

Portfolio Management



Topics

- Risk and Return and importance of diversification
- Correlation between asset classes
- Models of return and risk
- The Efficient Markets hypothesis
- Pricing, Liquidity and Fair Value
- Approaches to Fund Management

Topics

- Investment Management Principals: Fixed Income
- Socially responsible investing and ESG investing

Risk and Return and the Importance of Diversification

Risk and Return and the Importance of Diversification

Learning outcomes.....

- **Explain** the normal trade-off between risk and return, and the concept of dominance between investment strategies
- **Explain** the importance of risk measurement in the analysis of investments and why ex-ante and ex-post measures of risk may be very different
- **Identify** the commonly used measures of risk in investment analysis and fund management
- **Explain** the advantages and disadvantages of standard deviation as a measure of risk

Risk and Return and the Importance of Diversification

Learning outcomes.....

- **Explain** the implications of assuming that returns are normally distributed
- **Explain** the meaning of value at risk (VaR) and its advantages and disadvantages for risk management
- **Explain** the meaning of drawdown and its advantages and disadvantages as a measure of risk
- **Explain** tracking error and **Identify** its advantages and disadvantages as a measure of risk

Risk and Return and the Importance of Diversification

Learning outcomes.....

- **Explain** the impact of changing levels of price volatility over time and how this impacts measures of risk
- **Explain** the meaning of relative weights and the concept of active shares and their respective advantages and disadvantages as measures of risk
- **Explain** diversification and its role in constructing efficient portfolios, and its limitations during extreme market conditions
- **Define** the segmentation of risk into systematic (factor) risk and unsystematic (investment specific) risk

Risk and Return and the Importance of Diversification

Learning outcomes.....

- **Explain** the importance of correlation in constructing efficient portfolios, and the difficulties, limitations and meaning of correlation coefficients
- **Calculate** the correlation coefficients from standard deviation / covariance of two investments
- **Analyse** and **Explain** other types of investment risk, including inflation, currency, interest rate, fraud and counterparty risk

Risk and Return and the Importance of Diversification

Importance of risk measurement

- Objectives of a fund
 - To maximize returns Or
 - To match projected liabilities
- Greater the risk taken, greater the potential return
- **Dominant Investment Strategy:** A strategy that has **higher expected return** but **lower or same level of expected risk**, compared to other investment strategies.

Risk and Return and the Importance of Diversification

Importance of risk measurement

- **Ex-ante** risk and return: Measures of risk and return that are expected in future
- **Ex-post** risk and return: Measures of risk and return that have happened i.e. historical
- Most common measure of risk: ex-post standard deviation
- Criticisms of standard deviation as a measure of risk:
 - Past may not repeat in future
 - Upside and downside moves are considered, investors are only worried about downside moves

Risk and Return and the Importance of Diversification

Importance of risk measurement

- Criticisms of standard deviation as a measure of risk:
 - It assumes upside is equally likely as downside which may not be accurate
 - Volatility is generally not a complete measure of a risk, for example, inflation risk may affect non-growth asset.
- However, despite the criticisms, equity returns have shown higher standard deviation compared to portfolios of government debt.

Risk and Return and the Importance of Diversification

Importance of risk measurement: Alternative measures of risk

- **Semi-variance**: It is a measure of downside risk. Only observations below the mean are considered while calculating semi-variance.
- **Probability of Shortfall**: This is the probability that actual return will fall below some target return.
- **Expected Shortfall**: It is a measure of expected loss at a given probability level, say 5%. We need to assume some distribution, such as normal distribution, for expected returns.
- Standard deviation may underestimate the risk if returns are **not independent** across time periods, i.e. they are **autocorrelated**.

Risk and Return and the Importance of Diversification

Value at Risk (VaR)

- VaR is an estimate of capital loss on a portfolio or individual asset, over a given period of time, that will be exceeded with a given frequency or probability.
- Three important features of VaR:
 - **Time period:** VaR is always calculated for a time period, say 1-day VaR or 10-day VaR or monthly VaR.
 - **Confidence or probability level:** VaR is sometimes referred to as 'maximum loss' over some probability level or confidence. Typical probability / confidence levels are 95%, 99%.

Risk and Return and the Importance of Diversification

Value at Risk (VaR)

- Three important features of VaR:
 - **Loss amount or percentage:** VaR can be expressed in amounts or percentage of portfolio value.
- Thus, VaR is used to assess risk of investment portfolios for banks, securities' firms etc.

Risk and Return and the Importance of Diversification

Value at Risk (VaR): Three ways to calculate / calibrate VaR

- **Historical return approach (Back-testing or Simulation models):**
 - Arrange past returns from high to low and lowest 1% or 5% return will be taken as VaR at 99% or 95% of confidence, respectively.
 - Assumes history repeats itself.

Risk and Return and the Importance of Diversification

Value at Risk (VaR): Three ways to calculate / calibrate VaR

➤ Variance-Covariance approach:

- Assumes daily returns follow a normal (or similar) distribution.
- Advantage is that we know for a normal distribution, worst 1% of outcomes lie to the left of 2.58 standard deviations below the mean.
- However, assumption of a normal distribution is a limitation of this approach as real life is more complex than indicated by normal distribution

Risk and Return and the Importance of Diversification

Value at Risk (VaR): Three ways to calculate / calibrate VaR

➤ Monte Carlo approach:

The third method, the **Monte Carlo approach**, involves developing a mathematical model for stock price returns and running multiple hypothetical trials of the model. The term refers to any method that randomly generates trials, though the underlying parameters of the model may reflect historical experience of, say, mean and standard deviation. The random numbers used in these key inputs are then repeated many times and produce a distribution of possible values that are considered plausible. Using this set of generated outcomes, we can make a statement, just as in the historical approach, that on 1% of occasions the method produced losses worse than $x\%$. In VaR terms, we can say that on 99% of occasions we do not expect to lose more than $x\%$ in any one day.

Risk and Return and the Importance of Diversification

Value at Risk (VaR): Limitations

- Fat tails problem: Extreme value are more likely in real life compared to indicates by normal distribution
- Past may not be a reliable guide of future
- Scaling standard deviation:
 - In practice, banks would like to calculate daily VaR while pension funds would like to calculate VaR over longer horizons.
 - We can convert daily standard deviation into monthly as follows:

$$\sigma (\text{monthly returns}) = \sigma (\text{daily returns}) \times \sqrt{(T)} = 2\% \times \sqrt{20} = 2\% \times 4.47 = 8.94\%$$

Risk and Return and the Importance of Diversification

Value at Risk (VaR):

- VaR as a concept was criticized during financial crisis since actual investment losses were much higher than predicted by VaR models.
- Many VaR models since then have been revised to incorporate higher probability of extreme losses.
- Stochastic Investment Models:

The FCA (in June 2017) defines stochastic modelling as:

'a form of financial modelling of future outcomes based on ranges of values (rather than single estimates) where the value for each unknown variable, such as investment returns and inflation, is based on a statistical likelihood'

Risk and Return and the Importance of Diversification

Stochastic Models:

- Stochastic model is used to estimate probability distributions of the range of potential outcomes by allowing for **random variation** in inputs over time.
- For example, returns on asset is considered random i.e. follows a probability distribution.
- Hence in case of stochastic models, even if initial conditions are same, it will lead to different outputs over time.
- In contrast, in case of **deterministic models**, output of model is fully determined by the parameter values and the initial conditions.
- Apart from assessing risk, stochastic models can also be used to project a range of future returns with associated probability.
- However, such models should be used in financial advisory, as per FCA, only if retail investors are able to understand stochastic projections.

Risk and Return and the Importance of Diversification

Drawdown:

- It is the decline in price from historical peak value of investment, thus, measures the maximum value investors could have lost if invested at peak.
- It is an empirical (actual) measure not abstract.
- Disadvantages:
 - Longer time series tends to have greater drawdown
 - Maximum drawdown is a single number and hence will have huge and uncertain error distribution.

Risk and Return and the Importance of Diversification

Relative Drawdown:

- It measures drawdown relative to a particular benchmark.
- Maximum relative drawdown is a measure of maximum cumulative underperformance of a portfolio relative to a given benchmark.
- Too much underperformance will make it difficult to recover the performance and bring it back on track.

Risk and Return and the Importance of Diversification

Tracking Error:

- It is the difference between a portfolio's return and the benchmark's return.
- Sometimes called, **active risk**.
- More common way to calculate tracking error is

$$TE = \sqrt{\frac{\sum_{i=1}^N (R_p - R_B)^2}{N - 1}}$$

Where:

TE = tracking error;

R_p = return of manager or fund;

R_B = return of benchmark; and

N = number of return periods.

Risk and Return and the Importance of Diversification

Tracking Error:

- When calculated as a standard deviation, tracking error is more useful where there are a greater number of periods over which the performance needs to be measured.
- Factors determining tracking error:
 - ▶ The degree to which the portfolio and the benchmark have securities in common.
 - ▶ Differences in market capitalisation, timing, investment style and other fundamental characteristics of the portfolio and the benchmark.
 - ▶ Differences in the weighting of assets between the portfolio and the benchmark.
 - ▶ The management fees, custodial fees, brokerage costs and other expenses affecting the portfolio that do not affect the benchmark.

Risk and Return and the Importance of Diversification

Tracking Error:

➤ Factors determining tracking error:

- ▶ Potentially, timing differences between portfolio and benchmark if they are valued using different prices, perhaps because of pricing at slightly different times of day or using prices from different providers. The latter is particularly an issue in the bond market.
- ▶ The volatility of the benchmark.
- ▶ The portfolio's beta.

Risk and Return and the Importance of Diversification

Tracking Error:

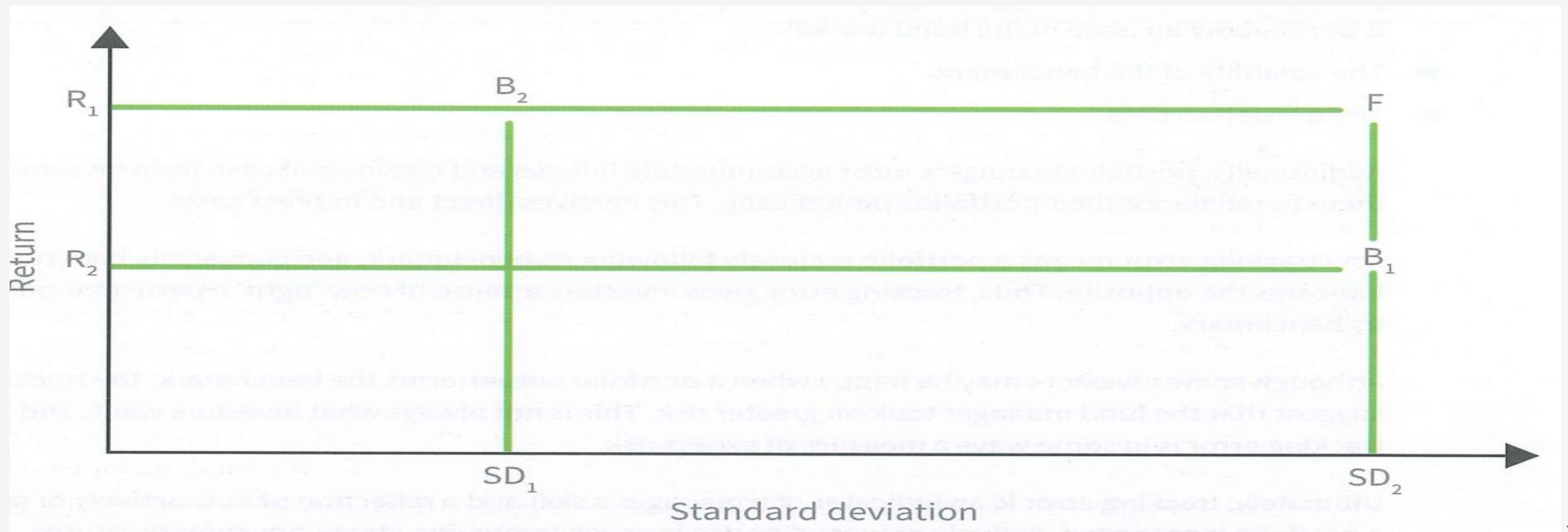
- Lower tracking error means portfolio is closely monitoring the benchmark. This is what **passive fund managers** prefer.
- Higher tracking error may be preferred by investors in **actively managed funds**. These funds seek to provide above benchmark returns by taking higher risk.

Setting a tracking index target has advantages and risks. By setting a limit, investors are preventing the manager from straying too far from the index they are benchmarked against. However, if the FTSE All Share falls by 20%, then the investor may not be happy with the performance of the fund.

Risk and Return and the Importance of Diversification

Comparing benchmark with portfolio:

- By plotting returns and standard deviations of portfolio and benchmark we can illustrate risks taken by the fund manager.



Risk and Return and the Importance of Diversification

Comparing benchmark with portfolio:

- A portfolio dominates the benchmark if
 - For a given level of risk, it has higher return Or
 - For a given level of return, it has lower risk Or
 - A combination of lower risk and higher return
- As already stated, assuming that returns are normally distributed is misleading because in real life, the probability of extreme returns is much higher than indicated by normal distribution.
- Moreover, volatility may cluster due to autocorrelation, and hence tracking error is useful for prediction only if volatility is not expected to change.

Risk and Return and the Importance of Diversification

Relative Weights and Active Shares:

- **Relative weight** of an individual security in a portfolio is its market value divided by the market value of portfolio.
- **Active share**: Difference between a weight of a security in the portfolio and benchmark index.

$$\text{Active share} = \frac{1}{2} \left(\sum_{i=1}^N \text{abs} \left(\text{weight}_{\text{portfolio},i} - \text{weight}_{\text{benchmark},i} \right) \right)$$

For example, a benchmark consists of 50% in each of two stocks, A and B. If a portfolio comprises 60% stock A and 40% stock B, then the active share measure:

$$\begin{aligned} \text{Active share} &= \frac{1}{2} (\text{abs} (60\% - 50\%) + \text{abs} (40\% - 50\%)) \\ &= \frac{1}{2} (10\% + 10\%) \\ &= 10\% \end{aligned}$$

Risk and Return and the Importance of Diversification

Relative Weights and Active Shares:

- If active share is 0%, it means the relative weights track index exactly and 100% means the portfolio has no overlap with the index.
- **Closet Tracker:** Portfolio with an active share of between 20% to 60% is a closet tracker. These funds charge higher fees compared to index tracking funds.
- Active managers can be categorized as:

- ▶ **Active stock pickers** take large but diversified positions away from an index.
- ▶ **Concentrated funds** combine very active stock selection with substantial exposure to unsystematic risk.
- ▶ **Closet index funds** have neither high active share nor substantial tracking error.

Risk and Return and the Importance of Diversification

Portfolio diversification and Total Risk:

- Portfolio diversification can lead to a more dominant or efficient portfolio.
- The risk that any asset faces can come from two sources:
 - **Unsystematic risk**: Risk specific to the asset, also called **specific** or **idiosyncratic** risk.
 - **Systematic risk**: Often called market risk, this risk affects all assets, though in different proportions.

Total risk = systematic risk + unsystematic risk

This additive rule can be applied to the investment's variances, because by definition the unsystematic risks are not correlated to the systematic risks. Note that standard deviations are non-additive.

Risk and Return and the Importance of Diversification

Portfolio diversification and Total Risk:

Example

A share has a total standard deviation of 14%, of which the specific element of risk is 10%. The systematic standard deviation is:

$14^2 = S^2 + 10^2$, where: S is the systematic risk.

$$S^2 = 196 - 100 = 96$$

$$S = \sqrt{96} = 9.8\%$$

Risk and Return and the Importance of Diversification

Portfolio diversification and Total Risk:

- As number of assets in a portfolio increase, its total risk declines due to the decline in systematic risk.
- Also, as assets are added to portfolio, some part of systematic risk may be offset by other assets.
- Thus, systematic risk can be altered to some extent.
- However, systematic risk cannot be completely eliminated.

Risk and Return and the Importance of Diversification

Correlation:

- ▶ $r = -1$, or **perfect negative correlation**. The two assets' returns always move in the opposite direction at the same time and to the same extent. That does not mean that the changes have to be the same amount, but rather that there is a constant relationship between them. For example, if every time one share went up in value by 1%, another went down by 0.5% (and vice versa), then they would have perfect negative correlation. By combining the two assets, it is possible to eliminate all risk. We already know that this is not realistic, since we stated before that only unsystematic risks can be reduced in this way – it is almost certain that any two stocks will have some specific risks which are not correlated.
- ▶ $r = +1$, or **perfect positive correlation**. The two assets' returns always move in the same direction, at the same time and to the same extent. By combining the two assets, there would be no reduction in systematic risk.

Risk and Return and the Importance of Diversification

Correlation:

- ▶ $0 < r < +1$, or **positive correlation**. The two assets' returns tend to move in the same direction at the same time. Close to +1 is strong positive correlation, and close to 0 is weak.
- ▶ $-1 < r < 0$, or **negative correlation**. The two assets' returns tend to move in the opposite direction at the same time. Close to -1 is strong negative correlation, and close to 0 is weak.
- ▶ $r = 0$. There is no relationship between the two assets' returns. This would imply that there are no systematic risks common to two stocks, which is unlikely considering virtually every stock is exposed to the market factor.

Risk and Return and the Importance of Diversification

Correlation:

Given the covariance of two securities, the correlation can be calculated as:

$$r = \frac{\text{covariance (x,y)}}{\sigma_x \sigma_y}$$

Where: σ_x and σ_y are the standard deviations of the two respective securities **x** and **y**.

Risk and Return and the Importance of Diversification

Correlation:

Example

The covariance of two securities is -30 , and they have standard deviations of 13% and 10% , respectively. The correlation coefficient between the two is:

$$\begin{aligned} r &= \frac{\text{covariance}(x,y)}{\sigma_x \sigma_y} \\ &= \frac{-30}{130} \\ &= -0.23 \end{aligned}$$

This indicates that there is a weak negative correlation between the two securities. Combining them together would give a much more efficient risk/return trade-off than either security on its own.

Risk and Return and the Importance of Diversification

Correlation: Shortfalls

- Correlations change over time. In extreme market moves correlations converge to +1.
- Correlations are meaningful only when asset returns follow normal or near normal distributions.
- Correlation only captures linear relationship.
- Correlation does not imply causation.

Risk and Return and the Importance of Diversification

Other types of Investment Risks

➤ **Inflation risk**

- Risk of unanticipated changes in inflation.
- Inflation linked bonds offer protection from inflation.
- Commodities, Equities and Real estate are also believed to offer hedge against inflation.

➤ **Currency risk**

- Overseas investments face this risk due to changes in currency rates.
 - Transaction risk: Risk of unfavorable movements in exchange rates
 - Translation risk: Accounting risk of translating foreign currency investments

Risk and Return and the Importance of Diversification

Other types of Investment Risks

➤ **Interest rate risk**

- Risk of change in interest-bearing asset values due to change in interest rates.
- Measured by duration.

➤ **Fraud risk**

- Arises due to false advertising, embezzlement, creation of false firms or investment strategies, counterfeiting currency or securities, false insurance claims, confidence trickery, tax fraud, pyramid sales etc.

➤ **Counterparty risk**

- Risk of default or counterparty not fulfilling its obligations

Correlation between asset classes

Correlation between asset classes

Learning Outcomes.....

- **Identify** the correlation between the various asset classes (equity, fixed income, property, cash and alternative investments) and explain its relevance to asset allocation
- **Explain** the limitations of correlation analysis in extreme market conditions

Correlation between asset classes

Asset allocation

- Asset allocation involves allocating funds to different asset classes in order to maximize returns on investment.
- Asset classes have different returns and standard deviations.
- Correlation between asset classes becomes important while constructing the portfolios.
- However, correlations keep on changing over time and hence optimal choice of asset allocation may be unreliable.
- Moreover, since private assets such as real estate, private equity are added to the portfolio, their correlations may be not be easily available or unreliable.

Correlation between asset classes

Asset Allocation: Correlations

EXAMPLE OF A RECENT MATRIX OF CORRELATIONS

	Cash	Gilts	UK equity	Commercial property	Market neutral hedge funds
Cash	+1	+0.20	+0.03	-0.09	+0.29
Gilts		+1	-0.20	-0.05	+0.06
UK equity			+1	+0.18	+0.28
Commercial property				+1	-0.03
Market neutral hedge fund					+1

Correlation between asset classes

Asset allocation: Correlations

- Correlations are often measured using around 5 years of monthly returns data.
- Considering the correlations given on previous slide, it will be very useful to add different asset classes from diversification perspective
- As an example of unstable correlations, correlations between US and UK stocks varied from +0.2 in 1970 to +0.9 in 2005 to +0.7 during 2014-16.
- Correlation between assets has little to do with volatility. So even if one asset has negative correlation with another asset, if it has very high volatility, overall portfolio volatility will remain high.

Correlation between asset classes

Asset allocation: Correlations

- Forecasting correlations is a difficult exercise but needs to be done in search of optimal portfolios.
- Two methods are widely used:
 - Extrapolate historical average correlations
 - Use correlation between factors in CAPM or APT to derive implied correlations between asset returns
- As discussed, during financial stress correlation between asset returns increases towards 1.

Models of Return and risk

Models of return and risk

Learning Outcomes.....

- **Identify** the assumptions behind the single-factor capital asset pricing model (CAPM) and identify other factors in common use
- **Calculate** the expected return on a security by applying CAPM through interpreting beta of a security
- **Explain** how the historic beta may be estimated using a scatter chart of historic returns
- **Calculate** the beta of a portfolio given the component betas and the investment weightings

Models of return and risk

Learning Outcomes.....

- **Define** the segmentation of risk into systematic (factor) risk and unsystematic (investment specific) risk
- **Calculate** the total risk given systematic and unsystematic components
- **Calculate** the beta of an investment given the systematic risk of the investment and the risk of the market
- **Calculate** the beta of an investment given the variance of market return, and the covariance of the investment return with the market return

Models of return and risk

Learning Outcomes.....

- **Explain** the limitations of CAPM
- **Explain** the concept of investments being exposed to a number of common factors which partially explain their return and risk profile ('arbitrage pricing theory')
- **Explain** the concepts of factor investing and smart beta

Models of return and risk

CAPM Assumptions

The derivation of the model requires some assumptions and simplifications about financial markets:

- ▶ Financial markets are perfectly competitive, free of taxation and transactions costs.
- ▶ All investors agree on the same investment period and have the same expectations about the returns and standard deviations of all assets.
- ▶ Investors can borrow or lend at the same risk-free rate of interest.
- ▶ Investors try to maximise their returns while simultaneously trying to minimise risk.

Models of return and risk

CAPM Assumptions

- The assumptions make CAPM simple to use for predictions. They are needed to derive important conclusion of CAPM represented by **Security Market Line (SML)**.
- However, these assumptions appear unrealistic and hence CAPM is criticized due to them.
- CAPM is a single factor model, but researchers have identified a range of other factors, which may influence a stock's return in addition to macro factors.
- These factors include firm-specific attributes such as
 - Value: Dividend or Earnings Yield or Book to market value ratio
 - Momentum: winners vs. losers

Models of return and risk

Beta and Security Market Line (SML)

➤ The SML specifies relationship between systematic risk and expected return on investment.

➤ The expression of SML is:

$$E(R_p) = R_f + \beta_p (E(R_m) - R_f)$$

Where:

$E(R_p)$ is the expected return on portfolio, or asset, p ;

R_f is the return available from a risk-free asset;

$E(R_m)$ is the expected return on the market portfolio;

β_p is the portfolio's CAPM beta coefficient; and

$E(R_m) - R_f$ is the (expected) market-risk premium.

Models of return and risk

Beta and Security Market Line (SML)

- Though the market portfolio should consist of all risky assets, for practical purposes, we use a **broad equity market index** such as FTSE All Share as a proxy for market portfolio for analyzing equities.
- Return on **short-term gilts** or **Treasury Bills** is used as a proxy for risk-free asset.
- **Beta** is the key parameter in the equation which is a measure of **systematic risk**.

$$\beta_p = \frac{\sigma_{R_p R_m}}{\sigma_m}$$

or:

$$\beta_p = \frac{\text{Cov}(R_p, R_m)}{\text{VAR}(R_m)}$$

Models of return and risk

Beta and Security Market Line (SML)

- Beta is derived by regressing returns on a security against returns on an equity index.
- A regression line is drawn with return on index on X-axis and return on security on Y-axis, this line is called **characteristic line**.
- **Beta** is slope of characteristic line.

Beta = 1	Return on portfolio moves in line with the market on average.
Beta > 1	Return on portfolio moves more than proportionately compared to the market return, making the portfolio more risky than the market.
Beta < 1	Return on portfolio moves less than proportionately compared to the market return, making the portfolio less risky than the market.

Models of return and risk

Beta and Security Market Line (SML)

Suppose that the variance of the market over the previous year is 250, and the covariance of stocks A, B and C with the return on the market is 180, 250 and 360 respectively. The CAPM betas of the three stocks are:

$$\beta_A = \frac{180}{250} = 0.72$$

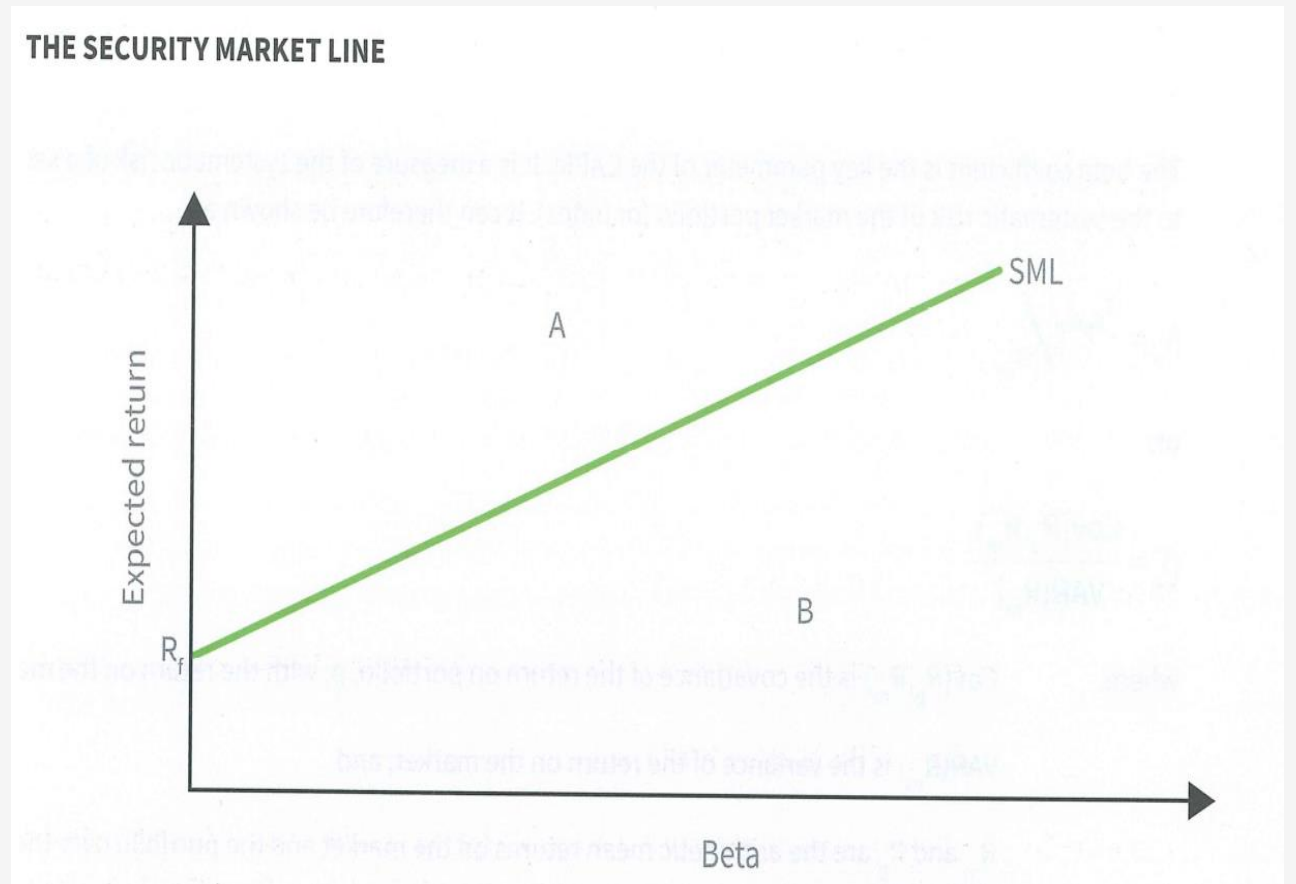
$$\beta_B = \frac{250}{250} = 1.00$$

$$\beta_C = \frac{360}{250} = 1.44$$

Models of return and risk

Beta and Security Market Line (SML)

- One of the predictions of CAPM is that all portfolios in equilibrium lie on SML.
- Those lying **below** SML are **overvalued** and hence their stock prices will **fall**.
- Those lying **above** SML are **undervalued** and hence their stock prices will **rise**.



Models of return and risk

Beta and Security Market Line (SML): Example

➤ Suppose an analyst estimates UK equity market return will be 8% and 1-year risk-free rate is 3%.

➤ Hence, SML equation is

$$E(R_p) = 0.03 + \beta_p(0.05)$$

We can calculate the expected return on stocks A, B and C, since we know that their betas are 0.72, 1.00 and 1.44, respectively.

$$E(R_A) = 0.03 + 0.72(0.05) = 0.066, \text{ or } 6.6\%$$

$$E(R_B) = 0.03 + 1.00(0.05) = 0.080, \text{ or } 8.0\%$$

$$E(R_C) = 0.03 + 1.44(0.05) = 0.102, \text{ or } 10.2\%$$

Models of return and risk

Forming portfolios using CAPM

- Portfolio Beta is weighted average of betas of individual securities in the portfolio, weights being market value weights of individual securities.

- Portfolio Beta:

$$\beta_p = \sum_{i=1}^N w_i \beta_i$$

Where:

β_p is the beta of portfolio (p);

w_i is the market value weight of constituent (i) of the portfolio; and

β_i is the CAPM beta of asset (i).

Models of return and risk

Forming portfolios using CAPM

- Considering that betas of stocks A, B and C are 0.72, 1.00 and 1.44 respectively, a portfolio beta assuming 25%, 50% and 25% is invested in the above stocks respectively is calculated as follows:
 - Portfolio Beta = $0.72 * 0.25 + 1.00 * 0.50 + 1.44 * 0.25 = 1.04$.
 - The fund manager can increase or decrease the beta by changing the proportions of money invested in different stocks.

Models of return and risk

Total Risk and CAPM Beta

- Total risk can be separated into systematic and unsystematic risk as follows:

$$VS_p = \beta_p^2 VS_m + VS_e$$

- For a well diversified portfolio, unsystematic risk approaches zero hence the total risk equals

$$VS_p = \beta_p^2 VS_m$$

Models of return and risk

Limitations of CAPM

- CAPM assumptions become its limitations.
- Beta is not a useful predictor of returns relative to the market. Hence CAPM has been extended to include additional variables.
- However, researchers have found that dropping the main assumptions of CAPM tends not to alter the main predictions of CAPM.

Models of return and risk

Factor Models

- Arbitrage Pricing Theory (APT) or multi-factor models assume that investment returns are driven by a set of common factors such as oil prices, inflation etc.
- Thus, APT holds that expected return from a security is a linear function of various macro-economic factors or theoretical market indices.
- Each factor has its beta coefficient that sensitivity of that security's return to that factor.
- The expected return derived from the model is used to price the asset correctly. If the price diverges from this model value, there will be arbitrage which will bring the price equal to the price derived from the model.
- Thus, APT assumes multiple factors and CAPM only one factor. This makes it a unique form of APT.

Models of return and risk

Factor Models

Academic research has identified the following macro-economic factors as being important in explaining stock returns:

- ▶ surprises in inflation;
- ▶ surprises in gross national product (GNP) as indicated by an industrial production index;
- ▶ surprises in investor confidence due to changes in default premiums in corporate bonds; and
- ▶ surprise shifts in the yield curve.

Models of return and risk

Factor Models

- However, since the factors mentioned on the previous slide, with a considerable time lag, they are generally not useful for constructing a factor model.
- Hence, factors that can be measured real time are used for constructing factor models.

Models of return and risk

Smart Beta and Factor Investing

- A **factor** is an attribute of a security that drives return persistently for that security.
- An investor can design a portfolio that is exposed to a set of factors by combining stocks having sensitivities to those factors.
- For example, an investor can create a portfolio that is sensitive to a factor of oil prices but neutral to a factor of interest rate changes.
- This type of investing is called **factor investing**.
- Instead of macro-factors, we can also identify **security attributes** such as value or size of the security.

Models of return and risk

Smart Beta and Factor Investing

- The most popular single factors are:
 - Low volatility, Momentum, Value, Quality, High Dividend Yield, Size.
- In this context, factor investing seeks to identify those factors which produce better risk-adjusted returns than traditional market cap-weighted indexes.
- This done in the form of ETFs and is called **smart beta investing**.
- This approach is beta investing because individual selection and analysis of stocks is not done beyond rules, which are transparent.

Models of return and risk

Smart Beta and Factor Investing

- For example, an investor decides to create a portfolio of smallest 20% of Russell 3000 stocks every year on 1st Jan. This portfolio is exposed to 'size' factor.
- It is called smart due to the perception that such portfolios perform better than traditional market-cap weighted portfolios over long periods of time.
- Thus, these strategies seek to combine stocks in portfolios in ways different from using market weights as portfolio weights.
- There are many weighting methods, each with its own risk and return properties.
- However, these strategies may also experience significant drawdowns and can underperform conventional strategies.

The Efficient Market Hypothesis

The Efficient Market Hypothesis

Learning outcomes.....

- **Identify** and **Explain** the key components of the efficient markets hypothesis (EMH), and explain the limitations of the EMH
- **Evaluate** the evidence on the market anomalies in relation to the EMH
- **Explain** the basic concepts of the behavioral finance school of thought
- **Evaluate** the evidence on the market anomalies in relation to the behavioral finance
- **Explain** the notion of 'bubbles' and 'financial amnesia' in financial markets

The Efficient Market Hypothesis

Efficient Market Hypothesis (EMH)

- EMH is the idea that the security prices instantaneously reflect all available information.
- Prices only change in response to **new information** which is unpredictable.
- Hence, security prices move unpredictably and follow a **random path**.
- If the EMH holds true, it implies that security prices will always equal or be close to their **fair or fundamental values**.
- Hence, active traders will find it difficult to outperform passive investment strategies.

The Efficient Market Hypothesis

Efficient Market Hypothesis (EMH): Three Versions

1. **Weak form** states that security prices already reflect all information contained in the past history of market prices and volume. Hence technical analysis is a fruitless activity. The weak form is consistent with the random walk hypothesis, which says that price changes through time are independent. It suggests that one could only beat the market by using fundamental analysis or insider trading.
2. **Semi-strong form** states that all publicly available information about a firm (e.g. annual reports) is already contained in the stock price. Since past prices are a part of publicly available information, then weak form also holds.
3. **Strong form** states that a security price reflects all information relevant to a firm, including information only available to company insiders. This is an unlikely and extreme case, as it would often involve the use of illegal inside information. If the strong form holds, then so does weak and semi-strong.

The Efficient Market Hypothesis

Efficient Market Hypothesis (EMH): Conditions for EMH to hold

- Large number of rational, profit-maximizing, active investors.
- Rational arbitrageurs eliminate influence of irrational agents.
- Information is freely and widely available and arbitrageurs eliminate mispricing, if any.
- However, in reality there is some evidence of predictability in security returns.
- For example, momentum, mean reversion, seasonal variations, impact of earnings announcements could bring some element of predictability in returns.

The Efficient Market Hypothesis

Efficient Market Hypothesis (EMH): Anomalies

- Predictability of returns due to certain factors can be considered as 'anomalies'.
- As discussed in previous topic, size and value factors may help generate superior returns and hence are anomalies that are common and heavily researched.
- **Noise trader risk:** Refers to unpredictable future actions of noise traders. Some irrational traders act on incomplete information and create 'noise' which is a source of risk for arbitrageurs.

The Efficient Market Hypothesis

Behavioral Finance

Standard Finance or Modern Portfolio Theory	Behavioral Finance
Rational investors	May not be rational
Efficient markets	Not efficient, even if hard to beat
Investors design their portfolios as per mean-variance portfolio theory	Investors design their portfolios as per behavioral theory
Expected returns depend only on risk	Expected returns depend on risk and other factors

- As per behavioral finance, investors
 - do not always process information correctly and hence may not infer correct probability distributions of future returns.
 - Often make inconsistent or suboptimal decisions leading to mispricing.
- This is inconsistent with EMH.

The Efficient Market Hypothesis

Behavioral Finance: Biases

- ▶ **Memory bias** leads to forecasting errors if agents give too much weight to recent experience when making forecasts. Forecasts are therefore too extreme given the uncertainty inherent in their information. For example, price-earnings (PE) ratios can be unrealistically high given recent information, due to excessive optimism being built into the stock price.
- ▶ **Overconfidence** leads agents to overestimate the precision of their beliefs or forecasts, and hence they tend to overestimate their abilities. Research shows that the most active retail investors underperform compared to those who trade the least.
- ▶ **Confirmation bias** is when an agent is more open to information which confirms their pre-existing views.

The Efficient Market Hypothesis

Behavioral Finance: Biases

- ▶ **Conservatism bias** occurs when investors are too slow in updating their beliefs in response to new evidence. For example, they might underreact initially to news about a firm. This could lead to momentum in stock returns.
- ▶ **Sample size neglect** is where agents infer wider population behaviour from a small sample. Trends are then extrapolated too far into the future. For example, a short-term good earnings report might lead to higher buying pressure on a stock which is not justified over a longer term.
- ▶ **Endowment effect** is when an investor places a higher value on an asset they own than they would if they did not own it.
- ▶ **Prospect theory/loss aversion** refers to the fact that individuals have been shown to value gains and losses differently (including selling winning stocks too soon and holding losing stocks too long).

The Efficient Market Hypothesis

Behavioral Finance: Biases

- ▶ **Anchoring** places too much emphasis on irrelevant facts, e.g. a previous stock price.
- ▶ **Faulty framing** is where normal investors fail to mark their stocks to market prices and maintain them at the purchase price in mental accounts. They instead mark stocks to market only when they sell the stocks and close the mental account. Normal investors do not acknowledge paper losses.
- ▶ **Hindsight bias**, which misleads investors into thinking that what is clear in hindsight was just as clear in foresight. This leads investors into thinking they could have foreseen losing stocks and avoided them. Agents may also blame themselves more when decisions are more unconventional, such as buying small, more speculative stocks.

The Efficient Market Hypothesis

Behavioral Finance: Biases

- ▶ **Herd behaviour** is the tendency for individuals to mimic the actions of a larger group, regardless of whether they are rational, even though they may not make the same choice as an individual. This can be seen in investors following trends and jumping on the latest bandwagon.
- ▶ **Mental accounting** is where agents segregate certain decisions. For example, many individuals have savings accounts paying a low rate of interest while maintaining credit card debts charging a high rate, rather than seeing these as an integrated account and netting them out.

The Efficient Market Hypothesis

Behavioral Finance: Biases

Example

An investor divides wealth into three accounts, say 70% to retirement income, 20% to education and 10% for holidays. Investors specify the desired probability of reaching their target for each goal, say 99%, 60% and 20%, respectively. Then, each account is optimised using mean-variance analysis and there is separate asset allocation for each sub-portfolio. The overall portfolio is the sum of the mental account sub-portfolios and it will lie on the mean-variance frontier.

The Efficient Market Hypothesis

Behavioral Finance

- Thus, behavioral finance tends to reject CAPM and favor multi factor models.
- As per behavioral finance arbitrage may be unable to correct mispricing due to implementation costs, model risk and uncertain time horizon.
- Critics of behavioral finance argue that it lacks predictive power that can be rigorously tested.
- However, despite that behavioral finance can contribute to drawing attention to unrealistic assumptions of modern finance theory and leading to improvements in it.
- Considering more and more market moves are hard to reconcile with traditional finance theory, behavioral finance explanations become more relevant.

The Efficient Market Hypothesis

Financial Amnesia and bubbles

- Financial Amnesia: Market participants forget the lessons of financial market history
- In the past, at times equity prices, real estate prices have risen continuously only to crash subsequently.
- Lack of market discipline could be caused due to failure of corporate governance among financial firms along with over reliance on such firms to impose market discipline.
- Incentives to senior management may encourage unsustainable activity, such as taking excessive risks, which may be detrimental for the financial system.
- Alongside behavioral biases, regulatory failure also occur, possibly due to organizational or resource constraints.

The Efficient Market Hypothesis

Financial Amnesia and bubbles

- **Bubbles:** When financial valuations move away from fundamentals bubbles get formed.
- Though there is no precise definition of 'bubbles'.
- Policymakers and regulators also feel that they cannot pass judgement as it has political consequences.
- It seems widely accepted that financial theory repeats itself and financial amnesia and bubbles are intertwined features of financial life.

The Efficient Market Hypothesis

Case Study: Heather

Pricing, Liquidity and Fair Value

Pricing, Liquidity and Fair Value

Learning outcomes.....

- **Explain** the relationship between pricing, liquidity and fair value for the asset classes of equity, fixed income, derivatives and alternative investments
- **Explain** the relationship between liquidity and the capacity of investment strategies

Pricing, Liquidity and Fair Value

Fair Value

- The problem of valuation arises for **illiquid assets**, such as property, equity traded in OTC market or derivatives such as CDS.
- For liquid assets, prices trade close to their fair value.
- **Fair value** is an accounting concept to refer to value of an asset or a liability for which market price cannot be easily determined.
- As per US GAAP standard FASB 157, fair value is the price at which an asset could be willingly exchanged in a current transaction, excluding an exchange during a liquidation sale.

Pricing, Liquidity and Fair Value

Fair Value: US GAAP Three levels of judgment

- The standard emphasizes on use of current market inputs in estimating the fair value of asset or a liability and refers to three levels of judgment in estimating fair value.
 - ▶ Level 1 uses quoted input prices from active markets and is clearly preferable; it is based on direct observations of identical assets.
 - ▶ Level 2 uses prices from similar but not identical assets.
 - ▶ Level 3 uses 'unobservable' indirect inputs such as assumptions by market participants – this is sometimes known as 'mark to management'.

Pricing, Liquidity and Fair Value

Fair Value: US GAAP Three levels of judgment

- Advantage of the standard:
 - Greater transparency since it brings difficult to value assets on balance sheet.
- Disadvantage:
 - It may lead to large write downs if current price is lower than original price. It may result into under-reporting of true value.

Pricing, Liquidity and Fair Value

Liquidity and Capacity of Investment Strategies

- **Capacity of investment strategy:** The basic idea is that the cost of implementing strategy increases as asset under management (AUM) increases, hence the performance could be adversely affected. This is particularly true with illiquid assets as bid ask spread rises for larger volumes of transactions.
- Three levels of capacities are mentioned on next slide.

Pricing, Liquidity and Fair Value

Liquidity and Capacity of Investment Strategies

- ▶ **Threshold capacity** is the level of AUM that allows the strategy to achieve its stated investment return objective.
- ▶ **Wealth maximising capacity** is the level of AUM that maximises the amount of wealth created, which is defined as the product of alpha (net of transaction fees) and the AUM.
- ▶ **Terminal capacity** is the level of AUM that reduces the alpha, net of transaction costs, to zero.

Pricing, Liquidity and Fair Value

Liquidity and Capacity of Investment Strategies

- Investment capacity can be assessed
 - By looking at impact of trading
 - By looking at the impact of accumulating large positions. This calculates concentration ratio.
 - A breadth ratio is inverse of concentration ratio.
- Using historical data, manager can select the desired breadth / concentration ratio.
- Capacity keeps changing over time depending upon market conditions.

Approaches to Fund Management

Approaches to Fund Management

Learning outcomes.....

- **Distinguish** between a 'top-down' and 'bottom-up' approach to fund management
- **Explain** how active and passive approaches can be blended in portfolio construction
- **Distinguish** between strategic and tactical asset allocation
- **Distinguish** between active and passive fund management, and explain costs and benefits to the investor
- **Explain** the major investment styles prevalent in the fund management industry

Approaches to Fund Management

Strategic and Tactical Asset Allocation

- **Strategic Asset Allocation:** Asset allocation from a long-term perspective, say 5 to 10 years to achieve return objectives subject to constraints.
- **Tactical Asset Allocation:** Deviating slightly from strategic asset allocation in the short term.
- Once the asset allocation is done, individual securities such as stocks and bonds need to be selected within the asset classes.

Top-Down Approach	Bottom-Up Approach
Wide asset classes are first determined with long-term strategic portfolio weights, allowing short-term tactical deviations.	An investor considers each security on its own merits and builds portfolio up from specific stocks. Becoming less popular.

Approaches to Fund Management

Strategic and Tactical Asset Allocation

EXAMPLE ASSET ALLOCATION

Asset	Strategic weight (%)	Tactical range (%)
Equities: UK	80	70 to 90
Equities: non-UK	20	10 to 30
Bonds: UK	0	0 to 10
Bonds: non-UK	0	0 to 5
Cash	0	0 to 10

Approaches to Fund Management

Strategic and Tactical Asset Allocation

- Strategic weights are determined by a number of factors such as
 - tracking a given market index
 - matching liability profile of a pension fund
 - Following what other funds are doing or using sophisticated tools to determine strategic weights
- Tactical asset allocation requires specification of ranges around the strategic weights.

Approaches to Fund Management

Passive Vs Active Fund Management

- Passive fund management involves tracking an index.
- Tracker funds attempt to mimic the performance of index.
- Cost of managing the fund and tracking error determine the success of the fund.
- Advantages: Low transaction costs and management charges compared to actively managed funds
- Disadvantage: In bear markets, this strategy is difficult to justify

Approaches to Fund Management

Passive Vs Active Fund Management

- Active fund management involves identifying mispriced securities and adjusting the portfolio to take advantage of mispricing i.e buy undervalued and sell overvalued securities.
- It is a relatively high risk, high return strategy.
- Active fund manager may use number of techniques to identify mispriced securities.
- If more funds are invested in mispriced securities, there will be more specific risk.

Approaches to Fund Management

Combining Passive with Active Fund Management

- **Portfolio Tilting:** Involves combining both passive and active fund management.
 - A fund manager might hold all the constituents of index but may change weights relative to index. Thus, the portfolio will be tilted in the direction of some securities.
 - The main challenge here is to determine degree to which the fund should be actively or passively managed.

Approaches to Fund Management

Combining Passive with Active Fund Management

PORTFOLIO TILTING

(1) Asset	(2) MV (%)	(3) A (%)	(4) B (%)	Tilt (%)	(5) C (%)	Tilt (%)
S1	0.10	0.10	0.10		0.10	
S2	0.20	0.20	0.10	(-0.10)	0.00	(-0.20)
S3	0.30	0.30	0.40	(+0.10)	0.20	(-0.10)
S4	0.10	0.10	0.10		0.20	(+0.10)
S5	0.30	0.30	0.30		0.50	(+0.20)

Approaches to Fund Management

Management Style:

➤ **Value Style:** These managers aim to identify undervalued shares. It has following three sub-styles.

1. Investors who invest in stocks with low PE ratios focus on companies selling at low prices relative to current or future earnings, including those stocks in defensive and cyclical sectors, or sectors that are currently out of favour.
2. So-called contrarian investors look for companies with low share prices relative to book value. These firms may have little or no current earnings or dividend yield, but are expected to experience a cyclical rebound or benefit from a firm-specific turnaround.
3. The final sub-style involves high-yielding stocks offering maintained or increasing dividends.

Approaches to Fund Management

Management Style:

- **Growth Style:** These managers aim to identify high growth companies. Investors are ready to pay higher current year PE since earnings are expected to grow faster than the market.
- **Market Oriented:** May tilt towards growth or value at different times depending upon the market conditions.
- **Small cap fund style:** Here, investment is done in small cap stocks. There can be sub-styles such as small cap value, growth etc.

Approaches to Fund Management

Management Style:

- The implications of style for asset management involve the extent to which portfolios are diversified. The diversification benefits may be lost if style results into concentrated portfolios.
- Style portfolios do not correlate closely with market as a whole. Hence, they create unsystematic risk which should be compensated for.
- During many time periods in the past, investors have concentrated on growth stocks (FAANG for example) from sectors such as consumer, service healthcare, technology.
- However, high growth stocks can be high beta stocks and hence be more volatile.

Approaches to Fund Management

Portfolio Composition in Practice:

- There are infinite number of investment portfolios. Some combinations as per Investment Association (IA), UK are given below.

IA MIXED ASSET SECTOR DEFINITIONS

Fund	Definition
Mixed investment 0–35% shares	Equities must comprise 0–35% of the portfolio, fixed income or cash to form a minimum of 45%, and at least 80% of the portfolio to be in ‘established’ market currencies (i.e. \$, £, €).
Mixed investment 20–60% shares	Equities must form a minimum of 20% of the portfolio up to a maximum of 60%, with at least 30% in fixed income or cash, and a minimum of 60% in ‘established’ currencies.

Approaches to Fund Management

Portfolio Composition in Practice:

- There are infinite number of investment portfolios. Some combinations as per Investment Association (IA), UK are given below.

Mixed investment
40–85% shares

This sets no minimum for the fixed income or cash part, but requires equities to form between 40% and 85% of the portfolio; this requires a minimum of 50% to be in 'established' currencies.

Flexible investment

This has no minimum in fixed income, equities or particular currencies.

Approaches to Fund Management

Portfolio Composition in Practice:

A practical example of a 'multi-asset defensive fund' provided by a global asset management firm would involve diversification across five asset classes (with their standard benchmark or strategic percentages in parentheses):

- ▶ cash (25%);
- ▶ bonds (50%);
- ▶ equities (15%);
- ▶ real estate (5%); and
- ▶ commodities (5%).

Investment Management Principals: Fixed Income

Investment Management Principals: Fixed Income

Learning outcomes.....

- **Explain** the following bond portfolio management techniques: cash matching/dedication, immunization, credit risk management and riding the yield curve
- **Calculate** the duration of a bond portfolio
- **Calculate** the theoretical gain from riding the yield curve
- **Explain** the benefits and risks of bond portfolio management strategies such as barbell

Investment Management Principals: Fixed Income

Learning outcomes.....

- **Explain** the characteristics and risks of a liability-driven investment (LDI) strategy
- **Explain** the process of an LDI strategy
- **Evaluate** some of the techniques and a basic measures of risk used in LDI

Investment Management Principals: Fixed Income

Bond Portfolio Management

➤ Objectives

- Matching future liability (for pension fund or insurance company)
 - Cash flow matching or Dedication
 - Immunization
- Achieving or surpassing a benchmark return (a bond index generally)

Investment Management Principals: Fixed Income

Bond Portfolio Management: Matching future liability: Cash flow matching or Dedication

- This involves purchase of bonds by investing institutions such as pension fund such that cash received from coupons and principal repayments exactly matches cash outflows expected.
- Such portfolios are called **dedicated portfolios**.
- There is no reinvestment risk or no interest rate risk (since no bonds need to be sold before maturity) and hence shifts in yield curves do not affect portfolio adversely.

Investment Management Principals: Fixed Income

Bond Portfolio Management: Matching future liability: Duration and Immunisation

- **Bond Portfolio Duration:** It is the weighted average duration of individual bonds that make the portfolio.
- Example: A portfolio consists of two bonds A and B with durations of 5 and 10, respectively. If 40% is invested in Bond A and remaining in Bond B, then the portfolio duration is
 - $40\% * 5 + 60\% * 10 = 8$
- Just as duration of assets or investments are worked out, similarly duration of liabilities can also be worked out depending upon the future cash outflows.

Investment Management Principals: Fixed Income

Bond Portfolio Management: Matching future liability: Duration and Immunisation

- Suppose, a portfolio manager has to meet a single payment liability of \$5000 at the end of 2 years, which of the following will meet duration of this liability with duration of asset (investment)?
 - Buying a one-year bond and then re-investing proceeds in another one-year bond.
 - Buying a two-year coupon paying bond
 - Buying a three-year bond and selling after two years
 - Buying a two-year zero-coupon bond

Investment Management Principals: Fixed Income

Bond Portfolio Management: Matching future liability: Duration and Immunisation

- **Immunization:** This involves matching duration of assets with the liabilities.
 - This reduces the uncertainty surrounding future cash flows from bond investment due to changes in interest rates.
 - Thus, the portfolio is 'immunized' from interest rate fluctuations.
 - It involves the gain (loss) from reinvested income offsetting the fall (rise) in the price of bond as interest rates rise (fall).
 - The two offsetting risks are 'reinvestment risk' and 'price risk'.

Investment Management Principals: Fixed Income

Immunisation: Assumptions and Challenges

➤ **Assumptions:**

- All cash payments are realized, no default or early redemption through call option.
- Yield curve is flat and yield curve changes are parallel.

➤ **Challenges:**

- As time passes, durations of portfolio and liabilities change at different rates. Hence it creates duration mismatch.
- The fund manager must rebalance the portfolio to match durations of portfolio and liabilities again, but it involves transaction costs. Hence, this decision needs to be taken carefully.

Investment Management Principals: Fixed Income

- **Bullet or Focused Portfolio:** Portfolio of bonds with individual bond durations similar to desired duration.
- **Barbell Portfolio:** Portfolio involving bonds with much smaller and much larger durations than the target duration.
- **Contingent Immunization:** Initially, the portfolio manager forms a portfolio as desired by him in respect of duration and yield. This continues as long as the portfolio performs well in relation to the associated liability. However, in case of poor performance, the manager resorts to immunization strategy.
- If the manager desires to **follow or surpass bond index return**, rather than creating a matching portfolio, then he is likely to match key characteristics of index such as duration, sector, quality etc. This may lead to tracking error, but transaction costs will be lower compared to full replication.

Investment Management Principals: Fixed Income

Credit Risk Management

In anticipation of a change in bond quality rating, a manager may trade some bond issues. For example, they may sell bonds expected to deteriorate in credit rating or buy bonds in sectors that are expected to outperform at certain stages of the economic cycle. In doing either of these actions, the manager is managing these anticipated changes in credit risk in order to outperform indices and enhance bond portfolio returns.

Investment Management Principals: Fixed Income

Riding the yield curve

- In this strategy, returns can be enhanced by identifying and overweighting bonds in a segment of yield curve that are undervalued.
- Suppose, two-year bonds are yielding higher and hence are undervalued compared to one-year bond, a manager should
 - Buy two-year bond and
 - Sell it after one-year at one-year bond's price which is higher due to lower yield of one-year bonds
- This strategy assumes relative mispricing continues till one-year period.

Investment Management Principals: Fixed Income

Riding the yield curve

Example

Question:

A one-year AA rated zero-coupon bond is currently priced at £94.79. A similar two-year bond is priced at £89.42. What additional return can an investor achieve over a one-year period by buying the two-year bond and selling it after one year, rather than buying the one-year bond and holding to maturity? Assume the shape of the yield curve does not change over the one-year period.

Investment Management Principals: Fixed Income

Riding the yield curve

Answer:

By buying the one-year bond, which matures at £100 after one year, the investor can gain:
 $£100 - £94.79 = £5.21$.

As a percentage of initial cost, this is equivalent to $£5.21 \div £94.79 \times 100\% = 5.5\%$. By buying the two-year bond and selling it after one year, the investor can gain: $£94.79 - £89.42 = £5.37$.

This is because, with no change in the shape of the yield curve, the two-year bond will be priced at £94.79 in one year's time when it only has one year to maturity. This is the same price as the one-year bond now.

As a percentage of initial cost, this return is equivalent to $£5.37 \div £89.42 \times 100\% = 6\%$. So, the additional return is $6\% - 5.5\% = 0.5\%$.

Investment Management Principals: Fixed Income

Barbell and Bullet Portfolios

- Suppose duration of a liability is 8 years and the fund manager would like to create a duration matched portfolio. Following possibilities exist.
- **Barbell Example:** Invest equally in a 4-year and 12-year duration bonds.
- **Bullet Example:** Invest equally in a 7-year and 9-year duration bonds.
- Advantage of Barbell portfolio: Manager can select from a much larger range of bonds.
- Disadvantage of Barbell portfolio: In case of non-parallel shift in yield curve, the durations of individual bonds in immunizing portfolio differ greatly compared to that of liabilities.

Investment Management Principals: Fixed Income

Liability Driven Investment (LDI)

- Key aim is to **reduce funding level risk**, by matching wholly or partly liabilities of financial institution (pension fund or insurance companies) or individual with its assets.
- LDI may involve use of derivatives to hedge interest rate and inflation risks.
- On one hand LDI is liability matching but it is also largely seen as a long-term investment discipline, looking at risk in new ways, and placing plan liabilities at center of investment process.
- LDI often involves fixed income and swaps but to increase return, it also involves high yielding components such as alternatives and equity.
- Due to financial market volatility, pension funds have focused on de-risking and hence equity protection strategies involving options are used.

Investment Management Principals: Fixed Income

Liability Driven Investment (LDI): Process of strategy

1. Using cash flow forecasts of the funding needs into the future (e.g. pension funding requirements) to identify a portfolio that can match these needs. The assets may have similar sensitivities to key variables such as inflation and interest rates, as can the cash flow projection. Hence this analysis can at least approximately match the liability cash flows to the asset cash flows. Swaps could be important here.
2. Determining the degree of acceptable risk must be specified by the trustees, as this establishes the overall risk constraints. This is similar to conventional approaches, except the liability matching in the previous bullet point plays a key role.
3. Assessing the possibility of active management outperformance given our asset allocation.
4. Implementing the LDI strategy and possibly using new types of investment vehicle (e.g. hedge funds).

Investment Management Principals: Fixed Income

Liability Driven Investment (LDI)

- Swaps play an important role in LDI strategies and offer some protection from interest rate and inflation risk.
- For example, interest rate swaps can be entered into by a pension fund with investment bank in such a way that if changes in interest rates cause liabilities to rise, then the bank will make payments to the fund, else the opposite.
- Similarly, inflation swaps can be entered into to protect the fund from inflation.
- Insurers also engage in LDIs in similar way as pension fund managers.

Investment Management Principals: Fixed Income

Swap spread

- Swap spread is the **difference** between swap rate and government bond yield.
- Since most LDI investors hold both the government bonds and swaps, **change in swap spread** is a source of **risk** for these investors.
- Changes in swap spread can lead to funding volatility as values of assets and liabilities change differently due to different discount rates being used.
- Causes of difference in swap spreads:
 - Deteriorating fiscal position
 - Financing risk (due to risk of rising finance cost)
 - Monetary and fiscal policies

Investment Management Principals: Fixed Income

Swap spread

- Causes of difference in swap spreads:
 - Bank regulatory changes
 - Central clearing of swaps leading to increased cost

Risk Measures for LDI

- Volatility of surplus i.e. surplus of plan assets over plan liabilities
- Risk can be defined as surplus tracking error (shortfall between actual and target surplus).

Socially Responsible Investing (SRI) and ESG Investing

SRI and ESG Investing

Learning outcomes.....

- **Explain** what is meant by ESG characteristics and socially responsible investing (SRI) and how they differ
- **Identify** history and evolving regulatory requirement of ESG investing and **Explain** the factors that have led to their development
- **Explain** why investors might or might not include ESG issues in their investment decisions
- **Describe** evidence on whether ESG investing leads to superior portfolio returns

SRI and ESG Investing

Learning outcomes.....

- **Explain** the main methods of incorporating ESG characteristics in investment decisions
- **Describe** the main challenges of incorporating ESG characteristics into investment decisions
- **Explain** what is meant by impact investing and contrast impact investing with traditional investment and ESG strategies

SRI and ESG Investing

SRI and ESG Investing

- SRI generally involves **ethical or value-based** investing.
- Two distinct SRI activities:
 - **Screening**: Including or excluding companies based on ethical criteria, for example, not including companies that produce weapons or tobacco. In some cases, a decision is required if a company is engaged in production of both ethical as well as unethical products.
 - **Shareholder advocacy and engagement**: Intentional investor may, through proxy voting, seek constructive change in companies by encouraging wider corporate responsibility.

SRI and ESG Investing

SRI and ESG Investing

➤ ESG factors consider:

- ▶ environmental issues which may include climate change, hazardous waste, nuclear energy and sustainability in general;
- ▶ social concerns which may include diversity, human rights, consumer protection, company culture, human capital and animal welfare; and
- ▶ governance issues which may include management structure and quality, shareholder rights, director

independence and remuneration, board skills and executive compensation, all of which are proxies for understanding management and decision-making quality.

SRI and ESG Investing

Stewardship

- Financial Reporting Council (FRC) publishes stewardship code which offers a set of principles for investment decisions, and which were considered to enhance shareholder value.

This most recent code (2020) establishes: *“a clear benchmark for stewardship as the responsible allocation, management and oversight of capital to create long-term value for clients and beneficiaries leading to sustainable benefits for the economy, the environment and society”* (FRC, 2020).

- The code comprises of a set of ‘apply and explain’ principles for asset managers and asset owners and to service providers.
- All principles are given reporting expectations of companies which indicate information to be included in stewardship report.

SRI and ESG Investing

Stewardship

Self Read

- Principles for Asset Owners and Managers (Page: 432).

Asset owners and asset managers cannot delegate their responsibility and are accountable for effective stewardship. Stewardship activities include investment decision-making, monitoring assets and service providers, engaging with issuers and holding them to account on material issues, collaborating with others, and exercising rights and responsibilities.

- Principles for service providers (Investment consultants, proxy advisors, data and research providers): (Page 433).

SRI and ESG Investing

History of ESG

Global ESG initiatives are organised by, among others, the United Nations (UN), Group of Twenty (G20), Financial Stability Board and the European Union (EU). However, it was the US trade unions of the 1950s and 1960s that became more aware of their potential for affecting the wider social environment using their accumulated capital. One of the most high-profile examples of disinvesting along ethical lines were the Sullivan Principles. These were drawn up in 1977 by Reverend Leon Sullivan to protest against apartheid by applying economic pressure on South Africa.

At that time, the distinguished US economist Milton Friedman argued that considering social responsibility adversely affects a firm's performance and that regulation will damage the macro-economy.

SRI and ESG Investing

History of ESG

Thus, a firm's valuation should not involve consideration of social issues. This view was widely held in investment circles until the 1990s when the idea of social capital entered the thinking on measuring value.

Environmental groups became more active and encouraged companies and capital markets to include ESG factors in their decision-making. This movement came alongside a growing awareness among investors of ESG issues. By the early twenty-first century, a range of products suitable for ESG-compatible investments were being developed. The phrase 'Triple Bottom Line', referring to the financial, environmental and social factors influencing corporate valuation was introduced around this time. There was growing interest in the correlation between environmental and social standards and financial performance, with most attention around environmental and social issues often related to climate change.

SRI and ESG Investing

History of ESG

The publication of *The 100 Best Companies to Work For* (1998) in the USA focused attention on corporate social responsibility and its link to financial performance. This was concerned with how companies are managed, shareholder relationships and treatment of workers. It suggested that improved corporate governance did not damage financial performance, but instead improved productivity and corporate efficiency, and the hiring of superior management. Research in the USA published in 2011 showed that *The 100 Best Companies to Work For* outperformed their peers by 2–3% per annum in terms of stock returns between 1986–2009, and systematically exceeded analysts' expectations.

In 2005, the UN Environment Programme Finance Initiative (UNEP FI) commissioned a report on interpretation of the law with respect to investors and ESG issues. It suggested that not only was it permissible for investment companies to integrate ESG issues into investment analysis, but it was also probably part of their fiduciary duty to do so. This led to the creation of the Principles for Responsible Investing (PRI) in April 2006, which was launched at the New York Stock Exchange (NYSE).

SRI and ESG Investing

Principles for Responsible Investment (PRI)

- PRI is an independent organization supported by around 2370 investment firms which aims to encourage responsible investment to enhance returns and better manage risks.
- It is supported by UN.

The mission of the PRI is as follows:

'We believe that an economically efficient, sustainable global financial system is a necessity for long-term value creation. Such a system will reward long-term, responsible investment and benefit the environment and society as a whole.'

- **Self Read:** 6 PRIs: (Page 435).

SRI and ESG Investing

Supply and Demand for ESG Investing

- On the demand side, there is a growing public awareness of
 - Environmental issues: Climate change, global warming, rising sea levels, nuclear power issues
 - Social concerns: Diversity of employment, human rights, animal welfare, consumer protection
 - Investors much better educated due to access to data and information
 - Empirical studies indicating that responsible investing does not lead to poor performance
 - Availability of responsible investing vehicles
 - Better returns from ESG investing and risk mitigation

SRI and ESG Investing

Supply and Demand for ESG Investing

- On the supply side,
 - Increased ESG disclosure requirements have improved transparency
 - Widely accepted international standards for ESG factors allow more portfolio construction in more objective ways
 - Reputational risk for firms if associated with poor ESG standards
 - Financial risk and impact on share price if there is a blow up on ESG issues
 - Six PRIs advocating advantages of ESG investing

SRI and ESG Investing

Advantages of ESG Investing

- Many empirical studies have indicated that
 - Well governed companies tend to outperform poorly governed companies
 - Companies with favorable ESG characteristics outperform companies with negative characteristics but it is mainly driven by governance issues. Impact of environmental and social factors was negligible.
 - Some studies have shown a positive correlation between ESG score improvements and performance.

SRI and ESG Investing

ESG factors in investment decisions

- Investors can treat ESG factors as any other financial factors. For example, in company analysis one can adjust forecasted financials or company valuation models for the expected impact of ESG factors.
- In addition to financial data, investors should also include analysis of intangible factors such as how company relates to environment, labor force, supply chain (i.e. social factors) and how closely the management team is aligned with shareholders (i.e. governance issues).
- ESG factor data from third-party vendors is available to understand how a company scores on various ESG factors. This will help in valuation and investment recommendation.
- However, fully integrating ESG analysis takes time and involves trial and error.

SRI and ESG Investing

ESG factors in investment decisions: Some challenges of including ESG into investment analysis

1. ESG factor information remains more resource intensive to acquire and assess than conventional audited financial information. It is still difficult to obtain consistent comparable, audited ESG information.
2. Disclosure by companies of their ESG progress often trails reality, suggesting that resources needed to obtain an accurate picture of company performance may be lacking.
 - a. Context is very important as different regulatory regimes around the world have different disclosure requirements. Hence, using raw data in valuation without that context could prove very misleading.
 - b. Traditional valuation tools can create a tension between their relatively short timeframes and the longer timeframes needed for many ESG issues to impact companies.

SRI and ESG Investing

ESG and impact investing

The Organisation for Economic Co-operation and Development (OECD) defines **social impact investment** as:

'the provision of finance to organisations addressing social needs with the explicit expectation of a measurable social, as well as financial, return.'

- The above concept is **impact investing** and has become increasingly relevant since social challenges are rising.

SRI and ESG Investing

ESG and impact investing

While ESG refers to considering environmental, social and governance factors in investing decisions, along with more traditional influences on valuation, impact investing describes the intentional investment in a company specifically to have a positive impact on environmental and/or social issues.

According to the Rockefeller Foundation's Global Impact Investing Network, there are a number of key characteristics of impact investing:

- ▶ **Intentionality:** by the investor to generate social and/or environmental impact through investments.
- ▶ **Return expectations:** the generation of a financial return on capital and, at worst, a return of capital.
- ▶ **Impact measurement:** the investor is committed to measure and report the social and environmental performance and progress of underlying investments. This helps ensure transparency and accountability, and helps build awareness of impact investment performance.

SRI and ESG Investing

ESG and impact investing

Impact investors have a wide range of financial return expectations with some intentionally investing for sub-market returns, but which are in line with their strategic objectives, while others pursue superior returns, perhaps as required by their fiduciary responsibilities. In a 2016 survey, most impact investors sought competitive, market-rate returns, though their individual approaches vary based on their objectives and capacities, and the choice of what to measure usually reflects investor objectives.

In general, best practice for measuring impact investing will include stating clearly the social and environmental objectives to the interested stakeholders:

- ▶ setting measurable performance targets relative to these objectives; and
- ▶ monitoring, reporting and managing the performance of investments against these targets to relevant stakeholders.