TOPIC 6 - OVERVIEW

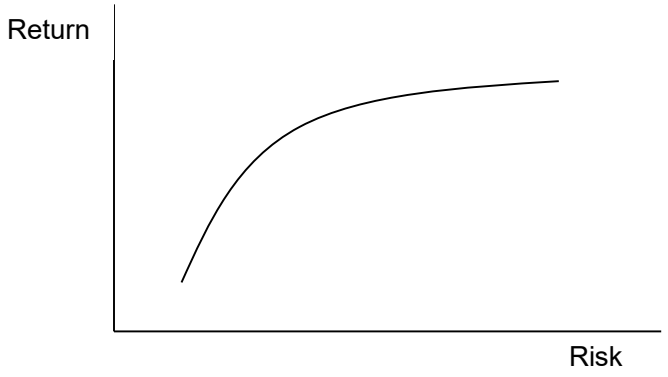
1. OVERVIEW

1.1 What is Risk?

- From a business perspective, risk can be considered as:
  - *Pure risk*: the risk of losing physical assets, which can be insured against
  - *Financial risk*: the risk of financial loss relating to business activities, which can be managed with risk management systems and internal controls

1.2 Risk versus Expected Return

- As an investor assumes more risk, higher returns are expected



- As well as many other factors, risk increases with time

1.3 Fundamental Risk Management Techniques

- Risk management involves identifying and evaluating risk, followed by implementation of risk management techniques to minimise risk exposure
- Fundamental risk management techniques are:
  - *Risk avoidance*: particular activities, which could result in loss, can be avoided. An example would be avoiding the business of securities margin financing
  - *Risk reduction*: techniques can be employed to reduce potential risk. An example would be buying foreign currency forward to lock into an exchange rate now for future settlement
  - *Risk transfer*: usually, at a cost, risk can be transferred. An example is taking out an insurance policy
  - *Risk retention*: the cost of the above three techniques may be prohibitive, making risk unavoidable. An example could be remaining exposed to foreign currency movements, allowing gains as well as losses

2. TYPES OF FINANCIAL RISKS

- Financial risk can be considered under five categories:

2.1 Credit and Settlement Risk

- **Credit risk** is the chance that a counterparty does not honour a legal obligation. This could be defaulting on a debt repayment or not honouring a forward contract commitment. Also referred to as counterparty risk
- **Settlement risk** is the risk that a transaction does not settle as intended, in terms of timing

2.2 Market Risk and Basis Risk

- **Market risk** is the risk of loss due to unfavourable movements in market prices, including stock prices, interest rates, currency rates and commodity prices
- **Basis risk** is the risk of loss from derivative and asset prices being unaligned

2.3 Liquidity Risk

- The risk of loss from an inability to sell at fair market value due to a shortage of available buyers

2.4 Operational Risk

- The risk of loss from failures or faults in processes, procedures or trading and settlement systems

2.5 Other Risks

- **Legal risk** is the risk of loss from unenforceability of contracts
- **Reputational risk** is the risk of loss from reputational damage
- **Strategic risk** is the risk of loss from implementing, or not implementing, new initiatives or strategies
- **Systemic risk** is the risk of loss from the breakdown of an entire system, eg the clearing and settlement system of the securities market

3. THE RISK MANAGEMENT PROCESS

- The risk management process can be broken down into four sequential steps: identifying, measuring, managing and monitoring

3.1 Identifying Risk

- The main requirement for identifying risk is an **understanding of the business**. Unintended losses can often be put down to poor understanding of a business, thereby making it difficult to know where the underlying risks lie

3.2 Measuring Risk

- Risk is measured using the mathematical concept of **standard deviation,** which measures dispersion around an expected value
- Standard deviation is the square root of the variance. Variance is calculated by applying probabilities to different possible returns in relation to the expected return. An illustration follows

Calculation of Expected Return

$$ER = \Sigma p_i r_i$$

ER = expected return
p_i = probability of return i
r_i = % return i

Example

Dead Certainty Limited has the following return probabilities for the next year. Calculate the expected return

Probability	Return
30%	4%
50%	8%
20%	10%

Solution

Probability	Return	Expected Value
30%	4%	1.2%
50%	8%	4.0%
20%	10%	2.0%
Expected return		**7.2%**

Calculation of Variance and Standard Deviation

$$Var = \Sigma p_i(r_i - ER)^2$$

$$SD = \sqrt{\Sigma p_i(r_i - ER)^2}$$

SD = standard deviation
Var = variance
ER = expected return
p_i = probability of return i
r_i = % return i

Example

Dead Certainty Limited and Good Chance Limited have the following return probabilities for the coming year. Calculate, for each stock, the expected return, variance and standard deviation

Dead Certainty		Good Chance	
Probability	**Return**	**Probability**	**Return**
30%	4%	40%	2%
50%	8%	40%	10%
20%	10%	20%	20%

Solution

Dead Certainty

Probability (p)	Return (r)	Expected Value	$p(r - ER)^2$
30%	4%	1.2%	0.0003072
50%	8%	4%	0.000032
20%	10%	2%	0.0001568
Expected return		**7.2%**	
Variance			0.000496

$$SD = \sqrt{0.000496}$$

$$= 0.0223$$

$$= 2.23\%$$

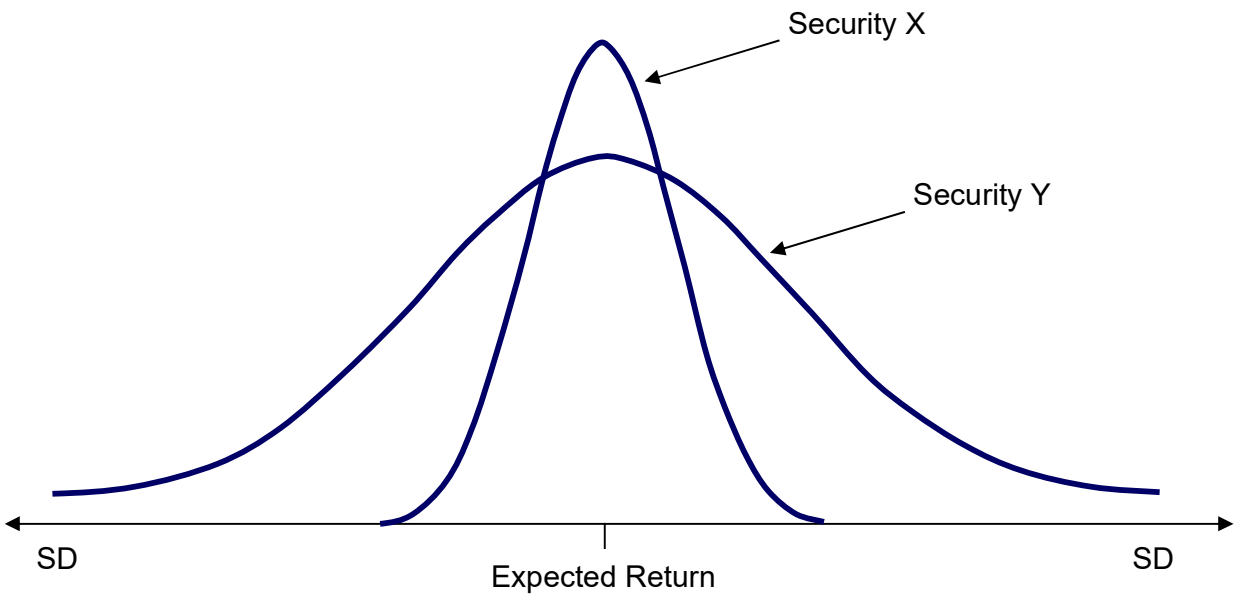
Good Chance

Probability (p)	Return (r)	Expected Value	$p(r - ER)^2$
40%	2%	0.8%	0.0018496
40%	10%	4%	0.0000576
20%	20%	4%	0.0025088
Expected return		**8.8%**	
Variance			0.004416

$$SD = \sqrt{0.004416}$$
$$= 0.0665$$
$$= 6.65\%$$

Conclusion: Good Chance, compared to Dead Certainty, has a higher expected return, but at a higher risk

The Normal Distribution Curve



- The normal distribution illustrates the dispersion of a security's return around the expected return
- The lower SD of security X means that the likely returns are more tightly clustered around the expected return. Security Y, with the greater SD, is riskier

Measuring Market Risk

- There are a number of market risk measures, including:
  - *Value at Risk (VaR)*: a popular measure of market risk used to calculate, at specified confidence levels, the likely change in the value of a portfolio of securities from a change in market conditions. VaR indicates the maximum daily loss likely to occur at, say, a 99% confidence level
  - *Stress testing*: involves testing a portfolio of securities to observe how it performs when particular market changes occur
  - *Duration*: measures the sensitivity of bond prices to changes in interest rates, taking into account yields, maturity dates and coupon cash flows
    - Duration approximates to the percentage bond price change from a 1% change in interest rates
    - The higher the yield, the lower the duration
    - The greater the time to maturity, the higher the duration
    - The higher the coupon, the lower the duration
  - *Dollar value per basis point*: measures the change in value of a debt security for a 0.01% change in yield (ie a single basis point)
  - *Option sensitivity measures*: measure the sensitivity of an option price to changes in time to expiry, volatility and security prices

Measuring Credit Risk

- Counterparty credit risk is either measured internally by credit analysts or externally by credit rating agencies (CRAs)

Measuring Liquidity Risk

- Liquidity risk is measured by identifying gaps in an organization's future cash flow which then enables the costs of funding liquidity shortfalls to be determined

3.3 Managing Risk

- Strong and flexible risk management systems and processes are vital to the maintenance of a smooth functioning financial system
- **Necessary attributes of a financial risk management system** include: comprehensive supervision, appropriate technology and training, a liquid derivatives market and clearly documented policies and procedures
- **Effective risk management** includes: reliable and independent pricing systems; accurate risk measurement; appropriate price limit setting; segregation of duties; compliance with all regulatory requirements; and adequate internal and external audit policies

3.4 Monitoring Risk

- A continuous process of reviewing risk management systems and processes
- There are firms providing risk management services to market participants, ranging from computer software to professional advice

4. FINANCIAL RISK MANAGEMENT IN HONG KONG

- HKSAR Government is keen that the Hong Kong financial markets adopt appropriate financial risk management systems, processes and techniques to ensure that Hong Kong follows world best practices.

4.1 Financial Risk Management Systems and Processes

4.1.1 Regulatory Structure

- **Regulations differ** depending on whether the entity is an authorized institution (AI), a fund manager or a corporation

Role of HKMA and the Basel Committee's Guidelines

- **HKMA** oversees the conduct and practices of all AIs. In doing so, it has adopted the guidelines recommended by the Basel Committee
- The **Basel Committee** was set up in 1974 to improve control measures of banks and to enhance the global banking environment
- The Basel Committee's "Core Principles for Effective Banking Supervision" specify four essential elements of a robust risk management system:
  - Active board management supervision
  - Effective organizational policies, procedures and limits for managing business
  - Adequate risk measurement, monitoring and management reporting systems
  - Comprehensive internal controls, including internal audit functions
- The Basel Committee has issued further guidelines for the banking industry over the years, focussing on raising capital quality, among other issues

Risk-Based Supervisory Approach

- **HKMA** has adopted a risk-based supervisory approach, concentrating on evaluating AIs' risk management systems, processes and procedures
- Under this approach, obligations of AIs include:
  - Comprehensive risk management systems
  - Policies, procedures, limits and controls to manage various risk types
  - Appropriate board committees, including audit and risk management
  - Systems and procedures to ensure compliance with HKMA
- HKMA carries out supervision of AIs through **off-site reviews** of statistical returns and accounting reports, **onsite-reviews** to inspect processes and systems and tripartite meetings between the HKMA, the AI and the AI's external auditor to discuss risk and controls

Capital Adequacy Ratios and Minimum Liquidity Requirements

- As capital is the foundation of a bank's strength, capital adequacy standards require that **minimum levels of shareholders' equity must be maintained** to support a bank's investment and lending activities
- **Capital adequacy ratios** measure a bank's capital expressed as a % of its risk-weighted credit exposures
- The Basel Committee recommends that financial institutions use **VaR models** to set appropriate capital levels to cover market risks in trading

Role of Securities and Futures Commission (SFC)

- The SFC **oversees the risk management systems**, processes and techniques adopted by licensed corporations in Hong Kong, and also regulates the way in which retail funds are marketed to the public

Corporate Governance

- Hong Kong companies are regulated by the **Companies Ordinance**
- Corporate governance refers to the process by which directors **supervise and control the management of companies** on behalf of shareholders
- Corporate governance processes **to manage financial risks** include: controlling credit exposures; controlling investments and written policies and procedures

4.1.2 Payment Systems

- **Interbank payment systems** are an important aspect of risk management in the international banking and financial system
- **"Delivery versus payment"** means that transactions are only settled when funds are available, thereby mitigating settlement risk
- Since 1996, Hong Kong has benefitted from the **Real Time Gross Settlement System** which ensures that all gross positions of banks are settled on a continuous, deal by deal basis

4.1.3 Credit Ratings

- **Credit rating agencies** (CRAs) assign credit ratings to debt issuers, based on their ability to repay their debts
- Moody's, S&P and Fitch are the **major CRAs**
- With debt issues on the increase, investors increasingly use **published CRA ratings** to help with investment decisions

Credit Rating and the Sub-Prime Crisis

- In 2007/2008, the credit ratings of collateralized debt obligations (CDOs) were of high investment quality when the underlying assets were of very poor quality
- Rating models were found to be deficient as they did not account for the default probability among sub-prime lenders or have considered the change in property prices

4.1.4 Novation

- Novation is used by securities exchanges to **minimize credit (counterparty) risk**
- In Hong Kong, for example, **the securities clearing house will act as the counterparty**, as buyer or seller, to each purchase/sale transaction completed on the stock exchange
- Each transaction is honoured by the clearing house as it is **backed by a compensation fund** made up of brokers' contributions, a bank guarantee and an insurance policy

4.2 Financial Risk Management Techniques

- *Using derivatives*: derivatives can be used **to manage traded market risk**. Through credit default swaps, they can also be used **to manage credit risk**
- *Exposure netting*: used by global corporations and fund managers, this technique involves **setting off gains in one asset against losses in another**. Parties can avoid making full settlement by netting off exposures
- *Documentation*: an important credit risk management tool for corporations. An example is the **global master agreement** covering OTC derivative transactions produced by the International Swaps and Derivatives Association (ISDA)
- *Securities margin financing*: securities are provided as collateral and marked-to-market on a daily basis. If the investor reaches a particular collateral loss threshold, payment is required to reduce the shortfall to zero
- *Mark-to-market*: book/collateral value is adjusted to reflect its current market value
- *Role of market makers*: market makers promote market liquidity, thereby minimizing traded market risk
- *Limit setting*: securities exchanges set limits as a means of managing market and credit risks

4.3 Financial Risk Management in the Future – Lessons from the Past

- Some **major corporate collapses** in the 1990s and 2000s highlight problems faced when financial risk management is not adequate
- The following cases also highlight the **importance of good corporate governance**

4.3.1 The Barings Case

- Barings Bank collapsed in 1995 through the actions of one rogue trader in Singapore, highlighting the need to segregate duties and implement transparent reporting lines
- The trader was able to conceal trading losses as he was responsible for trading as well as settling, clearing and transaction reporting
- Management of the bank were shown to have little understanding of futures trading and failed to question the extraordinary Singapore profits

4.3.2 The Enron Case

- Enron, the largest US energy-trading company, collapsed in December 2001 through very poor corporate governance, with earnings managed to maximise share price rather than the building of a long-term business
- By removing debt from the balance sheet, and artificially inflating revenue and earnings, shareholders were given the impression of a healthy, profitable company when the reality was the opposite
- According to disclosures, Enron overstated earnings by USD567 million between 1997 and 2001
- Complicit in the false reporting was the audit firm, Arthur Andersen, which failed to provide an independent view of the firm's financial statements. Arthur Andersen was convicted of criminal offences and eventually dissolved
- Executive option schemes contributed to the pressure on management to report continually increasing earnings
- The collapse caused significant losses to both shareholders and employees, with the latter losing their corporate pensions, which were heavily invested in Enron stock
- The Enron case highlights the need for:
  - Good corporate governance on the part of company boards, who should set business cultures of transparency and accountability
  - High quality, accurate information for shareholders
  - Avoidance of conflicts of interest among employees, directors and auditors
  - Investment portfolio diversification

4.3.3 The Metallgesellsschaft Case

- From 1992 to 1993, the US subsidiary of Metallgesellsschaft (MG), a major German industrial conglomerate, contracted to sell a fixed amount of petroleum products at specified prices on a monthly basis for 10 years. MG hedged the risk of rising oil prices with one-month futures contracts on the New York Mercantile Exchange (NTMEX)
- In November 1993, MG had contracted to deliver, at fixed prices, the equivalent of 160 million barrels of crude oil – 80 times Kuwait's daily production
- Although this large position was apparently safe, when crude oil prices dropped sharply, MG suffered large losses on its futures positions and had to find cash to cover margin calls
- In December 1993, market rumours emerged of cash problems at MG – the exchange demanded higher cash deposits from MG to keep the futures positions open and counterparty derivatives dealers demanded additional collateral
- By late December 1993, MG's board took management control and liquidated all futures positions incurring losses of USD1.33 billion

- **The MG case illustrates the risks of futures trading** and presents the following lessons:
  - Don't hedge long-term risks (10 years) with short-term instruments (1 month)
  - Top management needs to understand how futures hedging operates
  - Cash requirements for hedging must be quantified
  - Changes in cost-of-carry relationships can inflict losses when short-term futures contracts are rolled over

4.3.4 The Lehman Brothers Case

- Lehman Brothers, (Lehman) the fourth largest US investment bank, collapsed in September 2008, making it the largest US bankruptcy on record
- Pre-bankruptcy, Lehman was one of the leading underwriters of mortgage-backed securities (MBS), reporting a 2007 profit of USD4 billion
- As with other major investment banks, it's assets were largely long-term and its liabilities were largely short-term
- With the US housing bubble bursting in 2007, and mass mortgage defaults in 2008, Lehman reported a second quarter loss in 2008 of USD2.8 billion
- To sustain its position, Lehman required substantial short-term financing from lenders, which was not forthcoming
- Lehman finally filed for bankruptcy protection on 15 September 2008, leading to USD46 billion being wiped off its market value
- Lehman's demise came from a combination of business factors, however central to its spectacular fall was poor liquidity management and the perils of extreme leveraging

4.3.5 The Madoff Case

- The Madoff Case is considered to be the largest Ponzi scheme in US history, involving thousands of investors and billions of dollars
- Bernard Madoff was the chairman of the NASDAQ in the early 1990s. He was able to entice many celebrities into his fund, given his high status in the financial market
- Although the fund produced a return of 10-20% per annum consistently, Madoff did not make any trade transactions. He simply paid the returns to old clients with monies contributed by new clients
- The fund reported USD64.8 billion in client assets in its last statement – by the end of 2017, 37,011 victims of the scheme received a total of USD2.7 billion from the liquidation of Madoff's assets
- In 2009, Madoff was sentenced to 150 years in prison and forced by the court to pay back USD170 billion
- The case highlights audit issues with investment funds

4.3.6 Government Initiatives

- The HKSAR Government has instigated several initiatives over the years to promote best practice in financial risk management. Central to these initiatives are the HKMA and the SFC