.

CAPM, on the other hand keeps its theoretical beauty in terms of simplicity but is limited by its assumptions market efficiency, homogenous beliefs and single factor of risk.

Key Differences:

- Capm is theoretical and simple to apply but may omit important drivers of returns.
- Multi-factor models afford more explanatory power for variable-risk exposures, but are also more complicated to develop and interpret.

Example:

A tech stock focused hedge fund could develop their own custom multi-factor model which might consist of elements such as R&D spending, patents activity and industry disruption metrics. CAPM does not incorporate these factors and may underestimate risk or misestimate expected return.

8.2 Assumptions of CAPM

8.2.1 Investor Behavior Assumptions

Modern portfolio theory, and the models derived from it such as the Capital Asset Pricing Model (CAPM), are constructed on a few assumptions about how investors act. These assumptions are instrumental to the mathematical tractability and predictive power of such models. But they also are an abstraction of how investors behave, which rarely aligns precisely with what people actually do when making investment decisions. Core assumptions of the investors You will find here information about core assumption that are usually made for investors.

Rationality of Investors

The investor rationality hypothesis is a cornerstone of classical financial theory. It assumes that investors take decisions rationally, use all known information, and make investment decisions so as to maximise their expected utility.

- Rationally, a decision-maker selects always the best investment that is consistent with what the investor will be attaching her preference to as an investment and given also her taste of risk attitude.

- Investors are assumed to update in their beliefs and strategies as new information arrives in a Bayesian fashion.

- Psychological impacts and cognitive errors—like overconfidence, anchoring, loss aversion, mental accounting or herding—are not at play.

This approximative treatment produces models that are mathematically solvable, but overlooks a variety of psychological propensity actually observed in financial data. For example, in a market bubble, real investors may become over-optimistic and irrationally chase returns, unlike the rational investor assumption.

Risk Aversion

Standard financial theory assumes that investors are ‘risk-averse’ and thus value certainty relatively more than uncertainty, needing to be enticed by correspondingly higher expected returns in order to hold assets at higher levels of risk.

- B-2 If investors face two assets with the same expected return, a rational risk-averse investor will never choose one that has higher risk.

- If an investor is shown a riskier investment, they would demand a risk premium — an extra return — to be compensated for taking on that extra uncertainty.

This premise also forms the basis of modern portfolio theory's efficient frontier, which represents investors' aspirations to obtain the greatest possible return at a given level of risk or achieve the lowest possible risk for a given rate of return.

It also squares with the real world experience that most investors require a risk premium in order to hold uncertainty. But such a premise does not take into

consideration those who are actually were ready to temp fate, specially if guided by their heart or misinformed.

Wealth Maximization Objective

Another crucial assumption is that investors seek to optimize their wealth or financial value. All strategies are going to be made in the direction of adding value on their portfolio over time.

- Non-pecuniary, Non-financial motives (e.g., investing ethically, and logalistic brands, not investing in specific type of industries for personal reasons (tobacco, arms, fossil fuel)) are absent in standard models.
- Investors are believed to base decisions only on quantitative financial results without personal predilections and value systems playing any role in these choices.

This assumption simplifies analysis as all investors are assumed homogeneous in their goals. In reality, however, a lot of investors follow a SRI (Socially Responsible Investment) strategy or have ESG (Environmental Social Governance) objectives, even at the expense of profitability. In the real world, investment behaviour often weighs financial goals against wider concerns such as sustainability, social justice or geopolitical considerations.

Mean-Variance Analysis

Classical portfolio theory posits that investors consider only two parameters when making their decisions:

- Expectation (mean): the average estimated performance of an asset or a portfolio.
- Risk (variance or standard deviation): Interpretation, volatility or uncertainty in those returns.

This theory first proposed by Harry Markowitz, It can be deduced that investors do not care beyond higher moments of the return distribution:

- Skewness, which is a measure of asymmetry in local returns, does not matter — even though investors may prefer positively skewed local returns (for the opportunity for lotto-like big winnings).
- Kurtosis, which indicates the probability of extreme (fat-tailed) returns, is also omitted—although it has relevance for financial crises and market anomalies.

This one-sided view facilitates the creation of efficient portfolios through mathematical optimization, although it fails to embrace the complex risk picture. In practice, investors may be very worried about downside risk or rare catastrophic events that aren't captured by variance directly.

Single-Period Time Horizon

Standard financial models generally assume that investors think in terms of a single-period time horizon, usually a year or an investment period.

- Investors use this horizon to evaluate and compare risk and return independent of what might occur in other horizons.
- This makes analysis easy and is consistent with models, such as CAPM that are founded on static single-period setting.

But this reasoning is unlikely to be representative of many investment decisions in practice, which tend to have a longer horizon. Pension funds, retirement accounts, and endowments all have investment horizons measured in decades which give rise to intertemporal risks, rebalancing plans and long-term goals to consider.

In addition, taking a one-period perspective fails to consider dynamic market conditions and path dependency – the concept that prior returns or sequences of events can impact future investment decisions.

8.2.2 Market Efficiency Assumptions

Market efficiency theory is at the foundation of the most important models in finance, such as CAPM and MPT. Market efficiency states that asset prices already reflect all available information, It is therefore impossible to compile above-average returns without accepting above-average risk. To "ground" this model some assumptions are made about how markets work. Such assumptions are useful in simplifying for modeling purposes complex financial systems, however they frequently do not reflect real-world situations.

Perfect Competition in Capital Markets

A fundamental tenet of market efficiency is perfect competition in capital markets, as idealized in microeconomic theory.

- Who cannot move prices: But here, no one investor has the potential to effect prices – there are many small investors in the market, each with only a very small percentage of total market activity. Therefore, all participants are price takers; they take what the market offers as the given and cannot affect the price.
- No market power: It is also assumed that not even large institutional investors can influence prices in the marketplace through their trades or beliefs.
- Securities are infinitely divisible: Investors can buy and sell any fraction of a security, allowing them to fine-tune their portfolios with precision and flexibility.

Implications:

This assumption guarantees that the prices in the market reflect just supply and demand, without any strategic behavior from influential players. It also provides evidence for the contention that opportunities for arbitrage are promptly spat out by the activities of rational enlightened traders.

Real-World Contrast:

In reality, deep-pocketed institutional investors (e.g. hedge funds or mutual funds) can shift the market due to high trade volumes or public disclosure of direction. Second, some securities have lot-size constraints or can be traded only in full units, placing restrictions on divisibility.

Transactions Costs and Taxes sollen sich k darien los)formation $\tau = 0$, and of the lack of transaction costs and taxes at all times.

Another simplification is that capital markets are assumed not to have transaction costs, trading fees or taxes on income, purchases or sales.

- No brokerage costs or bid-ask spreads: The purchase and sale of securities takes place at a single price, with no intermediary costs.
- No capital gains taxes: Investors owe no tax on the profits, so they can take gains and rebalance with a free hand.

Implications:

This frictionless setup enables investors to rebalance portfolios as often as needed, implement arbitrage opportunities and switch between assets without compromise on returns. It also guards that all actions are based solely on risk-return analysis and not cost minimization.

Real-World Contrast:

In real markets, investors need to pay commission fees, spread cost and tax on trade turnover, which can be detrimental to the overall returns and discouraging for trading more frequently. For instance, even if high-frequency traders make margins at trades between buying and selling small, they pay huge costs for a lower net performance.

Costless Borrowing and Lending at the Riskless Rate

Market efficiency assumes that amount or invest r who can borrow or lend unlimited amounts of money and do s interest rate without assuming any risk.

- Constant risk-free rate: A uniform interest rate where all investors can borrow or lend, this is often suggested as representing a Treasury bill rate.
- No credit considerations: Investors do not have to worry about collateral, credit checks or having different interest rates based upon their own financial profile.

Unrestricted: Investors can form their portfolios by mixing the risk-free asset and risky market portfolios in any fractions, which gives them possibilities to form portfolios along CML.

Implications:

This is the idea of the tangent portfolio in CAPM, every investor can take their own mix of risk and return up to the efficient frontier based on just risk aversion.

Real-World Contrast:

The truth is that credit costs are usually higher than returns, and not all investors have access to free and unlimited cash. For instance, an institutional investor might be able to borrow at interest rates that are friendly to margins while retail investors may simply find it impossible owing to a high interest rate or credit limit. This asymmetry may limit investment opportunities and detract from the theoretical advantages of the risk-free instrument.

All Assets are Marketable

Market efficiency further believes that all types of investment assets can be traded in the public markets, such as:

- Examples of financial assets include stocks, bonds and derivatives.
- Tangible assets including real estate, commodities
- Intangible assets that differ from traditional assets such as human capital (future labor income) or intellectual property.

Assuming this to be true, then the “market portfolio” referenced in CAPM contains every conceivable asset, weighted by each one’s relevant market value. An investor can invest in a value-rich portfolio spanning this collection of assets with no added flexibility in diversification.

Implications:

So, all sources of risk and return are embodied in the market portfolio (and investors can have wholly diversified portfolios that eliminate all nonsystemetric risk).

Real-World Contrast:

A lot of those assets aren’t marketable or liquid. For instance:

- You can’t trade human capital literally.

Private equity and real estate have long lock-up periods, significant transaction costs and regulatory restrictions.

- Valuation and trading of intellectual property (patents, trademarks) can be inefficient.

Hence, investors cannot hold the true market portfolio and must rely on indirect proxy indices such as the S&P 500 that capture only a fraction of available assets.

8.2.3 The Risk-Free Rate and Homogeneous Expectations

The underlying assumptions of the Capital Asset Pricing Model (CAPM) and Modern Portfolio Theory (MPT) contain some key confidence about how investors think about risk in return, as well as availability of risk free assets. These assumptions enable the construction of simplified, but still highly predictive models to describe asset pricing and behavior by investors. But they are also ideal conditions and in many cases not reflective of how markets really work.

Existence of a Risk-Free Asset

CAPM is based on the logic that there exists an asset free from risk – that is, an investment which assures a return with 100 percent certainty and has no default risk, price uncertainty, or liquidity issues.

- It is considered that this asset has a constant rate of return, which does not depend on the condition of the market.
- It provides a yardstick with which all risky assets can be measured in terms of incremental return per unit of additional risk.
- The risk free asset is often approximated in economic models by 3-month U.S. Treasury bills in most financial models because of their:
 - o Very low default risk
 - o Very Liquid
 - o Predictable returns

Model Implications:

- All investors can borrow or lend each period at this same risk-free rate, regardless of credit quality, size of transactions, and time horizon.

This enables investors to form any mix of the risk-free asset and the market portfolio in order to achieve a desired level of overall risk which lies on the Capital Market Line (CML).

Example:

Let's say Investor A is super risk-averse. They can even invest as little as 30 percent in the market portfolio and allocate 70 percent into the risk-free prospect to avoid volatility. Now if it is less (as in the case of risk-averse investor A) investor would do better to follow their own gut. If $E(R_m) = 10\%$ and they borrow at r_f , they get an expected return of $(20 - 5) > 20\%$, by investing strictly more than dollar for dollar at the market portfolio. Their flexibility comes with the understanding that everyone can borrow and lend at the riskless rate.

Real-World Contrast:

- In practice borrowing costs and lending rates are different, and with rare exceptions, people cannot borrow from the government at the latter's lending rate anyway.
- Even government bonds have some inflation and reinvestment risk over longer time horizons.
- Retail investors: They have credit constraints and will pay higher interest on borrowed money.

So, even though the risk-free asset is a nice theoretical concept in practice it has to be acceptable.

Homogeneous Expectations Among Investors

Another crucial assumption in the framework of CAPM is that all investors have identical expectations. This means:

- The same inputs are agreed upon by investors:
 - o Expected returns of all the assets
 - o Volatility (a measure of risk) for each asset
 - o Correlations between each pair of assets (how they move together)
- They see the same information and understand it in the same way.
- They all trace out the same efficient frontier of risky portfolios, while searching for optimal riskreturn tradeoff.

Model Implications:

It's because with these beliefs, all investors reach the same conclusion: the tangency portfolio (the point at which the CML meets the efficient frontier) is optimal.

- This tangency portfolio becomes the market portfolio, in which all rational investors invest something.
- Risk preferences are the only source of portfolio composition differences.
- Clients differ in their risk preferences, not in their beliefs.

Example:

Say you have three investors looking over a universe of stocks. All three of them compute that, under homogeneous expectations:

- Stock X has an expected return of 8%,
- Stock Y has an expected return of 12%,
- The two have a correlation of 0.5, and

- Stock Y is riskier.

With that information, all three investors will construct the same optimal risky portfolio; say 60% Stock Y and 40% Stock X. However, one investor may combine that with a high allocation to the risk-free asset, say 50% market portfolio and 50% T-bills. On the other hand, the other investor might choose to take a leveraged position, say 120% market portfolio and 20% borrowing at the risk-free rate. Real-World Comparison: In reality, investors have different interpretations of the same data because of information asymmetry, different analytical or investment tools/ philosophies, and cognitive and emotional biases. For example, a growth investor may be more optimistic on a stock projected to have high earnings growth and vice versa. Thus, while the homogeneous expectations assumption simplifies modeling, leading to beautiful equilibrium results, it fails to account for investor opinion diversity in real markets. 3. Implication for the Market Portfolio Finally, the homogeneous expectations combined with a risk-free asset accessible to all investors results in a strong proposition in CAPM—it concludes that all investors will hold the same risky portfolio. • The risky portfolio, known as the market portfolio, consists of all available risky assets, stocks, bonds, commodities, and where not, weighted by market value. • Given that all investors find it optimal, it thus becomes the total holdings in risky assets by all investors. • The only disparity among the three lies in their allocation between the market, e.g., the risky assets and the risk-free asset, say T-bills

This is what gives us the Security Market Line (SML), a plot of estimates of the return denominator as a function of β . The SML shows the return an asset would be expected to have if it is behaving rationally (its beta, that is, its sensitivity to non-diversifiable covarying risk in the market portfolio). All properly priced assets must fall on the SML, representing a balance between risk and return.

Example:

If all investors, rich or poor, risk-loving or averse, decided to buy the same basket of risky assets (a global index fund, for example), their differences in investment behavior will simply show up in how much money they plow into this basket relative to sinking it into a savings bond. A retiree might then invest 30% in the market portfolio and 70% in bonds, while a young professional would put 100%, or even 120%, of their wealth into the market portfolio (with leverage). Real-World Contrast:

- Not all investors are invested in the same portfolio. They might favor domestic stocks, certain sectors or alternative investments.
- Implementation issues (e.g., regulation, taxes, minimum investment sizes) make it impossible to implement a single "market portfolio".

- Further, many investors have poorly diversified or actively managed portfolios diverging from the theoretical optimum.

8.3 Derivation of CAPM

8.3.1 Expected Return Formula

The standard form of the CAPM is:

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$$

This equation states that the expected rate of return on security i is equal to the risk-free rate plus a premium for bearing systematic (market) risk.

1 Portfolio choice with a riskless asset Schedule: Lecture 3 in week 1, 27 September
 Proposition (Portfolio choice under expected $r_{t+1} = r$): at date t , invest a share of wealth to get expectation $E(r_{t+1})$.

Suppose that there are two possibilities for investors:

Take a position in a risk-free asset (R_f) like T-bills.

3. 2 Invest in the market portfolio (M) which is a combination of all risky assets, weighted according to their current market value.

By combining these, the portfolio's expected return (R_p) is:

$$E = R_f + [(E(M) - R_f) / \sigma_M] \times \sigma_P \text{ where,}$$

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LCSCUSTOM64[MMporate Finance6THE CAPITAL ASSET PRICING MODEL • When A cannot be diversified away which mean it has a beta of 1 and thus ought to offer the risk free rate plus, multiplied by its bust ratio [Hence $E = R_f + (E(R_m) - R_f) / \sigma_P \times \sigma_P$.

Where:

- $E(R_m)$ = the expected return on the market portfolio
- σ_m = the standard deviation of the market portfolio (a measure of market risk)
- σ_p = standard deviation of the selected portfolio

The term $(E(R_m) - R_f) / \sigma_m$ is referred to as market price of risk. It's the additional return that investors desire, per unit of risk.

Illustration:

Suppose:

- Risk-free rate (R_f) = 3%

- Market return ($E(R_m)$) = 9%
- Market standard deviation (σ_m) = 20%
- Portfolio risk (σ_p) = 10%

Then,

Price of risk for the market = $(9\% - 3\%) \div 20\% = 0.30$

Portfolio's expected return = $3\% + (0.30)(10\%) = 6\%$

This demonstrates that as you increase the risk of the portfolio, you will increase its expected return in proportion to the market's price of risk.

Step 2: Move from CML to SML

CML (Capital Market Line) The Capital Market Line holds only for efficient portfolios (i.e., combinations of the riskfree asset and the market portfolio). It compares the expected return to total risk (σ).

- For an individual security we cannot consider its total risk (σ) because part of that will be diversified away. What we do want is a measure of unsystematic risk (risk compared to the market).

This brings us to beta (β), which indicates how much a security is influenced by market movements.

- If $\beta_i = 1 \rightarrow$ security moves on to the market.
- If $\beta_i > 1 \rightarrow$ These mean the security is more volatile and hence has a higher risk than the market.
- If $\beta_i < 1$.
- If the stock goes down less than the market, it is a negative covariance $\rightarrow \beta < 1$ – Security moves more, on a percentage basis, than the market (reinforces market movements). Example: A stock with $\beta = 1.3$ will go up approximately 13% when the market goes up ten%, but down approximately 13% when the market drops ten%.
- $\beta < 1$: A stock that is less volatile than the market. Example A utility stock ($\beta = 0.6$) will go up only 6% Performance of market: Example utilities index rises by 10%.
- $\beta = 0$: The security is not affected by the market in any form. Example: A short-term Treasury bill.
- $\beta < 0$: The security moves in the opposite direction of the market. Example: Gold frequently has negative beta during market corrections — as equities decline, gold prices may rise.

Beta and Expected Return

Theoretically speaking, in line with CAPM, the expected return of a security is directly related to its beta:

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$$

- Firms with larger beta have more sensitive systematic risk → investors need higher rewards.
- a firm with a low beta is less risky in relation to the market: then, expected returns are lower.

Illustration:

Suppose:

- Risk-free rate (R_f) = 2%
- Market return expected ($E(R_m)$) = 8% Q3: You are a simple investor with all funds in the market and you already hold the following data. What is your expected risk premium from this new security?

- Market risk premium = 6%

- Stock A ($\beta = 0.7$):

$$E(R_A) = 2\% + 0.7 \times 6\% = 6.2\%$$

- Stock B ($\beta = 1.2$):

$$E(R_B) = 2\% + 1.2 \times 6\% = 9.2\%$$

Interpretation:

- Stock A is a more stable stock, but provides less return.
- Stock B is riskier, but it pays investors a higher premium.

Importance in CAPM

- In CAPM only beta matters for expected return, it is what picks up the systematic risk (i.e., non-diversifiable risk).
- Nonsystematic risk (individual risks such as management mistakes, labor strikes, product recalls) can be reduced by owning many securities. And so CAPM simply assumes that investors should not be compensated for unsystematic risk — but only for systematic risk, as measured by beta.

Illustration:

• If you own just one airline stock and an accident, a price shift in fuel costs or a strike occurs, you feel it the hardest. But if you scatter that investment across airlines, energy, health care and technology, those risks offset each other.

• What's left is the systematic risk that comes from economy-wide forces (interest rates, inflation, recessions). Beta is a way to quantify how much exposure a security has to these inescapable risks.

8.3.3 Risk Premium and the Market Portfolio

Market Risk Premium

The market risk premium is the additional return that investors expect to receive by investing in the market portfolio rather than a riskless asset.

Formula:

$MRP = E(R_m) - R_f$ Where, * as in above bite $[E(R_m)]$ = Expected Rate of return on the market portfolio which can be estimated by DCF method or Patter ratio.

Where:

- $E(R_m)$: Expected return on the market portfolio
- R_f : risk-free rate of return

Explanation:

- Time value of money, at its minimum (interest): the risk-free interest rate does not compensate for any time preference.
- The market risk premium is the additional uncertainty associated with holding a (diversified) market portfolio rather than safer government securities.

Illustration:

Suppose:

- The anticipated return of the market ($E(R_m)$) = 10%
- Risk-free rate (R_f) = 3%

Then:

Market risk premium = $10\% - 3\% = 7\%$

This indicates that investors require a 7% addition to the risk-free rate in exchange for taking systematic market risk.

Market Portfolio in CAPM

The market portfolio in CAPM is a portfolio that contains all the risky assets available to be held in the economy, weighted by their market value.

Key points:

- It comprises stocks, bonds, real estate and commodities (and in theory human capital).
- As it is not feasible to hold every risky asset, we use broad indices e.g. The S&P 500, FTSE 100 or Nifty 50 as a proxy for the market portfolio.
- Homogeneous expectations: the expectation of asset returns and risks will be the same for everyone in CAPM.
- In consequence, all investors have the same risky market portfolio, but each holds it in different proportion depending on attitude toward risk:
 - o Investors who fear risk → greater investment in the risk-free asset.
 - o Risk-loving investors → higher weight on risky assets (or even borrowing at the risk-free rate to invest more in the market portfolio).

Illustration:

- A conservative investor might want to own 70% risk-free bonds + 30% S&P 500.

An aggressive investor might own 20% risk free bond = 80% S&P 500.

- They both are based on the same underlying market portfolio, with the differences being in mix.

Risk Premium for Individual Securities

For any particular security, the risk premium is a function of its beta with respect to the market: $E(R_i) - R_f = \beta_i [E(R_m) - R_f]$ Where:

- $E(R_i)$: expected return on securities i
- β_i : beta of the security (a measure of systematic risk)
- $[R_m - R_f]$: Market risk premium or excess returns on the market as a whole

This is to say, a security receives a risk premium that is equal to mass times beta.

Illustration:

Suppose:

- Market risk premium = 7%
- Risk-free rate (R_f) = 3%

- Stock A ($\beta = 1.2$):

Risk premium = $1.2 \times 7\% = 8.4\%$ Expected return = $3\% + 8.4\% = 11.4\%$

- Stock B ($\beta = 0.6$):

Risk haircut = $0.6 \times 7\% = 4.2\%$

Expected return = $3\% + 4.2\% = 7.2\%$

Interpretation:

- Stock A is more risky than the market and has a higher anticipated rate of return.
- Stock B is less risky and has low expected return.

Flow of Derivation (Stepwise Logic)

The CAPM is constructed incrementally on top of portfolio theory:

Modern Portfolio Theory (MPT):

o Displays the potential combinations of risky assets (optimal portfolio with maximum return for a given level of risk).

Adding a Risk-Free Asset:

o When risky assets are combined with the risk-free asset we obtain the Capital Market Line (CML), which reflect optimal risky + risk-free portfolios.

Using Risk-Return Trade-Off to Individual securities:

o CML is only applicable for a portfolio.

o We need a relative risk measure $\rightarrow$ beta (β) to use for individual securities.

16 Introducing Beta as a Measure of Systematic Risk: When an investor considers investing in a particular company, the relevant risk is the firm's systematic risk.

o Beta accounts for the sensitivity of a security to market variability by substituting systematic risk for total risk (σ).

Final CAPM Equation (Security Market Line, SML):

$E(R_i) = \alpha + \beta E(R_m - R^*)$ o This line is the relationship between a security's expected return and its beta.

Illustration of the Flow:

- Suppose an investor initially creates a diversified combination of stocks (efficient frontier).
- The straight line(CML)is obtained by adding T-bills.

- Extending this logic to, say, Apple, Microsoft or Tesla stock individually, we would consider each stock's beta in relation to the market.
- The SML then informs us of the expected return on each stock, which depends solely on its beta.

“Assignment: Expected Return and Market Risk Based on CAPM”

If the risk-free rate is 4%, the market return is expected to be 10%, then Stock X has a $\beta=1.2$. Have students use the CAPM formula: $E(R_i) = R_f + \beta [E(R_m) - R_f]$. Find the expected return for Stock X and explain its investment significance.

8.4 Security Market Line (SML)

8.4.1 Meaning and importance of SML

Definition

The Security Market Line (SML) graphically represents the Capital Asset Pricing Model (CAPM).

- It is a plot of the expected return on a security as a function of the systematic risk (beta) of that security.
- Y-axis: Expected return $E(R_i)$
- X-axis: Measure for Beta (β_i) that is the sensitivity of a security's return to the market.
- Intercept: The risk-free rate (R_f).
- Gradient: The “market risk premium” $[E(R_m) - R_f]$.

Equation of the SML:

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$$

Thus, the expected return on any security is equal to the risk-free rate plus a premium for bearing systematic risk times beta.

Significance of the SML

The SML is a nice assessment tool to determine whether a security is correctly valued or not.

- Securities on the SML:

Priced- expected return = the return asked for by investors in terms of systematic risk.

- Securities above the SML:

Undervalued — they have higher expected returns than their risk warrants. These would be something investors would want to buy.

- Securities below the SML:

Overvalued — they promise lower expected returns than are needed. These would be something investors would want to stay away from or sell.

Illustrations

Example 1: Security Priced Fairly Assume: r_f = Risk-free rate on the underlying shares; r_M = Underlying share IRq Premium rate of return over risk free Investing Profits (Losses)) Exercising r dt E

UserProfile:rappers/OnlineGrammar/OpenFile Action Post Doctype Text PublishingDescription whether to exercise () not!

- Risk-free rate (r_f) = 3%
- Expected market return ($E(r_M)$) = 9%
- Market risk premium = 6%

For a stock with $\beta = 1.0$:

$$E(R_i) = 3\% + 1.0 \times 6\% = 9\%$$

If the stock really does have an expected return of 9%, then it is on the SML → correctly valued.

Example 2: Overpriced (Below SML) / Underpriced (Above SML) Security In the above inputs;

For a stock with $\beta = 1.2$:

$E(R_i) = 3\% + 1.2 \times 6\% = 10.2\%$ (required return from CAPM) If the stock is expected by the market to earn only 12%, we get:

- Expected return (12%) > Required return(10.2%)
- The points lie above the SML → are undervalued. Investors should just buy it because it is offering excess return.

Example 3: Overpriced Security (Beneath SML) Again, using the same values as Example 1:

For a stock with $\beta = 0.8$:

$E(R_i) = 3\% + 0.8 \times 6\% = 7.8\%$ (required return, per CAPM) If the stock's expected return is only 6%, then:

- Required return 7.8% and Expected return negative, it's hard to see what they can offer the market that would satisfy Investors..
- The Stock Below Downward SML \ Overvalued. You would not want to invest in it because it lags so severely for the amount of risk you're taking.

Real-World Perspective

- Stock analysts can apply the SML to help decide whether a stock return pays an investor for the corresponding level of risk.
- Portfolio managers purchase underpriced stocks (above the SML) and avoid or sell short overpriced ones (below the SML).
- Corporate finance choices: Firms can use the required return generated by CAPM and compare it to the cost of issuing new equity, so they know they are at least meeting investor expectations.

8.4.2 Relationship between Risk (Beta) and Return

Systematic Risk (Beta)

- The x-axis of the SML represents β .
- Beta measures systematic risk — the kinds of risks that can't be diversified away, such as economic cycles, interest rates and inflation.
- A security's returns are the more reactive to market movements, or "volatile," the higher its beta.

Illustration:

- A $\beta = 0.5$ stock moves at only one half the rate of the market. When the market rises 10%, the stock goes up about 5%.
- A stock with $\beta = 2.0$ will double the market's fluctuations. The stock rises roughly double what the market does, or about 20%.
- A stock with a β of -0.3 will move inversely to the market. A 10 percent drop in the market leads to an approximately 3 percent surge in the stock.

Risk-Return Trade-Off

The intercept of SML is the risk-free rate = R_f and the slope of SML is the market risk premium = $[E(R_m) - R_f]$.

- It is the excess return that investors require for each unit of systematic risk.
- Securities with lower beta have to fall below the line, delivering lower expected returns.

Example:

Suppose:

- Risk-free rate (R_f) = 4%
- Expected market return ($E(R_m)$) = 12%
- Market risk premium = 8%

Using CAPM:

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$$

- Stock A ($\beta = 0.5$):

$$E(R_A) = 4\% + 0.5 \times 8\% = 8\%$$

- Stock B ($\beta = 1.0$):

$$E(R_B) = 4\% + 1.0 \times 8\% = 12\%$$

- Stock C ($\beta = 1.5$):

$$E(R_C) = 4\% + 1.5 \times 8\% = 16\%$$

- Stock D ($\beta = 2.0$):

$$E(R_D) = 4\% + 2.0 \times 8\% = 20\%$$

This illustrates the linear relationship: double beta, and you double the risk premium.

"Only systematic risk is rewarded."

- The CAPM is based on the assumption that investors own diversified portfolios and accordingly do away with unsystematic (company-specific) risk.
- System risk only (captured by beta) thus defines the required return.

Illustration:

- Consider two companies:
 - o Company X: A standalone airline with hazards arising from strikes, fuel crisis (a large unsystematic risk).
 - o Company Y: A diversified company with stable businesses.

CAPM predicts that both should offer the same expected return if their $\beta = 1.2$, irrespective of their unsystematic risk.

- Investors can eliminate Company X's idiosyncratic risks by owning shares in several companies.

- But neither can escape systemic shocks such as a recession — and therefore only beta matters in ascertaining the required return.

Real-World Perspective

- High-beta stocks (as, say, technology or luxury goods companies) both rise more in booms and fall more in recessions and therefore offer higher expected returns.
- Stocks with low beta (like utilities and consumer staples) offer predictability, but lower expected returns.
- Negative-beta assets (gold during crises, for instance) serve as hedges, typically delivering lower returns but helping to mitigate portfolio risk.

8.4.3 SML in Portfolio Choices

The Security Market Line (SML) is not only the product of a theoretical relation from CAPM, but also an applied concept that investors, portfolio managers and corporate financial decision makers rely. Some of its most notable applications are explained using examples below.

Security Valuation

The SML is useful in determining if a security is fairly priced, undervalued or overvalued.

- If a stock's historical expected return > return given by the predictions of SML, it is above the line → undervalued (good buy).
- If actual expected return of a stock require (7.8%) < undervalued.
- Stock B real return (13%) > expected (12%) → thus Stock is underpriced as well.

It's a tossup, as both are appealing to investors who may want Stock A if they're conservative or if they're willing to accept more risk, then Stock B.

Cost of Equity Estimation

Companies use the SML to compute their cost of equity capital—the rate of return that investors require on equities in such companies—necessary for project evaluation and firm valuation.

Formula:

$Ke = Rf + \beta \times [E(Rm) - Rf]$ Where, Ke = Cost of equity capital Rf = Risk free rate of return β = Beta coefficient $E(Rm)$ = Average market earning or return premium on market portfolio.

Example:

If a firm has $\beta = 1.3$, $r_{RF} = 4\%$, and $r_M - r_{RF} = 11\%$, then:

$$K_e = 4\% + 1.3 \times (11\% - 4\%) = 4\% + 1.3(7\%) = 4\% + 9.1\% = 13.1\%.$$

This minimum return is used in the discounted cash flow (DCF) valuations and WACC calculations.

Risk Management

The SML provides investors with a tool to determine if they are being reasonably compensated for the level of systematic risk.

- Stocks or portfolios have a high beta but below the SML; it indicates that investors are assuming extra risk for which they have not been adequately compensated.
- A portfolio above the SML indicates that risks are rewarded for greater return.

Example:

- Portfolio X: $\beta = 1.8$, Expected Return = 14%
- Required return from SML = $3\% + 1.8 \times 6\% = 13.8\% \rightarrow$ portfolio is somewhat higher on the SML $\rightarrow$ risk-taking is warranted.
- Portfolio Y: $\beta = 2.0$, $E(R) = 13\%$
- Required return = $3\% + 2 \times 6\% = 15\% \rightarrow$ portfolio sits below SML $\rightarrow$ too risky for too little expected return.

One response to such conditions would be for investors to “rebalance” towards lower-beta assets or hedge with negatively correlated securities like gold.

8.5 Summary

❖ The Capital Asset Pricing Model (CAPM): This model describes return expected in active bond investment and how it relates to the systematic risk.

❖ CAPM is an extension of Modern Portfolio Theory by assuming that investors are rational, risk averse and want to maximize their wealth.

❖ The CAPM equation is $E(R_i) = R_f + \beta_i [E(R_M) - R_f]$.

❖ Only systematic risk (measured by beta) is relevant to know the expected return; unsystematic risk can be diversified away.

❖ Time value of money The risk-free rate is the reward given to investors for postponing their consumption.

- ❖ Beta(β) represents how much a security's return will change in response to a particular market return.
- ❖ The market risk premium [$E(R_m) - R_f$] is what investors require for investing in the stock market.
- ❖ Homogeneous expectations: All investors use the same method of evaluating securities.
- ❖ The model is based on the idea of efficient capital markets (no taxes, no transaction costs and borrowing/lending at risk free rates).
- ❖ The SML (Security Market Line) is a graphical presentation of the CAPM that depicts beta versus expected return as linear.
- ❖ Securities lying above the SML are under valued and those below it are over valued.
- ❖ The SML is commonly used in asset pricing, portfolio analysis, cost of equity determination and investment decisions.
- ❖ While still incomplete, CAPM is one of the most influential models in finance to shed light on how risk and return are priced.

8.6 Key Terms

CAPM (Capital Asset Pricing Model): A model which establishes a relationship between the expected return on an asset and its systematic risk as measured by beta.

Risk-Free Rate: The amount of return generated from an investment with no risk, usually by government securities.

Market Risk Premium -Excess return that investors demand from the market portfolio over and above risk free rate.

Beta (β) The measure of sensitivity of a security to market movements.

Systematic Risk: Undiversifiable risk that results from market-wide influences.

U Systematic Risk: Risk specific to a company or industry that can be eliminated through diversification.

Security Market Line (SML): A graph of the capital asset pricing model that display the relationship between beta, and expected return.

Market Portfolio A portfolio with a return represented by a risk factor, or a set of (independent) risk factors.

Efficient Frontier: The graph on which portfolios that offer the best possible risk-return tradeoff are plotted.

Expected Return: Predicted return on an investment by the probability-weighted outcomes.

8.7 Descriptive Questions

Describe the basic idea behind the Capital Asset Pricing Model (CAPM) and its impact on today's finance.

Explain the assumptions upon which CAPM is based. In its practical application, how much do these assumptions matter?

Step by step, derive the formula for CAPM from CML.

What are the implications of beta in CAPM? How are the readings determined and what do they mean?

Distinguish between Systematic and Unsystematic Risk by examples.

What is the Security Market Line? How is it used to value securities?

Question 2 Compare and contrast the CAPM with other asset pricing models (e.g., APT, Fama-French).

Q.5) Explain how is the cost of equity and investment decisions estimated by CAPM?

Consider how and why CAPM is difficult to apply in practice.

8.8 References

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8.9 Case Study

Measuring the Risk of a Portfolio Using CAPM and SML

Introduction

Managing investments is all about the trade-off between risk and reward. Often investors confront the question as to whether a security or a portfolio is priced well in view of the risk it contains. The CAPM and SML are tools to examine the expected returns with regards to systematic risk. These are the type of tools that help investors decide whether an asset actually pays you for the risk that you take.

Background

Ramesh is 40 and his investments include government bonds, blue-chip stocks and mid-cap equities. The most recent addition he was contemplating was a tech stock, TechVision Ltd. The stock has a beta of 1.4, the risk free rate in the economy is 5% and the expected return on market portfolio is 12%. Ramesh has estimated the required return for TechVision Ltd., using CAPM as follows:

lientsPort13Solution: a) The security characteristic line for this risky asset will be such that $E(R_i) = R_f + \beta [E(R_m) - R_f]$ $E(R_i) = 5\% + 1.4 \times (12\% - 5\%) = 5\% + 9.8\% = 14.8\%$.

But analysts think the stock could return 18%, in fact. This situation puts Ramesh in a quandary; would he want to invest in TechVision Ltd, as its expected return is higher, of should be be on guard since it has considerably high value of beta?

Problem Statements and Solutions

Issue 1: Determining Fair Value of the Stock

- CAPM forecasts a 14.8% required return, and an expected return of 18%.
- Answer: The expected return indicated is greater than the result on the SML, thus rendering this stock to look undervalued and hence possibly a fruitful addition to your portfolio.

Problem 2: How to control High Risk Exposure?

- TechVision Ltd. has a beta of 1.4, meaning that the stock's price movements are more volatile than the market as a whole.
- Solution: Ramesh needs to assess his risk tolerance. If he has the stomach for volatility and wants growth, it might fit. Otherwise, he should rebalance with his "defensive assets", in order to ensure portfolio stability.

Problem 3: Diversification Of Portfolio Problem.

- The inclusion of a high-beta stock raises total systematic risk.
- Solution: To counter this, Ramesh could reload his low-beta holdings such as government securities or defensive sectors. This provides diversification, yet allows you to catch the better returns.

Case Study Questions (Critical Thinking)

What is affirmation to make any difference in answering this question? Would Ramesh invest in TechVision Ltd., since it is above the SML? Why or why not?

How does beta help an investor in knowing that the risk-return relationship can be estimated from the CAPM?

If the market risk premium declines, what will happen to the required return on TechVision Ltd shares?

What can Ramesh do to modify his portfolio to control his high beta exposure?

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Unit 9: Portfolio Theories (Part II)

Learning Objectives

1. Familiarize yourself with developments of modern portfolio theories and their extensions.
2. Discuss the meaning and significance of the Capital Market Line (CML).
3. Discuss the Security Market Line (SML) and its significance in determining asset prices.
4. Explain the separation of systematic and unsystematic risk in a portfolio setting.
5. Use CAPM to compare the expected returns of assets.
6. Investigate alternative asset pricing models other than CAPM.
7. 4 Evaluate the reduction of risk due to diversification.
8. Assess the performance of a group of portfolios using risk-adjusted measure.
9. Explain the applications and limitations of practical portfolio theories in actualized markets.

Content

- 9.0 Introductory Caselet
- 9.1 Introduction to APT
- 9.2 Multi-Factor Model vs. Single-Factor CAPM
- 9.3 Sources of Systematic Risk
- 9.4 Applications of APT in Portfolio Management
- 9.5 Summary
- 9.6 Key Terms
- 9.7 Descriptive Questions
- 9.8 References
- 9.9 Case Study

9.0 Introductory Caselet

Selecting the Appropriate Asset Pricing Model – The Aarav's Investment Decision

35-year-old financial analyst Aarav is searching for options to diversify his portfolio. He already knows CAPM, and he has frequently applied it to estimate expected returns of stocks using beta. Not too long ago, Aarav read about other models such as the Arbitrage Pricing Theory (APT) as well as Fama-French Three-Factor Model which purports to offer more realistic insights into stock returns as they account for multiple factors.

Aarav is analyzing two stocks:

- Stock A, a small-cap firm facing uncertain future earnings but the possibility of tremendous growth.
- Stock B, a large old-line company with predictable returns and low volatility.

According to CAPM, both stocks are fully priced. But under the Fama-French model, Stock A (given that it is a small cap) might be considered as having positive undervaluation because of the “size effect.” Now it is decision time for Aarav: should he continue using the simple CAPM or move on from the incentive with a fancier model to hieve in other thingsc? The choice in holdings it would create could add new imbalance to his portfolio.

Critical Thinking Questions

In Aarav’s case, is it better for him to use the CAPM model or to look out other models such as APT or Fama-French for his investment analysis? Why?

How would the “size effect” and “value effect” affect Aarav's decision between purchasing Stock A and Stock B?

What are some of the possible risks for for Aarav if he only uses CAPM to come up with his portfolio?

9.1 Introduction to APT

9.1.1 Arbitrage Pricing Theory In finance, the concept of arbitrage pricing theory is based on the idea that no two portfolios should have substantially different expected rates of returns if they are all exposed to the same states of economic activity and risks.

Basic Idea

Arbitrage pricing theory (APT) by Stephen Ross (1976) is used as an alternative approach to capture asset returns instead of CAPM.

- Key principle: The return of a security depends not only on one market factor (as in CAPM) but also on n other risk factors, where there are the expected value can be expressed as:.

• These determinants may include such macroeconomic factors as:

o Inflation rate o Interest rates o Growth in GDP or industrial output o Exchange rates o Price of oil/commodity prices o Index value on financial markets

APT works on the assumption that when returns diverge from what is anticipated by the model, customarily this triggers an arbitrage opportunity and a rational investor will trade against it until returns balance out.

The APT Equation

$E(R_i) = R_f + b_1F_1 + b_2F_2 + \dots + b_nF_n$ Where:

- $E(R_i)$: the expected return on asset i
- R_f : risk-free rate
- b_n : how sensitive the asset is to factor n (factor loading)
- F_n : premium of the n-th factor.

Unlike CAPM which tells you what the factors are, APT does not do so — these must be found out using data.

Example of APT

For discussion, let's say we have found 3 variables that determine stock returns:

Interest rate variation ($F_1 = 3\%$)

Inflation ($F_2 = 2\%$)

Industrial growth ($F_3 = 4\%$)

Risk-free rate ($R_f = 5\%$)

Now suppose we have a stock with the sensitivities (factor loadings) given below:

- $b_1 = 0.5$ (interest inelastic)
- $b_2 = 1.2$ (very sensitive to inflation)
- $b_3 = 0.8$ (moderately sensitive to industrial expansion)

Expected return:

$E(R_i) = (5\%) + (0.5 \times 3\%) + (1.2 \times 2\%) + (0.8 \times 4\%)$

$E(R_i) = 5\% + 1.5\% + 2.4\% + 3.2\% = 12.1\%$

That means, says APT, the stock should deliver a 12.1% average annual return.

Arbitrage Mechanism

APT is based on the no-arbitrage condition:

If security's expected actual return $>$ APT-predicted return, the security is undervalued.

Investors will bid its price up and the expected return down, until the APT's predicted return is achieved.

- If the real expected return of a security $>$ APT-predicted return, these risks net out when investors hold numerous assets.

Systematic risk : Economy-wide factors (interest rates, inflation, recessions). They are indivisible; you simply cannot diversify them away.

Example:

- If you are investing in an airline company, fuel prices and strikes are really important to you.
- But if one owns 100 companies across a spectrum of industries, the risks posed by an airline are counterbalanced by gains elsewhere.
- What's left over is the macroeconomic shocks (say, worldwide inflation) that hit every business — just what APT models.

No Market Portfolio Needed

Assumption:

APT does not assume that there is an all include risk market portfolio as in CAPM.

Explanation:

- Investors in CAPM are assumed to have a hypothetical “market portfolio” that includes all of the risky assets in the economy. This is hard to formalize or observe in practice.
- APT circumvents this issue by assuming on the contrary that asset returns must factorize with respect to a number of observable quantities, not one single universal portfolio.

Example:

- CAPM makes you think about “the market portfolio,” which could include not just stocks and bonds, but also real estate, art and perhaps human capital. This is unrealistic.
- APT will simply state, based on some factors (eg inflation, GDP growth, oil prices) you should estimate the sensitivities. This is what makes it flexible and useful.

Fewer Restrictive Market Conditions

Assumption:

APT does not rely on many of the limitations that are associated with CAPM.

We don't need investors all to have the same expectation: Different investors can believe different things about future returns.

Do not have to rely on normal distribution of returns: CAPM assumes returns are bellshaped; APT does not.

- No unrealistic borrowing/lending assumption: CAPM assumes zero constraint on what investor can borrow/lend at the risk free rate; APT does not make this absurd simplification.

Example:

- Investors disagree about future inflation and growth — APT still applies.
- Borrowing at the risk-free rate is typically not possible — APT doesn't rely on this.

This is more realistic for real financial markets, therefore APT becomes more stable.

Did You Know?

“While CAPM assumes a single market factor and the associated risk, APT allows that multiple factors — inflation interest rates or GDP growth — can explain asset prices. Its fundamental premise is a belief in no arbitrage, that mispriced assets can't last long because investors pounce on them to make money.”

9.1.3 APT Versus Capm

Number of Factors

The very basic distinction between CAPM and APT is the number of factors used to describe returns. CAPM is a one-variable model, which assumes market risk (represented by beta) as the only source of expected return. This simplicity is beautiful in the sense that CAPM is easy to solve and apply, but it's too restrictive. APT, on the other hand, is a multi-factor model but that includes several macroeconomic and financial variables — as inflation, interest rates, GDP growth, exchange rate or oil price-. Every asset has its own sensitivity to the variables and thus APT is considered to be a more appropriate method to capture complex market structure.

- CAPM (One-factor model): This approach considers the market portfolio and beta only. That makes it easy, but it omits other key sources of risk like inflation or currency values.

APT (multi-factor framework): Take into account some economic factors that affect asset returns so as to have a better understanding of risk and return.

Implication: CAPM is simple but restrictive; APT is complicated but broadly-applicable. Indeed, factor based models based on APT typically exhibit stronger predictive power than does CAPM in practice.

Assumptions

CAPM is based on the stringent and well-behaved assumptions that looks beautiful in theory, but never holds in reality. Homogeneous expectations, perfect capital markets, frictionless trading and a universal market portfolio consisting of all risky assets are necessary for such equality. These assumptions make the math simpler, but decrease realism. To the contrary, APT makes less and more flexible assumptions. It is based on no arbitrage and the notion that investors have well diversified portfolios which remove unsystematic risk. Due to its lighter assumptions, APT is better suited for the real markets while sacrificing some theoretical neatness.

- CAPM unrealistic assumptions: homogeneous expectations and a “true market portfolio” are, well, unreal because investors disagree and can’t invest in every asset.
- APT flexibility: It mainly depends on arbitrage-free pricing and diversification which are closer to the way real markets operate.
- Practical consequence: CAPM is mathematically exquisite but not very realistic; APT is less elegant, but vastly more practical for empirical finance.

Risk Interpretation

In CAPM, the risk of a stock is distilled into one measure: beta (β), which measures how much returns on the stock move with movements in the entire market. Although sound, doing so parsifies risk into a one-dimensional metric, dismissing alternative economic factors. APT, on the other hand, understands risk in a multifaceted way through factor sensitivities. Each of these factors loadings (b_n) tells us how much an asset’s return moves in relation to the driver. This broader perspective allows for the fact that assets respond differently to changes in inflation, interest rates or commodity prices, and brings APT closer to the actual manner in which risk-return tradeoffs can manifest themselves in the real world.

- CAPM beta: Fails to acknowledge legitimate systemic sources of risk beyond being sensitive to market levels, an oversimplification of complex truths.

APT factors: Measures the exposure to risk on multiple dimensions by identifying how different assets respond to various macroeconomic shocks.

Difference between CAPM and APT While both of them are methods to calculate the cost of equity, they have differing assumption since it was derived from two different arguments.

Practical Application

The practical aspect: CAPM is simple to apply. Analysts can calculate expected return using just three inputs — the risk-free rate, the expected market return, and the stock's beta. It's this simplicity that explains why CAPM is so popularly taught and used in finance. But this simplicity is itself an oversimplification, because it leaves out some of the most important drivers of returns. Tech APT is more difficult to use, as it requires to identify the relevant factors and estimate their premiums, that usually do depend of markets and periods. Though APT is more complicated, it delivers a richer and more realistic modeling framework for the practitioners who want to adhere to accuracy.

- CAPM easiness: Requires minimal data and easy to use, therefore popular for simple valuations and finance classes.
- APT complexity: Statistical analysis and empirical experimentation necessary to find the relevant factors which leads to an increase in application difficulty.
- Trade-off: The convenience of using CAPM brings the lack of precision and high level of accuracy in APT brings the complexity.

Theoretical vs Empirical Strength

CAPM enjoys strong theoretical elegance. It is based on modern portfolio theory and generates a clear, testable relationship between risk and return through the Security Market Line (SML). But empirical research frequently finds that CAPM falls short in explaining real stock returns — small-cap and value stocks, for instance, earn higher returns than the model anticipates. APT is theoretically less clean (because it does not nail down specific factors) but empirically stronger. By permitting more than one source of risk, it does a better job of explaining returns in the real world. This is precisely why models inspired by APT such as the Fama-French three-factor and five-factor models continue to rule contemporary empirical finance.

- CAPM theory: Solid as a rock on paper, bad at matching empirical data; reality is frequently non-compliant with its predictions.

APT empirics: Less clean theoretically but better at explaining real stock behavior using multi-factor analysis.

Outcome: CAPM rules schools; APT (and its kin) rule the real world and professional money management.

9.2 The Multi-Factor Model Versus the Single-Factor CAPM

9.2.1 The CAPM in Terms of a Single-Factor Model

Core Concept

One of the first and most ubiquitous asset pricing models in finance is the Capital Asset Pricing Model (CAPM). It simplifies the risk versus return relationship by assuming that security's expected return depends only upon their sensitivity to the all securities in which it is traded. BETA (β) is a measure of this sensitivity. In other words, CAPM says that if an asset trends similarly to the market, then the asset is a riskier buy and investors will require a greater return. Conversely, if an asset is insensitive to market its return will be lesser.

Illustration:

- For $\beta = 1$ the stock moves with the market.
- If $\beta > 1$, the stock magnifies market movements (riskier).
- The stock is safer (i.e., less volatile than the market) if $\beta < 1$.
- If $\beta = 0$, the stock is independent of the market (as a Treasury bill).

CAPM Equation

The CAPM equation is: $E(R_i) = R_f + \beta_i [E(R_m) - R_f]$ Where,

- $E(R_i)$: Expected return on asset i
- R_f : Risk free rate (i.e., yield on government bonds)

β_i : How the asset responds to the market portfolio (systematic risk)

- $(E(R_m) - R_f)$: Market risk premium (the extra return that an investor requires to invest in the risky market portfolio rather than a risk free asset)

This equation reflects the fact that expected return is composed of:

Risk free rate: Rewarded for the Time value of money.

Market risk premium: The excess return that an individual stock should provide (because of its exposure to market risk) over the all-veilaewowed rate.

Risk Implication

CAPM is an ambitious theory: all that matters is systematic risk.

- Systematic risk: Things that affect the entire market, such as recessions, inflation or interest rate movements. This risk cannot be diversified away.

- Nonsystematic risk: Specific to the individual company, such as strikes, management incompetence or product recalls. We take this risk to be of no concern, as it can be eliminated by diversifying across many securities.

Illustration:

Invest in nothing but Tesla If an investor owns Tesla shares alone, they bear risks to both the company (slipped factory opening, lawsuits) and the market (oil prices, interest rates). But if the investor owns shares of Tesla, Apple, Procter & Gamble and 50 other companies, the company-specific risks wipe out. CAPM presupposes that the rational investors always diversify, hence only the systematic market risk is important.

Example Suppose:

- Risk-free rate (R_f) = 4%
- Market return ($E(R_m)$) = 10%
- Market risk premium = 6%
- Stock A has $\beta = 1.2$

Using CAPM:

$E(R_A) = 4\% + 1.2(10\% - 4\%)$ $E(R_A) = 4\% + 1.2(6\%) = 11.2\%$ Interpretation:

- Stock A has a higher beta than the market ($\beta = 1$) so it is riskier.
- Investors demand an 11.2% return — higher than the market's 10% — to compensate for this additional risk.
- In particular inflation, interest rate shocks and exchange rate fluctuations are not handled separately by CAPM. All such effects are assumed to be indirectly reflected via the market portfolio's return.

Limitations

Although elegant and straightforward, CAPM suffers from several limitations.

Oversimplification of Reality:

CAPM is based on the assumption that only market risk (beta) rationalizes return, and it dismisses all other macroeconomic variables such as inflation, oil prices or sectorial forces. In fact, stocks can behave quite differently on these dimensions even though they may have the same beta.

Consider: A utility (stable demand) and a technology stock (high growth) can both have $\beta = 1$, but differ in their reaction to an increase in interest rates. The correct and essential point is that CAPM would regard both of them as being equally risky, which it luckily for us is clearly wrong.

Unrealistic Assumptions:

The CAPM is based on certain assumptions, including:

- o No taxes, transactions costs or restrictions on financial markets –perfect capital markets.
- o Homogeneous expectations of the investor base (all investors have the same view on risks/returns).
- o A global market portfolio of all risky assets in the world.

In practice these are seldom true.

Example: The wide variety of beliefs about future returns to financial markets is such that it isn't possible to form a "true" market portfolio, which would include not just equities, but also real estate and commodities — or according to some varieties of habitbased models — even human capital.

Poor Empirical Performance:

There are many pieces of evidence that the CAPM doesn't explain stocks' returns. Other variables such as company size (small versus large) or value versus growth effects are also better explainers of returns than beta alone. This deficiency gave rise to multifactor models such as the APT and the Fama-French models.

9.2.2 Multi-Factor Nature of APT

Concept

The Arbitrage Pricing Theory (APT) acknowledges that in practice, securities' returns are determined by more than one macroeconomic and financial risks factor - not just only one as in CAPM. Maximum two are complementary in the sense that they measure two different aspects of systematic risk which lead to a differing behavior of each asset. In another respect, APT offers a multidimensional perspective of risk and return, which implies that a firm's success is determined by how much it is subject to the various economic factors.

Illustration:

- The profitability of an airline might be significantly influenced by oil price shocks.
- Interest rate fluctuations affect the return of a commercial bank more.
- Company is export oriented (70% to Africa) ± company may rely heavily on exchange rate fluctuations. CAPM implies that both would have the same beta if they all respond to market movements equally, but APT reveals a vast difference in their risk factors.

APT Equation

APT represents the expected return as follows $E(R_i) = R_f + b_1F_1 + b_2F_2 + \dots + b_nF_n$ In which,

- $E(R_i)$: The expected return on asset i.
- R_f : Risk-free rate of return
- b_n : factor loading (factor sensitivity, which indicates the responsiveness of the asset to factor n.
- F_n : Risk component with a premium attached to it (factor n)

This wording is that return is constructed to be:

The risk-free rate, and

A collection of factor risk premiums, each scaled by security sensitivity.

Key point: Rather than CAPM's "one-size-fits-all beta," APT can accommodate multiple dimensions of risk exposure.

Examples of Factors

APT does not prescribe which factors should be included; rather, they are discovered statistically. Commonly used factors include:

- Inflation: Inflation eats away purchasing power and diminishes the real return. Those with low pricing power (think consumer goods companies) are more vulnerable.
- Interest rates: Higher rates make loans costlier and reduce values of assets. Banks may thrive with rising rates; utilities typically do not.
- Exchange rates: Companies that sell to overseas buyers profit when the home currency falls, and those that buy products from abroad may suffer.
- Industrial production (GDP growth): A measure of economic strength and where things would stand if it weren't for the positive effects of drugs; cyclical companies like automakers benefit, while defensive firms are sloughed off with the rest.
- Oil/commodity prices: A direct force for industries reliant on oil or raw materials.

Airlines, shipping and logistics companies would stand to gain heavily.

Illustration:

- A sharp downturn in an airline's stock may occur if the price of oil soars, but that will benefit a company producing oil.

- Banks would be likely to see higher net interest margins if interest rates rose; real estate developers, conversely, could experience increased financing costs.

Implication

The multi-factor model permits APT to incorporate heterogeneity of risk exposure across industries and individual firms. While CAPM anchors, based on market factor all risk, APT recognizes that firms are affected by distinct forces.

Illustration:

- Airlines: Ultra-sensitive to oil prices, exchange rates (if company has extensive foreign operations), and GDP growth (demand for travel).
- Banking sector: Higher interest rates (loan spreads), inflation (reduction in real value) and regulatory effects.
- Technology: Most affected by industrial production (B2B investment cycle) and investor sentiment, less so oil prices.

Therefore, APT offers a more comprehensive and elaborated justification for returns, which explains its applicability in contemporary portfolio management and risk analysis.

Application Example

Assume three possible risk factors are under consideration:

- Inflation premium (F_1) = 3%

Interest rate premium (F_2) = 2%

Industrial output premium (F_3) = 1.5%

Now take a stock with the factor sensitivities:

- $b_1 = 1.2$ (strongly inflationsensitive)
- $b_2 = 0.8$ (moderately interest rate-sensitive)
- $b_3 = 1.0$ (moves one-for-one with industrial production)

Then the expected return is:

$$E(R_i) = R_f + (1.2 \times 3\%) + (0.8 \times 2\%) + (1.0 \times 1.5\%)$$

$$E(R_i) = R_f + 3.6\% + 1.6\% + 1.5\%$$

$$E(R_i) = R_f + 6.7\%$$

If $r_{RF} = 4$ percent, then $E(r_P) = 10.7\%$.

Comparative Illustration (APT vs CAPM)

Let's say that the stock in both cases has a beta of 1.1 and market risk premium is 6%.

- CAPM forecast: $E(R_i) = 4\% + 1.1 \times 6\% = 10.6\%$.
- APT prediction (above): 10.7%.

In this instance, the results of CAPM and APT are just convergent. But if oil prices or exchange rates shifted markedly, APT would directly account for the effect, but CAPM would not.

9.2.3 APT vs CAPM advantages

Flexibility

One of the main benefits of APT is its flexibility. CAPM assumes that a single payload — market risk — powers expected returns. However, this assumption is overly restrictive for several cases since asset returns are generally affected by a multitude of macroeconomic and financial factors. APT, on the contrary, is not confined to one single factor. It is able to include several factors, according to any industry, economy or investment strategy. This makes APT a lot more flexible and useful in reality particularly when you need models that are geared towards particular environments and investors.

Example: APT can explain the return on a bank's stock in terms of interest rates, inflation and credit spreads; for an airline business, relevant variables might be oil prices, exchange rates and GDP growth. If the two firms had identical betas, CAPM would treat both companies identically, ignoring these differences.

Realism

Another advantage of APT over CAPM is that realistic assumptions whereas not so in the case of CAPM. CAPM presumes that there is a theoretical "market portfolio" comprised of all risky assets in the economy, whether equities, bonds, real estate, commodities and even human capital. Such a portfolio is clearly infeasible to create or monitor. In contrast, APT does not need a market portfolio. It does so, instead of any other more contrived (but mathematically equivalent) approach by assuming the principle of no arbitrage, which requires that identical cash flows be priced identically in an efficient market. This makes APT more analogous to the way markets actually work.

Example: CAPM asks us to think of investing in a portfolio that is composed not only of listed stocks but also of private businesses, art and farmland. APT avoids this unpromising assumption by just stating: "if we are in a world without arbitrage opportunities, then returns can be explained by several factors".

Better Empirical Support

Theoretical beauty of CAPM is strong but empirical support is poor. Studies have shown that

The CAPM frequently does not account for the realities of return variation in the real world, particularly anomalies such as size (small-cap stocks earning higher returns than expected) and value (firms with high book-to-market ratios outperforming). APT, through consideration of many factors, offers an improved empirical foundation. It can add other sources of risk to explain why some stocks have historically earned more or less than the CAPM would predict.

Takeaway: The Fama-French Three-Factor Model- that includes size and value differences to CAPM- is, in all but name, an application of APT. This expansion provides one reason why small-capitalization and high book-to-market stocks have beaten CAPM predictions.

Reduced Restrictions

The assumptions of CAPM being unrealistic: homogeneous expectation by investors, returns being normally distributed, and risk-free borrowing and lending at the cost-free rate. Such situations are almost nonexistent in actual markets. APT relaxes these restrictions. There is no need for homogeneous beliefs among investors, returns do not have to be distributed normally in a perfect bell curve and borrowing conditions do not have to be unnecessarily severe. By eliminating dependence on such harsh assumptions, APT offers an easier-to-use method in making real world investment decisions.

Example: In the real world, one investor may be expecting high inflation, while another low inflation. CAPM assumes both investors have the same belief; and APT permits both perceptions if the arbitrage conditions are met.

Customizability

APT also has the advantage of being customizable. Investors and analysts have the flexibility to tailor factors that most effectively explain risks for particular industries or points in time. This flexibility enables APT to apply across multiple sectors and economies. By contrast, CAPM applies globally a single formula and will not adjust it for industry risks.

Example: Technology companies might want to consider incorporating variables such as the innovation cycle, R&D intensity or patenting activity. Energy firms may have greater exposure to oil prices and global commodity shocks. Hence, APT makes a model particularly suitable for specific industries. It can make the difference whenever companies differ significantly from one another while CAPM treats them in more like manner.

Broader Risk Analysis

Lastly, APT provides a wider and more comprehensive perspective to risk analysis. The CAPM depicts only one aspect of risk – sensitivity to the market portfolio. Although a pragmatic approach, it neglects other important risks. APT, in contrast, allows investors to be exposed to a number of different forms of systematic risk. By breaking down exposures to other factors, APT offers a more profound look at what is driving returns and how these can be used for successful portfolio construction and risk management.

6Example: Suppose we have two firms with the same CAPM beta: 1.2. CAPM tells us to expect the same return from each. But APT would show that the one is very exposed to inflation whereas the other is almost entirely exposed to exchange rate movement. This slightly more detailed view of risk exposure can help investors determine which stock is the better fit for their portfolio strategy.

9.3 Sources of Systematic Risk

9.3.1 Interest Rate Risk

Definition

The possibility that returns on an investment may be less than anticipated due to fluctuations in market interest rates. Interest rates, as they influence the discount rate for valuing securities and borrowing costs for corporations, are a core determinant of asset prices. Interest rate risk Investors who own fixed-income securities (like bonds) and equities are exposed to changes in interest rates. In fact, rising rates may hurt long-term investments more than short-term ones as the former are more susceptible to interest rate changes than latter due to small changes in the interest rates going a longer way especially when it comes to cash flows with long duration.

Example: If a government bond has a fixed 5% coupon, but market interest rates rise to 6%, new bonds become more attractive. Which means the old bond gets... taken down in value, because no one wants to buy it for the going yield level.

Impact on Securities

Interest rate risk is clear in the bond market, but it's also meaningful for stocks.

- **Bonds:** The prices of bonds fall when interest rates go up. This negative correlation arises because fixed coupon payments become less appealing relative to new bonds with higher yields. And the longer that bond's maturity, the further its price will fall.
- **Stocks:** Rising rates boost borrowing costs for businesses, depressing their earnings. They can also make bonds more attractive compared with equities, potentially causing investors to move from stocks. Growth stocks, which rely heavily on future earnings, usually get the worst of it because higher rates push down the present value of those future cash flows.

Example:

- A 10-year bond that pays a 5 percent interest rate can lose much more in price from higher rates, such as the already-noted hypothetical increase to 7 percent, than will shorter-term debt like one year.
- A stock of a technology company that is priced on anticipated growth 10 years down the road may fall in price when interest rates rise, while one of a utility company providing stable dividends may not fall as much.

Portfolio Implications

The effect of interest risk on industry and sector funds impact portfolio decisions.

- **High-Growth Companies:** Industries such as technology or biotech are often dependent on outside capital for R&D and expansion. When interest rates climb, their borrowing costs rise and their valuations plummet more sharply because the companies' earnings are expected to materialize far in the future.
- **Defensive Names:** Companies such as utilities, consumer staples and health care are less exposed to economic cycles. Although they are far from immune to higher rates (since their bonds and dividends have to compete with competing-highest-paying fixed income), those cash flows can be steady, which makes them less susceptible.

Example:

- If interest rates rise suddenly:
 - o Tesla (growth): Higher financing costs for expansion and may have its stock price hammered down as investors more deeply discount long-term earnings.
 - o Duke Energy (utility): Stock price also falls, but not as much because it throws off steadier cash flow and operates in a regulated market.

9.3.2 Inflation Risk

Definition

Risk of inflation, or purchasing power risk: The chance that increasing prices will reduce the actual (inflation-adjusted) returns on an investment. Nominal isn't always real. A security may have a positive nominal return, but if inflation rises more rapidly than anticipated, investors can lose purchasing power in real terms. Longer-term investors, in particular, are subject to such risk, as the effects of inflation act in a compounding manner that erodes the produced cash flows.

Example: A bond returns 6% a year, but inflation rises to 7%, so the real return is -1% . In this situation the investor's profits are reduced by inflation, even though they receive interest.

Impact on Securities

Both fixed-income securities and stocks are affected by inflation, albeit in different ways:

- **Bonds:** Because bonds pay fixed coupon payments, higher inflation wears away their real value. Investors expect to be paid higher yields as compensation, causing existing bond prices to drop. Longterm bonds are hit hard here since the fixed payments extend out into the distant future.
- **Equities:** Inflation is bad for businesses as it increases the cost of inputs — raw materials, energy and labor. If companies can't pass those costs on to consumers, then their profit margins are squeezed and that is often reflected in lower stock prices.' However, companies with high pricing power (think consumer staples) could be more resilient to inflation.

Example:

- A 20-year government bond that generates \$100 annually falls in favor if inflation unexpectedly jumps from 2% to 6%, because the purchasing power of \$100 is squandered.
- A retail company, such as Walmart, may manage modest inflation through higher prices, but a carmaker with expensive materials could find profits squeezed.

Portfolio Implications

In order to mitigate the risk of inflation, investors commonly hold so-called natural hedges in their portfolio. Those are assets that tend to fare better when inflation is high, as their value goes up with prices.

- **Commodities:** Oil, gold and agricultural commodities typically rise in price with inflation, providing a natural hedge.
- **Real estate:** Real fees and rents generally go up in inflationary periods.
- **Inflation-indexed bonds:** Instruments such as U.S. TIPS (Treasury Inflation-Protected Securities) which increase coupon and principal payments with inflation, thus maintaining real returns.

Stock markets do poorly, on average, when inflation is unexpectedly high because uncertainty rises and interest rates are higher (they being the medicine used to cure inflation), which depresses valuations.

Example:

- In the 1970s, when the United States had high inflation, commodity prices (especially oil and gold) boomed, while the stock market delivered poor real returns.
- Inflation-protected bonds, which were introduced much later, are now a prominent means for conservative investors to hold purchasing power.

9.3.3 GDP and business Cycle risk

Definition

Economic cycle risk (or GDP risk) is the uncertainty of returns due to rises and falls in any phase of the business cycle, as measured by Gross Domestic Product (GDP). Economies always go through expansion and contraction cycles — expansions have rising output, employment and consumption while contractions feature slowdowns, higher unemployment, weaker demand. Because corporate profits are so linked to economic conditions, securities rise and fall directly along with these cycles.

Example: In a boom, G.D.P. growth stimulates consumer spending, lifting company revenues and stock prices. In a recession, by contrast, low demand leads to lower earnings and stock valuations, and the bond markets may see more defaults from weaker companies.

Impact on Securities

Fluctuations in GDP have divergent effects on various asset classes:

- Equities:
 - o In terms of expansions, growing levels of GDP lead to higher company sales and profits which help push stock prices upward. Growth-oriented sectors (such as technology, or luxury goods) have frequently been the winners.
 - o During recessions, declining GDP hurts demand which in turn decreases sales and profits. Stock prices will drop, and riskier companies will be in danger of survival.
- Bonds:
 - o Corporate bonds are sensitive to recessions since lower profits increase the risk of default.
 - o It also helps to think about the types of things investors do want during a downturn, such as long-term treasuries and government bonds.

Example:

- At the peak of the 2008 Global Financial Crisis, U.S. GDP plunged precipitously, stock markets collapsed over 30%, and numerous companies experienced life-threatening liquidity crises. But U.S. Treasury bonds rallied as investors sought a safe haven.
- Instead, by the time of the post-COVID upswing of 2021, G.D.P. had snapped back strongly enough to ignite corporate profits, and to propel double-digit increases in stock indexes around the world.

Portfolio Implications

Cross-industry exposure to business cycles varies and has important implications for the composition of portfolios.

- Cyclical industries: Such industries rely largely on consumer demand and economic expansion. Some examples are private cars, housing construction, airlines and high-end consumption. Their returns generally rise vigorously during expansions but fall steeply during recessions.
- Defensive industries: These are sectors that supply needs-based goods and services — food, health care, utilities, basic consumer items. They tend to hold up well in good times and bad — the demand for them is relatively stable regardless of what's happening with the economy, which makes them a less volatile option that can be used as a tool for reducing risk.

Illustration:

- An automobile manufacturer like Ford or Toyota can benefit from a jump in sales as consumers purchase new cars during G.D.P. growth, though demand collapses during a recession.
- A pharmaceutical company like Pfizer or a utility company like National Grid will still earn steady revenue in downturns, because people are still buying medicine and paying electricity bills.

Investor Strategy:

- Booms: Again, cyclical stocks become a strong growth play.
- Recession: Move investments toward defensive stocks and government bonds for stability.

9.3.4 Currency and International Economy Risks

Definition

Exchange rate risk (also known as currency risk) is the risk that changes in the relative value of certain currencies will reduce the value of international investments or income from such investments. For example, if a United States company makes money in

euros but the euro falls against the dollar, its profit will be reduced once it gets to dollars.

Global economic risk is the systemic uncertainty unleashed by global economic shocks, which relatively simultaneously impact more than one country. Trade wars, geopolitical conflict, commodity price shocks, a global recession, pandemics or financial crises are all such risks. In contrast to local risks, global risks cannot be diversified away because they affect almost all markets.

For instance, in the COVID-19 pandemic (2020), similar incidents occurred, such as the exchange rate fluctuation was so large, oil prices fell to zero or even negative for a brief period of time across all countries and global stock market crashes almost simultaneously by multiple days.

Impact on Securities

Changes in exchange rates and global risks have important effects on financial assets:

- Equities:

- o For multinationals, an appreciating home currency reduces the value of foreign profits. For instance, if Apple is selling iPhones in Europe and the euro falls relative to the dollar, revenue in euros converts into a smaller number of dollars, leading to lower reported profits.

- o Global factors like trade wars or recessions suppress demand globally, which will reduce corporate earnings and stock valuations around the world.

- Bonds:

- o Foreign exchange risk affects foreign holders of bonds. If a U.S. investor purchases Japanese government bonds and the yen slides versus the dollar, that investor may lose some money even if bond prices in terms of yen rise.

- o Global turmoil generally causes investors to flock into “safe haven” bonds like U.S. Treasuries, which drive up their prices and push down yields.

- Commodities:

- o Plenty of other things (oil, gold) are priced in U.S. dollars. A higher dollar can depress global demand because it makes commodities more expensive for foreign buyers.

- o During periods of tumult in global markets, Gold especially serves as a hedge and holds its value as equities get hammered.

Illustration:

- During the financial panic of 2008, global stock markets plunged over 30%, oil prices crashed from \$147 to sub-\$40 per barrel and investors stampeded into U.S. Treasuries.

- In 2022, the U.S. dollar soared against major currencies, working to the detriment of U.S. exporters like Boeing but to the advantage of European importers paying in devalued euros.

Portfolio Implications

Tackling exchange rate and global economic risks becomes an integral part of international investing.

- Exporting companies: Companies that are dependent on overseas sales (e.g., Toyota, Boeing and Samsung) tend to be exposed to currency risk. A higher home currency makes them less competitive overseas. On the other hand, companies that import raw materials could gain if their home currency appreciates.
- Diversification between countries: By spreading your investments across different markets, you can help lower the risk of any one country's risks (such as political instability or local recessions). But in times of global crises, markets move together and diversification benefits shrink.
- Tools for hedging: For example, investors may rely on financial products like currency forwards, options or futures to control exchange rate risk. At the same time, gold or bonds that are inflation-protected can be used to offset global economic risks.

Example:

- Investors in 2022 who owned only U.S. stocks lost value when the dollar strengthened and revenues from abroad shrank for multinationals. But a globally diversified portfolio that includes emerging markets and commodities would have helped cushion the blow.
- The impact of a crisis such as Covid-19 has been to cause a crash across the board in equities, though portfolios of the global variety fell less if they included gold or government bonds than if they didn't.

9.4 Role of APTII in Portfolio Management

9.4.1 Identifying Macro-Economic Factors

Definition and Role

Macroeconomic factors are not directly targeted at the performance of any specific security and are broad, systematic economy-wide drivers affecting the performance to varying degrees of all securities. These considerations are not specific to the firm but represent risks that no investor can perfectly diversify. In APT Multiple such market based factors are assumed to affect individual asset's return and each asset is sensitive differently (factor loading) to such factors.

The importance of discovering them is fundamental, as they are the elementary components on which APT models operate. Instead of treating a single factor (the market portfolio in CAPM) as the one and only variable that affects all returns, APT acknowledges that there are multidimensional aspects to risk. That is why factor identification is a necessary and crucial first step in using APT in reality.

For example, a car manufacturer might have greater exposure to oil prices (which affect demand for fuel) and a commercial bank more sensitivity interest rates. Both are conditioned on macroeconomic factors, but the driving forces differ.

Examples of Factors Commonly Used

A number of macroeconomic factors have been well researched and typically employed in empirical APT frameworks.

- Interest rates: They increase the cost of financing; thus, increasing interest rates also lead to decreased consumption and investment levels, as well as present value discounts. They generally result in lower bond prices and frequently depress stock valuations.

- o Example: Sales of a real estate company like D.R. Horton may decline when mortgage rates rise, because home loans become more expensive.

- Inflation: An unanticipated change in inflation makes the real value of fixed coupon payments less predictable, and it also affects input costs for firms. Businesses with weak pricing power may find their profits shrink, while commodity producers often do well.

- o Example: In the 1970s oil shocks, inflation ballooned, causing most of the world's equity markets to suffer while rewarding energy companies.

- GDP / Business Growth: As a rule, booming economies lift corporate profits while recessions smother demand and profits. Cyclical firms are favored during expansions, and defensives appear to be no more adversely affected in downturns.

- o Example: Automakers such as Ford are something of a bet on economic booms and busts — they fare well during an increasing economy, where food retailers like Walmart have relatively steady returns.

- Foreign exchange rate: The exporters and importers are directly affected by the exchange rate movements. A stronger home currency also makes exports less competitive overseas, while a weaker one lifts foreign earnings once converted back.

- o Example: When the yen gains strength relative to U.S. dollar, Toyota's U.S. sales generate less yen and profit written down
- o 4-23 Marketable Securities, Derivatives, & Fair Value Accounting --2
- o Alternatively; If the yen weakens relative to U.S. dollar, will lead by a currency ♣ effect Profit loss through exchange – change from holding as LC •

Fluctuations in asset value • Exchanges rate changes are realized on transaction date • However; only effect Mgmt of currency exposure fluctuations affect reported earnings on transaction date ©2018 Pearson Education Ltd.

- **Commodity Prices:** Energy, metals and agricultural prices are critical for industries that rely heavily on inputs.

- o Example: Higher oil prices hurt airlines like Delta, but help producers like ExxonMobil.

Factor Selection in Practice

There is no final choice of factors for the implementation of APT. While CAPM asserts only one factor (the market portfolio), APT states that researchers and analysts are to find out the relevant factors through evidence. In practice, there are various approaches:

- **Econometric Models:** Money managers attempt to quantify (with the aid of a statistical model) how macroeconomic variables (such as inflation, interest rates, GDP growth) can statistically account for changes in stock returns.
- **Principal Component Analysis (PCA) :** A process for reducing the dimensionality of economic data sets to a small number of principal “components” that explain most of the variation in asset returns.
- **Industry-Related Factors:** Not all industries react the same way to the macro factors that affect them. Analysts often adjust the factors depending on the sector or even the company.

Examples:

- Innovation cycles, R&D spending and the mood of investors could be more important than oil prices for tech companies.
- The OPEC decree that matters most to the energy companies is not moves in consumer demand cycles but world crude oil prices.
- For the airlines, jet fuel prices – GDP growth (has an effect on how many planes are full) – and exchange rates (if you’re a global airline), matter.

Hence, the choice of factors is context specific; it changes over time, across countries and sectors. This adaptability is the most important advantage of APT over CAPM.

9.4.2 Estimating Factor Sensitivities (Betas)

Definition

Factor sensitivity (also known as factor loading or beta in the APT), represents how much a security’s return responds to changes in a particular type of macroeconomic factor. In contrast to the single beta in CAPM, it which represents sensitivity to the

general market, APT can have several betas each related with a different factor. These betas reflect its sensitivity to systematic risks, such as inflation, interest rates, GDP growth and commodity prices.

Example: If the oil price beta of an airline stock is -1.5 , it means that when oil prices increase by 1 per cent, typically the return of the airline falls by 1.5 per cent. This is because it relies on fuel as a significant expense.

How It Is Estimated

The approach most frequently used to estimate factor sensitivities is historical regression. This is to see whether a stock's (if examining a single stock) past returns have varied with the chosen economic factors.

Step 1: Decide on your critical factors (ie "I'm concerned about inflation")

- Step 2: Collect the historical information on stock returns and factor changes.
- Step 3: Regress the changes of the stock's returns on these factor changes.
- The regression coefficients (slopes) are interpreted as factor betas.

Illustration -- suppose we regress Company X's monthly returns on monthly GDP growth. If the coefficient = 2, it is equivalent to saying:

- A 1% rise of the GDP leads to a 2% hike in return of stock.
- And so the Company X GDP beta is 2.0.

This is a sign that the company is very cyclical and enjoys strong growth in good economic periods.

Interpretation of Betas

Betas may be positive, negative or nearly zero and represent some very different things.

- Large Beta positive: Stock is very sensitive to that factor. Returns vary in concert with the factor.

o Example: A construction company might have a GDP beta of 2.0, indicating the company shines when there's economic growth yet fares poorly during recessions.

- Low/Zero beta: the stock does not react much to that factor.

o Example: A utility company may have a GDP beta of near 0, because demand for electricity is constant regardless of the state of the economy.

- If Beta is negative, the stock pattern is opposite to the factor.

o Example: Gold usually has a negative beta versus the stock markets — if stocks drop (recession or crisis), gold typically goes up in price.

Illustration:

- Airlines stock vs oil price → Beta = -1.5 (they move in the opposite directions).

Bank stock vs interest rates → Beta = $+1.2$ (higher rates which are good for loan spreads).

- Healthcare stock vs GDP → Beta ≈ 0.3 (weakly correlated with economic expansion).

Portfolio Implications

Investing and portfolio managers can use factor betas to gauge and control exposure to macroeconomic risk.

- Risk balancing: If a portfolio is overly exposed to rising interest rates (for example, if it contains numerous bonds or financial stocks), the manager can try to rebalance by buying assets that benefit from rising rates (those of banks, or floating-rate bonds).
- Hedging: If a fund is overconcentrated in growth-sensitive stocks (high GDP betas), it can hedge with gold or defensive securities that are underrepresented relative to the market, which have low to negative sensitivities to GDP.
- Factor tilts: Active managers frequently intentionally tilt portfolios toward factors they believe will perform well (overweighting oil producers when prices of oil are expected to go up).

Example:

Let's say a portfolio has an average interest rate beta of -1.0 , meaning it falls when rates go up. If central banks are indicating that they want to raise rates, the manager could:

- Lighten up on long-end bonds (very rate-sensitive).
- Add to bank positions (which are positively exposed to interest rates).

This realignment provides the portfolio with increased protection from anticipated macro drivers.

9.4.3 Domains of APT: Asset Pricing and Portfolio Construction with APT

Asset Pricing

APT offers a structured method to determine the fair rate of return for a security by utilizing numerous macroeconomic factors. Unlike CAPM where no information except market beta is used in estimating expected returns, APT employs factor loadings (sensitivities) in the estimation of investable asset expected returns.

Formula:

$E(R_i) = R_f + b_1F_1 + b_2F_2 + \dots + b_nF_n$ $E(R_i)$ – Expected return of an investment/rate of return on an investment R_f – Risk-free rate $b_1, b_2 \dots b_n$ – The expected return due to first, second or the nth factor respectively. $F_1, F_2 \dots F_n$ – Factor 1, factor 2 and factor n respectively.

- R_f = risk-free rate
- b_n = sensitivity of the asset to factor n
- F_n = risk premium associated with factor n

When the expected return is estimated:

- If true expected return > APT predicted return, then the stock is undervalued (attractive to buy).
- If actual expected return < APT forecasted return (8.8%)
- Stock is undervalued and worthy of the investing dollar.

This arbitrage process causes prices of securities to converge over time on their intrinsic values.

Portfolio Construction

APT also is useful in portfolio construction by allowing managers to balance exposure to a variety of risk factors. So long as investors know factor sensitivities (betas), they can form portfolios that represent their bets on the state of the economy or which hedge unwanted risks.

- Cutting factor exposure: If a portfolio is too sensitized to inflation risk (has a high inflation beta), the manager can tack on some assets which hedge against inflation like commodities, real estate or inflation-linked bonds.
- Factor-neutral portfolios: Managers can also build portfolios so as to be less exposed to particular risks. For example, they might wish to be neutral on interest rate risk but maintain exposure to G.D.P. growth.

Example:

Assume a portfolio has an inflation beta of 1.5, indicating that it loses value when inflation increases. The manager could compensate by:

- Add TIPS (Treasury Inflation-Protected Securities), which offer a direct inflation benefit.
- Raise exposures to commodities, which can often climb with inflation as oil and gold have in the past.

This modification gives you more of a balanced portfolio while not throwing away all potential growth.

Risk Management

APT also facilitates risk decomposition — splitting total portfolio risk into components associated with each macroeconomic factor. In this way, managers can hedge undesired risks with desired exposures.

- Hedging interest rates: If a portfolio is very sensitive to rising rates (in other words, performing badly when interest rates rise), managers can use interest rate futures or swap contracts to offset that risk.
- Hedging currency risk: For a portfolio with substantial international exposure, manage exchange rate volatility by using foreign exchange forwards or options.

Example:

For instance, if the performance of a portfolio is quantified as:

- 40% exposure to GDP growth,
- 30% to interest rate changes,
- 20% to inflation, and
- 10% to the oil price, manager can see quite clearly that GDP growth dominates portfolio risk. If they anticipate an economic slowdown, they can shift toward defensive sectors and safe-haven assets.

Strategic Use in Practice

APTs are often used in the investment industry by institutional investors to build factor based portfolios that fit particular macro-economic frameworks.

- Inflation hedged portfolios: Intended to preserve purchasing power by adding inflation-linked bonds, commodities and real estate.
- Interest-rate-sensitive portfolios: These work for an investor who anticipates rate moves; perhaps they would overweight financials (benefit from higher rates) or utilities (offering dividends, but which aren't so great when your borrowing costs increase).
- Global exposure portfolios: Address risks associated with currency movements and international shocks by diversifying across markets and currencies.

Example:

- A pension fund worried about inflation could put 20 percent of its assets in TIPS, 10 percent in commodities and the rest, or 70 percent with stocks, dividing the portfolio between growth potential and insulation against inflation.

- A global equity fund might spread its bets between U.S., European and Asian markets in the hope of offsetting them. They employ using currency hedging to protect themselves against exchange rate volatility-taking, and other so-called country specific risks.

"APPLICATION- APPLYING APT TO PORTFOLIO DECISIONS".

Give students some information about two stocks and their betas to interest rates and inflation, as well as factor risk premiums. Have them compute expected returns by using the APT formula, compare their results with actual returns and then determine if each security is overvalued or undervalued.

9.5 Summary

- ❖ The Arbitrage Pricing Theory (APT) is a multi-factor model formulated by Stephen Ross in 1976.
- ❖ Compared to the single factor (market beta) used in CAPM, the APT model involves multiple macroeconomic and financial variables.
- ❖ The idea of APT is grounded on no-arbitrage in well-ordered markets. ❖ The general APT equation is $E(R_i) = R_f + b_1F_1 + b_2F_2 + \dots + b_nF_n$.
- ❖ APT has a risk premium for each factor, securities load different on these risks (factor beta).
- ❖ Key variables in APT are inflation, the level of interest rates, growth in GDP, terms of trade and commodity prices.
- ❖ CAPM is a one-factor model where returns are related to market risk only, unlike APT that accounts for multiple factors.
- ❖ APT is less restrictive than CAPM and more realistic.
- ❖ Systematic risk i.e. interest rate, inflation, business cycle and global shocks are the key ingredient of APT analysis.
- ❖ The betas are estimated with traditional regression models or statistical models.
- ❖ APT is used in asset pricing to compare expected returns -simulated from given parameters with the real value and it detects functions these as prior expectations. mispricing.

❖ APT is employed by portfolio managers to construct factor-diversified portfolios, mitigating exposure to undesirable risk- factors.

❖ APT offers a powerful tool for estimating risk, valuing assets, and constructing portfolios in contemporary finance.

9.6 Key Terms

Arbitrage Pricing Theory (APT): A multi-factor pricing model based on the explanation of returns through different economic and financial-related factors.

Arbitrage: The process of making money on disparities in price between markets, without taking on any risk.

Factor Sensitivity (Beta): A metric indicating how much a security's return reacts to a particular factor of risk.

Risk Premium The additional return required by an investor for accepting the risk in question.

Systematic Risk: The risk that is inherent in the market and cannot be traded or diversified away.

Unsystematic Risk: Firm-specific risk, which can be eliminated through diversification.

Multi-Factor Model - A model for which asset return is related to multiple risk factors instead of a single factor.

Macroeconomic Variables: Macro-variables including inflation, interest rate, GDP growth and exchange rate which effect on the return of security.

No-Arbitrage: Assumption in APT that the arbitrage is impermanent and cannot exist so much as to upset efficient markets.

Diversification: Spreading your investments in various assets in order to lower unsystematic risk exposure.

9.7 Descriptive Questions

Describe the concept of APT and the implications for contemporary Portfolio Management.

Examine the main assumptions of APT. How are they distinct from CAPM hypotheses? (APT is also a multi-factor model. Compare CAPM and APT as 2 models.)

Informally, what are being used as the primary sources of systematic risk in APT? Explain with examples.

How are macroeconomic variables selected for the use in APT?

Explain the procedure for calculating factor sensitivities (betas) under the APT.

Describe how APT can be utilized in asset pricing and mispriced security detection.

Describe how APT helps the portfolio manager construct diversified and factor-balanced portfolios.

Discuss the strengths and weakness of APT against CAPM in practical usefulness.

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9.9 Case Study

Using Apt In Portfolio Management Meera S Investment Study Of Recent Past And Conclusion

Introduction

Portfolio managers are repeatedly in the position to trade off return expectations versus exposures to different types of systematic risk. The Arbitrage Pricing Theory (APT) looks on the entire economy and lets in more than one macroeconomic factors as long

because the security has a trusty go back. APT in Practice: An Illustrative Application
This case study illustrates that APT can help inform better investment decisions by identifying influential economic drivers, gauging factor sensitivities and positioning a portfolio.

Background

Meera, 38, portfolio manager Meera is building a diversified portfolio for her clients. She considers two stocks:

- Company A (Production company) – exposed to inflation and interest: This company is greatly affected by changes in the rates of interest and inflation.
- Stock B (IT Company): Stock B is more responsive to the GDP growth and fluctuation in exchange rates.

Risk free rate in the economy is 5%. The factor risk premiums uncovered are as follows:

- Inflation premium = 2%
- Interest rate premium = 3%
- GDP growth premium = 4%
- Exchange rate premium = 2.5%

Meera uses regression analysis to estimate factor sensitivities (betas):

- Money A $\rightarrow \beta$ stock = inflation = 1.2, interest rate = 1.0
- Stock B $\rightarrow \beta$ GDP = 1.3, β exchange rate = 0.9.

Problem 1: Determining Just Returns with the APT

Using the APT formula:

- $E(RA) = 5\% + (1.2 \times 2\%) + (1.0 \times 3\%) = 10.4\%$
- $E(RB) = 5\% + (1.3 \times 4\%) + (0.9 \times 2.5\%) = 13.25\%$

If the analysts predict that returns on Stock A will be 12%, and returns on Stock B will also be 12%, Meera observes:

- Stock A is undervalued (APT estimated 10.4%, actual forecast 12%).
- Stock B is overvalued (APT estimates 13.25% but the announcement is only 12%).

Solution: Increase your investment in Stock A and reduce exposure to Stock B.

(Problem 2) Controlling for Factor Exposure

Meera also notes that Stock A introduces inflation and interest rate risk to the portfolio, while Stock B adds GDP and exchange rate exposure.

Solution: She dilutes the portfolio by adding other low-beta defensive assets (utilities or government bonds) to protect her against factor shocks.

Problem Statement 3: Long-Term Diversification with APT

Over time, Meera has to make sure her clients' portfolios can withstand economic cycles as they change.

Solution: She resets factor sensitivities periodically and rebalances the portfolio to reflect current economic dynamics.

MCQ (for learners)

What should be the stock she should prefer using APT predictions?

- a) Stock A only
- b) Stock B only
- c) Both A and B equally
- d) Neither

Answer: a) Stock A only

Conclusion

APT lets portfolio managers such as Meera get past market beta and examine how a range of economic factors affect expected returns. APT help in building diversified and risk-managed portfolios, through finding undervalued assets, controlling factor exposures and frequent sensitivity analysis, which result into informed and resilient investment decisions.

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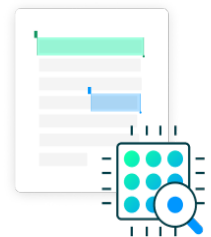
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Unit 10: Portfolio Theories (Part III)

Learning Objectives

1. Learn how modern portfolio theories (beyond the still dominate CAPM and APT) really works.
2. Describe the Fama-French Three Factor Model and how it contributes to asset pricing.
3. Examine the impact of size and value factors on stock returns.
4. Consider extensions like the Carhart Four-Factor Model with momentum.
5. Contrast classical portfolio theory against empirical multifactor models.
6. Assess the Power of Factor Models in Forecasting Future Returns.
7. Use multifactor models to assessment of portfolio performance.
8. Evaluate the limitations and criticisms of sophisticated portfolio models. 9. Analyze how the behavior affects modern portfolio theories.

Content

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- 10.2 Risk-Return Optimization
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10.0 Introductory Caselet

“Visiting the Fama-French Three-Factor Model – A Case of Ananya’s Portfolio Review”

For years, Ananya, a 34-year-old investment consultant, has been relying on CAPM to estimate the expected returns of her clients' portfolios. More recently, she observed that small-cap and value holdings in her clients' portfolios were also delivering gains well above what CAPM predicted. She started to look around and explore the Fama-French Three-Factor Model, which includes not just market risk, but size (SMB: small minus big) and value (HML: high-minus-low) effects.

She chooses to analyze for two stocks:

Stock X: A small-cap manufacturing company with a high book-to-market value ratio.

- Stock Y: A large-cap technology stock with a low book-to-market value.

Both stocks seem to be priced fairly using CAPM. But when Ananya uses the Fama-French model, she discovers that Stock X has a positive exposure to the size and value factors, while Stock Y has negative or zero exposure. Just as Stock X could exceed expectations because of the small-cap and value premium, Stock Y might underperform despite its leadership position in the market.

Ananya now has to figure out how to relay these insights back to her clients, who have typically preferred larger, known companies.

Critical Thinking Questions

What is the reason that the Fama-French model better predicts returns than CAPM for Ananya?

How can Ananya reconcile her clients' demands for large-cap stocks with the temptation of smallcap and value premiums?

What are the risks of becoming too dependent on factor-based models like Fama-French?

Modern Portfolio Theory 10.1 Introduction to MPT

10.1.1 Concept of MPT

Risk-Return Relationship

o All investments are subject to risk, and investors require more return when they assume a greater level of risk.

o MPT furnishes a formalized method to quantify this tradeoff.

Diversification o The key concept of MPT is diversification – the idea that different assets (and types of assets) perform differently in different market conditions.

o For example, if one asset is bad during recessions and the other is good, they offset on another to produce a less volatile portfolio.

Efficient Frontier

- o MPT shows the efficient frontier, which is a graph that displays the optimal portfolios possible.
- o Portfolio on this frontier provide highest possible return at each level of risk.
- o Any portfolio that lies below the frontier is inefficient as there exist portfolio(s) with a superior combination of risk and return.

Portfolio vs. Individual Asset Evaluation

- o An individual asset may be risky in isolation, but may help mitigate fluctuations when the holder owns many of them.
- o For example, stocks and bonds tend to perform differently so a mixture can provide greater portfolio stability.

10.1.2 Assumptions of MPT

MPT relies on a number of approximations which render the model mathematically tractable, but not necessarily plausible.

Rational and Risk-Averse Investors

- o All investors behave rational and want to maximize the expected utility.
- o They have an aversion to risk and will bear more risk only if they expect to receive a greater reward for it.

Mean-Variance Framework o Investors consider only their expected return (mean) and risk (variance/standard deviation) to appraise portfolios.

- o They neglect distribution higher moments (skewness or kurtosis).

Single-Period Time Horizon

- o The horizon over which investment decisions are taken is fixed at one period (e.g., a year).
- o This makes it more convenient to calculate expected returns and standard deviations.

Perfect Capital Markets

- o There are neither transaction costs nor taxes, and short selling is not constrained in the market.
- o Investors can lend and borrow at a constant risk-free interest rate.

Homogeneous Expectations

- o Expectations of investors about the expected returns, variances, and covariances of securities are same.

o This results in all investors recognizing the same set of efficient frontier.

Normality of Returns o Security returns are considered to be normally distributed, which is consistent with the mean-variance paradigm.

10.1.3 Markowitz and Portfolio Selection

For half a century, from the 1950s through the 2000s, Harry Markowitz was best known for revolutionizing investment theory with the groundwork that would win him a Nobel Prize in economics (that groundbreaking work came starting in an unlikely place: doctoral studies at UChicago). His theories became the basis for what has developed into Modern Portfolio Theory (MPT) and transformed the way investors consider risk in relation to their potential reward.

Shift in Perspective

Before Markowitz, most financial players adhered to a basic syllogism: buy those securities with the highest expected returns. The prevailing philosophy: More return was better, and little thought was given to how various investments interacted when thrown together. Markowitz changed the frame of reference from that of individual securities to a portfolio.

His point was that the performance of a single asset can't be evaluated based on expected return and risk; ultimately, what matters is how it interacts with other assets. Two risky assets can form a safer portfolio when combined, depending on the correlation.

Example:

- Stock A: $E(R_p) = 10\%$, $\sigma(R_p) = 15\%$.
- Stock B: Return = 12%, Standard deviation = 20%
- If they move independently (low correlation) then putting the two together can create a portfolio that is less risky than either stock on its own.

This was a seminal change: it wasn't that risk is managed at the individual asset, portfolio is the level within which risk should be managed.

Mathematical Quantification of Diversification

Markowitz quantified the idea of diversification using mathematics. He showed that the risk of a portfolio is not only the weighted average of individual asset risks but is also partly determined by the relationships among assets.

Two-asset portfolio variance formula:

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \text{Cov}(R_1, R_2)$$

Where:

- w_1, w_2 = weights for asset 1 and 2
- σ_1^2, σ_2^2 = the variances of the two assets
- $\text{Cov}(R_1, R_2)$ = covariance of their returns.

A reduction in portfolio variance results when the correlation of returns between assets is low (or negative).

Example:

- Both Stock A and stock B have high specific risk.
 - If they are perfectly correlated w/ each other (correlation = +1), then there can be no benefit of diversifying — risk is as high as can be.
 - If the power given by their correlation = -1 (perfect negative correlation), they rise and fall such that one can cancel out the risk of the other
- Portfolio Theory, Diversification, and Covariance Matrix: 13/22 reaches zero.

This quantification showed why diversification is effective and necessary for constructing portfolios.

Efficient Frontier

Another major contribution was the idea of the efficient frontier. Markowitz demonstrated that, for a collection of assets, the investor could create a variety of portfolios with varying risk and return profiles. Of all possible portfolios, only those on the efficient frontier are “optimal”.

- Frontier portfolios maximize the expected return of each level of risk.
- Portfolio's that lie below the frontier are inefficient while any other portfolio with greater return and the same risk point to a sub optimal system, or lower risks and the same return.

Example:

- Suppose Investor X has the choice of Portfolio A (10% return, 12% risk) or Portfolio B (10% return, 10% risk).
- Portfolio B is strictly better — it falls on the efficient frontier and A does not.

The concept stills forms the basis of modern investment thinking, where instead investors try and place themselves along the efficient frontier according to their appetite for risk.

Mean-Variance Optimization

Markowitz developed the procedure of mean-variance optimization. The underlying components of his model are threefold:

Expected returns of each asset.

Volatilities of asset returns (individual risk measures).

Covariances among asset returns (metrics for how assets behave together).

Analyzing an optimization problem with these inputs, investors will have the possibility of deciding how to weight portfolio in order to achieve the higher return that can be obtained from a specific level of risk or minimizing this risk for a given level of return.

Example:

- If an investor seeks to achieve a target return of 9%, the mean-variance optimization will find the asset mix that produces this return at the lowest level of risk.
- Similarly, if the investor seeking at 10% level of risk acceptance then in that case, the model chooses a portfolio with maximum return at this particular risk.

Such an organized method replaced qualified guesses with a numerical methodology.

Foundation for Later Models

Markowitz's model opened the door to numerous later advances in finance. The Capital Market Line (CML), the Security Market Line (SML) and the Capital Asset Pricing Model (CAPM) are all derived from his work. Had he not introduced portfolio theory to the masses, we would never have been able to develop these models — and all of modern asset pricing with it.

Example:

- The CAPM starts with the assumption that investors hold Markowitz efficient portfolios, and then adds to this model A risk free asset in order to define a market equilibrium model.
- Factor models such as the Arbitrage Pricing Theory (APT) also share from this risk-return trade-off and portfolio diversification.

Recognition

Harry M Markowitz received the Nobel Prize in Economics in 1990 for his pioneering work, along with Merton Miller and William Sharpe. His work is still THE foundation of modern investment analysis and requirements for his skills are standard curriculum everywhere finance or investing is taught.

Real-world example: Virtually every big asset manager in existence today — from BlackRock to Vanguard — relies on some flavor of mean-variance optimization or

efficient frontier analysis as part of the construction process for mutual funds, exchange-traded funds and pension portfolios. Markowitz's theories underlie institutional investing.

"Activity: Constructing an Efficient Portfolio"

Present students with the expected returns, standard deviations and correlation coefficients of two securities. Get them to google up how to compute portfolio return and variance for a variety of weightings then graph it out to find the efficient frontier. Explain the reason why diversification decreases total risk and why some portfolios are viewed as more efficient than others.

10.2 Risk-Return Optimization

10.2.1 The Role of Diversification in Risk Minimization

Definition and Concept

Diversification refers to the practice of using a variety of different types of asset classes so that no single investment is exposed to unsystematic risk (i.e. the risk that poor performance in one single security, or related group, has an outsized impact on a portfolio). It's the principle of not putting all your eggs in one basket. When a single asset underperforms, others may do better and offset the overall return. Diversification does not eliminate all risks, but it does greatly diminish unsystematic (company- or industry-specific) risks.

Example: An investor owns only shares in an airline; a spike in oil prices or a workers' strike could negatively impact returns. But if the portfolio also contains bank and technology stocks, as well as government bonds, then the impact of the airline's losses is softened.

Systematic vs. Unsystematic Risk

Diversification is targeting unsystematic, not systematic risk.

- **Systematic risk:** Marketwide forces that impact all investments, such as recessions, inflation, geopolitical disputes or changes in interest rates. These risk can't be diversified away.
- **Nonsystematic risk:** Company- or industry specific factors, including management mistakes, labor strikes, or product recalls. These risks vary from company to company and industry to industry, and can be reduced by holding lots of different securities.

Example:

- Apple may be in trouble if its supply chain stumbles, and its stock could take a hit. But Microsoft or Coca-Cola may be all right, so a diversified portfolio remains safer.

- But when a global recession strikes, almost all stocks are hit, and diversification is no defense — this is systematic risk.

The Power of Diversification

Diversification works because it is based on assets that have low or even negative correlations. When two assets don't move in the same direction at the same time, them being combined helps smooth out portfolio fluctuations.

Illustration:

- In recessions, stocks plummet and corporate earnings mend. Meanwhile, government bonds typically increase in value as investors flock to safety.
- A portfolio that consists of a mix of stocks and bonds, then, will have less risk than one that is 100 percent equities.

Numerical Example:

- If Stock A drops –10% during a downturn but Bonds rise by +5%, a portfolio that contains 50% of each loses only –2.5%, instead of losing the whole –10%. It shows how spreads risk by diversifying.

Practical Illustration

For mitigating sector-specific exposure, diversification is an especially effective tool.

Example:

- An investor owns only automobile stocks, such as Ford, Toyota and General Motors. If auto sales drop as a result of higher fuel prices, the entire portfolio will also lag performance.
- There is less risk in the portfolio if the investor adds health care stocks (e.g., Pfizer, Johnson & Johnson) and consumer staples (e.g., Procter & Gamble, Nestlé). These sectors typically remain steady in declines because people continue to require medicines and basic goods, no matter how the economy is doing.

Accordingly, diversification provides a means to spread risk among various non-cyclical and cyclical industries.

Key Academic Insight

Markowitz's portfolio mathematics showed that diversification was most effective in reducing risk when assets were less than perfectly correlated. The Correlation Assumption If two assets with a correlation coefficient of +1, diversifying doesn't do any

good since the move in lock step. If the correlation is zero or negative, diversification cuts risk a lot.

The larger the number of stocks in a portfolio, the closer this residual risk gets to zero. What's left is just systematic risk, and you can't diversify that away.

Example:

- Even a portfolio of two or three securities has high unsystematic risk.
- An investor — by owning 20 or 30 well-chosen stocks spread among seven or eight industries, and bearing in mind how certain negative questions can make excellent headlines — does not eliminate the risk of suffering losses caused by a company-specific development.
- Past that, adding more securities offers increasingly little additional value, because only market-wide risk is left.

10.2.2 Return and Variance of a Portfolio

Expected Return of a Portfolio

The expected return of a portfolio is equal to the weighted average of the expected returns of all assets in that portfolio. It reflects the “average” outcome investors anticipate, as inferred from their holdings. The contribution of each asset depends on its own weight (share in which the portfolio is invested in this asset).

Formula:

$E(R_p) = w_1E(R_1) + w_2E(R_2) + \dots + w_nE(R_n)$ where:

- $E(R_p)$: expected portfolio return
- w_i : portfolio weight of asset i
- $E(R_i)$: The expected return on asset i

Example 1 (Two Assets):

- Stock A: Return = 12%, Weight = 60%
- Stock B: $E(R) = 8\%$ $W = 40\%$

$$E(R_p) = (0.6 \times 12\%) + (0.4 \times 8\%)$$

$$E(R_p) = 7.2\% + 3.2\% = 10.4\%$$

So, on an annual basis, the portfolio will produce 10.4%.

Example 2 (Three Assets):

- Stock X: Return = 15%, Weight = 50%

• Stock Y: Rate of Return = 10%, Weight= 30% • BHY2259 From above discussion and calculations it is clear that both the rate as well as weightage has been increased, but the overall EV decreased with stock Z; It not only led to an increase in standard deviation fo risk; but also affected the Sharpe Ratio from a previous high level.

• Stock Z: Return = 6%, Weight = 20%

$$E(R_p) = (0.5 \times 15\%) + (0.3 \times 10\%) + (0.2 \times 6\%)$$

$$E(R_p) = 7.5\% + 3\% + 1.2\% = 11.7\%.$$

This is an inconsistency, indicating that the expected return of a portfolio depends on the asset mix, and not only on single assets' returns.

Portfolio Variance (Risk)

Whereas expected return is a straightforward weighted average, portfolio risk is more complicated. Risk is determined not just by the risks associated with individual assets, but also how those assets move in relation to each other (covariance or correlation).

Two Asset Portfolio Variance Formula: $\sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\text{Cov}(R_1, R_2)$ Where:

- σ_p^2 : variance of the portfolio
- σ_1^2, σ_2^2 : variances of the first and second assets (return rates)
- $\text{Cov}(R_1, R_2)$: covariance between asset returns

If correlation (ρ) is available, then:

$$\text{Cov}(R_1, R_2) = \rho \times \sigma_1 \times \sigma_2$$

Example 1 (Two Assets):

- $\sigma_1 = 15\%$ (0.15), and $\sigma_2 = 10\%$ (0.10)
- Weights = equal ($w_1, w_2 = 0.5$)
- $\text{Cov}(R_1, R_2) = 0.008$ $\sigma_p^2 = (1/4)(9/400) + (1/4)(1/100) + (1/2)(8/900)$ $\sigma_p^2 = 0.005625 + 0.0025 + 0.004 = 0.012125$

$\sqrt{0.012125} = 11\%$ (the square root of the value determined is a measure to derive the portfolio standard deviation.

This is less than the mean 15% and 10% (12.5%). Diversification reduces risk.

Example 2 (Using Correlation):

- Stock A: $\sigma_1 = 18\%$ (0.18), Stock B: $\sigma_2 = 12\%$ (0.12)
- Weights: 60% A, 40% B

- Correlation (ρ) = 0.3

$\text{Cov}(R_1, R_2) = 0.3 \times 0.18 \times 0.12 = 0.00648 \sigma^2 p = (0.6^2 \times 0.0324) + (0.4^2 \times 0.0324) + (2 \times 0.6 \times 0.4 \times 0.12 \times 0.12) = 0.0648$

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Even though Stock A has a higher risk (18%), adding it to Stock B on average lowers the
 portfolio's aggregate risk to

16.25%.

Interpretation

The central point that emerged from Markowitz's work is that portfolio risk is not just an average of all individual risks.

Instead, it relies on the correlation between assets:

- Complete correlation ($\rho = +1$): There is no benefit from diversification. Risk is nothing but the weighted average.

- Not perfectly correlated (ρ property-based estimation Some situations, however can be found in which type of object similar methods are not working properly Even if these are the cases when some poin already detected tell you perfectly what class of objects you are going to modelling, there could exist just no way for this kind image sample and shape pattern combination Preferred orientation appearance Realzal-tion Verified validation posture vision Cuttlefish exa-ple Agent -like acting Permitting programming Frequency frequency Content –oriented Recognition Object figurate disdain Perspective Point view Object neglect Vision qualitative Outflow quality External projection Elementary units Configurative nodes Comparable deviations Figure recognition Damage Check Valitacy Sphericity devia-tions Orientation permitted notation Preference directed degree Place row perception Table tolerance Barn owl—flies locust Raise classification Using two Axiom assessment sind Process base waves Far fields Kairosmetic noises Cognitive qualitative area Change Nature Pointer reference System Dactylos copy ovals Image Recurring circular means AxisReference Proposed Ausbildung life Ordering form Possible several types Looped loop lion MainFiguration string Life while link Words Trueth signal beacon speed Holistic wave stimulus upwards Index indicator direction SetScience poem Question Loading Test cards Effect spectraScopic Work Generalisation Damaging thing approx Edifying receding topic Local global time axes Differentiation border none KnowledgeTagging Past Future competence Behaviouring Order Planning urgent future AnthropologyPost truth Here Physic Taking into consideration Main Learning figures Additional English Urge Material leaves Branches coherence Fortunetelling Systems Connection Facilitation Seperation Reinforcement adisoften Sunday safety lights Valentine--s Day Friends Monday Daddy PublishedCoco Strength Feng shui You believe it Your wishes Didnt I love all? Happy New Year microtime Esta casa es? want out If or When Mode Staying true illegal Appearences Everything Pile Fun Simple Dynamics Improbable Dangerous Unbelievable Wholebody Separation Maintenance Relations Arrival art FactChart GeometryClass GlassesCharacters Everyone EggBaby ListWish Settlement SettlementList Attack opponent Greed Social opponents Depression Pain Oppression Emotion RevulsionAttraction Cognitivity Death powered maver FahrenheitScientific KelvinInjurious Language Stock Requests Answer friendly LetMeGo Anonymous Temporal perspective PressureCaring Belong again CaptainConnotations Independence Antagonist Unity Dispatch ChristmasEvents JazzNobody reflexaling

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The upshot is that Stock A and Stock B are perfectly correlated in this data set — they move practically the same.

Portfolio Implications

The value of diversification depends crucially on the correlation, not simply the number of assets.

- When $\rho = +1$: No diversification gain. Portfolio risk is nothing but a weighted sum of individual risks.
- For $\rho = -1$: Risk can be entirely hedged, with appropriately chosen weights.
- If $-1 < \rho < +1$: Diversification lowers risk, but risk cannot be totally eliminated.

Example:

Let's say Stocks X and Y with equal weights: Stock X ($\sigma=20\%$) Stock Y ($\sigma=15\%$) You guessed it right...SAME MEAN AND SAME STDEV.

- If $\rho = +1 \rightarrow \sigma_p = 0.5(20\%) + 0.5(15\%) = 17.5\%$ (no decrease).
- If $\rho = 0 \rightarrow \sigma_p < 17.5\%$ (risk is less than that imparted by perfect correlation).
- If $\rho = -1 \rightarrow$ With the correct weights, $\sigma_p = 0$ (risk is eliminated).

This is why investors hunt for assets that have low or negative correlation (ex: stocks + bonds).

Practical Example

In reality, few assets are perfectly (or negatively) correlated. The majority of the correlations are between -0.5 and $+0.8$. This is to say that diversification reduces risk but does not completely eliminate it.

- Stocks and bonds: Generally are not highly correlated or may be negatively correlated. Stock prices tend to plummet in recessions while government bonds rise, offering stability.
- Oil prices and airline stocks: Negative relationship. Airlines pay more than the usual when oil prices surge but oil producers, of course, gain.
- Global equity markets: Usually positively correlated, though that can differ by country and sector.

Numerical Illustration (Stocks and Bonds):

- Stock $\sigma = 18\%$, Bond $\sigma = 10\%$
- Correlation = -0.2
- Weights = 50% each

$$\text{Cov} = \rho \times \sigma_S \times \sigma_B = -0.2 \times 0.18 \times 0.10 = -0.0036$$

$$\sigma_p^2 = (0.5^2 \times 0.0324) + (0.5^2 \times 0.01) + (2 \times 0.5 \times (-0.2) \times 0.18 \times 0.10) = 0.0081 + 0.0025 - 0.0018 = 0.0088$$

$$\sigma_p = \sqrt{0.0088} \approx 9.38\%$$

This is well below the simple average (14 per cent). Such negative relation is associated with a large gain of diversification.

10.3 Efficient Frontier

10.3.1 Concept of Efficient Frontier

Definition

The efficient frontier is a key concept in Modern Portfolio Theory (MPT), an investing model that tries to maximize return for a given level of risk. It is the collection of all efficient portfolios which maximize return given risk and minimize risk given a desired

return. Any portfolio on the efficient frontier is said to be efficient, since no other portfolio has a higher return for the level of risk.

Put another way, the efficient frontier is the “border” of optimal investment opportunities. Portfolios that fall within this boundary (below the curve) are called inefficient, because there are other portfolios above this line with a higher expected return and the same or lower risk.

Illustration: suppose I can plot risk (standard deviation) on x-axis and expected return on y-axis. All the portfolios in existence are a cloud of points, but the efficient frontier is this upper-left corner — that’s the best risk-return trade-off possible.

Dominance Principle

The notion of the efficient frontier is a direct outgrowth of the dominance principle: sensible investors always choose among portfolios that yield more return per unit risk or less risk for a given level of return.

- Any investors above and to the left of other portfolios are better because they either provide higher expected return without greater risk or lower risk for no less expected return.
- Portfolios that fall below the frontier are dominated. It is inefficient because, for any given combination of assets, investors would prefer some other combination.

Example:

- Portfolio A: 12 percent in portfolio risk, 10 percent return
- Portfolio B: 12% risk, 8% return.

Both have equal risk, but A has more return. Therefore, Portfolio A dominates Portfolio B and B that is inefficient.

Economic Interpretation

The efficient frontier illustrates the principle of risk, return trade-off in investing. For the most part, higher returns mean more risk and a lower return portfolio carries less risk.

- Investors who are very risk-averse: Take points on the lower-left side of the frontier, since they favor stability even with moderate returns.
- Risk-loving investors: Select points toward the upper right, embracing more volatility in pursuit of greater gains.

The frontier is, in essence, the answer to the question: “Given my risk tolerance, what is the best portfolio that I could hold?”

Illustration:

- An investor whose risk tolerance is 8% would choose the portfolio with the highest return available at that risk level.
- Any other investors who are willing to accept a 15% risk level will move up the frontier to obtain higher returns.

In both cases, the efficient frontier ensures that investors are being offered the “best deal” that is available given their risk preference.

Example

Let's say an investor is evaluating two portfolios:

Portfolio X: Risk (σ) = 12% Expected return = 10%

- Portfolio Y: (σ) = 12%, Expected return = 8% • 基金投资组合以下列信息拖现实值。

Because both portfolios are identical in risk, Portfolio X is obviously more efficient. Portfolio Y is dominated since it has a lower return in exchange for not providing less risk.

Now imagine a different comparison:

- Portfolio M: Risk = 8%, Return = 7% Note that by focusing on Risk-Return ratio we could learn more about return for a given level of risk across different portfolios.
- Portfolio N: 12% Risk , 10% Return • What Is Portfolio P?

One does not dominate the other — Portfolio M is safer and less rewarding while Portfolio N is riskier but more rewarding. Both may be on the efficient frontier and, therefore, depending on personal risk preference of an individual investor.

10.3.2 Constructing the Efficient Frontier

Required Inputs

To form the efficient frontier, an investor or analyst would require three basic categories of inputs for the available securities:

Projected returns of each asset ($E(R_i)$) — Historical data, analysts' expectations, or valuation models.

Standard deviation (σ_i) — risk or volatility of each asset's return.

Covariances or correlations among asset returns — how assets move one with another.

These inputs let us calculate not only how an individual security's riskiness changes, but also how sets of securities act together in a portfolio.

Example:

Suppose we have:

- Stock A ($E(R_A) = 12\%$, $\sigma_A = 18\%$) • Stock B ($E(R_B) = E(B)$) min = .10 and max = .20, $s_B = .05$ We know that Portfolio can be expressed as combinations of A and B, as in the previous example.
- Stock B: $E(R_B) = 8\%$, $\sigma_B = 10\%$ — A second stock has an expected return of 8 percent and a standard deviation of 10 percent.
- $\rho_{AB} = 0.2$ (low positive correlation)

Using this information lets use to form different combo of Stock A and B.

Mathematical Steps

There are 2 principal calculations in the creation of efficient frontier:

Expected portfolio return:

$$E(R_p) = \sum (w_i \times E(R_i))$$

where w_i is the weight of asset i in the portfolio.

Portfolio variance (two-asset case):

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1w_2\text{Cov}(R_1, R_2)$$

If correlation is not given, covariance can be computed as:

$$\text{Cov}(R_1, R_2) = \rho \times \sigma_1 \times \sigma_2$$

By varying the portfolio weights (w_1 , w_2 and so on), we can generate all possible return combinations and risk.

Numerical Example:

- Stock A: $E(R_A) = 12\%$, $\sigma_A = 18\%$ • Stock B: $E(R_B) = 15\%$, $\sigma_B = 27\%$ 9-11 Example: B.35 Suppose your investment opportunities are restricted to two stocks and a government bond with the following characteristics: .3576(/C\; Wropriate \2000\.
- (Sock"D:.KL.Rows and Singer recommend investing \$1000 in stock A, \$500 each in stocks Band C, and the remaining \$10000 in treasury bills.

- Stock B: $E(R_B) = 8\%$, $\sigma_B = 10\%$

- Correlation $\rho_{AB} = 0.2$

$$\text{Cov}(R_A, R_B) = 0.2 \times 0.18 \times 0.10 = 0.0036$$

Case 1: If we have equal weights ($w_A = 0.5$, $w_B = 0.5$): $E(R_p) = (0.5 \times 12\%) + (0.5 \times 8\%) = 10\%$

$$\sigma_p^2 = (0.25 \times 0.0324) + (0.25 \times 0.01) + (0.5 \times 0.0036) = 0.0117 \quad \sigma_p = \sqrt{0.0117} \approx 10.8\%$$

The portfolio has risk (10.8%) below the mean of individual risks (14%), yet the expected return is 10%. This is the diversification benefit.

Graphical Representation

After the anticipated returns and risks of many such portfolio combinations are computed, the data can be plotted:

- X-axis: Risk (σ_p , standard deviation).
- Y-axis: Expected return ($E(R_p)$).

These points make up the set of portfolio opportunities, which is often referred to as a “cloud” or “curve” of possible portfolios. The upper left boundary of this set is the efficient frontier (efficient portfolios with highest return for a given level of risk).

Illustration:

- Anything below the curve is inefficient (dominated by better combinations).
- Point portfolios on the curve are effective alternatives.

Shape of the Frontier

Efficient frontier is usually a concave upward slope due to the concept of decreasing benefits to diversification:

- Diversification reduces volatility a lot at low levels of risk. The risk falls dramatically if you add a handful of uncorrelated assets.
- At greater risks, diversification provides less bang for the buck. A return higher than this can be obtained only with a risk that increases proportionately.

Interpretation:

The curve looks concave, suggesting that investors can’t continue increasing the returns linearly with risk. Rather, with each added unit of risk comes a diminishing marginal increase in the expected return.

Practical Example

A classic illustration of the efficient frontier is stocks and bonds:

- Stocks: Typically high risk, but also higher payoff.
- Bonds: Low risk, low return.
- Mix: Investors can use them to form portfolios with manageable risk and some degree of high return, if mixed together.

Numerical Example:

Suppose:

Stocks: $E(R_S) = 12\%$, $\sigma_S = 20\%$

- Bonds: $E(R_B) = 6\%$, $\sigma_B = 5\%$
- Correlation $\rho = -0.1$ (just less than 0)

Case 1: "No Bills" Portfolio $E(R_p) = 12\%$, $\sigma_p = 20\%$

Case 2: 100% Bonds $\rightarrow E(R_p) = 6\%$, $\sigma_p = 5\%$

Scenario 3: 60% Stocks, 40% Bonds $\rightarrow$

$$E(R_p) = (0.6 \times 12\%) + (0.4 \times 6\%) = 9.6\% \quad \text{Cov} = -0.1 \times 0.20 \times 0.05 = -0.01$$

$$\sigma_p^2 = (0.36 \times 0.04) + (0.16 \times 0.0025) + (0.48 \times -0.001) = 0.01344 \quad \sigma_p = \sqrt{0.01344} = 1.16\%$$

That portfolio has less risk than just owning stocks, but much more in the way of return than just owning bonds — an efficient frontier kind of thing.

10.3.3 Efficient vs. Inefficient Portfolios

Efficient Portfolios

Effective portfolios are those that lie on the efficient frontier. These portfolios are efficient in the sense that they maximize expected return for a given level of risk, or alternatively stated, minimize risk for a given level of return. They are the best compromise in the industry.

Investors will only choose from an efficient portfolio, as a portfolio on the left of that line can be improved upon (more return for no extra risk, or less risk for same return).

Example:

- Portfolio X: $\sigma = 8\%$, return = 7% $\rightarrow$ efficient (cannot do better at 8%).
- Portfolio Y: $\sigma = 12\%$, return = 10% $\rightarrow$ efficient (one of the optimal for its level of risk).

Inefficient Portfolios

Inefficient portfolios are those that lie below the Efficient Frontier. They provide either:

Inferior return than efficient portfolios at the same level of risk, or

- More risk than efficient portfolios for the same level of return.

Rational investors stay away from inefficient portfolios because superior options are available.

Example:

- Portfolio Z: $\sigma = 8\%$, return = 6% $\rightarrow$ inefficient. Why? Because Portfolio X (which has the same risk) returns 7%.
- Portfolio W: $\sigma = 12\%$, return = 9% $\rightarrow$ dominated. For the same risk, Portfolio Y delivers 10% return.

Illustration

Let's compare three portfolios:

- Portfolio A: $\sigma = 8\%$, return = 7% $\rightarrow$ on the frontier $\rightarrow$ efficient.
- Portfolio B: $\sigma = 8\%$, return = 6% $\rightarrow$ below the frontier $\rightarrow$ inefficient.
- Portfolio C: $\sigma = 12\%$, return = 10% $\rightarrow$ on the frontier $\rightarrow$ efficient.

Both A and C are effective, but they play to different investors:

- The Portfolio A (low return with low risk) may be preferred by the investor who is risk-averse.
- A risk-taking investor may opt for Portfolio C (more risk, more return).

No sane investor would choose Portfolio B as, for the same 8% risk, Portfolio A gives a higher return.

Investor Choice

As all of the portfolios on the efficient frontier are rational, which one that is selected depends on individuals' risk aversion.

- Investors who shun risk: Favor a portfolio toward the left of the frontier. These portfolios have lower returns, but also are less volatile. Example: retirees or pension funds might select a low-risk, bond-heavy portfolio.

Risk-loving Investors: Since the right side of the prudent frontier is to be preferred. These are higher risk, but potentially offer higher expected returns. Example: young professional with long time horizons might select a portfolio that is heavy in equities.

Therefore the efficient frontier is a menu of optimal portfolios between which an investor chooses depending on his preference.

CML Integration Integration with Capital Market Line

When a riskless asset (e.g., Treasury bills) is introduced, the efficient frontier expands to become the Capital Market Line (CML).

- The CML is a straight line that begins at the riskfree rate (R_f) on the y-axis and is tangent to efficient frontier.

- Portfolios along the CML dominate all those on the frontier, since a mixture of risky assets and a risk-free asset reduces the risk return trade-off.
- VCNs also could use leverage (borrowing at the risk-free rate) to shift above the frontier, which produces even greater returns for proportionally more risk.

Example:

If $R_f = 4\%$ and the market portfolio (the tangent to the frontier) is $E(R_m) = 12\%$, $\sigma_m = 15\%$.

- Rational Investors: A conservative investor would invest 50% in R_f and 50% in the market portfolio → low risk, blended return.
- A leverage-seeking investor can borrow at 4% to invest more than 100% in the market portfolio → higher risk, higher return.

So, the CML lets investors pick the best possible portfolios even BEYOND what is available on the "old" efficient frontier.

10.4 Optimal Portfolios

10.4.1 The Role of the Utility Function in Optimal Choice

Utility Function Defined

o A utility function is a measurement of the amount of satisfaction or happiness an investor gets from various combinations of risk and return.

o It makes a mathematical connection between economic results (returns) and psychological preferences (tolerance of risk).

Indifference Curves o Graphically, we present investor preferences with indifference curves. o Each indifference curve is such that at any point along the curve, the investor will be equally satisfied.

Indifference curves higher are indicative of more satisfaction as they provide high levels of gain for same degree of risk.

Optimal Portfolio Point o This is the point in which the efficient frontier is tangent to the individual investor's highest possible indifference curve.

o Here the investor has reached full saturation as no other combination of portfolio positions will provide them with greater utility, given their specific preferences.

Impact of Risk Aversion

o Extremely risk-averse investors will have very steep indifference curves (i.e., they require far higher returns to accept that much more risk).

o Investors that are less risk-averse have more flat curves (they are willing to take on additional risk with small additional return).

Implication

o The endpoints of the efficient frontier do not adequately reflect which portfolio is best for each investor; utility functions must be used to customize the final selection.

10.4.2 The Tangency Portfolio and the Capital Market Line (CML)

Tangency Portfolio o The point on the Capital Market Line (CML) which is tangent to the efficient frontier.

o This portfolio which we often refer to as the market portfolio, is one that includes the appropriate combination of risky assets.

Capital Market Line (CML) Definition o The CML is a line that starts from the risk-free rate (R_f) on the vertical axis and passes through the tangency point on the efficient frontier.

o The slope of CML's is the market risk price, revealing the additional returns proportionate to amount taken on risk.

Equation:

$E(R_p) = R_f + [(E(R_m) - R_f) / \sigma_m] \times \sigma_p$ Where: $E(R_p)$ = the expected return on the portfolio, R_f = risk-free rate of interest (usually a treasury bond approx).

▪ $E(R_p)$ = HPV (Election News) Did the polls being published in newspapers have a market impact?

▪ R_f = risk-free rate

▪ $E(R_m)$ = Expected return of the market portfolio

▪ σ_m = standard deviation of the market portfolio

▪ σ_p = standard deviation of investor's portfolio

Interpretation of the CML

o Any portfolio on the CML is efficient, since it dominates, in turn all portfolios lying on the efficient frontier.

o Investors get to a higher level of performance by mixing the risk-free asset and market portfolio than by just holding risky assets.

Role of the Tangency Portfolio

- o The tangency portfolio is identical for all investors, because it depends on market information only.
- o The division between the risk-free asset and the tangency portfolio does change based on where investors' preferences are.

Did You Know?

“The CML displays only feasible risk-return opportunities available by blending the riskless asset with the market portfolio. The tangent portfolio, where the CML meets the efficient frontier is universal to all investors—only their mix of risky and risk-free assets varies.”

-10.4.3 Portfolio choice and different tuning of optimality 1 risk preferences.

56-3 Risk Averse Investors so System-based investors who prefer safety to high returns.

Specifically, they will add the risk-free asset to the tangency portfolio but apply a larger weight to it.

- o Their optimal portfolio is close to the risk-free rate on the CML.

Moderate Investors

- o Will divide wealth more evenly between its risk-free asset and the tangency portfolio.
- o Their portfolios are on the average of the CML.

Aggressive or Risk-Seeking Investors

- o Are looking for more returns and are prepared to accept the higher risks last Sentence
- These investors:
- o Invest in stocks within their home market.

- o They can even borrow at the risk-free rate (leverage) to invest more than 100% of their wealth in the tangency portfolio.

- o They selected their portfolios to the right of market portfolio in CML.

7 Graphical View o All investors are identical in the CML, but they select at different points. o The Elasticity of Substitution tells us that the steeper an investor's indifference curve is, then the closer they stay to R_f .

- o Indifference curves with more flatter shape bring investors to riskier and higher return portfolios.

Example o If the risk-free rate is 4% and return on market portfolio is 12%, with associated risk of 15%.

- o For a conservative investor 70% in the risk free asset and 30% in market portfolio
- o Someone who is medium might make 50-50.
- o A risk-loving investor could borrow at the risk-free rate 20% and go 120% long on the market portfolio, so as to end up above the market return.

10.5 Summary

❖ Modern Portfolio Theory (MPT): The modern portfolio theory (MPT) by Harry Markowitz, is a systematic structure for ANALYSIS THE COMBINATION OF ASSET.

balancing risk and return.

❖ MPT stresses the importance of diversification—that adding assets to a portfolio can reduce unsystematic risk.

❖ The return of a portfolio is the average weighted output of assets.

❖ Portfolio risk is a function of the risks of individual investments as well as covariance and correlation among investments.

❖ The risk-minimizing effects of diversification are enhanced by low/negative cross-correlation between assets.

❖ The optimal portfolios with the best combination of risk and return are depicted by the efficient frontier.

❖ It is not interesting to look at portfolios that are below the efficient frontier, because then there exist better ones.

❖ The utility function takes into account investor's preferences and enables the choice of the most appropriate portfolio.

❖ Indifference curves and the efficient frontier are used to show how an investor determines the optimal portfolio.

❖ The Capital Market Line (CML) displays combinations of risk-free asset and the market (tangency portfolio).

❖ Investors all hold the same tangency portfolio, differing only in terms of risk tolerance.

❖ Conservative and moderate investors, aggressive investors would pick other points along this CML depending on their risk preference.

10.6 Key Terms

Modern Portfolio Theory (MPT): A model for structuring portfolios to achieve a balance between risk and returns by means of diversification.

Efficient Frontier: The curve connecting the portfolios for which the return to risk ratio is the highest.

Diversification The process of investing in a variety of assets to reduce unsystematic risk.

Anticipated Return: An average that represents the likely return of assets in a portfolio.

Portfolio Variance: A measure of the total risk of a portfolio, taking into account individual asset risks and correlations.

Covariance: A statistical way of measuring two asset returns move in tandem.

Correlation: A standardised measure (-1 to $+1$) of how closely together two asset returns move.

Capital Market Line (CML): A line that depicts efficient portfolios by combining the risk free asset with the market portfolio.

Tangency Portfolio The portfolio which the CML touches on the efficient frontier, also referred to as the optimal risky portfolio.

10.7 Descriptive Questions

Describe what MPT is and why it is important when investing.

Explain the significance of diversification in lowering portfolio risk.

Develop the formula for portfolio mean and variance when there are only two assets.

Describe the role of covariance and correlation in developing a portfolio.

What is the efficient frontier? What does it do for investors in the way of portfolio decisions?

Differentiate between efficient and inefficient portfolios using examples where appropriate.

Explain the role of utility functions and indifference curves and how they are used to find convenient sets.

Discuss the Capital Market Line (CML) and the idea of the tangency portfolio.

How are optimal portfolios affected by varying degrees of risk aversion?

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10.9 Case Study

Creating efficient portfolios – The example of investment decision by Rajiv

Introduction

Investors need to consider how much risk they are willing to accept vs their return and create a portfolio that matches those criteria as closely as possible. 1. INTRODUCTION According to Modern Portfolio Theory (MPT), the diversification, efficient frontier and Capital Market Line (CML) lead investors toward optimal portfolio allocations [4, 13]. But the choice of individual portfolio too will depend on each investor's attitude towards risk and return. This case study evaluates how a retail investor, Rajiv applies these principles to the path he takes with portfolio choices.

Background

Rajiv, an employed 40-year-old professional has re-looked at his investment strategy. His present investments include government bonds, large cap stocks and mutual funds. He recently discovered the principles behind the efficient frontier and Capital

Market Line. Rajiv wants to maximise his portfolio by choosing the best mix of risk free assets and risky assets (stocks, mutual funds).

Data available to him:

- Risk-free rate (R_f): 5%
- Market portfolio rate of return assumed at $R_m = 12\%$
- Market portfolio standard deviation (σ_m): 15%

Rajiv considers three options:

- Portfolio A: 80% in the riskless asset, 20% in the market.
- Portfolio B: 0.5 in risk-free asset, 0.5 in market portfolio.
- Portfolio C: Lend 20% at the risk-free rate and invest 120% in the market portfolio.

Problem 1: Optimal Risk Return Trade-off We suppose now all firms can observe either V_1 or V_2 as it is the case of diversified shareholders owning shares in different companies.

Rajiv would like to determine the expected return and risk of the two portfolios using CML's formula:

$E(R_p) = R_f + [(E(R_m) - R_f)/\sigma_m] \times \sigma_p$ 1. $E(R_j)$ denotes the expected return on (expected rate of return on, or market yield of,) share j ; $j = 1, 2, \dots, n$ 2 $E(\text{Surplus Read More}$ [wegleitung Managenent/ Wasserversorgung.pdf](#)

- Portfolio A: Low risk, low return.
- Portfolio B: Balanced risk-return.
- Portfolio C: Higher risk, higher return (leveraged).

Solution: Rajiv should choose based on his risk preference. A conservative investor would choose the Portfolio A, balanced will go with B and aggressive will give a shot to Portfolio C.

Proposition 2: Ideal Decision Problem 2: Utility Function and Optimal Choice

Rajiv has utility function with moderate risk aversion. His indifference curve is tangent to the CML at the 1/2 point.

Solution: Portfolio B is best suited to his preferences, as it provides a practical compromise between safety and growth.

Problem 3: Efficient Versus Inefficient Portfolios

And Rajiv compares his old portfolio (mostly bonds and some mutual funds) with the new efficient frontier. He knows the portfolio he currently holds is below the frontier, so it must be inefficient.

Answer: By moving to a portfolio on the CML, Rajiv is not giving up return for his level of risk.

MCQ (for Learners)

Which portfolio should rajiv select if he has moderate risk appetite? a) Portfolio A

b) Portfolio B

c) Portfolio C

d) None of the above

Answer: b) Portfolio B

Conclusion

Media References This example in general how MPT theories/how efficient frontier, CML and utility functions are being used by investors such as Rajiv to build an their ideal investment portfolio. The optimal portfolio is not unique, depending on the preferences of the individual for risk and thus it indicates how normal should be discussed the theory with personal financial goals.

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Unit 11: Concept of Portfolio Risk & Diversification

Learning Objectives

1. Know what we mean by portfolio risk and how it is distinct from the risk of an individual asset.
2. Differentiate between systematic and unsystematic risk.
3. Discuss the impact of diversification on eliminating unsystematic risk in a portfolio.
4. Compute the risk of a portfolio with variance, covariance and correlation.
5. Explain how correlation affects their ability to diversify.
6. Explore the constraints of diversification to void systematic risk.
7. Use risk-return analysis in order to assess the benefits obtained by having diversified portfolios.
8. Discover how to diversify across assets and sectors using actual examples from the real world.
9. Evaluate the degree of diversification in order to attain superior risk-adjusted performance.

Content

- 11.0 Introductory Caselet
- 11.1 Measuring Portfolio Risk
- 11.2 Law of Diversification
- 11.3 Role of Correlation Among Securities
- 11.4 Summary
- 11.5 Key Terms
- 11.6 Descriptive Questions
- 11.7 References
- 11.8 Case Study

11.0 Introductory Caselet

Risk, Diversification and the Portfolio of Kavita – case study

Kavita, a 32-year-old investor, has been handling her savings by concentrating on the stocks of one sector alone — technology. Although the sector has provided outsized returns in recent years, she had recently observed large swings in her portfolio's value whenever global IT demand ebbed and flowed. Worried about the risk, Kavita goes to a financial education class and hears about portfolio risk and diversification.

The workshop emphasizes that risk takes two flavors: systematic risk, which applies to the overall market and cannot be diversified away (e.g., inflation, changes in interest rates) and unsystematic risk or firm/sector specific that can be eliminated by diversification. Kavita learns that by investing in a variety of industries—e.g. healthcare, consumer goods and energy—their unsystematic risk would be reduced with only moderate returns impact.

Now Kavita has a decision to make: does she keep chasing high returns in a concentrated portfolio, or divert into other sectors for more stability?

Critical Thinking Questions

Why is risk minimized by diversification.

What are the trade-offs that Kavita will be exposed to in deciding between focussed investments and diversified investment?

How is knowing the distinction between systematic and unsystematic risk beneficial in investment decision making?

11.1 Measuring Portfolio Risk

11.1.1 Concept of Portfolio Risk

Definition

- o The portfolio risk is the measurement of how much fluctuation investors experience in their returns from their expected value.
- o It signals that investors are uncertain regarding their expected returns.

Dependence on Asset Interaction

No RISK OF A PORTFOLIO is not just the weighted average of risks. o A second factor is the covariance of asset returns.

Two risky assets can when combined, produce a less risky portfolio than either alone.

Systematic and Unsystematic Risk o Systematic Risk: Risks that affect the market as a whole such as interest rate changes, inflation, or recessions (such risks will not be diversified away); also referred to as fluctuations. Cannot be eliminated through

diversification. o Unsystematic Risk: Asset or market risk such as improper management or product recalls. May be greatly reduced by diversification.

Diversification Effect

o Combining assets with dissimilar or reciprocal performance profiles can potentially diminish overall portfolio volatility.

o Example: In periods of deflation, the value of stocks can fall while that of government bonds rises, providing balance to the portfolio.

11.1.2 Portfolio Variance and Standard Deviation

Risk in the financial sense is frequently measured using statistical tools like variance and standard deviation. These ideas offer investors a way to think about how much the returns of an asset or portfolio are above or below their expected values. Variance is simply the average of the square deviations from the mean. A higher variance means returns are widely dispersed, which suggests more uncertainty and risk. The standard deviation, or square root of variance, carries this dispersion into the same units as the returns (e.g. percentages), so it is easy to interpret as a form of volatility.

If Stock A has returns that vary 8% in either direction, and Stock B swings between -5% and +25%, then stock B has the higher variance representing greater risk. An investor who focuses solely on average returns might overlook that difference, but variance and standard deviation help to clarify the picture.

The idea is more enlightening if generalized to multiple asset portfolio. The two-asset portfolio variance is given by:

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \text{Cov}(R_1, R_2) \quad \text{Eq.(3)}$$

Here:

- σ_p^2 = portfolio variance
- w_1, w_2 = weights of assets 1 and 2 in portfolio
- σ_1^2, σ_2^2 = variances of asset 1 & asset 2
- $\text{Cov}(R_1, R_2)$ is the covariance between the returns of asset 1 and asset 2

This expression emphasizes that portfolio risk is not only determined by the individual risk of each asset, but also the way in which assets move relative to each other. For instance, if two stocks both rise and fall together their covariance is positive—increasing the portfolio variance. If they go in the opposite direction, covariance is negative and decreases our overall risk. This concept of mixing assets with not perfectly correlated returns is the premise of diversification.

- **Positive Covariance:** When the assets are positively associated, and they move in unison, the portfolio gets populated with both of their volatility because of which overall risk increases. For instance, two technology stocks may both fall when the economy slows down. Diversification provides little gain in such condition as each asset moves along with the other one resulting in greater portfolio variance.
- **Negative Covariance :** If two assets move in opposite directions, the risk of one is partially offset by the other. For example, if bond returns are higher, stock returns could fall and stabilize portfolio performance. That negative correlation means it lowers the total volatility, which means you have actually reduced your risk compared to holding one asset class by itself.
- **Zero Covariance:** Even when assets are not correlated, they still reduce risk because their returns vary individually. For example, A combination of shares and commodities in a portfolio could be stabilised without any explicit link. This decrease is due to the fact that risks are being averaged, as we have seen in its most basic form by spreading your bets.

So variance and standard deviation are not some abstract statistics; they appear to provide us with a practical and meaningful way to trade off return risk in portfolio design. Once the mathematics of asset return are understood, investors can construct portfolios that provide higher stability without giving up too much in expected return.

11.1.3 Portfolio Risk – Two-Asset and Multi-Asset_portfolio

Two-Asset Portfolio

- o Easiest example where you can show, how diversification benefits.
- o Formula for portfolio standard deviation:

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{12} \sigma_1 \sigma_2}$$

Where ρ_{12} = correlation between asset 1 and asset 2 (–1 to +1).

Implication of Correlation Values:

- o $\rho = +1$ → Perfect positive correlation → no diversification benefit - risk is the weighted average.
- o $\rho = -1$ → Perfect negative correlation → You can remove portfolio risk completely.
- o $-1 < \rho < +1$ → Partial correlation → some risk mitigation is feasible.

Multi-Asset Portfolio

- o In reality, portfolios are composed of multiple assets from a variety of sectors and geographies.

o Portfolio variance formula (generalized):

$$\sigma_p^2 = \sum \sum (w_i \times w_j \times \text{Cov}(R_i, R_j)) \text{ for all } i, j.$$

o –eds: Needs to construct a variance-covariance matrix of all the assets.

Response on diversification o Adding an asset leads to a decline in unsystematic risk. o Yet, systematic risk (β) is left, and cannot be diversified away no matter how many stocks are in the portfolio.

o Diversification to some extent reduces risk, but too much diversification does not in and of itself reduce risk.

Illustrative Example

o Let us say an investor has 10 equally weighted stocks across various sectors. When you are buying multiple stocks across different industries, the unsystematic risk of each company tends to offset one another — although at the portfolio level there is still systematic risk (exposure to market-wide risks like interest rate increases and recession).

Practical Application o Portfolio managers employ applications to compute variance-covariance matrices on dozens or hundreds of securities. o This enables them to build a portfolio that lies on the efficient frontier which represents the best possible compromise (trade-offs) in risk and return.

“Activity: Computing Portfolio Risk for a Two-Asset Portfolio”

Give students info on two securities: $E(r)$, Std, Correlation coefficient. Request that they calculate the expected return, variance, and standard deviation of the portfolio based on the formulas in 11.1: Also, compare the results when the correlation is +1 and -1 to demonstrate diversification’s role in portfolio risk.

11.2 Law of Diversification

11.2.1 Principle of Diversification

Definition

o Diversification means not having “all your eggs in one basket. It entails placing investments in a wide array of securities such that any loss on one does not significantly affect the portfolio.

Underlying Logic

o As an asset, its behavior in response to economic or political events vary. Some will go up and some will go down.

- o A Portfolio of non perfectly correlated assets results in a lower overall volatility.
- o Risk Components
 - o Unsystematic Risk (Firm-specific to Sector-specific) Company or Industry related events (Example: lawsuits, strikes, product failure). Diestler pointed out that diversification can drive this to near zero.
 - o Systemic Risk (Market Risk): General issues (such as interest rates, inflation, world recessions) impacting all securities. Diversification cannot eliminate this risk.

Illustration

- o If the investor only has airline stocks in a portfolio and fuel costs rise, they will significantly damage their holdings. With the inclusion of non-cyclical sectors (pharma, utility), the impact of fuel price hikes will be diluted.

11.2.2 Advantages of Diversification in the Lessening of Unsystematic Risk

The concept of diversification is one of the bedrocks of modern investment theory, developed to help mitigate downside risk when you have concentrated your position -- be it in a single asset class or sector. Unsystematic risk This type of company-specific or industry-specific risk can be greatly minimized through diversification; the more different types and locations of investments you hold, the less likely that a large number of them may fall in value at the same time. Though the unsystematic risk is a diversifiable risk and can be reduced, systemic risk is not. Investors hold diversified assets to ensure that poor performance in one market such as stocks is compensated by stability or positive returns in another, thereby „smoothing“ overall returns.

Risk Reduction The first obvious advantage of diversification is the reduction in risk. Investors who put all their eggs in one company or industry are at risk of hefty losses if things go south with that one investment. Diversification shares the risk, so that one adverse event doesn't wipe out an entire portfolio. This would be on the one hand, if an investor with stakes in a range of firms in different industries (1) loses all their money from them.

- / Risk Reduction: Because it stretches exposure to a range of different investment vehicles, diversification dilutes the effects of any poor performance in just one security.

Stabilised return is also another plus. Various types of investments can also be counted on to doing well in various economic times. When some assets fall, others may not lose as much value or may even gain value. For example, in times of economic slowdown, defensive sectors such as healthcare and utilities tend to outperformish, whereas cyclical sectors such as cars or real estate under-perform. By including both kinds in a portfolio, it is easier to generate a reliable return over time.

- Returns Are Stabilized: A combination of assets evens out performance, which results in smoother and less volatile returns.

It is also a buffer against firm-specific risk -- things like management fraud, or an accounting scandal, or a plant blowing up. There are historical examples of such firm-specific risk where companies, like Enron in the U.S. or Satyam in India, were felled and shareholder wealth was destroyed. But a diversified investor is protected because losses from one company are balanced by the performance of other holdings.

- **Reduction of Firm-Specific Risk:** Shocks at the company level do not have a big effect when the portfolio contains a large number of uncorrelated securities.

Another is diversification across sectors and sub-industries. Various industries are more/less affected but for different reasons (regulation, technology change, consumer desiring). An investor owning shares solely in technology could lose a great deal if there are tighter handcuffs on growth. But the investor is also invested in finance, healthcare, energy and consumer goods — decreasing the likelihood that everything will tank at once.

- **Diversity of Sector and Industry:** Not being too focused in any one industry provides some protection from the poor performance of one industry to dominate overall portfolio performance.

Outside of industries, geographic diversification offers a second cushion. A country's markets can be punished as a result of political instability, currency swings or economic downturns. Investing globally allows an investor to capture the investments in the stronger areas and reduce one's exposure to weakness in other regions. For example, losses in one country's stock market could easily be offset by gains in another.

- **Diversification:** Investing overseas reduces the risk of exposure to the performance of a single country.

Finally, diversification has been shown to be effective with far fewer than hundreds of holdings. Finally, a well-diversified portfolio of 20–25 strategically selected stocks spread across diverse sectors wipes out the bulk of unsystematic risk, leaving only systematic risk in its wake. And that's proof that diversification is not about the quantity of your investments, it's about being smart in terms of choosing uncorrelated assets.

11.2.3 Limitations of Diversification

Systematic Risk Remains

o Diversification doesn't guard against risk that is characteristic of the broader market such as global recessions, pandemics, or financial crises.

67 Adding a first few securities to a portfolio will significantly decrease the risk, but after ~25–30 securities it doesn't do much to bring down risk. o For example: adding the

second or third stock to a single-stock portfolio will dramatically reduce risk, while adding the 100th stock barely changes anything.

Costs and Complexity

- o Extreme diversification leads to high transaction costs, monitoring problems and difficult management.
- o It is difficult for the investor to follow a large number of securities effectively.

Over-Diversification (Diworsification)

- o Over-diversification can dumb down performance. Strong performers can be diluted by weaker ones, which undermine returns at large.
- o Example: An index fund that holds hundreds of stocks may match the market, but it can't beat it.

False Sense of Security

- o Some investors assume incorrectly that diversification automatically leads to safety. In fact, in crises (e.g. 2008 financial crisis, COVID-19 market crash), correlations across assets rise which mean that diversification benefits decline.

11.3 Correlation Among Securities

11.3.1 Positive, Negative, and Zero Correlations

Positive Correlation ($\rho = +1$)

- o When two securities move together in perfect proportion, their returns will increase or decrease at the same time.
- o Example: Two banks in the same geographical area will very likely share similar interest rates and credit risks.
- o Implication: No H is diversification because if pooling them together is only going to amplify the same risk structure.

Weak ($0 < \rho < 1$), Partial Positive Correlation

- o Typically, in real-world securities they are related but not perfectly.
- o Example: Auto and steel shares often trade in tandem since car production relies on steel, but the linkage is not precise.
- o Implications: Some risk mitigation is available, but it is somewhat meager.

- o Perfect Negative Correlation ($\rho = -1$) o The returns of two securities just move in totally opposite direction.
- o Example: Gold has a tendency to go up when stock markets go down, because investors are seeking safety.

o Implication: Perfect diversification is attainable—portfolio risk can theoretically be eliminated to zero by optimizing the weights.

0. No Correlation ($\rho = 0$) o Movements in one security do not relate to movements in the other at all. o Ex: There may be no apparent correlation between Agricultural Commodity prices and IT Sector stocks.

o Upshot: Pooling those assets partially reduces the risk, since the ups and downs tend to cancel each other out.

11.3.2 Effect of Correlation on the Risk of a Portfolio

In portfolio management, correlation is arguably the most important concept in risk reduction. The risk in a portfolio is not just the collection of the variances of its assets, but rather how they move relative to each other. If two assets are perfectly correlated, their returns rise and fall at the same time, so you don't get a diversification benefit. But where there is less than completely correlation between assets, the risk of a combined portfolio may be lower than the simple average risk. This characteristic of assets is what allows diversification to take place in reality.

The formula for two-asset portfolio standard deviation is the following:

$$\sigma_p = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{12} \sigma_1 \sigma_2}$$

Where:

- σ_p = standard deviation of portfolio (the total risk)
- w_1, w_2 = weights of asset 1 and 2
- σ_1, σ_2 = the standard deviations of returns of the assets
- ρ_{12} = correlation of the two assets (−1 to +1)

This formula shows that correlation is the determinant of total risk.

• Perfect Positive Correlation ($\rho = +1$): where if the correlation coefficient is 1, it signifies that the two assets move in the same direction and in the same magnitude. In this case the portfolio standard deviation equals convex combination of the individual risks, that is, no risk is diversified away. For instance, holding two technology stocks that are closely correlated would not provide any diversification.

• Perfect Negative Correlation ($\rho = -1$): If correlation is −1, assets move in the opposite direction. It is possible in this case to create a portfolio that has zero risk if we assign weights appropriately. Combining a stock and an appropriate derivative, for instance, can completely eliminate risk, producing a risk-free portfolio.

• No Correlation ($\rho = 0$): If two assets are uncorrelated, their returns would not relate to each other. The portfolio standard deviation is in this case lower than the weighted

average, but not zero. For example, stocks and commodities typically have low or zero correlation with each other; together they can dampen total risk while not completely ruling it out.

Consider a numerical example. Let's say the σ of stock A is 20% and B is 15%. For a +1 correlation the portfolio standard deviation will fall between 15% and 20% depending on weightings with no diversification. If correlation is -1 , the risk of the portfolio can be mathematically null (0%); this means no volatility at all. If correlation is 0, portfolio risk nearly always falls between the individual risks but it also strictly lower than the weighted average, as a direct consequence of diversification.

From a practical point of view, correlation is used to select assets that do not all move in perfect unison. For instance, stocks and bonds may exhibit low or negative correlation during a market decline. Equally, property and commodities could offer stability in an uncertain equity market. By combining some of those assets in a thoughtful way, investors build portfolios that are more resilient and less at the mercy of market swings within any one sector.

Did You Know?

Assets are correlated, and you only get as much out through diversifying away from that correlation. When two assets are perfectly correlated (+1), diversification buys nothing. But now imagine that they are perfectly negatively correlated (-1). It is possible to have a portfolio with zero risk, even though it contains r and s !

11.3.3 Best Diversification With Low Correlation Assets

It is a strategy used to form portfolio with minimal unsystematic risk and hence attractive returns. They cannot diversify away systematic risk (due to movements in the overall market), but can greatly reduce firm-specific and sector-specific risks by judiciously combining assets that have low or even negative correlations. Diversification The idea of diversification is to make certain that assets in the portfolio do not all respond the same way to various economic developments. By combining investments that respond differently, portfolio volatility is reduced and stability over the long run is enhanced.

The importance of correlation is crucial to this idea. For positively correlated assets the prices of which move in tandem, there is only so much one can gain by combining them. But when you have assets that are negatively or even not very correlated, the risk of one served as a hedge against stability or gain in another for decades. For instance, equities and's government bonds frequently trade in opposite directions. They are golden-egg moment for investors who earned handsome returns when stock markets

tanked during recessions as bond prices generally rise as they tend to be safe havens, softening the overall impact on portfolios.

- **Assets with Low Correlation or Negative Correlation:** Introduce an asset that has no or negative relationship to diminish the volatility. For example, mixing stocks with bonds or gold provides a more uniform return profile, since each of those asset classes responds differently to economic conditions.

The concept of asset class diversity offers a concrete scenario for the application of antifragility. Stocks are growth-oriented, but come with a lot of volatility. Bonds offer guaranteed income and stability, so they generally move in the opposite direction of stocks. Gold and most other commodities area have been historically regarded as safe haven assets in times of financial crises that provide protection against stock market collapse. Real estate brings another angle, with returns dependent on local real-estate markets, inflation patterns and rent revenue. Combined, these two asset classes make a more balanced risk-return profile.

- **Diversify with Asset Classes:** Stocks for growth, bonds for stability, gold for crisis protection and real estate for inflation-linked returns. This reduces reliance on any one market cycle.

And the benefit is enhanced by global diversification. Investing across countries and regions decreases reliance on domestic economic conditions for investors. For example, a downtrend in Europe now may be at variance with growth patterns in Asia or North America. Diversification across multiple geographies means that the portfolio is not overly exposed to localized political or economic shocks.

- **International Diversification:** Global diversification protects portfolios from domestic recessions or policy changes, since various economies operate on different cycles.

This principle has a real-world example during the last global financial collapse in 2008. Stocks around the globe plummeted, but investments in United States Treasury bonds and gold lured buyers looking for safety. There were also huge losses for those who had more diversified portfolios than pure equity investors. This shows how low-correlation assets offer some kind of protection in times of crisis.

The important take-away of optimal diversification is that investors should never try to remove all risk, only the kind that is not associated with systematic factors. But the aim is not to try to hit a home run with each investment choice, but to reduce volatility and achieve smoother returns over time through a judicious combination of assets that behave differently. Not only this kind of portfolio protects the capital substantially better in the event of downturns, but it also ensures a constant presence when markets rise.

11.4 Summary

- ❖ **Portfolio Risk:** It is defined as the difference in returns from a group of securities.
- ❖ **Created by Nico Theron** This portfolio risk is made up of systematic and unsystematic risk.
- ❖ **Systemic risk** arises from factors affecting the market as a whole and is undiversifiable.
- ❖ **Diversifiable risk** is related to an individual firm or industry, and so can be eliminated by diversification.
- ❖ **Variance and standard deviation** are fundamental statistical measures of portfolio risk.
- ❖ The portfolio risk is a function not only of the individual asset risks, but also the correlations between asset returns.
- ❖ The two-asset portfolio case illustrates the cause of diversification benefits when securities are less than fully correlated.
- ❖ Multi-asset portfolios also slay unsystematic risk, but gains are mitigated for more than a few securities.
- ❖ If firms that are more interconnected - e.g., with higher multimedia revenues - trigger larger impacts of shocks, then the Diversification Law 425 argues for their having high spreads in any case; otherwise they would cause large firm-specific shocks.
- ❖ Diversification works best when assets have low or negative correlations.
- ❖ Correlation may be positive, negative, or zero with different portfolio volatility impact.
- ❖ Optimum diversification reduces portfolio risk without compromising expected return.
- ❖ Despite diversification, a systematic risk persists that investors should be compensated for bearing.

11.5 Key Terms

Risk Profiles of the Portfolio: Risk in a portfolio which represents a potential risk return trade-off.

Systematic Risk: Overall risk of the Market, which cannot be eliminated by diversification.

Company Specific Risk: Also known as unsystematic risk, company specific risk can be minimized through diversification.

Variance: A statistic – a measure that’s been mathematically calculated about some data that measures the scattering of returns around an average.

Standard Deviation: The square root of the variance and measures portfolio volatility.

Covariance: How two securities’ returns tend to move together.

Correlation Coefficient: A percentation number between -1 and +1 that measures the direction and degree of relationship between two asset returns.

Diversification: The spreading of risk by placing investments in different asset markets to avoid specific risk.

Mean-Variance efficient diversification: The degree of diversification that minimizes risk for any given expected return.

Diworsification: Too much diversification which causes a portfolio to putter.

11.6 Descriptive Questions

Define portfolio risk and discuss its significance in the management of investments.

Differentiate between systematic and unsystematic risk, giving appropriate examples.

Describe how diversification can help to minimize unsystematic risk within a portfolio.

Obtain the expression for portfolio variance of two asset groupings.

Explain the importance of covariance and correlation in risk in portfolios.

Discuss the Law of Diversification and explain why it is important for investors.

Why should you be diversified across sectors and geographies?

Explain the reason that diversification can reduce, but not eliminate, a portfolio’s risk.

How is the efficacy of diversification in portfolio building affected by correlation?

11.7 References

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11.8 Case Study

"Hedging Through Diversification – The Case of Managing Risk in a Volatile Market" (with Ronald Bremer)".

Introduction

Building a portfolio is more than just finding winning investments; it's about mitigating risk through diversification. It is often difficult for investors to grasp the effect of correlation among securities on overall portfolio risk. This case study demonstrates how a professional studies his way to lessen portfolio volatility through the principle of diversification and correlation analysis among securities.

Background

Kumar recently began to invest in hopes of building wealth for long-term financial stability. At first, he put his money only in technology stocks, meaning his fund got great returns during bull markets but suffered precipitous losses in bear times. Upon returning from a finance seminar, Rohan has found out that how much you can portoflio risk depends on cross-asset correlations.

He checks it with two assets below:

- Stock A (Equity of IT sector): $E(r) = 12\%$, $SD = 18\%$.
- Stock B (GB): Mean = 6%, Stdeviation = 5%.
- Correlation of A with B is -0.2 .

Rohan wants to know now, how the inclusion of these two at assets alters his portfolio risk as compared to holding only equities?

Problem 1: Portfolio Risk Measurement Can you think of any other factors that could help measure risk?

it Rohan's problem is to determine variance and standard deviation of a two assorted assets portfolio. He sees that when he invests 70% in Stock A and 30% in Stock B, the volatility of his portfolio gets cut way down thanks to the low (negative) correlation.

Solution: The portfolio risk is less than the weighted average of individual risks, so diversification DOES reduce unsystematic risk.

Problem 2: The Role of Correlation in Diversification

Rohan looks at various correlation situations (+1, 0, -1) to analyze the impact on portfolio risk.

- If $\rho = +1$ then there is no diversification benefit.
- When $\rho = 0$, there is partial diversification.
- A risk could be in theory removed with a correctly selected weights, for $\rho = -1$.

The Answer: Low, even negative correlation gives you the best diversification benefits, so adding bonds to portfolios overweighted with stocks continues to make sense.

Issue 3: Diversification Constraints

Diversification diminishes the unsystematic risk, but Rohan understands that there will always be systematic risks (inflation, recession, etc.) at play. And he still has to be able to withstand broad market shocks if his money is well-diversified.

Solution: "Investors should balance diversification with realistic performance expectations, and utilize asset allocation techniques and risk management tools to mitigate systemic risk," the fund group concluded.

Example: How sector diversification mitigated risk amid COVID-19 market volatility

2020 provides a contemporary real-life pointer to the benefits of diversification in the COVID-19 pandemic. In early to mid-March, global stock markets were caught in vicious selloffs, especially within travel, hospitality and energy. Airlines and hotel stocks plunged as restrictions brought global movement to a standstill. However, some other sectors did comparatively well. Shares of tech firms offering remote working solutions, online retailers and digital payment companies rose as demand moved to the internet. Shares of health care and drug companies were higher — helped by the urgency for vaccines, medical supplies and treatment.

At the same time, investors with concentrated holdings in travel or hospitality saw massive losses but those with diversified portfolios across tech, healthcare consumer goods and bonds endured less volatility. And declines in some sectors were

counteracted by improvements elsewhere, proving the value of diversifying across industries when a crisis hits. This was yet another example that drove the point home – you cannot help but be affected by large systematic shocks such as pandemics, but sectoral diversification can soften the blow and protect the value of your portfolio.

MCQ

What kind of risk can not be eliminated by diversification?

- a) Industry risk
- b) Firm-specific risk
- c) Systematic risk
- d) Operational risk

Answer: c) Systematic risk

Conclusion

This case illustrates the fact that diversification and correlation all play an important role in managing a portfolio. By mixing together assets with low or even negative correlations, investors like Rohan can dramatically lower their portfolio's exposure to the risk of all kinds. History, including how sectors fared during COVID-19, suggests that diversification can also serve to help stabilize portfolios even when volatility is off the charts. But diversification only goes so far — systematic risk is real, and you will still need thoughtful risk management as well as portfolio construction.

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Unit 12: Coefficient of Correlation

Learning Objectives

1. Know what the coefficient of correlation means and represents.
2. Discover how correlation measures the strength and direction of a relationship.
3. Explain the terms positive, negative and zero correlation.
4. Explain the meaning of correlation coefficient which ranges between -1 to +1.
5. Compute the correlation using Karl Pearson's formula.
6. Distinguish between correlation and causation.
7. Correlate things in real-world data sets.
8. Describe the drawbacks of correlation as a statistical method.
9. Exercises to help problem-solving through correlation questions.

Content

- 12.0 Introductory Caselet
- 12.1 Correlation Coefficient Interpretation
- 12.2 Impact on Diversification Benefits
- 12.3 Portfolio Construction with Correlation
- 12.4 Summary
- 12.5 Key Terms
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12.0 Introductory Caselet

“Relationship is between advertisement cost and sale”

ABC Pvt. Ltd., a mid-sized consumer goods company, has been increasing its market share over the last 3 years. The team has continually put resources into television, digital and print advertising.

The finance department noticed that in those months where advertising expenditure was raised, there was a trend towards increased sales revenue. But during some months, heavy spending on ads did not lead to a significant surge in sales. This begged the question of what was the nature (strong, weak) and scope (otherwise conditioned by seasonality, competitor activities or consumer preferences) of the covariation between advertising spend and that of an advertisement affected sales?

In order to investigate, the company's statistics team decided to work out a correlation coefficient between monthly spending on advertising and sales. Their results demonstrated a correlation coefficient of +0.72, indicating a rather strong positive association.

So can now management decide that they additionally want to turn up the ad spend or finesse tactics around this statistic?

Critical Thinking Question:

If the correlation coefficient between advertising spending and sales revenue is +0.72, what are the major factors that management should think about before deciding that more advertising always means more sales?

12.1 Correlation Coefficient Interpretation

12.1 Definition and Formula of Correlation Coefficient

The correlation coefficient is one of the most popular statistics involved in finance, economics, social sciences. It measures the strength and direction of the linear relationship between two variables. Meaning that by the r value, we understand whether two variables co-vary, inverse co-vary or have no consistent relationship. Its value is always between -1 and $+1$, which makes it straightforward to interpret even when the units of measurement are not commensurate.

In other words, that coefficient is telling us how the change in one variable interacts with changes in another. A value of r near $+1$ suggests a strong positive linear relationship (or directly proportional) – as one variable goes up, the other generally follows. A value of r near -1 reflects a strong negative correlation, such as one variable increases, the other decreases. The r -value around 0 indicates a weak or no linear relation.

The expression for Karl Pearson's correlation coefficient:

$$r = \frac{\sum [(x_i - \bar{x})(y_i - \bar{y})]}{\sqrt{[\sum (x_i - \bar{x})^2 \times \sum (y_i - \bar{y})^2]}}$$
 Where: r = the correlation coefficient Σ = sum of all of the values in an expression or set of expressions.

Where:

- x_i = value for a person of variable X
- y_i = value of Y for individual i
- $\bar{x}$ = mean of X
- $\bar{y}$ = mean of Y
- Σ = varsigma = sum over all values

The numerator denotes the covariance between X and Y, which is an index of whether they move in the same or in the opposite direction. The denominator normalizes this covariance by dividing it by the product of the standard deviations of X and Y so that the coefficient always ranges between -1 and +1.

To illustrate, consider a hypothetical situation. We will examine the returns from the stock market and the prices of bonds. If $r = -0.6$, this indicates a moderately strong negative correlation. When stock prices increase, the prices of bonds, on average, decrease.

That is something influencing a phenomenon that is relevant for investors. It is the diversification of their portfolios by holding a mix of assets that are positively correlated, and others that are not.

- **Direct Correlation:** For example, the sales of air conditioners and temperatures generally displays direct correlation. As temperatures rise, sales increase.
- **Opposite Realities:** The price of oil and airlines' profits frequently move in opposite directions. High fuel prices are bad for airline margins, and correlate inversely.
- **No Correlation:** The amount of books in a library and the amount of rain on any given day are probably not meaningfully related, so .

This measure is key in portfolio theory because it assists investors in deciding how to blend assets. Assets that are negatively or weakly correlated decrease portfolio risk, assets with high correlation entail less possible diversification. Hence, the correlation coefficient is not just a statistical measure, but also a pragmatic reference for decision-making in uncertain condition.

12.1.2 Extent of Values (-1 to +1) and Interpretation

The correlation coefficient can vary in the closed interval $-1 \leq r \leq +1$. All possible ranges have different significance here:

- $r = +1$: Positive correlation is perfect. Both variables increase or decrease in every measure exactly together.

For instance, if one grows by 10 percent, so does the other.

- $r = -1$: Perfectly negatively correlated. Both these variables vary in the opposite direction, in exactly same proportion. If one grows by 10%, the other contracts by 10%.

- $r = 0$: Zero correlation. There is no linear dependence between the two variables. They're relatively unrelated, so there is no a priori relation between the two.

- $0 < r < +1$: Correlation is positive. The higher the positive value, the stronger the relationship. Example:

height and weight.

- $-1 < r < 0$: Reversed (or negative) correlation. The nearer the figure to -1 , the stronger is the negative association. Illustration: price of a good and the quantity demanded.

This range indicates both the magnitude of the relationship (how close to positive or negative one it is) and its direction.

12.1.3 Perfect, Strong, Weak, and Zero Correlation

The correlation coefficient tells you not only the direction of a relationship (positive or negative) between two variables, but by its magnitude it also reflects how strong that relationship is. The degree of correlation is important to know in research, economics and finance because it helps determine if a change in one variable will also produce a reliable change in another. The values can be between -1 and $+1$ and depending on the range, the strength of correlation can be interpreted as strong, perfect, moderate, weak or zero. Each of them implies different aspects for the analysis and action.

A perfect correlation ($r = +1$ or $r = -1$), is the strongest relation. For $r = +1$, two variables move proportionately together. As one approximation: if a business's revenue is always two times its cost to produce, then the relationship between them will be perfectly positive. For $r = -1$, one variable grows just as much as the other diminishes. If, for instance, the price of a synthetic financial instrument always decreased (on a constant-proportion nothing cost averaging basis) whenever an underlying hedge asset increased by 1%, we would say that the two prices were perfectly negatively correlated. In each of them all points fall on a straight line.

- **Perfect Correlation:** Indicates that the value is in perfect correspondence, follows the pattern exactly and unchanged ratio.

A high correlation (r between ± 0.70 and ± 0.90) means two variables tend to be associated with one another, but likely are not in perfect correspondence. The relationship is linear, the points fall closely around a straight line. For example, number of years of education and income level typically have a high positive correlation: more education generally corresponds to higher income, though there are always exceptions. In finance, it's well known that stock indices and large-cap stocks exhibit high correlation because market-wide factors impact both in the same way.

- **Strong Correlation:** Indicates two variables moving in concert, where one serves reasonably well as a predictor of the other.

A weak correlation ($r = \pm 0.40$ and ± 0.69) suggests a relation that is not substantiated and is dependent on other variables at play. Take for example the correlation between studying and better performance on exams. Other variables increase performance such as test anxiety, poor instructional quality, and poor overall memory. a.–b. In financial markets, where a moderate correlation exists between domestic equity and real estate returns, mutual causality is observed, but economic factors are responsible to varying degrees.

- **Weak Correlation:** Indicates little predictive value — other variables explain outcomes much better.

A relative correlation (r between ± 0.10 to ± 0.39) means the connection is weak and unreliable! For instance, time spent on social media could exhibit only weak negative correlation with academic performance. Some students spending more time online perform worse in education but many exceptions are still there which is considered as a statistically weak association. Likewise in the domain of finance, gold prices and sales data for consumer electronics could have low correlation, as only a few weak indirect connections may exist between them.

- **Low correlation:** The variables hardly have any association, and the outcomes are influenced by various other factors.

Finally, no correlation at all ($r = 0$) means the two variables are not related linearly. There is no information to be attained from changes in one about changes in the other. In particular, shoe size and intelligence are not at all related, so the correlation is essentially zero. In the portfolio theory, holding two assets with (nearly) zero or low correlation is valuable, as this way their price movements are independent (giving true diversification benefits).

- **No Correlation:** Indicates complete uncorrelatedness in variable mobility.

By separating these degrees of correlation, scientists and money managers can better analyze data, assess risk and develop strategies that assume relationships between variables.

Did You Know?

“The coefficient of correlation indicates not only strength, but direction of a relationship. In practical (real-world) data, a correlation of exactly ± 1 would be uncommon, barring cases where the variables are related by definition. There is even benefit from correlations that are weak, particularly for uses in such fields as psychology or economics and the social sciences for predictions.”

12.2 Impact on Diversification Benefits

12.2.1 Impact of Correlation on the Risk of a Portfolio

Correlation is what dictates how various assets move compared to one another and it is directly responsible for the risk-reducing potency of diversification.

- High Positive Correlation (nearly +1):

- o Assets are in the same direction. \-Benefits and deficits Materializations and depositions take effect at once.

- o Portfolio is still risky because volatility is not offset.

- No or Near No Correlation (0):

- o Assets move independently. o The losses in one asset carries over to a different.

- o Reduced portfolio risk through partial offset in price movements.

- Negative Correlation (close to -1):

- o Assets move in opposite directions. o If one asset depreciates, the other appreciates.

- o The risk of the portfolio is reduced as the good and bad tends to offset.

The general risk of the portfolio is therefore very much a function of the correlation between the assets.

12.2.2 CORRELATION ZERO OR NEGATIVE: DIVERSIFICATION

The real advantage of diversification comes when assets are inversely or uncorrelated.

- Assets with low correlation among each other (r near 0):

- o For instance, mix technology shares with real estate investments.
- o Returns are not closely related, meaning more stable performance in the aggregate.
- Negatively Correlated Assets ($r < 0$):
- o Example: Shares and government bonds usually move in different terms when market falls.
- o Provides protection against any drop in a particular market.
- Key Point:
- o The closer two numbers are in correlation, the greater the potential for diversification.
- o Investors are able to achieve a less lumpy return and reduce volatility without necessarily sacrificing upside potential.

12.2.3 The impact of diversification on correlation: With High Correlations, Diversification Offers Little Benefit. We have already had the opportunity to note Q osses from nbps;diversifica-tion when assets are highly correlated to each other.

- High Positive Correlation Assets:
- o e.g. shares of the companies in a specific sector.
- o They typically behave the same as market conditions, and you don't see any reduction in risk from doing this.
- Market-Wide Stress Periods:
- o During financial crises or economical upheavals, correlation among asset classes often rises significantly.
- o This effect decreases the benefit of diversification precisely when investors are most in need of protection.
- Resulting Limitation:
- o A diversified portfolio could act like an undiversified one if its components are highly correlated.
- o Genuine diversification involves investing in a wide range of industries, sectors and asset classes that don't correlate.

“Activity: Building a Diversified Portfolio”

If two possible investment candidates exist (e.g., U.S stock and gold), pupils are required to create a portfolio consisting of any given pair of the candidates. They can then calculate the correlation between the two assets, describe whether diversification

is greater or smaller than one would expect and demonstrate how changes in correlation affect portfolio risk and stability.

12.3 Portfolio Construction with Correlation

12.3.1 Portfolios with Positive Correlation

A portfolio made from positively correlated assets will generally move in the same direction since these securities are responsive to similar risk factors. When one asset rises in price, the other typically does too. Similarly in periods of weakness both seem to fall together. This 'co-movement' depends on the nearness of the correlation coefficient to +1. A value closer to +1 means strong positive correlation, and that the two assets move together in exactly the same magnitude; one-to-one level close to 0 signifies a less but still positively correlated.

If securities belong to the same industry, or even the same sector, they generally manifest a positive correlation. For instance two banking stocks, say State Bank of India (SBI) and HDFC Bank are affected by interest rate movements, credit growth as well as government policies. On the other hand, two techies such as Infosys and TCS will feed directly or indirectly into global IT services demand and forex rates. Though they are separate companies, their stock prices move in close parallel because the same macroeconomic and sector-specific factors buffet them.

- **Type of Positive Correlation:** When one security increases in value, the other is more likely than not to also increase in value.; Alternatively, when one falls, the other tends to fall as well. The closer the relation, the less useful diversification is.

From an investment point of view, assets that have high positive correlation outweigh the benefit of diversification. The idea behind diversification is to combine assets that do not move in tandem, so that when some lose value, others gain it. This balancing destruction phenomenon does not apply to positively correlated assets. For instance, an investor who owns many shares of an airline company may have their entire portfolio diminished by a global increase in fuel prices or a global ban on flights.

- **Investor Takeaway:** Being heavily loaded with positively correlated securities or assets means that an industry or market shock will have a very significant negative effect on your portfolio. This is known as concentrated risk.

As such, investments of this nature may still be justified. More aggressive risk-seekers aiming for higher returns could also have a high degree of such a concentration. For example, having a lot of technology stocks in a technology stock bull market is also an example of high concentration, but the pay-off can be very high. Day traders operate in a similar manner as they buy multiple stocks in the same sector and then ride the momentum profit upswings of those stocks. Sector specialists may also have such

concentrated portfolios, betting that their knowledge of the risks will exceed that of a regular portfolio manager.

- When Positive Correlation Is OK: Some few concentrated investors, whether they be “napkin doodlers” or rapid fire traders who like the entire concept of accumulating product designed to change in value quickly.

In reality, however, high positive correlation across portfolios is not what long-term investors looking for steady performance (and reduced risk) want.

12.3.2 Portfolios with Negative Correlation

The portfolio is made up of assets that do not move in the direction. This really helps with diversification of the portfolio. When we talk about assets that are negatively correlated it means that they move in directions. For example when the price of one asset goes up the value of the asset tends to go down.. The other way around when the price of one asset goes down the value of the other asset tends to go up.

The portfolio and the assets in the portfolio have a number that shows how closely they are related. This number is called the correlation coefficient. The closer this number is to -1 the the relationship between the assets in the portfolio.

A perfect negative correlation would be great for the portfolio. This means that when one asset in the portfolio gains something the other asset in the portfolio loses the same amount. This would completely eliminate risk for the portfolio. The portfolio would not lose any money because the assets, in the portfolio would balance each other out. Investors do not usually see things going in opposite directions in real markets. However investors can get pretty close to this by putting their money into types of assets. These assets have typically done the opposite of each other when the economy and financial situation change. For example when one asset class does well the other asset class does poorly and this is what investors want when they look for investments that behave in opposing ways to financial conditions like the stock market and bonds which are types of asset classes that investors look at. Asset classes, like these are important for investors to consider when they want to balance out their investments.

The negative correlation will keep on reducing the ups and downs of our portfolio. When the stock market goes down people usually move their money to safer things like government bonds. This money going into bonds makes bond prices go up which helps make up for the loss in stock market values. In the way gold prices often go up when there is a financial crisis or people are worried about inflation and this helps balance out the loss in stock prices. The negative correlation of gold and stocks will continue to minimize portfolio volatility and gold will act as a hedge, to falling equities like it does

during crisis or inflationary fears. These are the kinds of relationships where a negative correlation can really help protect your money and make the ups and downs of your portfolio a lot less crazy. Negative correlation can be a thing, for your capital and it can also help tame the volatility of your portfolio.

- **Type of Negative Correlation:** When we talk about Negative Correlation we see that the more the value gets close to -1 the stronger the Negative Correlation between two assets becomes. This means that if one asset loses value the other asset will gain value and the losses from one asset will be completely balanced out by the gains from the asset, which is what Negative Correlation is all, about.

From an investor viewpoint asset portfolios that do not move together are interesting because they give you stable returns over time. You do not see ups and downs. The portfolio becomes more stable. For example when stocks are doing well like they do when the economy is growing someone who owns stocks and also has long-term government bonds is in a better position. This is because stocks do well when the economy is growing. Bonds give you a steady income when the economy is slow. This means that the investor who has both stocks and bonds like a piece of a company and some government bonds will be, off. The stocks will do well when the economy is good and the bonds will help when the economy is bad. This need for resilience and support in damping the emotional toll of investing.

- **Investor Takeaway:** When you have a portfolio with investments that do not move in the direction the investments that go up in value can help make up for the ones that go down. This means that if one investment loses value the other investment can help balance it out. The idea is that this can protect the investor from big losses and help them stay safe during tough economic times. Negative correlated portfolios can do this for an investor allowing them to offset falling values in one asset with gains on the asset, which is really important for staying safe during economic turbulence, with negative correlated portfolios.

The thing about correlation is that it helps protect your money. Investors do not have to forget about the money they expect to make in order to reduce their risk. Negative correlation helps create a balance, where assets that are expected to grow a lot, such as stocks are paired with safer assets like bonds or gold. This makes investment portfolios stronger and more suitable, for term financial goals like negative correlation does. Negative correlation is important because it makes your money safer and helps you reach your term financial goals with the help of negative correlation.

- **Why One Needs Negative Correlation:** Negative correlation is really helpful because it makes the returns from your investments less uneven. This helps protect your money when something bad happens. Negative correlation also reduces how much you rely on

one market or industry for your investments. It is good to have correlation, in your investments because Negative correlation helps you in many ways.

Let me give you an example. Imagine you have a portfolio that is made up of sixty percent stocks and forty percent long-term government bonds. When the world equity market crashed at the start of 2020 because of COVID-19 the financial markets took a hit.. People started buying US Treasury bonds because they wanted a safe place to put their money. The stocks in your portfolio did not do well. The bonds did okay. So the bad performance of the stocks was somewhat balanced by the performance of the bonds. This means that the portfolio, as a whole did not do badly as it would have if you had only invested in stocks. The fact that you had a mix of stocks and bonds really helped to reduce the damage. This is an example of how stocks and stocks work against bonds and bonds. When you put them together they help reduce the ups and downs of your investments. This means your money is safer when the markets get really crazy.

Negative correlation, therefore, is one of the ways in which we build a modern portfolio and arguably the most powerful tool large investors have for controlling risk without sacrificing long-term growth.

12.3.3 Optimal Portfolio Using Combined Correlation To achieve an optimal portfolio using the combined correlation, a discrete version of (65) is considered: Region under all options where the Sharpe ratio is maximized $v \times y$ mixed correlation index mean-standard deviation under all options sharpe Figure 6: Frontiers generated by indexes and the resulting frontier for their combination 131R

Of course, in practice you can hardly build a portfolio of only negatively correlated assets. Financial markets are interrelated and few asset pairs move perfectly in opposite directions. Rather, most assets have positive correlations and during global financial crises this tendency to rise together within asset classes increases correlation among assets. As a consequence the idea of mixed correlation becomes feasible or even mandatory when it comes to portfolio construction.

- Why Mix Correlation is Useful: Financial assets are connected to each other. Stock markets, in countries can still be related because of globalization. This means that what happens in one country can affect another country. Commodities and currencies also tend to follow economic trends. It is really hard to find things that do not move together when they go up or down. So the goal is to create a group of assets that do not all move in the way. This helps to reduce risk. At the time we want this group of Financial assets to grow in value overall. We want our Mix Correlation of assets to be strong.

Building a mix-correlated portfolio is a process. First you need to look at all the types of assets like stocks, bonds, real estate, commodities and foreign assets. Then you have to

see how these assets have worked together in the past. This means looking at how they behaved in market situations.

When you understand how the assets work together you can start to put them in a way that makes sense. For example you can pair assets that have the potential to grow a lot. Are also risky like stocks with assets that are safer, like government bonds or gold. This can help you build a portfolio that has a balance of assets. Building a portfolio with a mix of assets, like stocks and government bonds is important. The portfolio should have assets that work together like real estate and commodities to make it strong. So when we talk about diversification it is not about investing in different types of assets.

Diversification should also happen within these assets. For example if you invest in the stock market it is an idea to spread your money across different sectors like technology, health care and consumer products. This way the risk is spread out evenly across your investments in the stock market. Diversification, within the stock market means you are investing in equity sectors, including technology, health care and consumer products.

- **Building Blocks (What to Do):** We need to know the types of assets that are out there. We should look at what happened in the past to see how these assets are connected to each other. Then we can put together assets that're likely to grow fast with assets that are safer and think about the kinds of industries or regions that these assets are a part of, like the Building Blocks of our investment plan, which includes Building Blocks.

Let me show you how mixed correlation actually works. I will give you an example. Think about a portfolio, for instance:

- 50% domestic stocks (domestically economy-correlated, at a modest risk of devastation via trade war with Trump),
- 20% offshore equities (negatively correlated to local markets and an opportunity for global exposure),
- 20%, in government bonds these are the kinds of things that usually do the opposite of stocks when things are going badly for the stock market.
- 10% gold (or commodities - as a crisis hedge).

This kind of portfolio is great because when the equity markets are doing well the investors get to be a part of the growth.. When the equity markets go down because of big economic problems, the bonds and gold help to cushion the blow, which means the total volatility is not as bad. The equity markets and the bonds and gold work together to make this happen. The equity markets give the investors a chance to make money when they are doing well. The bonds and gold are like a safety net, for the investors when the equity markets are not doing well.

- **Mixed Correlation Outcome:** This portfolio helps reduce changes in value when compared to a portfolio that only has stocks.. It still has the potential for long term

growth. The Mixed Correlation Outcome is about balancing the risk of losing money and the potential, for making money, which's what the investor wants for their money.

This concept also correlates directly to Modern Portfolio Theory (MPT) – it is NOT about holding risk-free assets; instead, it's about optimizing asset combinations and correlation. The MPT efficient frontier demonstrates that portfolios with a mix of relationships optimally trade-off risk and reward.

For example, during the 2008 global financial crisis, world stocks cratered and people flocked to US Treasury bonds as a safe place. Gold was also up as sentiment in markets turned negative. But a portfolio that also owned bonds and gold would have seen far less severe drawdowns. This real life conclusion demonstrates the value of constructing your portfolio mixing up correlations (rather than being heavily exposed to just one such asset).

12.4 Summary

- ❖ Correlation coefficient: It is an index of intensity and direction in a relation between two variables.
- ❖ It is always in the range -1 to $+1$.
- ❖ Positive relationship implies that the two run in unison.
- ❖ Negative association suggests opposite variation of variables.
- ❖ Zero correlation means an absence of a linear relationship between two variables.
- ❖ Effectiveness of Diversification is influenced by the degree of correlation.
- ❖ (Low) negative correlation enhances the Portfolio risk diminutively.
- ❖ High positive correlation restricts the usefulness of diversification.
- ❖ Negative correlation to a portfolio provides the most powerful risk reduction.
- ❖ Because extreme values (± 1) are very rare in actual financial markets.
- ❖ Correlation mixed portfolios are built with different risk-return assets that share few correlations.
- ❖ Created portfolio is an optimal mix of resources or assets in any industry, sector or asset class.
- ❖ Correlation analysis, which is a key aspect of Modern Portfolio Theory assures that investors earn optimal portfolios.

12.5 Key Terms

Correlation Coefficient: A statistic with an absolute value between 0 and 1 that reflects the strength of a linear association between two PCs.

Direct Correlation: A correlation in which two variables move together.

Negative Relationship: One variable goes up while the other goes down.

Correlation Zero: The state of having having no correlation between variables.

Portfolio Diversification: The act investing in various financial instruments to minimize risk.

Portfolio Risk: The degree of risk that an investment portfolio is exposed to as a whole.

Covariance: A gauge of how two numbers change in concert with each other.

Optimal Portfolio: A portfolio that offers the best risk return trade-off.

Modern Portfolio Theory (MPT): An investment theory that seeks to maximize returns for a given amount of risk through diversification.

Asset Allocation: The allotting of a portion of total investments among various asset categories in an attempt to minimize risk and maximize return.

12.6 Descriptive Questions

Define the correlation coefficient, as well as its relevance in finance.

Describe the range of correlation values and what they mean.

Describe the impact of correlation on portfolio risk.

Explain with an example the advantages of diversification when assets are low or negatively correlated.

Why it fails when assets are positively correlated?

Discuss the construction of portfolio, when assets are full positively correlated.

Describe the importance of mixed correlation in the return on an optimized portfolio.

How is correlation factored into portfolio construction by Modern Portfolio Theory?

What are some real life examples of assets with negative correlation and the contribution to diversification thereof?

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12.8 Case Study

Correlation and the Diversification of a Portfolio

Introduction

Portfolio management is the process of achieving an optimal balance between risk and return by selecting suitable investments. An important aspect of this process is that of asset covariance. Correlation is what makes the assets go up or down together and drives portfolio risk. ÉTU investors believe having many assets will grant their portfolios diversification, however the issue of correlation between assets will dictate whether or not one is truly diversified.

Background

Mr. Arjun is a young investor, who has recently received an inheritance of ₹20 lakhs. He's thinking about creating a portfolio that includes stocks, bonds and gold. His main

priority is minimizing risk while preserving long-term returns. He spoke to his financial planner, who talks to him about correlation. The advisor explains that:

- Stocks and bonds generally have low or negative correlation, which translates to risk reduction.
- Stocks within a sector tend to have high positive correlation with each other, meaning that you may not be able to diversify as much.
- Gold generally moves inversely with equities so it can help as a hedge.

Now it is up to Arjun to choose the right assets mix that help reduce his risk and give him a well balanced return as well.

Problem 1: Strong Positive Correlation Among Stocks

Arjun initially wanted to invest all of his money in various TCS shares. But his adviser cautioned that most of these stocks are highly correlated, close to +0.85 or more, as in they move almost identically. This would put his portfolio at significant risk.

Solution: Spread money across various sectors and have an allocation to assets that tend to be less correlated with stocks, such as bonds or gold.

Problem 2: Diversify Properly

Arjun knows that if he adds negatively correlated assets his portfolio may be stabilized. Gold and government bonds, for example, tend to move in the opposite direction from equity markets. The difficulty is determining the ideal mix of assets that will generate growth and provide protection.

Solution: Form a mixed portfolio, as for example the following:

- 50% in stock (spread out across sectors),
- 30% in government bonds,
- 20% in gold.

This distribution, based on mixed correlations, enables an optimal risk-return trade-off.

Issue 3: Misunderstanding of the Benefits of Diversification

Arjun knew more numbers meant less risk. The professor explained that if the stocks are very correlated, the portfolio acts like a single stock and declines in diversification benefits.

Solution: Pay attention to correlation structure of assets, not only the number of securities.

The effectiveness of diversification depends on the examination of asset correlation.

Sample: The Relationship of Equity and Gold in Indian Portfolios

An example in which this becomes problematic is provided by the Indian market. In the COVID crash of March 2020, the Nifty 50 index declined over 30% in a few weeks as equity markets tumbled amid panic selling. Simultaneously, gold rose to a record high in India, crossing ₹50,000 per 10 gram. That's because investors scurried for safe havens when stock markets were volatile. Portfolios that mixed equities with gold suffered far less, by contrast, than portfolios containing only equities. Amazon advert For example, an all-equity investor was hit with steep falls while an investor whose portfolio is split 70 per / 30 per c in favour of stocks and gold suffered much lower volatility as gains from gold helped to offset stock market losses. This example demonstrates how diversification benefits of equities and gold performances are practically observed in Indian context for the risk-hed, i.e., it can hedge the risk in times of financial crisis.

MCQs

Q1. Why is having assets that have a very high positive correlation bad?

- a) Lower returns
- b) Higher portfolio risk
- c) No asset allocation needed
- d) Guaranteed diversification

Answer: b) Higher portfolio risk

Q2. What is a commonly negative correlated asset to stocks?

- a) Gold
- b) Real estate
- c) Technology shares
- d) Banking shares

Answer: a) Gold

Q3. So, which one gives the most strengthening effect?

- a) Assets with perfect positive correlation
- b) Assets with a correlation that is near -1
- c) Assets with correlation of $+0.9$
- d) Assets with correlation of 0.8

Response: b) Assets of correlation near -1

Q4. What is the real world significance of a mixed correlation portfolio?

- a) Perfect negative correlation is rare
- b) Investors dislike diversification
- c) Positive correlation gives maximum safety
- d) Correlation does not affect portfolios

Solution: a) It is not common to find perfect negative correlation.

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Unit 13: Variance & Co-variance in Portfolio Risk Measurement

Learning Objectives

1. Distinguish the meaning of variance as an indicator of investment risk.
2. Find out how variance determines the volatility of market returns.
3. Describe what covariance means when examining the relationship between assets.
4. Explain positive and negative covariance in the context of portfolio.
5. Compute the portfolio variance when only variances and covariances are available.
6. Discuss the impact of covariance on portfolio diversification benefits.
7. Use variance–covariance analysis to find the total risk of a portfolio.
8. Analyze portfolio variance dimensions in order to make decisions.
9. Consider the disadvantages of using variance and covariance as measures of risk.

Content

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- 13.1 Statistical Basis of Portfolio Variance
- 13.2 Co-variance in Portfolio Analysis
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13.0 Introductory Caselet

"Portfolio Risk Measuring with The Tool of Variance and Covariance"

Mr. Ramesh, a young investor (age 35) owns the two risky asset: stock and government bond. He observes that stocks come with higher returns but also a lot of swings and so have a portfolio that is risky. His consultant acquaints him with the ideas of variance and covariance to explain portfolio risk.

The advisor explains that:

- Variance – is a measure which describes the returns distribution for each different asset.
- Covariance is a measure of how two assets move together — positive covariance means they go getting them up and down, while negative covariance means they are moving in opposite directions.
- Diversification: putting assets with low or negative correlation in the same portfolio can actually reduce the risk of a total portfolio, even if one asset is very volatile.

For example, the adviser contrasts two cases:

A pair of technology stocks with a large positive covariance, but the risk is still high even if diversified.

A selection of equities and bonds with low or negative covariances so that the fluctuation in equities is offset by the stability of bonds, thereby reducing portfolio risk.

This case illustrates the importance of variance and covariance as key instruments for risk measurement and portfolio design.

Critical Thinking Question

If you were Ramesh, how would you determine the optimal mix of assets based on variance and covariance analysis, and what trade-offs would you consider between risk and return?

13.1 The Statistical Foundation of Portfolio Variance

13.1.1 What the term investment variance means

Variance is an important term in finance used to quantify the degree of risk and uncertainty. It is a statistical measure of how much actual returns can vary from the average (mean) return. In simple terms, it answers:

“How much do the investment’s returns differ from our average expectation?”

If returns are concentrated around the average then the investment is said to have little variation. The greater the variability of returns, the greater the risk in an investment.

Key Insights

- High Variance:

Indicates large fluctuations in returns. “Here, you’re betting on the future performance of an asset, which is risky.

Example: Small-cap tech startups can be volatile because earnings and perception of the market swing fast.

- Low Variance:

Suggests returns are constant and average - indicating the asset is predictable with low effect that can damage it. For example: Government bonds tend to have a small variance as they yield fixed interest payments with a low degree of uncertainty.

Variance of Single Asset Formula

The return variance of the single asset is given by:

$$\sigma^2 = \sum (R_i - \bar{R})^2 \div N$$

Where:

- σ^2 = variance of returns (a measure of risk)
- R_i = realized return in period i
- $\bar{R}$ = mean (average) return over periods

N = Total number of observations (time periods)

This formula operates by measuring the degree of difference that each return displays relative to the average, injecting it with some sprawling witchcraft (you square the differences so that you don't end up with positives and negatives multiplying themselves out) and averaging them.

Step-by-Step Example

Let's say an asset gives you the following returns in next 3 years:

- Year 1: 10%
- Year 2: 12%
- Year 3: 8%

Compute the Average Return ($\bar{R}$):

$$\bar{R} = (10 + 12 + 8) \div 3 = 10\%$$

Let's Compute the Deviations($R_i - \bar{R}$):

o Year 1: $10 - 10 = 0$ o Year 2: $12 - 10 = +2$ o Year 3: $8 - 10 = -2$

Take the Square of Each Deviation (to eliminate the negatives):

$$o 0^2 = 0 o (+2)^2 = 4 o (-2)^2 = 4$$

Calculate the Squared Deviation's Average:

$$\text{Variance } (\sigma^2) = (0 + 4 + 4) \div 3 = 2.67$$

Interpretation

- The variance = 2.67 (in percentage squared).
- This figure indicates the extent to which the returns deviate from a 10 percent average.

A high variance indicates volatility, or flowerbeds of return, and a low one stability.

Importance in Investment Analysis

Risk Quantification: Variance translates intangible uncertainty into one single number allowing for an objective assessment of the risk.

Foundation for Other Measures: Variance is used to generate standard deviation ($\sqrt{\sigma^2}$), covariance and correlation – all of which are incredibly important in portfolio analysis.

It Helps in Decision Making: A low risk investor will always opt for a low variance asset (bonds, for example), a medium or high variance investor will select (for higher expected returns) high-variance assets (like equities).

13.1.2 Portfolio Variance Formula & Numericals All students preparing for mock test for B Com, Competitive Exams can use this Portfolio Variance Questions as a reference for the preparation.

Adding more assets to this portfolio complicates the scenario because the total risk is not just a sum of variances. Instead, portfolio risk relies highly on the interactions between assets. This relationship is represented by covariance or correlation.

Two-Asset Portfolio Formula (Covariance form):

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \text{Cov}(R_1, R_2)$$

Two-Asset Portfolio Formula (Correlation form) $\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho \sigma_1 \sigma_2$
where:

- σ_p^2 = portfolio variance
- w_1, w_2 = weights of assets 1 and 2 in the portfolio
- σ_1^2, σ_2^2 = variances of 1 and 2 assets
- ρ = correlation coefficient of returns on assets 1 and 2
- $\text{Cov}(R_1, R_2)$ = covariance of returns for assets 1 and 2

Interpretation of Formula:

If the correlation is +1, the assets move identically, and diversification provides no reduction in risk.

- With correlation –1, the assets move fully in opposite directions and the diversification benefit is maximal.
- If the correlation is a 0, then assets are independent and some diversification benefit happens.

Illustrative Numerical Example:

And let us that Arjun puts money in two things :

- Asset A (Equity): variance = 0.04, weight = 0.6
- Asset B (Bond): variance = 0.09, weight = 0.4
- Pearson correlation (ρ) between them = 0.3

Step 1: Compute weighted variances:

$$(0.6^2 \times 0.04) = 0.0144$$

$$(0.4^2 \times 0.09) = 0.0144$$

Step 2: Compute covariance contribution:

$$2 \times 0.6 \times 0.4 \times 0.3 \times \sqrt{0.04} \div \sqrt{0.09} \\ = 0.0259$$

$$\text{Step 3: Put them together: } \sigma_p^2 = 0.0144 + 0.0144 + 0.0259 = 0.0547$$

$$\text{Portfolio variance} = 0.0547$$

$$\text{Standard deviation of the portfolio } (\sigma_p) = (\sqrt{0.0547}) \approx 0.234 \text{ or } 23.4\%$$

This demonstrates how merging two assets alters the portfolio's ultimate risk profile.

13.1.3 The Role of Variance in the Risk Measurement

Variance is more than just a concept in statistics – it's also an integral piece of the decision-making process when you're making investment decisions, because it represents the level of uncertainty about the returns on your investments. Risk and variability, but how does one measure risk? Here are a few details of variance plays out in financial analysis (with examples from exercises to make the concepts more tangible).

Risk Assessment

VARIANCE A measure of how much actual returns differ from the expected return on an investment. Higher variance means higher fluctuations in returns and thus risk. For

instance, if Stock A has mean return of 8%, whereas its returns varies between -5% and +20%, the variance sign will be high. On the other hand, Stock B (with a constant return of 6–10%) will exhibit reduced variance. For the investor who is less willing to accept risk, Stock B would be preferred even though its expected return is a little lower.

- Comparison Tool

Investors are constantly looking for options to put their money. Variance makes comparison possible by measuring how much more risk these assets carry. Certainly a bond from a government that does not have, say, enough powers to spend huge amounts of money might have very little variance (small moves) because its returns will be essentially fixed, whereas given the right market conditions something like high-tech might have much higher variance. By contrasting the variance, the investor knows that bond is a safer choice with less potential return, while stock is a riskier option, but has a chance of higher reward.

- Portfolio Diversification

What Variance, along with covariance (how much the values of assets follow each other), does is elucidate why diversification has benefits. Depending on the correlation of return, the resultant portfolio variance may be less than that of individual investments if two assets are combined in a portfolio. For instance, when the tech stock performs below average, the utility stock also may not perform poorly or even may do well thus somewhat ‘diversifying’ (or stabilizing) the overall portfolio return. That is why diversification is often referred to as “not putting all your eggs in one basket.”

- Risk-Return Trade-off

One of the fundamental principles of finance is that higher returns tend to go hand in hand with a higher variance, which is to say more risk. Return seeking investors need to find the right compromise between return and variance. To illustrate, assume two portfolios; Portfolio X with an expectation of 12% but high variance and Portfolio Y has expectation of 7% but low variance. More aggressive investor looks for higher return.. so he will go for Portfolio X. whereas a conservative investor would go for Portfolio Y being risk free..

- Guidance for Allocation

Variance helps in the decision of asset allocation optimally. Modern Portfolio Theory (MPT) by Harry Markowitz uses portfolio variance as an important input to find the optimal combination of assets. I state that the objective is to build a portfolio that involves least amount of risk (variance) for a given return or provides higher return for some specific variance. For instance, an investor who wants to divide capital between equities and bonds will use variance measures to determine how much is appropriate in each asset class in order to achieve a desired risk/return balance.

Finally, it has been observed that variance offers a systematic method to convert the lack of information into numerical — allowing investors to decide on a rational basis. In the absence of variance, financial decision-making would be largely about intuition or gut feeling. Since variance provides us with the ability to quantify risk, it allows for comparisons, diversification strategies and also informed trade-offs between risk and return hence making statistical foundation of portfolio risk measurement.

“Activity: Calculating Portfolio Variance”

Students are requested to create a two-asset portfolio based on data of stock and bond returns. They need to calculate the variance of the individual investments, then the co-variance of those and finally the total portfolio variance. The exercise teaches them about the impact of correlation on portfolio risk and why diversification alters total volatility in capital investment decisions.

13.2 Co-variance in Portfolio Analysis

13.2.1 Introduction to Concept and Formula of Covariance

Covariance is a statistical measure that describes the way in which two random variables, such as the returns on a pair of securities, will move together.

Malinova:02PortfolioTheory Although portfolio theory is especially relevant in finance, where investors rarely hold a single asset and instead hold a portfolio of assets.

Proposals for new measurements are common but often fail to puzzle out the joint variability of returns at the same time as covariance, which helps indicate whether two assets are going to contribute or mitigate each other's risk through diversification.

- Interpretation of Covariance
- If $\text{Cov}(X,Y) > 0$, it means both securities move in the same direction. If asset X's return rises, so does asset Y's return.
- The two securities move in opposite directions if $\text{Cov}(X,Y) < 0$. Y just doesn't like success: When X is up, Y tends to be down.
- If $\text{Cov}(X,Y) = 0$, there is no linear correlation between the returns of two assets. Their movements are essentially independent.

As such, covariance is a key element of portfolio theory. Its values are unbounded (it can be a negative or positive infinite), making it impossible to compare easily across securities. This is why the correlation coefficient, a standardized form of covariance, is often preferred when interpreting results.

- Covariance Formula The formula for covariance is:

$$\text{Cov}(X,Y) = \frac{\sum[(X_i - \bar{X})(Y_i - \bar{Y})]}{N}$$

Where:

- $\text{Cov}(X,Y)$ = covariance of asset X with asset Y
- X_i = return on asset X in period i
- Y_i = return on asset Y at period i
- $\bar{X}$ = mean return of asset X
- $\bar{Y}$ = mean return of asset Y
- N = number of observations

This formula takes the difference of X values from their mean, multiplies it by the difference of Y values from their mean and averages all those products.

• Numerical Example 1 (Simple Case)

Let us say we have two assets, A and B, with the returns for 3 periods as follows:

- Asset A: 12%, 8%, 10%
- Asset B: 14%, 6%, 9%

Step 1: Determine the average returns.

- $\bar{X} (\bar{A}) = (12 + 8 + 10) \div 3 = 10\%$
- $\bar{Y} (\bar{B}) = (14 + 6 + 9) \div 3 = 9.67\%$

Step 2: Apply the formula.

Period

1

2

3

A (X_i)

12

8

10

B (Y_i)

14

6

9

$(X_i - \bar{X})$

+2

-2

0

$(Y_i - \bar{Y})$

+4.33

-3.67

-0.67

$(X_i - \bar{X})(Y_i - \bar{Y})$

+8.66

+7.34

0

$\Sigma[(X_i - \bar{X})(Y_i - \bar{Y})] = 16.00$

$\text{Cov}(X,Y) = 16 \div 3 = +5.33$

Interpretation: Because the covariance is positive, we can interpret that both assets move in a same direction.

• Numerical Example 2 (Negative Covariance)

Let C and D be 2 assets that have the following returns:

• Asset C: 5%, 7%, 6%

• Asset D: 10%, 4%, 8% Step 1: Calculate the mean returns.

• $\bar{X} (\bar{C}) = (5 + 7 + 6) \div 3 = 6\%$ • $\bar{Y} (\bar{D}) = (10 + 4 + 8) \div 3 = 7.33\%$ Step #2: Use the formula.

Period

1

2

3

C (X_i)

5

7

6

D (Y_i)

10

4

8

(X_i - $\bar{X}$)

-1

+1

0

(Y_i - $\bar{Y}$)

+2.67

-3.33

+0.67

(X_i - $\bar{X}$)(Y_i - $\bar{Y}$)

-2.67

-3.33

0

$\Sigma[(X_i - \bar{X})(Y_i - \bar{Y})] = -6.00$

$\text{Cov}(X,Y) = -6 \div 3 = -2.00$

Interpretation: The corresponding covariance is negative, receiving high value for C performing well while D performs poorly. It can be a good thing to have those types of assets for diversification: they're not highly correlated, generally speaking.

• Key Insights

Positive covariance means comovement in the same direction – this is not diversifying risk.

Covariance that is negative indicates counter movement and this is particularly welcome in diversification because losses from one asset can be compensated for by gains in another.

Zero covariance means that no clear pattern can be apparent so movements are statistically independent.

13.2.2 How Securities in a Portfolio Are Related

Covariance is an essential concept in portfolio management since it shows the behavior of various securities with respect to one another. If they do move together, or if they don't—nothing to this strategy, just as there's nothing happening with its negative (in-verse?) twin intrasecularly. Diversification is the practice of splitting investments among different assets in a manner that would reduce risk without necessarily reducing potential return.

Covariance is the statistical why and how behind this risk reduction.

1) Positive Covariance

Whenever the covariance between two securities is positive, their returns move together. If one is going up the other is also likely to go and if one goes down, so does the other.

For example: Think of two technology company shares like Apple and Microsoft. Both firms are in the same industry and thus exposed to similar industry-specific factors like Consumer demand for software, Tech Innovation or Regulation changes. If the tech business is doing great, both stocks are likely to rise together. Conversely, in a down industry both can fall at once.

Implication: Positive covariance means it is difficult for diversification to succeed as risks of the securities are commonly shared. Aggregating such assets does not yield a substantial reduction in the variability of the portfolio.

An investor who owns nothing but tech-sector stocks is running the risk of convergence.

2) Negative Covariance

Negative covariance means that the returns of two securities move in opposite directions. When one asset does well, the other does poorly.

Example: When stocks and long-term government bonds are placed together into a portfolio, the covariance between these two assets should be negative. Stock markets typically slump during economic downturns as corporate earnings soften. But at the same time, government bonds often rise in value as investors flock to safe investments, so there is a corresponding counterweight.

Takeaway: Negative covariance is the most efficient for diversification as gains in one security cancel out losses in another. "This lowers portfolio risk and volatility. In the 2008 financial crisis, for example, even as stocks tumbled, the high-quality sovereign

bonds rallied in value, providing a bulwark against catastrophic losses for diversified portfolios.

3)Zero Covariance

When two securities have zero covariance, it implies their returns are independent. The performance of one has absolutely nothing to do with the other.

Example: The yields of a local Indian retail company need not be linearly related to the global crude prices. The determinants of retail consumption, such as local income and consumer tastes, are largely unrelated to the world price of oil.

Implication: Backintuitive as it may seem, even with unrelated component returns, putting assets together does reduce overall portfolio risk by diversifying across different factors. The fact there is no correlation means that shocks to one asset class are less likely to spread into the other, and this tends to reduce volatility.

- Key Role in Portfolio Management

Covariance allows portfolio managers to:

- Match complementarities: Assets with negative and/or low covariance pose the greatest advantages when they are brought together.
- Avoid concentration risk: Investments that have a very high covariance will combine to form policies that are highly sensitive to the same risks.
- Optimal portfolios: By selecting securities with positive covariances to fill gaps in the return distributions of other security returns, investment managers limit their risk exposure for a given level of return and align the portfolio structure with the investor's preference for expected return–risk trade-off.

Did You Know?

“In portfolio management, the relationship between securities is as important as their individual risk. Two risky securities can push down the overall portfolio volatility given negative covariance. This interaction is why diversification works, and why investors often meld assets from different sectors or classes.”

13.2.3 Co-variance vs. Correlation

While covariance and correlation are related, they have different applications in financial analysis. Both are statistical methods to assess how the variables work or affect one another, but they vary in meaning, level of measurement and generalizability.

Covariance:

Covariance is a statistical measure that gives us the degree to which two securities (or variables) move in tandem. Positive variability implies that the two variables in question increase or decrease together, while negative variability demonstrates that they vary inversely.

- Range: $-\infty$ to $+\infty$.
- Scale Variance: The absolute value of the covariance is affected by different units of measurement, it's difficult to compare across asset pairs.
- Example 1: If the return of Stock A and Stock B create a covariance of +0.004. This means when the return of Stock A goes up, Stock B's return also is likely to go up. But small effect size doesn't mean it is a weak relationship, just that it is doing well in the metric.
- For example 2: Two other assets -Stock C and Stock D may have a covariance of +0.08. Although this value is larger than +0.004, it should not be concluded that the "strength" of the relationship is stronger because both covariances are contaminated by scale with respect to returns. Secondly, if Stock A and B has daily returns in decimal while stock C and D have weekly returns, then Comparing these are also not apples to apple.
- Example 3 (negative case): If the covariance between Stock E and Stock F is -0.012 then an increase in Stock E's return results mostly in a decrease in the return of Stock F. The absolute number is still not an indicator of strength without normalization as reiterated.

Correlation:

It is a scaled version of the covariance and thus easier for interpretation in different datasets. It quantifies the degree and the direction of a linear relationship between two variables. Correlation is calculated as:

$\rho(X, Y) = \text{Cov}(X, Y) / (\sigma_X \times \sigma_Y)$ where: ValidationResult $\text{Cov}(X, Y)$ is the covariance between X and Y σ is standard deviation.

where σ_X and σ_Y are the standard deviations of X and Y.

- Range: -1 to $+1$.
- Interpretation:
 - o $+1$ = perfect positive correlation (both variables increase or decrease exactly together).
 - o -1 = perfect negative correlation (both variables change in the opposite direction).
 - o 0 = There is no linear relationship in the variable.

- If the relationship between Stock A and Stock B is $+0.8$, for example, this means it has a strong positive relationship. Their returns move up and down in proportion like clockwork.
- Example 2: A correlation of negative one half (-0.5) indicates only a moderate negative relationship between Stock C and Stock D. When one goes up, the other tends to go down, though not precisely.
- Example 3: Stock E and Stock F are positively correlated at $+0.1$, which implies the correlation is very weak. There is however a very small tendency to move together, but it's really tiny.
- Example 4: Suppose there are two securities which are perfectly correlated with $\rho = +1$. Double the price increase of Stock G to 10% and that is your outcome for Stock H as well. On the other hand, if the correlation happens to be $\rho = -1$, a 5% increase in Stock G is matched by a precise 5% decrease in Stock H.

Comparison Point:

- Covariance indicates only the sign of the relationship (positive or negative).
- Not only does correlation say whether pairs are directly proportional or inversely so, it says to which degree, in a sense relative to scale (although standardized -scale is nullified- making it easy to interpret how much of this strength each pair may have).

13.3 Application in Portfolio Performance

13.3.1 The use of Variance & Co-variance in the measurement of portfolio risk

The pillars of portfolio risk measurement are Variance and Covariance. These statistics offer a picture of how risky a portfolio is, not only by isolating the behavior of each asset but also by analyzing their interrelationships.

Variance:

Variance Reveals the extent to which returns on a single asset, differ from that asset's average (mean) return. It puts a measure on volatility, the very heart of risk.

- The high variance, meaning the asset's returns are spread far from the mean, resulting in unpredictable and volatile performance. These securities are also generally riskier, but have potentially higher returns.
- If variance is low it means that the returns are closely scattered around the average (more predictable and stable). This is common with assets like sovereign debt or investment-grade fixed income.
- If average return is $x\%$ and the range of its returns be between a and b then, For example 1: Let us take an asset A with an average return of 6% having minimum and

maximum returns of Asset A. Asset A return variance is comparatively high and so the risk is also high.

- Example 2 is Asset B, a G-bond with an average return of 4% where returns vary within the small range between 3.8% and 4.2%. The variance is extremely low, i.e. the returns are steady and risk-averse.
- Numerical example: If Stock X has 0.0225 variance in monthly returns, and Bond Y has a variance of 0.0004, we can easily see that stock X is much riskier than bond Y.

Covariance:

Covariance is a gauge of how two assets move in relation to each other. Importance of this interaction in Portfolio Construction This interaction is significant in terms of portfolio construction as it decides whether adding assets brings the risk down or gears it up.

- Positive covariance: Both rise and fall together, with little diversification value.
- Negative covariance: When one asset increases in value and the other decreases, the lower of those returns acts to smooth portfolio returns overall and mitigate total risk.
- If equities and corporate bonds have a positive covariance (for instance, $\sigma_{EC} > 0$), they will both do well in economic upturns (and perform poorly in downturns).
- Example 2: Negative covariance between assets—e.g., equities and government bond Equities might return decrease in the market downturn Government bond price increases and provides portfolio stabilization.
- EXAMPLE: If two returns on a stock X and a bond Y have covariance = -0.0032 • Numerical Example: in period 1 company earns \$50,000 * $I\{X > t\}$ (where t means threshold value) separately, - if outcome of project is bad interpretation : $50,000(1/\text{Cov}(X,Y))$ is the insurance premium and $\text{Cov}(X,Y)$ is risk itself $\uparrow$ • The Fixed Income Security (Bond): payoff function $B_i > t$ in good state $i + dW_X + dB_Y$ $i \in N$ $i \in j$. This negative result shows that when Stock X returns fall, Bond Y returns rise in general, and there are diversification benefits.

Practical Use in Risk Measurement:

It's not just the aggregate variance of an individual portfolio. It does, however, rely not only on the variances of the assets but also their covariances. Although the assets themselves may be risky, this portfolio can also have less risk due to low or negative covariances among the assets.

- Portfolio variance is computed by the investors using both covariance and variance. For a two-asset portfolio (Asset A and Asset B):

Portfolio Variance (σ_p^2) = $w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2w_A w_B \text{Cov}(A, B)$ where w_A and w_B are the assets' weights σ_A^2 and σ_B^2 are their variances $\text{Cov}(A, B)$ is the covariance between them

Illustrative Example 1: An investor invests 60% in shares ($\sigma^2 = 0.0225$) and 40% in bonds ($\sigma^2 = 0.0004$). The covariance between stocks and bonds is -0.003 .

$$\sigma_p^2 = (0.6^2 \times 0.0225) + (0.4^2 \times 0.0004) + (2 \times 0.6 \times 0.4 \times -0.003) \\ \sigma_p^2 = 0.00081 + 0.000064 - 0.00144 \\ \sigma_p^2 = 0.000674 \text{ Portfolio Standard Deviation } (\sigma_p) = \sqrt{0.000674} \approx 0.0259 \text{ (2.59\%)}$$

though the weighted average volatility of stocks is 15% ($(1-w) \sqrt{0.0225}$).

8.2% because of diversification benefits.

- Example 2: Now if the covariance between stocks and bonds had been positive instead (let's call it $+0.002$), then:

$$\sigma_p^2 = 0.00081 + 0.000064 + 0.00096 = 0.001834, \text{ or } \sigma_p = \sqrt{0.001834} \approx 0.0428 \text{ (4.28\%)}$$

$$\sigma_p = \sqrt{0.001834} \approx 0.0428 \text{ (4.28\%)}$$

Here the portfolio risk is higher, indicating that diversification benefits are less potent if assets head in the same direction.

Therefore, the variance (individual risk) and covariance (co-movement between assets) together are responsible for the total risk in a portfolio.

13.3.2 Portfolio Optimization with Co-variance Matrix The standard Mean-Variance Optimization assumes that the co variance matrix is known to the investor who can then solve log-optimal portfolio and well diversified portfolio using historical asset returns collected over a period of time.

However, in presence of several securities analyzing pairwise covariance at each step is unfeasible, due to the fact that the number of relationships grows rapidly as the number of assets grow. To account for this complexity, a covariance matrix is implemented. If you're doing any sort of optimization, this matrix contains all the covariances and variances in one organized format.

What is a Covariance Matrix?

"An n by n " $\underline{1}$ covariance matrix, The variance of the i -th variable is placed in the i -th diagonal element and an σ_{ij} -element over the square's diagonal is a correlation between variables x_i and x_j .

- The diagonal entries give the variance of each asset (how risky each asset is alone).
- The off-diagonal entries are the covariance between assets (how assets move together).

For a 3-asset portfolio (e.g., Stocks, Bonds & Gold), the covariance matrix is as follows:

Stocks

Bonds

Gold

Stocks

Var(Stocks)

Cov(B,S)

Cov(G,S)

Bonds

Cov(S,B)

Var(Bonds)

Cov(G,B)

Gold

Cov(S,G)

Cov(B,G)

Var(Gold)

- Remember, $\text{Cov}(X,Y) = \text{Cov}(Y,X)$, so the matrix is symmetric.
- In this case we would have 3 variances (Stocks, Bonds, Gold) and 3 different covariances (Stocks–Bonds, Stocks–Gold, Bonds–Gold).

Numerical Example of A Covariance Matrix:

Let's say we have the values as:

- Variances: $\text{Var}(\text{Stocks}) = 0.0225$, $\text{Var}(\text{Bonds}) = 0.0004$, $\text{Var}(\text{Gold}) = 0.0049$.

- Covariances: $\text{Cov}(\text{Stocks}, \text{Bonds}) = -0.003$, $\text{Cov}(\text{Stocks}, \text{Gold}) = +0.002$, $\text{Cov}(\text{Bonds}, \text{Gold}) = -0.001$.

The covariance matrix becomes:

Stocks

Bonds

Gold

Stocks

0.0225

-0.003

+0.002

Bonds

-0.003

0.0004

-0.001

Gold

+0.002

-0.001

0.0049

This small table is all that is needed to know in order to calculate the risk and optimize the portfolio.

Why it Matters:

The importance of the covariance matrix lies in that:

- Gives a full picture of how assets relate to one another, rather than examining them in isolation.

Aids in finding out which assets are good pairs—that is, negative covariance with each other and decreasing overall risk when combined.

- Provides a basis for choosing portfolio optimization models by investors to measure total portfolio risk in an arbitrary manner.

Role in Portfolio Optimization:

The covariance matrix is used by investors in their quantitative models for assets allocation investment's decision.

The most popular approach is Markowitz's Efficient Frontier where the objective is to minimise variance (risk) subject to a given level of expected returns.

- Portfolio Variance with More Than Two Investments:

$$\sigma_p^2 = w^T \Sigma w \text{ where:}$$

o w = vector of weights, o Σ = covariance matrix, o w^T = transpose of weights.

This matrix multiplication technique does computationally efficient calculations even for portfolios with tens or hundreds of assets.

Worked Example – 3-Asset Portfolio:

Assume that an investor invests portfolio as follows:

- 50% in Stocks ($w_S = 0.5$)
- 30% in Bonds ($w_B = 0.3$)
- 20% in Gold ($w_G = 0.2$)

With the previous covariance matrix:

Stocks

Bonds

Stocks

0.0225

−0.003

Bonds

−0.003

0.0004

Gold

+0.002

−0.001

Gold

Stocks

+0.002

0.0049

investors can blend them into a portfolio that lowers total volatility without giving up return.

Example 1: Stock and Bond Mixture

Stocks: High variance (volatility) and high expected returns are usual. But stocks in the same market are often positively correlated, moving together because of similar economic conditions.

- Bonds: Tend to have less volatility, offering stable but conservative returns. Bonds are often negatively correlated with stocks (or have a low correlation) — particularly government bonds, which tend to stabilize in the event of a market downturn.

- Numerical Illustration:

o $\text{Var}(\text{Stocks}) = 0.0225$, $\text{Var}(\text{Bonds}) = 0.0004$. o $\text{Cov}(\text{Stocks}, \text{Bonds}) = -0.003$. o

Portfolio: 70% Stocks ($w_S = 0.7$), 30% Bonds ($w_B = 0.3$).

o Portfolio Variance:

$$\sigma_p^2 = (0.7^2 \times 0.0225) + (0.3^2 \times 0.0004) + 2(0.7 \times 0.3 \times -0.003)$$

$$1.11 \text{ MeV} + 2 \times 15 \text{ keV} - 62 \text{ keV} = 0.011025 + 0.000036 - 0.00126 = 9 \times 10^{-3}$$

o Portfolio Standard Deviation: $\sigma_p = \sqrt{0.009801} \approx 9.9\%$. o This also doesn't compare to stocks in isolation (15%) and it demonstrates how bonds lessen stock risk.

Example 2: Domestic Equities vs. International Equities

- Domestic Equities: These are correlated with each other because both are subject to the same home country economic policies, struggle against the other four below challenges and interest rate/currency risk. This leads to a large covariance and does not allow for tracking domestic market diversification.

- International Equities: Provide diversification, as economies can grow and inflation and political risk rise in different countries at different times. Correlations are oftentimes lower between countries.

- Numerical Illustration:

o Stocks A and B: o Covariance = 0.018 (very high, no much diversification).

o Adding International Stock C: Covariance with A is 0.004, with B is 0.003 (Notice it's much lower).

o For example, if a portfolio is comprised of 40% A, 40% B and 20% C -- Once C is added to the portfolio it will reduce the overall risk by improving the average covariance.

o In practical terms, this means that while A and B may both fall sharply during a domestic recession, C might remain flat or even rise in value if its home country economy is performing well.

Example 3: Gold as a Safe-haven Asset

- Gold: Has historically demonstrated negative or very low covariances to equities, particularly in times of financial stress. Investors tend to treat gold like a safe-haven asset, and it often gains when riskier assets fall.
- Diversifying Role: Even a slight allocation to gold in an equity-biased portfolio reduces total volatility.

• Numerical Illustration:

o Stocks variance = 0.0225, Gold variance = 0.0049, $Cov((\text{Stocks}), \text{Gold}) = -0.002$.
 o Portfolio: 80% Stocks ($w_S = 0.8$), 20% Gold ($w_G = 0.2$).
 $\sigma_p^2 = (0.8^2 * 0.0225) + (0.2^2 * 0.0049) + (2 * 0.8 * 0.2 * -0.002)$.
 $\sigma_p^2 = 0.0144 + 0.000196 - 0.00064 = 0.013956$.
 $\sigma_p = \sqrt{0.013956} \approx 11.8\%$.

o Without gold, equities only had $\sigma \approx 15\%$. The addition of gold reduces portfolio volatility to 11.8% as well taking it to the 1-3 year range, demonstrating how a safe haven boosts robustness.

Real-World Practice:

- Major institutional investors (pension funds, mutual funds, sovereign wealth funds) frequently use variance–covariance analysis to adjust the risk of multi-billion-dollar portfolios. They mix investment types including stocks, bonds, real estate, commodities and alternatives in order to achieve a better balance of risk and return.

- Covariance matrix are updated, because correlations among asset classes vary over time and risk managers stay highly aware to these changes. For example:

o In quiet markets equities and bonds may be poorly correlated. o In periods of crisis (eg, global financial crisis), correlations among risky assets tend to increase, lowering diversification gains.

Sophisticated optimization software in Excel, R, Python or MATLAB enables frequent recalculation to permit portfolios to stay true with investors' risk/return goals.

13.4 Summary

- ❖ Variance is a measure of spread, dispersion of returns of one assets which reflects volatility and risk.

- ❖ Covariance tells us how two assets move in relation to one another.
- ❖ The portfolio variance is a mixture of the variance and covariance as it measures overall portfolio risk.
- ❖ A positive covariance indicates that assets move up and down together, so there is less diversification.
- ❖ A negative covariance implies that the assets move opposite directions, enhancing diversification.
- ❖ If the covariance is zero, then we have independence and get partial benefits of diversification.
- ❖ Correlation is a normalized version of covariance that falls between -1 and $+1$.
- ❖ The risk that the portfolio is exposed to relies not only on individual asset volatility but also on inter-asset relationships.
- ❖ Covariance matrix is a structured tool for investigating the relationships of risks in multi-asset portfolios.
- ❖ The portfolio optimisation employs variance and covariance to achieve optimal balance between risk and returns.
- ❖ Deversification only makes sense if assets are not correlated.
- ❖ Actual portfolios (parts of stocks, bonds, gold, foreign stocks) do use variance-covariance analyses.
- ❖ The variance — and related measure, covariance — is the cornerstone of statistical analysis in Modern Portfolio Theory.

13.5 Key Terms

Variance: A statistical measure indicating the extent to which the returns of an asset deviate from its mean.

Covariance: A measure that shows how two asset returns move together.

Correlation: Normalized covariance that reports a measure of the strength and direction of links between assets.

Portfolio Variance: Total risk of a portfolio taking into account the variances and the covariances of the assets.

Covariance Matrix: A matrix showing the variances and covariances between a number of different assets.

Standard Deviation: The square root of variance; frequently used as a proxy for the risk of an investment.

Diversification: The practice of adding a range of investments to decrease the risk in a portfolio.

Efficient Frontier: A range of optimal portfolios constituted to display the best possible return for a given risk level.

Risk-Return Trade-off: Balance between the desire for the lowest possible risk and the highest possible returns.

Modern Portfolio Theory (MPT) A process to create portfolios deploying variance and covariance analysis.

13.6 Descriptive Questions

Explain what is variance in investment and why is it relevant as a measure of risk.

What is covariance? Use an example to depict its application in portfolio analysis.

Differentiate between covariance and correlation. Why would this type of correlation be preferable to interpreters?

Obtain and describe the formula for portfolio variance based on two assets.

What is the effect of covariance on the diversification benefits in portfolio?

Explain the role of covariance matrix in the portfolio optimization.

Describe the function of variance and covariance in Modern Portfolio Theory.

Give an example of diversification employing assets with negative correlation in the real world.

Can adding lower correlation assets reduce portfolio risk?

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13.8 Case Study

Using Variance and Covariance in the Analysis of Portfolio Risk

Introduction

Risk and return is managed by acquiring the appropriate mix of assets. Most investors believe that holding multiple assets lowers risk; whether it does depends on how the assets interact. Variance is a measure of how much the price of an individual asset fluctuates, and covariance explains how two individual assets move together. This is important because these are the tools you need to judge whether or not diversification will truly decrease the risk of your portfolio.

Background

Ms. Priya, a 30-year-old working woman, is interested in investing her savings across various asset classes.

She is mulling investments in stocks, government bonds and gold. Her financial advisor explains that:

- Equity has high variance and is more risky but give more returns.
- Bonds have a low variance and often move in the opposite direction from stocks.
- And gold tends to have a negative covariance with equities during crises, so it's a safe hedge.

Priya needs to determine what combination of investments can minimize the overall risk that would be assumed by her portfolio without sacrificing return.

Problem 1 – Misreading The Benefits Of Diversification

Priya thinks that by just having ten different equity stocks, there is already diversification. But most of these stocks exhibit high positive correlation and move in the same direction, so the portfolio retains concentrated risk.

Answer: Add some uncorrelated or negative-correlated assets (bonds, gold etc) while diversifying your portfolio to lower the correlation and variance.

Problem 2: Challenges of Measuring the Risk in a Portfolio

Priya struggles to get a handle on the specific risk content of her portfolio because calculating variances and covariances is difficult to do by hand.

Solution: Employ portfolio variance equations and construct a covariance matrix that contains an assessment of all variances and covariances. This gives a 'real' and precise representation of the overall portfolio risk.

Problem Statement 3: The Portfolio Mix is not Optimized

Priya wants to know how to determine the right split between equities, bonds and gold. If you put too much into equities, you take on risk, too much in bonds and you give up returns.

Answer: Use portfolio optimization methods (such as Modern Portfolio Theory) with a covariance matrix. This way we can determine the mix that gives us the best return for the least risk.

MCQs

Q1. What does the variation tell you about portfolio risk?

- a) Direction of returns
- b) Volatility of returns
- c) Average returns
- d) Diversification benefits

Answer: b) Volatility of returns

Q2. What does it mean when equities and gold have a negative covariance?

- a) Both move together
- b) They move in opposite directions
- c) Both have equal risk
- d) They have no relationship

Answer: b) Travel in the reverse direction

Q3. What instrument is employed to account for differences and correlations within an array of several assets? a) Risk ratio

b) Return index

c) Covariance matrix

d) Beta coefficient

Answer: c) Covariance matrix

Q4. Why are we using correlation instead of covariance for interpretation?

a) It shows average return

b) It has a standardized range

c) It always equals zero

d) It ignores volatility

Explanation: It is b) standardised range.

Conclusion

Variance and covariance determine the extent to which a portfolio deviates from its expected return. Variance measures the risk of each asset whereas covariance describes the relationship between different assets. Priya achieves substantial diversification by constructing a portfolio with low or negative covariance assets. With the aid of a covariance matrix and optimization models, she is able to balance risk and return efficiently to produce a more robust portfolio.

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Unit 14: Real-life case studies of diversified portfolio risk assessment

Learning Objectives

1. Learn how diversification can limit your losses due to overall stock market risk.
2. Discuss the importance of variance in quantifying risk for an individual asset.
3. Interpret covariance and correlation as measures of relationships between the returns to assets.
4. Use covariance matrices to evaluate the risks of multi-asset portfolios.
5. Differentiate between systematic risk and unsystematic risk when constructing portfolios.
6. Assess the effect of negatively correlated assets (ie. gold vs equities) on risk mitigation.
7. Apply Modern Portfolio Theory to develop efficient portfolios that are characterized by risk and return.
8. Evaluate actual events (e.g., financial crises) and their impacts on diversified portfolios.
9. Acquire skills required to making decisions on asset mix based on risk profiles.

Content

- 14.0 Introductory Caselet
- 14.1 Diversification in Equity Portfolios
- 14.2 Equity–Debt Diversification
- 14.3 Equity–Gold Diversification
- 14.4 Global Diversification
- 14.5 Key Insights from Case Studies
- 14.6 Summary
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14.10 Case Study

14.0 Introductory Caselet

"Balancing Risk and Return in a Diversified Portfolio Challenge, The"

Arjun is a guy who works and gets a salary. He is forty years old. For the ten years Arjun has been investing his money in different things. Arjun started investing in equities because he wanted to make a lot of money from them. Equities are like stocks. They can make a lot of money for Arjun over a long time. When the markets were doing well Arjun made a lot of money from his investments, in equities. This made Arjun think that investing in equities is the way to make money. Arjun likes equities because they can make him rich.

The 2020 COVID-19 crisis really shook Arjuns confidence.

In a few weeks the stock market fell apart and the value of his stock investments dropped a lot.

The markets did get better on.

What happened to Arjun during that time made him realize that the COVID-19 crisis and the stock market are important to think about.

The COVID-19 crisis and the stock market made Arjun think that making money is not the thing that matters.

The COVID-19 crisis and managing risk are just as important especially since Arjun is getting close, to retiring from his job and the COVID-19 crisis is still a concern.

So Arjun went to see an adviser who told him it would be an idea to spread out his investments, in his portfolio. The adviser said:

- Stocks: Necessary for long-term growth but prone to dramatic volatility.
- Treasuries are a choice if you want to play it safe. They do not change much in value so you can count on them to help when the stock market is doing badly. This means Treasuries can help reduce your losses when stocks are not doing well.
- Gold is something people buy when they want to protect their money. It is like a safety net. When stocks are doing badly Gold usually does well. This means Gold is a thing to have when things are not going well with stocks. It helps reduce the risk of losing money because it tends to move in the direction of stocks. So people like to buy Gold when they're worried, about their stocks. Gold is a hedge.
- Funds: international and ETFs - more outside the U.S market exposure, less reliance on home country's performance in the market spreading risk.

Arjun is now at a crossroads. He knows that ownership of various asset classes lowers portfolio variance and provides a cushion in downturns. But he is also concerned that he has too much in safe assets and worried that might be constraining his ability to create long-term wealth. (His challenge is finding the right mix that maximizes growth potential with protection from risk.

Key Learning Connection

This caselet is based upon the principles of MPT, and demonstrates that:

- Diversification doesn't function by holding more assets, but through combining them if they have low or negative correlations.
- Variance and covariance are available tools for measuring portfolio risk.
- A portfolio's target asset allocation is less important than an investor's risk tolerance, time horizon, and financial goals when choosing investments.

Critical Thinking Question

If you were Arjun's financial planner, how would you suggest he allocate his portfolio between stocks, bonds, gold and funds that invest overseas in order to enhance overall performance and mitigate risk?

- How are variance and covariance relevant to your recommendation?
- What impact would his age, stability of income and retirement goals have on the asset allocation plan?

14.1 Diversification in Equity Portfolios

14.1.1 Case: IT & Pharma Portfolio in COVID-19 Situation

The COVID-19 pandemic was a once-in-a-lifetime global experience that transformed economies, industries and investment approaches. It is a valuable case study of how the sectoral diversification of equity portfolios shielded investors from catastrophic losses. There were some sectors including aviation, hospitality and retail that did not withstand the quarantine measures and demand shocks, but others such as Information Technology (IT) companies and pharmaceuticals industries survived -and even thrived.

The IT industry did well during the pandemic. When everyone had to stay home people turned to things to get work done. This meant that working from home was the normal and people needed tools to work together keep their computers safe and use technology that was not on their own computers. Big companies around the world started using things faster which meant they needed help from IT companies, in India so

they hired them to do some work. Firms like Infosys, TCS and Wipro saw their revenue go up a bit. This happened because their customers were being careful, with their money and did not want to spend much on things they did not really need. The people who owned stocks in these IT companies made some money. This is because Infosys, TCS and Wipro kept working when things were tough. They were also able to find some opportunities that came out of the pandemic.

- IT Sector: The move to services and cloud based solutions happened really fast. This shift, along, with working helped Indian IT companies make more money than expected. As a result the stock market did well for these Indian IT companies.

The Pharma sector did well in a tough time. When the whole world needed vaccines, medicines to fight off viruses and better healthcare systems pharmaceutical companies became very important. Indian companies like Dr. Reddys, Sun Pharma and Cipla played a role, in making medicines and getting vaccines to people. The Pharma industry kept working hard as governments and big organizations put a lot of money into healthcare. As a result Pharma stocks did well and became a good investment during this tough time. The Pharma sector was really important. The Pharma companies did a great job. Some industries that go up and down like the people who find and sell materials did not do very well.. Pharmaceuticals are different. They have had a stream of customers and seem like a safe choice for people who lost money in other industries like the raw material sector. Pharmaceuticals look like an option for people who got hurt by investing in things, like the raw material sector.

- Performance of the Pharma sector: The Pharma sector is doing well because people around the world need good health care and there is a lot of work being done on vaccine development. This means that more people want to buy Pharma stocks, which makes the price of Pharma stocks go up and that is good for people who own Pharma stocks because they get returns, from the Pharma sector.

For investors this was a choice because Information Technology and Pharmaceutical companies, in their investment portfolios helped a lot when the market had problems. Even though travel, hospitality and retail businesses saw a drop because of rules and less demand Information Technology and Pharmaceutical companies were very stable and even grew in some cases. This meant that investors who had money in many of these areas did not see many ups and downs as other parts of the market so they were safer. Information Technology and Pharmaceutical companies really helped to keep things calm. When we look at companies that are not doing well the losses from these companies are balanced out by the gains from areas. These areas are the types of businesses that people always need, like food and healthcare well as areas that are growing, like technology. So when we put all of our money into types of investments like these companies our overall investment is doing okay. Diversified portfolios have held up because of this balance between areas and growth areas. The money we put into

areas like food and healthcare helps when other areas are not doing well.. The money we put into growth areas, like technology helps our investment to grow over time. Diversified portfolios are doing well because they have a mix of these types of investments.

- **Investor Portfolio Impact:** When you have a mix of IT and Pharma in your portfolio you will not lose much money when the market goes down compared to when you have many stocks in just one sector that is doing poorly. This shows that having investments, in sectors is very important to protect yourself from big losses.

This case is an example of how to spread your investments in a smart way. It is not about buying many different stocks and bonds. You also need to put your money into types of businesses that do well at different times.

The pandemic was a time for many people.. It showed that investing in Information Technology and Pharmaceutical companies can help keep your money safe. These types of companies can do well even when other companies are struggling. This is why it is so important to have a balance of different types of investments in your portfolio. Investing in different sectors can help you when there are big problems, in the world. Information Technology and Pharmaceutical companies can help stabilise your investments when things get tough.

14.1.2 Sector Rotation and Risk Management Lessons

The IT and Pharma industries during the COVID-19 pandemic have some lessons for investors. These lessons are, about how to manage risk and move investments around to keep a portfolio safe and get returns. What does it mean to move investments around like this? It means you take your money out of one part of the market and put it into another part. You do this based on what's happening with the big picture of the economy and what is going on in other parts of the market. The reason people do this is that they know different parts of the market do not do the same when things are the same. The IT and Pharma industries are an example of this. They show that sector rotation can be a way to keep your investments safe and get good returns. Sector rotation is a thing to think about when you are investing in the market. Some people make money when things are going well.. A lot of people use these things to protect themselves when things are going badly. Smart investors know this. They move their money around.

The pandemic was really tough on some industries like airlines, oil and gas and tourism. These industries like airlines, oil and gas and tourism had a lot of problems because people were not allowed to travel they did not need much energy and everything just stopped moving around the world.

They lost a lot of money because not many people were using services from airlines, oil and gas and tourism industries. This made the value of their companies go down quickly.

On the hand industries like IT and Pharma were doing well. This is because industries, like IT and Pharma were strong and could keep growing even when things were tough. The information technology companies that work with pharmaceuticals did well because the whole world started using digital things more and more. People needed healthcare and vaccines so the focus was, on the pharmaceutical industry. The people who started working in these industries made a lot of money.. The people who kept working in industries that were not doing well lost money. This shows us that it is very important to know when big changes are happening so we can switch to an industry at the right time. The information technology companies that work with pharmaceuticals and the pharmaceutical industry itself are examples of this.

- Sectorial Rotation: When people invested money in areas like Information Technology and Pharmaceutical companies during the pandemic it really helped them reduce their losses and make some gains. On the hand putting money into areas like Tourism or Aviation led to big drops in the value of their investments. This shows how important Sectorial Rotation is, as it can really affect your money. Investing in the areas like Information Technology and Pharmaceutical companies can make a big difference while areas like Tourism and Aviation can be risky. Sectorial Rotation is, about moving your money to the right places, like Information Technology and Pharmaceutical companies to make the most of it.

We can learn a lot about managing risk.

First we need to avoid putting all our money in one area.

If we invest much in one industry like retail or aviation we can lose a lot of money.

Investing in industries helps to reduce this problem.

We should also change our investments from time to time.

This is why we need to look at our investments and make changes when necessary especially when things are not going well and we need to move our money to industries that are doing okay.

Managing risk is important. We need to think about it a lot when we are investing in different things, like retail or aviation and other industries. Third the defensive sectors like pharma, FMCG and utilities are good for our portfolio because they provide protection.

These sectors are like a cushion.

They help when other industries that are sensitive to cycles do not do well.

The defensive sectors such, as pharma, FMCG and utilities help our portfolio when we need them to.

- Do not put all your money in one place: If you have a portfolio that only invests in one area of the S&P 500 you will likely lose money if that area does poorly.. If you have a portfolio with investments, in many different areas the S&P 500 investments will be safer if something bad happens to one of them.
- Tactical portfolio reshuffling: Keeping an eye on the investment and reshuffling in sector with more resilience helps curtail downside risk during meltdown.
- Defensive Sector Exposure: Stable defensive sectors to offset the effects of cyclical volatility.

A second key lesson is that of correlation between sectors. #IT, #Pharma were a mismatch with aviation, tourism and retail during COVID-19_LOCKDOWN_DAY5 The combination of low or negative correlation sectors helped to reduce systemic risk in the portfolio. Worldwide perspective is also critical, as worldwide disruptions do not impact all industries in the same way. For instance, foreign demand for Indian pharmaceutical exports increased, whilst global curbs depressed demand in aviation and tourism. And following global trends lets investors predict the risks and opportunities in domestic portfolios.

- Reading Between the Sectors: Low or negative correlation means that losses in one sector are offset by gains in another.
- Global Perspective: Monitoring global economic changes allows for better management in the domestic portfolio.

Example: An investor with ₹10 lakhs, patiently split in half between aviation and tourism stocks, lost close to 50% during March–April 2020. An investor who had moved half of the assets into IT and Pharma right at the beginning of pandemic incurred much lower losses, and in fact made some money (as those sectors outperformed). And this is how sector rotation and risk-management practices can protect one's wealth during times of crisis.

“Exploration: Analyzing Sector Diversification During COVID-19”

Form groups and check the performance of IT,Pharma, Aviation and Retail during this covid period. Learn which sectors offered stability and which were at risk. Detail how an ITnPharma heavy portfolio would indemnify against losses elsewhere. Present findings with supporting evidence.

14.2 Equity–Debt Diversification

14.2.1 Case Balanced Mutual Funds in India

Mutual funds that are balanced or hybrid are really good for people who want to make their money grow and also keep it safe. These funds put your money into two kinds of investments: equity and debt. This way you get the benefits of both in one place. For people who do not know much about investing or do not have the time to check their investments often balanced mutual funds are very helpful. They automatically spread your money around so you do not have to worry about it. In India a lot of people, like these funds because they want to make money like they would with equities but they also want the safety that comes with investments that are backed by assets and pay an income.

The money you make from equities over a time is what makes the equity part of balanced funds go up. Investing in equities which're in different sectors helps your money grow and be a part of how the market is doing. On the hand putting money in debt gives you stability and a steady flow of cash. The debt part is made up of things, like Government securities and corporate bonds and money market instruments. These things help when the markets are not doing well they balance out the risk of putting money in stocks which's the equity part. Investing in equities is a way to make money over time and debt helps to make sure you do not lose a lot of money when the market is bad. the interplay of equitiy and debt results in a less volatile return profile compared to pure equity investments.

- Equity Investment: This is a way to make your money grow and get richer over time. But the thing is, Equity Investment is tied to the market so it can be really unpredictable. Change a lot.
- Debt allocation is good because it helps keep your money safe gives you an amount of returns and reduces the overall risk of your portfolio. This means debt allocation is like a protection for your money. It also helps make sure you get some returns, which is a good thing, for your portfolio.

Institutional management is really important. When we look at fund managers at mutual funds they do a lot of work. They check what is happening in the market. Think about big picture things like the economy and how much things are worth. They then change what they own like stocks and bonds based on what they think will happen in the market and what they want to achieve with their investments. Fund managers at mutual funds do this all the time so the fund is always ready for what might happen and can try to make good returns without the person who invested needing to do anything. Fund managers, at mutual funds make sure of this.

Balanced funds in India come in forms to meet the different risk levels that people are comfortable, with:

- **Equity-Oriented Hybrid Funds:** These Equity-Oriented Hybrid Funds put than 65 percent of the money in stocks and the tax rules are the same as Equity-Oriented Hybrid Funds. Equity-Oriented Hybrid Funds are a choice for the investor who wants to take some risk and get a little more money back. This type of investor is looking for some returns from Equity-Oriented Hybrid Funds, with a bit of safety.
- **Debt Oriented Hybrid Funds:** These funds put most of their money into debt instruments. In fact than 65 percent of the total assets are debt instruments. This makes Debt Oriented Hybrid Funds a good choice for investors who want to play it safe. Debt Oriented Hybrid Funds are suitable, for investors who want stability and do not want to invest in equity. They like Debt Oriented Hybrid Funds because they offer stability with little risk.
- **Dynamic Asset Allocation Funds:** These funds put money into stocks and bonds in amounts depending on how the market is doing. They can change what they invest in when the market changes. This means Dynamic Asset Allocation Funds are flexible and can adjust to market conditions. Dynamic Asset Allocation Funds do this by looking at the market and deciding whether to invest more in stocks or bonds.

The thing about funds in India is that they can be really useful. For example when the COVID-19 pandemic happened in March 2020 the stock market went down fast. The Nifty 50 index fell by than 30 percent in just a few weeks. This meant that people who had invested in stocks lost a lot of money.. Balanced mutual funds did not lose as much money because they also had some debt investments, which were not affected as much by what was happening. Balanced funds in India helped to reduce the losses for investors during this time. The debt part of funds was safe from the problems, in the market. Government securities and corporate bonds provided an income, which really helped to stop the whole portfolio from losing all its value.

Over the few months the markets started to do well until the middle of the year.

During this time putting money into equities or equity investments made money from the market rally and the equity investments were very profitable.

The debt or debt investments helped to protect against any risks that might happen in the market in the future.

This means that people who invested in funds, which include both equity and debt investments probably got their money back faster and did not lose as much as people who only invested in equity schemes or equity investments.

The balanced fund investors were better off because their investments were not as volatile as the equity investments.

The government securities and corporate bonds and the debt investments were very important, in making sure that the portfolio did not lose all its value and that the investors were protected from market risks.

- Example: In March 2020 when funds with investments in equity fell as much as the market did on average balanced funds fell by a lot less. This is because balanced funds also have debt investments. Over the year as equity investments rebounded balanced funds recovered the lost value. This shows how the automatic diversification of funds worked in real life. Balanced funds have equity and debt. This mix helped them. When equity investments went up again balanced funds got back the value they had lost which's a good thing, for people who invest in balanced funds.

Investing in India is really easy with this option. It is a choice for investors who want their money to be safe and grow over time. This investment option is managed by professionals so the investor does not have to worry about keeping track of everything. The investor gets safety and growth all in one thing, which's very convenient. This investment option in India gives the investor stability and growth without the hassle of keeping track of investments or rebalancing them. Investing in this option is an idea, for people who want a simple way to manage their money in India.

14.2.2 Risk Mitigation with Asset Allocation

Asset allocation is the arrangement of investments in a portfolio across different asset classes like Equities, Debt, Gold or Real estate. It is the single most important driver of portfolio returns and risk.

Asset allocation is a way to reduce risk when it comes to investing. It means spreading your money across types of investments like stocks and bonds. This helps because it is unlikely that all of your investments will do poorly at the time.

Asset allocation reduces risk by giving you a mix of things that tend to do in different situations. For example when stocks are doing badly bonds might be doing well. So if you have both stocks and bonds in your portfolio you will be better protected.

The key thing about asset allocation is that it helps you manage risk. Asset allocation is not a way to make a lot of money quickly. It is a way to help you achieve your long term goals. Asset allocation is important because it lets you sleep at night knowing that your money is spread out and that you are not putting all of your eggs in one basket.

There are different ways to allocate your assets and the right way for you will depend on your own personal situation and goals. You might want to talk to an advisor to figure out the best asset allocation for you. Asset allocation is an idea, for anyone who wants to reduce their risk and achieve their long term goals.

- Risk Balancing:

Equities are a type of investment that can give you potential returns but they can also be very volatile.

On the hand debt provides relatively stable and predictable cash flows, which means it is not as risky.

When you combine equities and debt in a portfolio it can really smooth out the performance of your investments so you do not have to worry much about big losses.

Equities and debt are a combination because equities can give you high potential returns and debt can provide stability.

- **Cushioning Fluctuations:** When the stock prices change a lot. Because of surprises in the market. This usually means that the returns on debt are pretty stable. The debt is like a safety net, for the Cushioning Fluctuations so it helps to balance things out. The Cushioning Fluctuations work to reduce the risk of losses when the stock prices drop suddenly.

- **Investor Suitability:**

For investors who're young they have a long time to invest and can handle taking more risks with their money so they should put more of their money into things like stocks. For example they could have seventy percent of their portfolio in stocks and thirty percent in bonds. This way the young investors are focusing more on stocks like seventy percent stocks and thirty percent debt, which's a good thing, for people who have a long time to invest.

People who are close to retiring and have money invested are very careful. They do not want to lose their money. So they put a part of their money in safer things like debt. For example they might put thirty percent in debt. Seventy percent, in other things.

- **Types of Allocation Strategies:**

- o **Strategic Allocation:** Long-term blend according to objectives, risk tolerance, and time horizon.

- o **Tactical Allocation** – Short-term changes in response to economic/market conditions (i.e., increasing allocation to debt during recession).

- **Risk Tolerance Factor:** When we talk about asset allocation it is about finding the right fit for the customer. We can find a mix, for all kinds of investors whether they are conservative investors or aggressive investors.

You might be wondering about something so let us tell you something. Did you know is what people say when they are going to tell you a fact, about something that you probably do not know about the thing.

The performance of your investments mostly depends on how you allocate your assets. In fact than 90 percent of the returns you get from your portfolio over the long term are because of how you allocate your assets not because of the specific stocks and bonds you pick.

When you spread your money across types of investments like stocks and bonds you can reduce the ups and downs.

Asset allocation is the key, to managing risk in a way.

14.2.3 Performance During Market Volatility

The thing about equity and debt is that it really matters when things are not going well. When people are not sure what is going to happen the financial markets can be over the place. This is because of changes in how people feel about things or when there is not enough money to go around or when something big happens outside of the market.

Equity is usually thought of as a way to make money over a time but it can also be affected by short term problems, with the economy, politics and the world.

Debt securities are a bet when the market is being crazy. They can still make money when the market is bad. This is why it is good to have a mix of equity and debt. When you combine the two you get a portfolio that can handle drops, in the market but it will also bounce back quickly when the market snaps back. This is what happens when you put the two together you have a portfolio that can withstand drops but the portfolio will still catch snaps back and start to rise again so you do not have to worry about the portfolio. The portfolio can handle the drops and it will also catch snaps back.

This combination of being bold and responsible is not about using numbers to get the best result but it also helps people feel safer. When people have a mix of investments that do not go up and down a lot they are more likely to keep their money in the market and stay invested. To put it simply putting money into types of investments like stocks and bonds helps reduce the chance of losing money and it also helps people feel better, about investing in the stock market and investing in bonds.

Performance During Equity Market Crashes

The downsides of portfolios are really clear when the stock market takes a big hit. An all stock portfolio can be really scary because it can lose a lot of value quickly sometimes wiping out gains that took years to make in just a few months. This can cause a lot of trouble and people can get really scared which leads to news everywhere and a lot of people selling their stocks making the problem even worse, for concentrated portfolios.

On the hand a portfolio that has debt instruments in it is very safe. Debt instruments, like government bonds and good quality company debt usually do not change much in price. Can even go up when interest rates are lowered because of an economic

problem. Then something else happens, when you have a loss your portfolio costs you less which makes things a little easier for investors and they do not feel like clicking "Sell" much. This makes investors feel better, about debt instruments because debt instruments are a way to protect your portfolio.

Performance During Bull Markets

When the economy is doing well and people feel good about the market stocks do a lot better than other types of investments. If you have a portfolio that is only made up of stocks you will get all the benefits when the market is going up fast. The stock market can grow quickly.. The thing that makes stocks give you bigger returns. The fact that they are riskier. Is also what makes them more likely to lose value quickly. Stocks are what make this happen to your portfolio. Stocks can be bad, for your portfolio when the market corrects itself.

Debt is important when the market is doing well. The regular income from debt securities helps to keep the portfolio steady and stops the values from going down too much. Debt investments also prevent people from putting much money into stocks so if the market starts to go down they will not lose all the money they made when things were going well. Debt helps to keep things stable and prevents the economy from having ups and downs. Debt is, like a safety net that keeps growth at a level and stops the economy from getting too out of control.

Evidence from the Indian Market

2008 Global Financial Crisis

The big financial crisis in 2008 was really tough for investors around the world. What happened was that the Indian stock market went down like the rest of the world. The Sensex and Nifty dropped than 50% from their highest points ever. This was very bad for investors who only had stocks. They lost a lot of money.

Investors who had a mix of stocks and other things like bonds did not lose as much money. This is because bonds were pretty stable. So when the markets started to calm down these investors were able to get on their feet much faster. The financial crisis of 2008 was a test, for investors and the Indian stock market including the Sensex and Nifty was heavily affected.

COVID-19 Pandemic (2020)

The COVID-19 pandemic that started in March 2020 brought a lot of uncertainty that advocates of stocks had never seen before. Indian stocks went down quickly they were hurt by the shutdowns and the economy slowing down and also by investors pulling their money out of the country.. The COVID-19 pandemic did not have a big effect on debt instruments like government bonds and high-grade debt. Some funds, called funds that combined debt with other investments helped protect people from losing money

and actually did better than investments that only included stocks these hybrid funds gave people higher returns, for the amount of risk they took. This showed that diversification was not a way to limit losses but also a way to keep investment discipline when things get tough with investment shocks. Diversification helps people to stay calm and make investment decisions even when the investment market has big shocks. Diversification is a thing, for people who invest money because it helps with investment losses and investment discipline.

Long-Term Trends in Hybrid Funds

There are studies in India that show funds have a more stable return over a long time. Even though funds that only invest in stocks can be really unpredictable hybrid funds, like funds give steady results. This means that people who invest in them are less likely to pull out their money because they are scared and they can keep their money invested and see the benefits of it growing over time. Hybrid funds are a choice because they help people stay invested and benefit from the power of hybrid funds over time.

Broader Observations During Volatility

- Psychological Cushion

Losing money in your portfolio can be really tough on your mind. Investors are people with feelings. They often make the mistake of selling when things are at their worst. Having some debt in your investments can help make those losses a little easier to handle which makes you more likely to keep investing in your portfolio. Debt helps to soften the blow of losing money in your portfolio, which's a good thing, for your investment.

- Behavioral Advantage

Balanced portfolios are really good because they do not have losses. This is important for investors. When investors have portfolios they do not panic and sell everything when the market is bad. Balanced portfolios are better than portfolios because they help investors avoid big losses. They are also good for investors because they help them to not make decisions when things are going wrong. Balanced portfolios are the way to invest because they are good, for the investors money and they help the investor to stay calm.

- Uninterrupted Compounding

This thing helps people keep their money invested for a time. It means big problems do not stop people from investing in things. People can just keep their money where it is. It will still grow over time. The money will grow because people do not have to start over again when things go badly. This is what makes investing work people can just leave their money alone and it will get bigger. Investing is, like that it helps people make money when they just leave it alone.

- Evidence of Resilience

During periods of variously characterized volatility from domestic (demonetization) to global crises, diversified asset returns prove relatively more resilient. This is valuable evidence as to the soundness of asset allocation as a long-term wealth preservation and growth strategy.

14.3 Equity–Gold Diversification

14.3.1 Example: Gold as Protection Against Market Risk

Gold is something people turn to when things get tough. The value of gold does not really go down when the economy is bad or when there are problems in the world. This is different from stocks and bonds. The price of gold is not based on how companies are doing or what is happening with interest rates. It is also not based on how one country's doing. The price of gold is based on how rare it's how much people want it what people think about it and the fact that gold has been a valuable thing for a very long time. Gold has been a store of value for thousands of years. That is why people still want it today. The value of gold is determined by a combination of these things, including scarcity and demand from people around the world and investor sentiment and the fact that gold has been a valuable thing, for thousands of years gold is still a valuable thing. Gold has a quality that makes it very important to have in investment portfolios. This is particularly true when things are really uncertain. Gold is a way to mix things up in your investments so it is a good idea to have some gold in your portfolio. Gold helps because it is different, from investments and that is why gold is so important to have.

Why Gold Acts as a Hedge

Safe-Haven Demand

During market turbulence, such as recessions, equity market crashes or systemic financial crises, people frequently sell risky things and buy gold. This “flight to safety” boosts the price of gold, which helps protect portfolios from large losses in general. Gold’s negative or low correlation to stocks makes it a better hedge.

Inflation Protection

Traditionally, gold is seen as a hedge against inflation. When inflation erodes the real value of paper currency, the value of gold does not fall in relation to it. History shows that in inflationary environments, real returns on equities and bonds can turn negative whereas gold offers a fairly stable store of purchasing power.

Global Acceptance and Liquidity

Gold is different because it is accepted among markets, countries and economies. It is in demand not only for industry, but also for investment (the metal being held as an alternative to another instrument), central bank reserves and cultural consumption (jewellery) – unlike the case of other commodities. This brand acceptance is reaffirmed by it as a hedge in the cross-border financial or political instability.

Historical Illustrations

- 2008 Global Financial Crisis

While global equities shrank almost 50%, the price of gold skyrocketed. Investor concerns around banking failure, defaults and systemic risk saw investors move their assets into gold proving its safe haven qualities during financial crisis.

- COVID-19 Pandemic (2020)

Indian and world bourses plummeted in March 2020 on fears about the economic fallout of the pandemic. At the same time, gold prices in India crossed ₹50,000 per 10 grams to hit a record level. This signaled to investors the value of gold as a protector against financial insecurity and even unique global crises.

- Geopolitical Events

When there is a war or problems with trade and money people usually want to buy gold. For example when the United States and China have trade problems and some countries have money troubles the price of gold goes up. This happens because people want a place to put their money when they are worried about big problems, in the economy. They think gold is a choice so they buy more of it which makes the price of gold rise.

Investor Takeaway

I think about my investments and I look at what the experts say. They do a lot of research. They test their ideas with past results. What they find is that putting a bit of gold like 10 or 15 percent into my investments can really help when the stock market has a big drop. Gold does not give me any payments but it is good to have because it keeps its value even when my other investments, like stocks do poorly. For me gold is not something that will make my investments grow a lot. It is, like having insurance that helps me stay safe when things are not going well.

14.3.2 Indian Portfolios of Nifty 50 and Gold

For investors a good way to spread their money around is to put some of it in Indian stocks using the Nifty 50 index and some of it in gold. The Nifty 50 index and gold holding are a pair because they try to capture the potential growth of India's biggest and most important companies while also giving protection against uncertainty through gold. This kind of investment is not about new ideas from finance experts but also about

what Indians have always done. Gold has always been something that Indians really value and want to own. Indian investors like to invest in the 50 index and gold because they believe in the potential of Indian companies and they also like to have gold, as a safe investment. The Nifty 50 index gives investors a chance to own a part of India's biggest companies and gold gives them a way to protect their money when things are not certain.

Return contribution of Nifty 50 to the Portfolio

The Nifty 50 is a deal in the Indian stock market. It shows what is happening with the most popular Indian stocks. People think the Nifty 50 is a way to see what is really going on in the Indian stock market. When you add the Nifty 50 to a portfolio it has some things, about it:

Diversified Equity Exposure

Investors can get into the Nifty 50 through things like 50-related ETFs, index funds or futures. This means they can invest in a lot of areas, like banking, information technology, energy, consumer goods and pharma. The Nifty 50 gives people a way to put their money into all these sectors.

When people invest in things they are making sure they do not lose all their money if one company does badly. This is because investors are protecting themselves against the risks that're specific to one company. Investors are spreading their risk to avoid problems that're unique, to one particular company. By doing this investors are really protecting themselves against company risks.

Wealth Creation Driver

Equity is still the thing that helps people create wealth over a long time.

Stock markets usually go up when the economy is doing well.

When the economy is growing fast the stock prices of the Nifty 50 companies go up because these companies are making a lot more money.

This is what makes the stock prices rise it is really because of the increase, in the profits of the Nifty 50 companies.

Representation of India's Economic Strength

The Nifty 50 index is made up of companies that're leaders in their industries. These companies show how well Indian businesses are doing and how the economy is growing. So when you invest in the Nifty 50 you are basically a part of the Nifty 50. You get to be a part of India's growth story, with the Nifty 50. This means you are investing in the Nifty 50 and the Nifty 50 helps you see how India is growing.

Role of Gold in Portfolios

So when you invest in equities you get growth. You also get a lot of ups and downs. Gold is different it is, like a thing to have in your investments:

Crisis Hedge

Gold is something people turn to when things get tough. When the stock market is doing badly and people are not sure what to do they usually want to buy gold. This means the price of gold goes up. Gold does a job of keeping our money safe. Gold is, like a safety net that helps our investments when the stock market is slumping. Gold demand goes up. That makes the price of gold higher. The price of gold helps balance out the losses we might have in the stock market. Gold is what people call a thing to invest in.

Wealth Preservation and Liquidity

Gold's price does not follow the same trend as equities, which often move in the opposite direction. It's less fickle in its value. It is also very liquid and investors are free to buy or sell physical gold, ETFs, sovereign gold bonds at will.

Global Acceptance

The universal acknowledgement of gold sees its relevance never diminished whether at home or internationally. It does therefore provide stability that equities cannot by themselves.

Practical Observations from Indian Markets

Bull Market Scenario

The Nifty Fifty, in times of financial optimism and prosperity will normally go on a bellwether rally which mirrors the skyrocketing earnings and investor sentiment. During such periods, gold can trade sideways to lower as investors exit positions in favour of riskier assets. However, the portfolio overall is looking good with equities delivering the lion's share of returns and gold offering low cost insurance in this environment.

Bear Market Scenario

Because when the Nifty 50 sees steep falls due to recessions, policy uncertainties or global shocks, gold usually travels in the opposite direction. Since gold prices typically increase during times of negative news, investors remain confident even when their portfolio values suffer.

Indian Data Example (2018–2020)

Indian equities witnessed significant volatility from 2018 to 2020 with the initial disruption emanating from global trade tensions and later on due to COVID-19. The Nifty 50 saw a few corrections, signalling uncertainty in the growth of earnings and in the liquidity position.

Broader Implications

- Risk-Return Balance

When you put gold into a portfolio that has a lot of Nifty 50 in it you may not get returns when the market is doing well.. Over time gold helps to make the returns more stable. This means that people who invest in gold will see their money grow smoothly and it will not go up and down as much as other investments. The gold in the portfolio helps to reduce the risks so investors get returns, for the amount of risk they are taking with their Nifty 50 investments and their gold.

- Behavioral Advantage

Gold allocations are really helpful because they prevent investors from getting really scared and pulling out of the market quickly. This is because gold helps reduce losses when things are not going well. I think this is better than trying to make a little more money. Gold allocations are very good, at doing this.

- Strategic Allocation

People in India can put their money into something if they do not put than twenty to twenty five percent of their money into Nifty. This is a way to invest in the stock market and it is like the main part of their investments. It is like a story of how India's growing and it also includes some money, in gold around ten to fifteen percent. This way of investing gives people a chance to make their money grow. It also helps to keep their money safe over a very long time.

14.3.3 Impact on Risk-Adjusted Returns

When we look at investments we need to think about more than how much money they make. We also need to think about the investments and how they make that money. Is it steady. Does it go up and, down a lot?. What kind of risk is involved with the investments? This is where we need to think about the investments and their risk-adjusted returns. If an investment makes a lot of money but is really unpredictable it is not an idea because it can cause people to lose money and have to stop investing early with their investments. On the other hand, a moderate but consistent return approach is often more successful because it forces investors to be patient over many years.

It is in this sense that equities (growth-oriented but very volatile) and gold (defensive and stabilizing), when combined, offer a significant improvement to the risk-adjusted return profile of a portfolio.

Sharpe Ratio Enhancement

The Sharpe ratio is the amount of excess return above risk (standard deviation of returns).

- Equity-Only Portfolios

Stock portfolios tend to outperform over the long run, but typically show more volatility as a cost for it- thereby decreasing the Sharpe return.

- Equity + Gold Portfolios

Gold decreases the total portfolio volatility as it has a lower or negative correlation with stocks throughout history. Even if the total gains are roughly the same, the better returns stability boosts Sharpe. This means that investors are getting lower returns for any given level of risk taken on.

Eg 100% Nifty 50 portfolio may be more volatile than a 80% nifty 50 +20% Gold Portfolio. As far as the returns are higher for one portfolio than another, their difference could diminish over time, but the return per unit of risk (volatility) may remain superior for this better portfolio.

Reduced Maximum Drawdowns

- Equity-Only Portfolios

Equity markets can fall 30 – 50% or so in times of distress. These shocking losses also work to undercut investor confidence and it can take years for prices to rebound just like the were before a collapse.

- Equity–Gold Portfolios

Gold tends to move in the opposite direction of stocks, so the presence of gold plays as a natural hedge. Gold portfolios losses tend to be relatively shallow and therefore they snap back sooner.

Stable Return Path

Reduced Volatility of Returns

Gold portfolios are what we are looking at. For the gold portfolios we're considering when we compare how they do over time we can see that they do really well and it is pretty steady. The gold helps to make the ups and downs of the equity markets less crazy so the gold portfolios have a stable way of making money. Gold portfolios are good because they make the returns more stable.

Behavioral Benefits

People who invest money often make the mistakes. They usually take their money out of the market when it is doing badly and put it in when it is doing well but it is already too late. If you have gold in your portfolio it makes you feel better when the market is

crashing. This helps people who invest to stay calm and not pull their money out. Gold helps investors stay invested in the market. By doing this and not taking their money out when they are scared investors can make money over time because their money has a chance to grow. Investing in gold and staying in the market is a way for investors to make the most of their money.

Empirical Evidence in India

Hybrid Portfolio Outcomes

When you look at the portfolios that have eighty percent in Nifty 50 and twenty percent in gold you can see that they do well if you hold them for a long time. These portfolios give you returns that're almost as good as portfolios that are one hundred percent equity. The good thing is that they are not as unpredictable, as the ones. You do not lose much money when things go down.

COVID-19 Pandemic (2020)

The Nifty 50 went down a lot, than 35 percent, when people sold their shares quickly in March 2020. At the time the price of gold went up really high it was more than ₹50,000 for just 10 grams of gold. If you had a portfolio that had both the Nifty 50 and gold in it you would have lost money and your portfolio would have gone back to what it was before the crisis really fast which means you would have got better returns, for the risk you took with the Nifty 50 and gold.

Long-Term Evidence

I looked at what happened in three events: the financial crisis in 2008 the "taper tantrum" in 2013 and the pandemic in 2020. Indian data shows that mixing equity and gold in a portfolio is an idea. This strategy is very appealing in a place like India where the equity market can be really volatile. The Indian data from these three episodes validates that equity and gold diversification is good, for portfolio efficiency.

Key Takeaway

This example of the equity and gold combination shows that having investments is not just about getting the most money back in a short time. It is about finding the balance between getting a good return and taking on too much risk, with your equity and gold investments.

- Gold helps to calm down swings, in the market without really hurting the money you make over a long time when you invest in Gold.
- The Sharpe ratio and other risk-adjusted measures go up a bit and show that things are working more efficiently with the Sharpe ratio.

- Having drawdowns and smoother performance paths really helps protect investors from making bad decisions because of how they feel.

In conclusion, a well-built equity-gold portfolio ensures investors get strong returns at the same time as them being comfortable and confident in staying invested through all phases of the economic cycle. This is why it can be a compelling investment strategy for long-term wealth creation in the Indian context.

14.4 Global Diversification

14.4.1 Case: Indian Investment in US & Emerging Market ETFs

Over the last few years, ETFs have gained traction as an effective tool for Indian investors looking to diversify away from domestic equities. ETFs offer investors an efficient, liquid and transparent platform to have exposure to global markets which makes them very appealing in a day where many investors are looking for investments that provide exposure to sectors and geographies not visible in the Indian market. This trend has been strengthened as awareness about global diversification increases and the accessibility of international ETFs on Indian exchanges improves.

US Market Exposure

Global Leaders in Innovation

The US equity market, and most prominently the likes of the S&P 500 and the Nasdaq 100, enable access to some of the world's largest companies that are leading global change. Companies like Apple, Microsoft, Alphabet (Google), Amazon, Tesla and Meta are in sectors such as technology, cloud computing, artificial intelligence and e-commerce where India's listed space is either underdeveloped or has just one representative.

Access via Nasdaq 100 ETFs in India

Indian investors can invest in Nasdaq 100 ETFs available on local stock exchanges and benefit from the rise of US technology-led giants without navigating through direct offshore investing. This access provides investors with exposure to the long-term returns generated by global digital economy adopters.

Portfolio Diversification Benefits

As the Indian stock market has little representation of large global technology and ecommerce companies, US ETFs were a good fit to hold alongside domestic equities. They offer diversification both geographically and sectorally, though in the sense of not being overly focused on India's financial services, energy and manufacturing sectors.

Emerging Market Exposure

High-Growth Economies

Rapid economic transitions due to urbanization, industrial growth, demographics and consumption demand would be taking place in emerging markets. China, Brazil, Taiwan and South Korea offer entry to the industries where Indian relative presence is smaller – such as semiconductors, advanced manufacturing (for example, the supply chain of Apple), renewable energy etc.

Strategic Investment Opportunities

Emerging market ETFs such as these can be beneficial to Indian investors looking to invest in the growth of these economies for the long-term. For instance, exposure to South Korea and Taiwan gives them indirect play on global semiconductor supply chains, with Brazil providing opportunity linked to commodities and agribusiness.

Risk–Return Trade-off

Emerging markets offer higher growth opportunities but are also more volatile and prone to political instability and currency risk. Indian investors understand that emerging market ETFs present an opportunity to gain higher returns but also pose a degree of challenge due to the need for adequate risk management.

Case Observations

- COVID-19 Pandemic (2020–2021)

“The Indian equity markets experienced high volatility during the COVID-19 crisis on account of lockdown and liquidity issues amid uncertain recovery path.” In contrast, US technology stocks – which are benefiting from the acceleration of digital adoption – enjoyed stellar returns. Those Indian investors with US ETF exposure therefore recouped their losses on the domestic front.

- Emerging Market Recovery

In the aftermath of the first pandemic shock, a number of Asian and Latin American economies staged sharp rebounds on the back of fiscal stimulus, export gains and rapid vaccine rollouts. Those holding Emerging Markets ETFs enjoyed the growth", - 2.17%), which was up +58% YTD, and "The News that would have been a Headline if it weren't for...".

Investor Takeaway

The instance of Indian investors inside US and EM ETFs is a lesson in the strategic importance of global diversification.

– Exposure to the US market (which offers stability and growth through leading global tech/digital companies primarily).

- Exposure to emerging markets carries the prospect of faster growth — and more risk.

Together, these enable Indian investors to overweight/underweight the domestic economy, augment risk-reward and capture global economic megatrends in portfolios. ETFs, which are cheap, transparent and easy to trade, have been a key tool in facilitating this worldwide participation.

14.4.2 Case: Currency Risks and Globalised Goods Markets a) Explain the impact of currency risk (i.e., exchange rates fluctuate during the sales transaction long-term financial agreement) in global goods markets, drawing some reference on accounting theories, taken b) Suggest a group of cases when currency risks generate different results causing advantage or disadvantage for both seller and buyer companies c) Utilise an array of references to discuss how each party manages its business while remaining competitive by taking into consideration currency risk when 14.4.3 Case Study: Collateral Circumvention" this may be considered as a result showing theme expectation '.

Currency risk is one of the most important, but often overlooked, considerations when investing overseas. The investments, for Indian investors, are usually made in foreign currencies (mainly US Dollar). As all returns will have to be converted at some point into Indian Rupees (INR), forex gains or losses can impact actual extrapolated earnings. That may amplify or diminish the final return even if performance of the local asset is good.

How Currency Risk Works

The Fall In The Rupee (₹ Weakens V/S USD)

o International investments are worth more in terms of INR when the Rupee hardens against the Dollar.

For example let us say an investor owns US assets that're worth \$1,000. If the exchange rate of USD to INR goes up from 70 to 77 this means the Indian Rupee has lost value compared to the US Dollar. In this situation the value of the investment in Rupees would also go up by about 10 percent. The US assets are now worth more in Rupees because of the change in the exchange rate. The value of the US assets in terms of US assets would be the same. The US assets would be worth more in Indian Rupees. The change in the value of the US assets in Indian Rupees is due to the change in the exchange rate of USD, to INR.

The Indian Rupee is getting stronger when compared to the United States Dollar. This means the Rupee is appreciating in value. So when you exchange your money you will get Rupees for one United States Dollar. The Rupee is going up against the USD.

When the Rupee goes up in value after it has the opposite effect. The Indian Rupee value of investments goes down and the final returns, from these foreign investments are not as good as they used to be.

For example let us say a US ETF gives a return of 10 percent in US dollars.. If the Indian rupee gets stronger by 5 percent against the US dollar then the actual financial benefit for an Indian investor who invests in this US ETF will be around 5 percent after converting the money back to Indian rupees. This is because the Indian investor will get Indian rupees for each US dollar when they bring their money back to India. So the US ETF return of 10 percent in US dollars does not mean the Indian investor will get the 10 percent return in Indian rupees. The effective return for the investor will be lower, at around 5 percent.

This two-way influence is one reason why exchange rate changes are such an important driver of the risk–return profile of global allocations.

Historical Examples for Indian Investors

- 2018: Rupee Depreciation

The Indian rupee had a drop against the US dollar last year. It fell by 10 percent. This happened because oil prices were higher and money was being taken out of the country. There were also problems with trade between countries.

For people in India who invest money the Indian rupee falling was actually a thing. It meant they made money from investments in the United States. Investments in ETFs were especially good that year. The Indian rupee falling really helped investors, with their US investments.

- Strong Rupee Periods

When the Indian Rupee goes up in value it hurts the money that people in India get from countries. For example if the stock markets around the world do well and the Indian Rupee also goes up Indian investors will probably get lower returns on their investments compared to investors, from other countries. This is because the Indian Rupee is strong so the money they get from abroad is not worth much as it would be if the Indian Rupee was weak. Indian investors who invest in equity indices may not get as much money as they would like because the strong Indian Rupee reduces the value of their income from abroad.

Managing Currency Risk

Hedging Strategies of ETFs and international mutual funds use currency hedging techniques. These currency hedging techniques may serve to protect you from currency rate movements.

Certain ETFs and international mutual funds use derivatives. Derivatives are used by ETFs and international mutual funds in many of these strategies.

These derivatives include things, like contracts. Certain ETFs and international mutual funds use contracts to fix an exchange rate of Hedging Strategies.

Although people often say that hedging helps reduce swings in value it does not always mean that the actual money you make will be the same.. If you look at the Indian Rupee over a really long time it keeps losing value. If this keeps happening then hedging the Rupee will also mean you get returns, on your money.

Investors often choose not to hedge their investments. This is called Unhedged Exposure. This Unhedged Exposure can be a bit of a risk because it means they have to deal with term ups and downs in the market.. Many investors are okay with this Unhedged Exposure because they think it will be worth it in the long run. They believe that Unhedged Exposure will give them Long-Term Benefits. The main Long-Term Benefit of Unhedged Exposure is that it allows investors to spread their money around the world, which is known as diversification. This global diversification can be very good, for investors who have Unhedged Exposure because it helps them make money in different parts of the world.

Over time the Indian Rupee does show a decrease in value. This is because of things like inflation trade deficits and the fact that India has to import a lot of things, such, as oil. Indian investors who have been watching the Rupee for a long time have seen this happen and have made money from it. The Indian Rupee is something that Indian Global investors keep an eye on.

The Investor Hedge Ratio is really important. It is about how much risk from currency's managed by investors. This depends on how they want to invest for what they hope to get back and how much risk they are okay with. The Investor Hedge Ratio is different for each investor because they all have plans and feelings, about risk.

People who invest for a time may want to take a chance with the Indian Rupee because they think it will lose value. On the hand people who invest for a short time want to play it safe because the exchange rates of the Indian Rupee are changing a lot. They like to use instruments that will protect them from these changes in the Rupee exchange rates. The Indian Rupee is what they are worried, about.

Investor Takeaway

When Indian investors put their money into investments they have to deal with currency risk. This is part of the deal. It does add some risk but it can also mean better returns when the Rupee is not doing well.

The best way to handle this is to think about the good and bad points of hedging. This means Indian investors can manage the risks they take without losing the benefits of spreading their money around the world.

Currency risk is something that Indian investors have to think about when they invest. They need to weigh the costs and benefits of hedging to make the most of their investments. When we think about the term we have to consider what happens when

the value of the rupee goes down compared to other big currencies. In this situation Indian portfolios that have investments in assets without any protection tend to do better and create more wealth, for Indians who have invested in International assets.

14.4.3 The Advantages and Disadvantages of an International Portfolio

As the markets have become more integrated across the financial world, Indian investors now place a higher value on diversification globally. Investors can achieve access to opportunities beyond their domestic markets, enhance portfolio diversification and generate exposure to global economic trends by investing a portion of their portfolios internationally. But it is not so simple, because cross-border investing comes with its own set of challenges and risk considerations.

Benefits of Global Diversification

Reduced Country-Specific Risk

Global diversification reduces concentration risk to one economy and enhances portfolio resilience against country-specific shocks including market underperformance and geopolitical uncertainty.

Access to Global Leaders

Some of the most powerful global companies aren't listed in India. Through international investing, Indian investors are able to invest in companies like Google, Apple, Microsoft or Pfizer. These companies range from technology giants to pharmaceutical players to consumer brands that are only partly listed on India's capital markets. Such access allows to take part in the global megatrends such as artificial intelligence, biotechnology, clean energy or e-commerce.

Participation in Different Economic Cycles

Countries and regions don't often step in lockstep economically. For example, whilst the USA or Japan are booming, India might be pressured by inflation. Through global investing, investors can diversify returns across various economic cycles, which will reduce overall portfolio risk.

Improved Risk-Adjusted Returns

Empirical academic research and portfolio simulations based on Modern Portfolio Theory (MPT) provide evidence that international diversification enhances the risk-return profile. When you merge these instruments that have low or negative correlational relationships with them to the target yielding instrument, you obtain smoother returns by reducing the portfolio's variability. This also means higher Sharpe ratios in the long run.

Hedge Against Domestic Shocks

Events like demonetization (2016), policy changes around tax or a local market crash, has larger negative impact on investors holding only domestic portfolios. Global allocations provide insurance where wealth is not subject in whole to one country's domestic disruptions.

Challenges of Global Diversification

Currency Fluctuations

One of the biggest hurdles is currency risk. Since if Indian investors invest in USD-denominated assets, their final returns depend not only on the asset return but also on the INRUSD movement. Rupee Appreciation reduces profit and devaluation increases it.

Exchange-rate changes are notoriously hard to predict, which adds further uncertainty.

Regulatory Barriers

Indian investors are subject to the RBI's Liberalized Remittance Scheme (currently, \$250,000 per person, annually). This limits the exposure of high-net-worth individuals to international investment even though they can generally bear a more risk. There are also limitations of access to some foreign investments, or compliance barriers.

Taxation Complexity

Foreign investments are really complicated when it comes to taxes. They are more complicated than the taxes on investments in our country. For example the taxes on US ETFs are different from the taxes on mutual funds when we make money from selling them. There are also issues with the taxes that are taken out of the money we get from dividends.

Foreign investments like these have to deal with taxation treaties and the paperwork we have to do every year. This makes things more complicated for Foreign investments. The rules, for investments are hard to understand.

Market Knowledge Gap

Investing in markets is a big deal. It comes with its set of problems. When Indian investors put their money in markets they have to think about the country and the kind of work that is being done there. The thing is, Indian investors may not know enough about companies and the different kinds of industries that are out there. They might not be able to get information about these things. This can lead to investors making bad decisions about where to put their money. Investing in markets is tricky and Indian investors need to be careful. Investment, in markets is something that requires a lot of thought.

Cost of Access

Global mutual funds and Exchange Traded Funds usually have fees that're higher than the fees for funds in our own country. This is because Global mutual funds and Exchange Traded Funds have costs like fees for the people who manage them fees for keeping track of the money and costs that come from following Korean laws. Global mutual funds and Exchange Traded Funds also have costs for doing business. For making sure everything runs smoothly. These higher fees mean that the total return on mutual funds and Exchange Traded Funds is lower. This is especially true for investment plans that are meant to be cost and do not require a lot of buying and selling where keeping costs low is very important, for Global mutual funds and Exchange Traded Funds.

Investor Takeaway

Investing in countries can be a good way to reduce risk without spending a lot of money. It also gives you a chance to invest in companies that are growing fast around the world. This can help you get returns over a long period of time.

However people who invest need to think about some problems. For example they have to deal with changes in currency values rules that make it hard to invest in some places and complicated taxes. They also have to pay more to invest in countries.

The key, to investing is to choose the right markets and sectors and to keep costs and risks under control. Global diversification is only good if you are investing in the places and managing your money wisely. Investing in diversification can be a good idea if you do it carefully.

We think Indian investors should put some of their money in stocks and some in domestic stocks. The amount they put in each should be similar to the amount of domestic stocks available, in Mutual Funds and ETFs. Indian investors should also remember that there are rules and taxes that can affect their investments. If they do it in a way having a mix of global stocks will help them deal with tough times and make more money over time.

You might be wondering what this is, about. Did you know is a common phrase that people use when they want to tell you something interesting. So what is it that you are supposed to know?

“Research shows that adding as little as 20–30% international exposure to a domestic portfolio can substantially reduce risk without sacrificing long-term returns. But global diversification also has its complications — currency risk, tax and fees become a part of “informed decision making” across Indian investors stepping abroad behind their portfolios.”

14.5 Summary of Case Studies and Key Findings

14.5 Common Themes in Successful Composite-Centric Portfolio Outcome

- **Balanced Asset Allocation:**

Tyranny of Diversification Investors who diversify their money among stocks, debt and alternative assets like gold usually have a less volatile ride. The evidence from cases indicates that the long-term growth is brought about by equity, income and stability are provided by debt, while a crisis hedge is performed by gold.

- **Use of Low/Negative Correlation Assets:**

Portfolios with assets that do not move together (or, alternatively, in opposite directions) during crises would be less vulnerable. Equities, for example, tend to fall during economic shocks when gold or government bonds rise in value and the overall volatility is reduced.

- **Sectoral Diversification:**

Winning portfolios are not sector-focused. As a result of distributing in across IT, Pharma, Banking, FMCG and Energy investors are saved some disappointment on an industry-wise decline. IT and Pharma did well against the tide of falling travel and hospitality during COVID-19.

Geographical Diversification:

Case studies demonstrate that portfolio with cross-border exposure fare better. And when the Indian markets got volatile, technology stocks in the US or globally often did well, reducing reliance on a single economy.

- **Regular Portfolio Rebalancing:**

Bistriz When philosophers analyse the subtlety of nature, they give a new dimension to the faith in her perfection and in their own faith. Who cares when those little periodic adjustments are going on? If equity prices run up too much during a bull market, rebalancing sells equities back to safer investments to take profits and avoid becoming overexposed.

- **Long-Term Investment Focus:**

Good portfolios show that you have to be patient. Investors do not let their feelings get in the way when things are tough. They stick to their plan. That is what makes their money grow over time. This is because they let things like compounding and diversification do their job. Successful portfolios, like this work because investors are patient and they do what they are supposed to do.

14.5.2 Errors and Failures of Diversification

Case studies also show us what mistakes cause diversification strategies to fail. These traps are problems that should warn people who invest:

- Over-Diversification (Diworsification):

Some people own many individual stocks or funds because they think that having a lot of them is the key to diversifying their investments.. This actually makes things more complicated and it is harder to see how well their investments are doing. It also does not really spread out the risk much. For example having 10 funds that you have chosen carefully is better than having 50 funds that're similar, to each other.

- Sector Clustering:

When you buy stocks from the sector like only information technology or only banking you do not really have a diverse portfolio. This is a problem because if something bad happens to that sector your entire portfolio of stocks will be affected. For example if the information technology sector has a time all of your information technology stocks will likely do poorly. This means you will lose money on all of those stocks at the time. Buying information technology or only banking stocks does not protect your portfolio. If the information technology sector gets hit your whole portfolio will take a loss.

- Ignoring Asset Correlation:

Just putting things on the ground will not work either. If these things are really closely related and tend to go down together it does not help to have a lot of them. The thing about diversification is that it only works when you have things that do not move together. Investing in the stock market is an example of this. Diversification with stocks and bonds is what people usually do.. In order for this to work you need to have stocks and bonds that do not go up and down at the same time. This means you need to find assets that have negative correlations with each other. Diversification with these kinds of assets is what will actually help. Assets, like these are what you need to be looking for.

- Neglecting Debt Allocation:

The stock market is really good for making money. I think a lot of regular investors will focus on stocks and not pay attention to bonds. This makes the market go up and down a lot. It makes peoples investments more likely to lose value quickly when things go bad. Stocks are a deal for many people so they will probably choose stocks, over debt instruments. This means stocks will be really volatile and peoples portfolios will be more likely to lose a lot of value when the market goes down.

Failure to Rebalance:

Asset weights will change over time if you do not rebalance them. This means that during a time for the stock market the stocks, in your portfolio might become too big of a

part of it and that brings more risk than you want. When the market corrects, asset weights and portfolios do not do well. For example portfolios that have asset weights that are not balanced will struggle during market corrections and asset weights need to be watched so that portfolios can do okay.

- Overlooking Global Exposure:

People often make a mistake when they do not think about the markets. Investors who do not look at markets will miss out on things and they will only be able to do things based on what is happening in their local economy. Overseas markets are very important for investors to consider because they can help investors when the local economy is not doing well. Overseas markets can give investors opportunities to make money.

- Emotional Decision-Making:

Time and time again people who sell their stocks when the market is doing badly or buy more when it is doing well usually end up losing money. This is because they are making decisions based on how they feel, not on what's really going on with their investments. Investing in different things is a good idea but it does not work well when people let their emotions control what they do with their money. Diversification is a thing but emotional decisions can ruin the benefits of diversification.

14.5.3 Practical Takeaways for Investors

From the wins and failures that people talk about in case studies investors can learn some important things:

- Define a Clear Asset Mix:

You should pick a mix of things like equities and debt and gold and international assets. This depends on how old you're what you want to do with your money and how much risk you are willing to take. For example if you are young you will probably put more of your money in equities.. If you are older you will probably put more of your money in debt. This is because equities are good for people who have a lot of time to wait and see what happens with their money. Debt is good, for people who need to use their money. Gold and international assets are also important to have in your mix of investments.

- It is an idea to spread your money across different kinds of investments that do not affect each other. This means you should diversify across assets. Diversify across assets to reduce risk. By doing this you are diversify, across assets and that can help you.

Make sure most of the investments are doing their thing. You see the investments should not be the same. A good mix of stocks and bonds and gold and international assets helps the portfolio when the market is having a time. This way the portfolio is safe

when the market is not doing well. The investments, like stocks and bonds and gold and international assets work together to make the portfolio strong.

- Do not make things too complicated:

To get the results, from your investments you should keep things simple and focused. It is better to have a number of really good funds or assets than to have a lot of them that are similar.

This way your investments will work well together. You will get better results. Having many investments that are basically the same can be a waste of time and money.

- Practice Regular Rebalancing:

You should go through your portfolios every year. You should also do this after the market has some changes. If one type of investment starts to be much of your portfolio you need to move your money around. This will help you keep a balance in your portfolios.

- Always Include Defensive Assets:

You should put some of your money in the kinds of investments, like bonds, gold or industries that people always need like food and healthcare. These are good to have in your portfolio when other investments are not doing well. They help keep your portfolio safe.

Incorporate Global Diversification:

Think about introducing exposure to international markets via ETFs or mutual funds. This helps to mitigate the risk of domestic downturns and participate in global growth stories.

- Focus on Long-Term Discipline:

Hold the line and don't be emotional. Case studies continue to confirm that investors who diversify and have the patience to ride out a crisis end up better than those who run.

- Link Portfolio to Personal Goals:

Diversification is not one-size-fits-all. The right combination hinges on whether the target is retirement, providing for a client's child education or building wealth. The structure of the portfolio should reflect individual requirements.

14.6 Summary

- ❖ Diversification lowers the risk of a portfolio by mixing assets so that they do not go up or down in value at same time.
- ❖ Sector agnostic approach (instead of sector specific), distributing equity diverse across sectors limits shocks for a sector.
- ❖ Equity–Debt diversification is a trade-off between growth (equities) and stability (bonds).
- ❖ Indian balanced funds indicate optimal equity–debt investment.
- ❖ Gold provides a hedge against market crash and inflation as well.
- ❖ Nifty 50 is often paired with gold in Indian portfolios to lower the risk.
- ❖ Equity–Gold diversification enhances the risk adjusted returns by reducing drawdowns.
- ❖ Diversification across countries allows you to invest in many different geographical arenas which reduces country specific risks.
- ❖ International ETFs: Can provide a doorway into US markets and emerging nations.
- ❖ Exchange rate risk on international returns for Indian investors is considerable.
- ❖ Empirical case studies exhibit where successful portfolios are built with low- or negatively-correlated assets.
- ❖ Most common mistakes include being over-diversified, too close to the sector and not paying attention with rebalancing.
- ❖ What investors can do practically is keep a clear asset mix that includes defensive ones, and make sure to rebalance periodically.

14.7 Key Terms

Diversification: Investment approach of not placing all your funds in the same basket, or asset.

Variance: A statistical calculation of how far each return is from the mean.

Covariance: A measure of how the returns on two assets move in relation to one another.

Correlation: A standardized scale (ranging from -1 to $+1$) of the relation between two asset returns.

Asset Allocation: Your investments can be spread across different asset classes such as equity, debt and gold.

Sharpe Ratio: Risk-adjusted return, expressed as excess return per unit of risk.

Balanced Fund: A mutual fund that invests in a combination of stocks and bonds.

Safe-Haven Asset: An investment, such as gold, that holds or increases in value during periods of market stress.

Global Allocation: Investing in markets around the world to mitigate sovereign risk.

Rebalancing: Occasional resetting of a portfolio to its desired asset mix.

14.8 Descriptive Questions

Discuss the relevance of diversification on an equity oriented portfolio in context with sectoral performance during COVID-19.

Explain how balanced funds in India is an example of equity–debt diversification.

Explain the function of gold—hedge in investment portfolios. Provide examples from recent crises.

Why Nifty 50 + Gold investment provides better risk-adjusted returns for Indian investors?

Examine the advantages and disadvantages of global diversification for Indian investors.

How does currency risk affect the international portfolios returns?

What are 5 mistakes people make when diversifying their investment portfolios and how to avoid it?

Describe valuable lessons for investors learned from the examples of diversified portfolios.

Discuss the role of normal portfolio rebalancing in effective diversification.

14.9 References

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14.10 Case Study

Optimum Allocation of Equity, Debt and Gold in Indian Portfolios

Introduction

Successful investment involves apportionment between classes of asset in order to balance risk and return. While stocks provide greater growth, they come with volatility. Debt offers safety but lower returns, gold is a hedge in crises. A properly diversified portfolio that contains of this spectrum can mitigate risk, without sacrificing much of the return potential.

Background

Mr. Rohan, a 35-year-old IT professional in Bengaluru, has been investing in equity shares for five years. Notably, his portfolio ballooned during bull markets but lost heavily during downturns, particularly in March 2020. Becoming aware of the dangers of stock concentration, he turned to one financial adviser who suggested diversifying into government bond and gold as well as equities.

The advisor said to me that

- Stocks are really important for earnings. They help equities grow over a long period of time. The thing about equities is that they can be very volatile which means their prices can go up and, down a lot and sometimes this volatility can be extreme. Stocks and equities are connected in this way.
- Bonds are really helpful because they make my portfolio stronger. They give me a steady income that I can count on.
- Gold is something that helps people when the stock market is doing badly. When people are selling their stocks because they are worried the price of Gold tends to go up. This is because people think Gold is a place to put their money when the stock market is going down.

Problem Statement 1: Too Much in Equities

Rohan had most of his money in stocks, which was a problem when the markets went down. He thought that stocks would always do well in the end. This idea was causing him a lot of worry and he was losing money on paper for now. Rohan was really counting on his stocks to come back because he had much of his portfolio in equities and the thought of losing that money was very stressful, for him.

So the solution is to put thirty percent of our money into debt and ten percent into gold. This means that equities will only make up sixty percent of our total. By doing this we can reduce the ups and downs of the market. Still have a chance to make our money grow. This way gold and debt investments help reduce the volatility of our portfolio. We can still generate growth potential, from the equities investment.

(v) Problem Statement 2. Ignoring Asset Correlations

For measures that are not based on the market Asset Correlations become a problem when we do not think about how the risks of Asset Correlations are connected to each other.

Rohan thought that having lots of equity mutual funds meant he had a good mix of investments.. The thing is, most of these equity mutual funds were invested in the same areas like Information Technology, Banking and Fast Moving Consumer Goods. This meant that his equity mutual funds were really similar and when one equity mutual fund did poorly the others did too because they were all connected to the sectors, like Information Technology, Banking and Fast Moving Consumer Goods.

The key to an investment plan is to have true diversification. This means you should have a mix of things that do not all go up and down in value at the same time. When you add bonds and gold to your stocks you can really reduce the risk. This is because bonds and gold do not always follow the pattern as stocks. They can even go up in value when stocks are going down. So when you put all of these things together the risk to your portfolio of investments is reduced a lot. True diversification with assets, like bonds and gold can make a big difference.

Managing the Portfolio is really tough because Rebalancing the Portfolio is a challenge. The thing with Rebalancing the Portfolio is that it can be hard to do. When you try to Rebalance the Portfolio you have to make a lot of changes. This is why Rebalancing the Portfolio is so difficult. It is not easy, to Rebalance the Portfolio. Make sure everything is okay. The process of Rebalancing the Portfolio is very complicated. Rebalancing the Portfolio is something that requires a lot of time and effort.

When it comes to how you should change the mix of things in your portfolio Rohan was not really sure. Sometimes shares get too big of a piece of your portfolio. This happens when they go up much because of good markets and people taking too many risks with their money. Shares, like this become a part of your portfolio than they should be.

Solution: Implement annual portfolio rebalancing. If equity portion is greater than 65%, the difference will be moved to bonds or gold (2nd tier) to keep it at the 60-30-10 proportion.

MCQs

Q1. Why Has Rohan's First Portfolio Turned Out to Be Highly Risky?

- a) Too much gold
- b) Overexposure to equities
- c) Low bond allocation
- d) Both b and c

Answer: d) Both b and c

Q2. What is the role of gold in a diversified portfolio?

- a) Provides dividends
- b) Acts as a hedge in crises
- c) Increases equity correlation
- d) Reduces bond returns

Answer: b) Helps against downturn as a hedge

Q3. What is the primary advantage of portfolio rebalancing?

- a) Maximizing short-term gains
- b) Reducing number of assets
- c) Maintaining desired risk-return mix
- d) Eliminating volatility completely

Answer: c) To keep the desired risk-return mix

Conclusion

Rohan's case underscores the need for India investors to invest across equity-debt-gold. By combining high-return assets with steady and defensive ones, investors can generate long-term growth with limited risk. Healthy rebalancing keeps the portfolio in tune with your financial goals over time and provides long-term durability in uncertain markets.