Derivatives

Topics

- Derivatives
- Selling short, stock lending and contract for differences (swaps)
- Convertibles and Warrants
- Credit Derivatives

Derivatives

Derivatives

Learning outcomes……..

- **Distinguish** between forwards, futures and options
- **Explain** the nature, trading and settlement of exchange-traded derivatives
- **Identify** the motive for using a futures contract rather than a trade in underlying asset
- **Explain** the nature of, and reasoning behind, a contango and backwardation market
- **Define** the ‘basis’ of a futures contract

Derivatives

Learning outcomes……..

- **Describe** the main features of the following ICE Futures contracts: short-term interest futures, long gilt futures and FTSE 100 futures
- **Explain** the possible uses of the above contracts in an investment management context
- **Define** the concept of index arbitrage
- **Distinguish** between American-style and European-style options
- **Differentiate** between the time value and intrinsic value components of an option premium

Derivatives

Learning outcomes……..

- **Determine** when an option is in-the-money, out-of-money or at-the-money
- **Calculate** the time value of an option, given the premium, strike price and current market price
- **Explain** the use of futures and options in hedging an equity portfolio
- **Calculate** the number of futures or options contracts required to hedge a portfolio with a specified beta value
- **Identify** and **Explain** the factors that determine the premium of an option

Derivatives

Types of Derivatives

Forward Contracts	**Futures Contracts**
A contract between buyer and seller who agree to a future settlement of underlying asset at a price agreed upon today.	A contract between buyer and seller who agree to a future settlement of underlying asset at a price agreed upon today.
Traded Over the counter (OTC)	Traded on Exchanges (In UK for trading Futures and Options, **ICE Futures Europe** is the main exchange)
It is a customized contract	It is a standardized contract
Commonly used in Forex markets	Commonly used in many markets such as equity, bonds, currencies and commodities

Derivatives

Types of Derivatives

Swap (Contract for Difference (CFD))	**Options Contracts**
Series of forward contracts	Options contract, called **contingent claim contract**, gives right to the buyer to buy or sell underlying asset at a fixed price in future.
Traded OTC	Thus, unlike futures, options give **right to buyer** not the obligation. But the seller of option only **has obligation**, no right.
Interest rate Swap, Currency Swap and Equity Swap are main types	Could be exchange traded or OTC

Derivatives

Role of Clearing house for exchange traded derivatives

- The trades between buyers and sellers are guaranteed by the clearing house.
- It means even if one of the parties defaults the other party is not affected due to guarantee from clearing house.
- So, the buyers and sellers do not have credit risk in case of exchange traded derivatives but clearing house faces credit risk from each buyer and seller.
- To ensure that this credit risk is taken care of, the clearing house collects "**margin**" from buyers and sellers. This margin or deposit is called "**initial margin**" when buyer or seller takes a position in exchange traded derivatives.

Derivatives

Role of Clearing house for exchange traded derivatives

- Daily, **gains are paid** to those who made profits and **losses are collected** from those who made losses.
- If the losing party does not pay, the clearing house has the initial margin as a collateral, hence the clearing house does not suffer from default.
- For futures,
  - Buyer (**Long futures**) loses if price of future falls and gains if price of futures goes up
  - Seller (**Short futures**) loses if price of futures goes up and gains if price of futures falls

Derivatives

Role of Clearing house for exchange traded derivatives

- Traditionally, forwards are customized and OTC contracts. Hence the buyers and sellers both take risk of default on each other.
- After 2008, in order to make OTC derivatives safer, regulators started requiring OTC derivatives to be cleared and settled through organized clearing bodies or structures.
- One such example is CME ClearPort which clears transactions across multiple asset classes globally for agriculture, equities, foreign exchange, interest rates and metals markets.
- ClearPort becomes counterparty to every transaction, limiting credit risk by guaranteeing financial performance.

Derivatives

Differences between Forwards and Futures

Futures	Forwards
Exchange-traded	OTC
Standard contract (delivery dates, size)	Negotiable/flexible
Liquid (easier to close out)	Not liquid
Low credit risk	High credit risk
Margin requirements	No margin – negotiable

Derivatives

Trading Futures Contracts

- Futures price depends upon the underlying asset price (called spot price). Generally, these prices move in line with each other.
- On **expiry** of futures, futures price and spot prices **are equal**.
- Before the expiry, futures price is different than the spot price which is known as 'basis'.
- Basis = Spot price – Futures price
- **Contango**: When futures price > Spot price; **Backwardation**: When futures price < Spot price

Trading Futures Contracts

- Backwardation occurs because Convenience Yield > Risk-free rate
  - **Convenience yield** is the benefit associated with holding the asset rather than having a contract which may deliver asset sometime in future.

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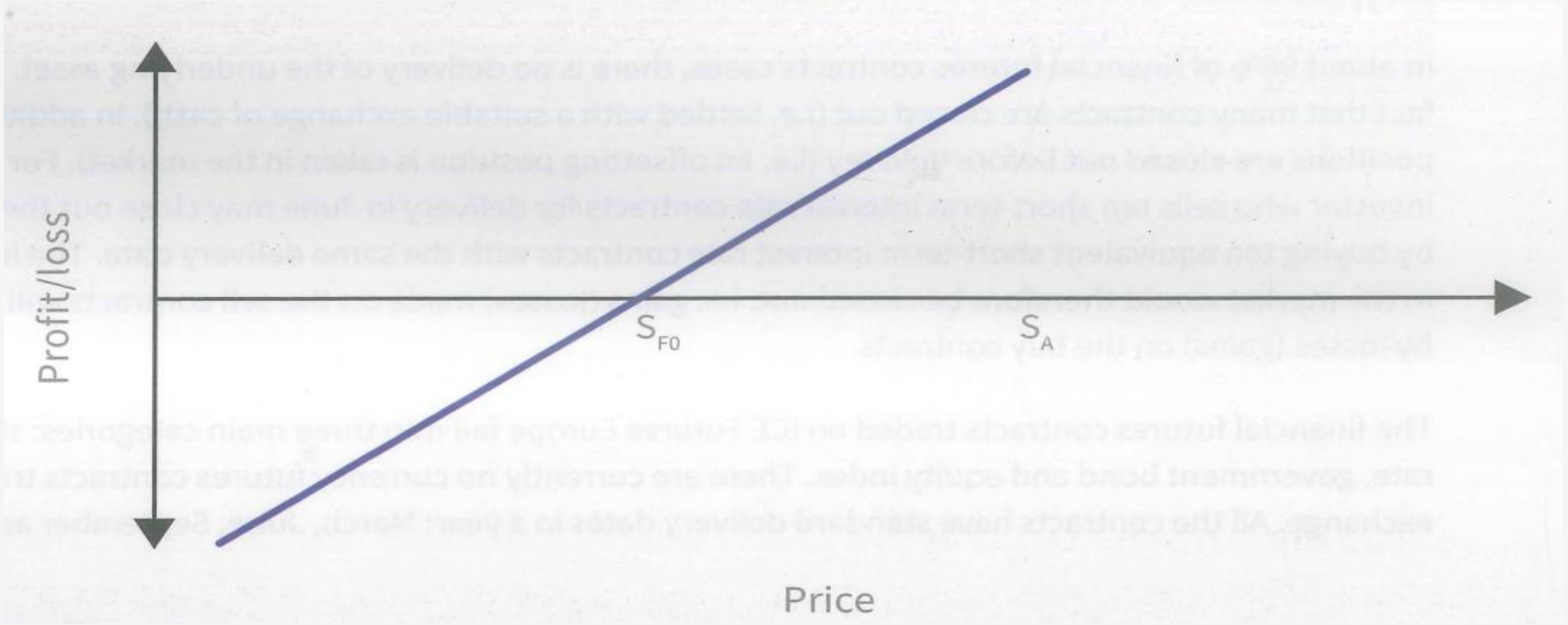
Profit or Loss from buying futures contract:



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Closing out Futures Positions

- A **buy** (Long) position in futures needs to be closed by
  - taking a **sell** (Short) position in the same futures.
- A **sell** (Short) position in futures needs to be closed by
  - taking a **buy** (Long) position in the same futures.
- Closing of futures contract depends upon liquidity of the contract. Generally, futures are more liquid in **nearest** contract to expiry.
- Futures are mainly used for speculation and hedging.

Derivatives

Using Financial Futures

- Investors can take view on short-term or long-term interest rates using financial futures.
- **Advantages of financial futures** over underlying asset such as Gilts or Equity shares.
  - lower transaction costs
  - generally, higher liquidity of futures contracts
  - Rapid execution of futures transactions compered to the cash market
  - Short positions by selling futures, which may not be possible in cash market
  - System of margins allowing investors **advantage of leverage**
- In about 98% of futures contracts, there is no delivery of underlying asset. Because of most of futures are closed out before delivery or settled in cash.

Derivatives

Using Financial Futures

- When the contracts are closed out, gains (losses) on buy contracts exactly equals losses (gains) on sell contracts

The financial futures contracts traded on ICE Futures Europe fall into three main categories: short-term interest rate, government bond and equity index. There are currently no currency futures contracts traded on this exchange. All the contracts have standard delivery dates in a year: March, June, September and December.

Derivatives

Short term ICE Futures Europe Interest rate contracts

- 3-month Sterling ICE Futures Europe Contract
  - Known as **Short Sterling** futures contract which is **cash settled**
  - Based on ICE Libor rate for 3-month deposits
  - Deposit amount of £ 500,000
  - Priced as 100 – Rate of interest
    - If the contract price is 95.25, then interest rate is 100 – 95.25 = 4.75(%).
  - Value of a basis point for the contract: 500,000 * 0.01% * 3/12 = £ 12.50
  - Tick Size: Half a basis point: £ 6.25

Derivatives

Short term ICE Futures Europe Interest rate contracts: Trading based on expected Interest Rate movement

Suppose Short Sterling Futures are trading at 95.25 and two traders expect the following:	
Trader A: Expects ICE Libor i.e. short term rates to **fall**	**Trader B**: Expects ICE Libor i.e. short term rates to **rise**
The trader should go long (buy) futures at 95.25. Number of contracts: 45	The trader should short (sell) futures at 95.25. Number of contracts: 27
Suppose, after few days, interest rates fall as expected and futures trade at 97.15, what will be the gain to trader?	Suppose, after few days, interest rates rise as expected and futures trade at 93.95, what will be the gain to trader?
Gain = 45 * (97.15 – 95.25)*100 * £12.50 = 106,875	Loss = 27 * (95.25 – 93.95)*100 * £12.50 = 43,875

- **Strategy: Buy** if interest rates are expected to **fall**, **Sell** if interest rates are expected to **rise**

Derivatives

Short term ICE Futures Europe Interest rate contracts: Trading based on expected Interest Rate movement

- **Trading Strategy: Buy** if interest rates are expected to **fall**, **Sell** if interest rates are expected to **rise**

- **Hedging Strategy:**
  - **Future borrowers** should **go short** in interest rate futures
  - **Future lenders** should **go long** in interest rate futures

Derivatives

Long Bond Futures contracts

- Underlying: Gilts for Sterling contracts
  - Delivery based settlement
  - Delivery of pre-specified gilts can be given by the seller
  - Seller delivers **Cheapest to Deliver** (CTD) bond

- Bond portfolio managers can utilize long bond futures to hedge interest rate risk
- A bond portfolio manager who **is worried about increase in interest rates** and consequently fall in bond price, should **go short on bond futures**.

Derivatives

Long Bond Futures contracts

Bond portfolio managers can make use of bond futures contracts. For example, suppose that a portfolio manager who holds long-term gilts in their portfolio believes there will be an increase in long-term UK interest rates. As this would reduce the prices of the gilts held, they decide to hedge this risk by using long gilt futures contracts. They sell ten long gilt futures at a price of £115.50.

Note that the contract value of one long gilt futures contract is £100,000. Therefore, the manager will have to deliver gilts with a nominal value of £1m if they intend to deliver. The tick value of this contract is 0.01 of 1% of the face value of the contract, i.e. £10 (£100,000 × 0.01 × 0.01). If long-term interest rates do rise, and the price of long gilts in the manager's portfolio falls, then this will be compensated for by a gain on the futures contracts. This can be seen if we assume that the price of the long gilt futures contract falls to £114.40. The portfolio manager decides to close out their position in the futures market by taking an offsetting position – that is, buying ten long gilts futures contracts with the same delivery date. The fund manager's gain will therefore be:

Derivatives

Long Bond Futures contracts

Gain = (price of contracts sold – price of contracts bought) × 100 × number of contracts × tick value of contract

= (115.50 – 114.40) × 100 × 10 × £10 = £11,000

Derivatives

Equity index futures

- Underlying: Index of ordinary shares such as FTSE 100 Index
  - Cash settlement
- FTSE 100 futures contract
  - Priced at £10 per Index point
  - Tick size: £5
  - Thus, change in Index by 10 points, say from 6500 to 6510, will result into a gain of £100 for the buyer and loss of £100 for the seller.

Index arbitrage

- An arbitrageur exploits pricing anomaly between different markets, by buying it cheaper and selling it costlier.
- In doing this, arbitrageurs help remove the price discrepancies in both the markets.
- **Index arbitrage**: Trading anomalies between index pricing and futures contracts on the index.
  - Due to technology advancements, such opportunities have become limited.
  - Whenever there is sufficiently large difference between index price and the futures price, arbitrageurs will exploit the difference by buying one and selling another
  - Thus, index arbitrage plays an important role in linking futures price and cash index price.

Derivatives

Options

- **Call option**: It is a **right to buy** the underlying asset at a fixed price (called **strike price** or **exercise price**) on or before a specific date.
  - Call buyer has the right and call seller has the obligation.
- **Put option**: It is a **right to sell** the underlying asset at a fixed price (called **strike price** or **exercise price**) on or before a specific date.
  - Put buyer has the right and put seller has the obligation.
- **European-style options**: Can be exercised only on expiry or maturity date.
- **American-style options**: Can be exercised any time before or on expiry or maturity date.
  - Costlier than European options

Derivatives

Options

- Majority of exchange traded options are American options including options on ICE Futures Europe
- ICE Futures Europe offers options on:
  - Stock of around 120 publicly traded UK companies
  - FTSE Index
  - Range of futures contracts
  - Different maturity options are available. Similarly, options on different exercise prices are available.

Derivatives

Options

Note that there are other types of option, including the so-called exotic options. These exotic options include:

- **Asian options**, where payoff depends on the average price of the underlying asset over a given period of time. This averaging implies relatively low volatility.
- **Bermudan options**, which are hybrids of European and American options. They can only be exercised on pre-determined dates – say, on one day each month – thus allowing investors to buy or sell a security at a pre-set price on both pre-set dates and the final expiry date.

Derivatives

Trading Options

- **Option premium**: Price which is paid by option buyers to option sellers.
- As options are traded, option premium keeps on changing.
- Option premium can be bifurcated into two components:
  - **Intrinsic Value**: It is the value to be received if the option is exercised immediately. Or the value by which the option is **In-the-money**.
  - **Time Value**: It is the difference between option premium and Intrinsic value

Derivatives

Trading Options

To recap, for call options:

- **out-of-the-money** implies that the price of an asset is **below** the exercise price;
- **at-the-money** implies that the price of the asset **equals** the exercise price; and
- **in-the-money** implies that the price of the asset is **above** the exercise price.

And for put options:

- **out-of-the-money** implies that the price of an asset is **above** the exercise price;
- **at-the-money** implies that the price of the asset **equals** the exercise price; and
- **in-the-money** implies that the price of the asset is **below** the exercise price.

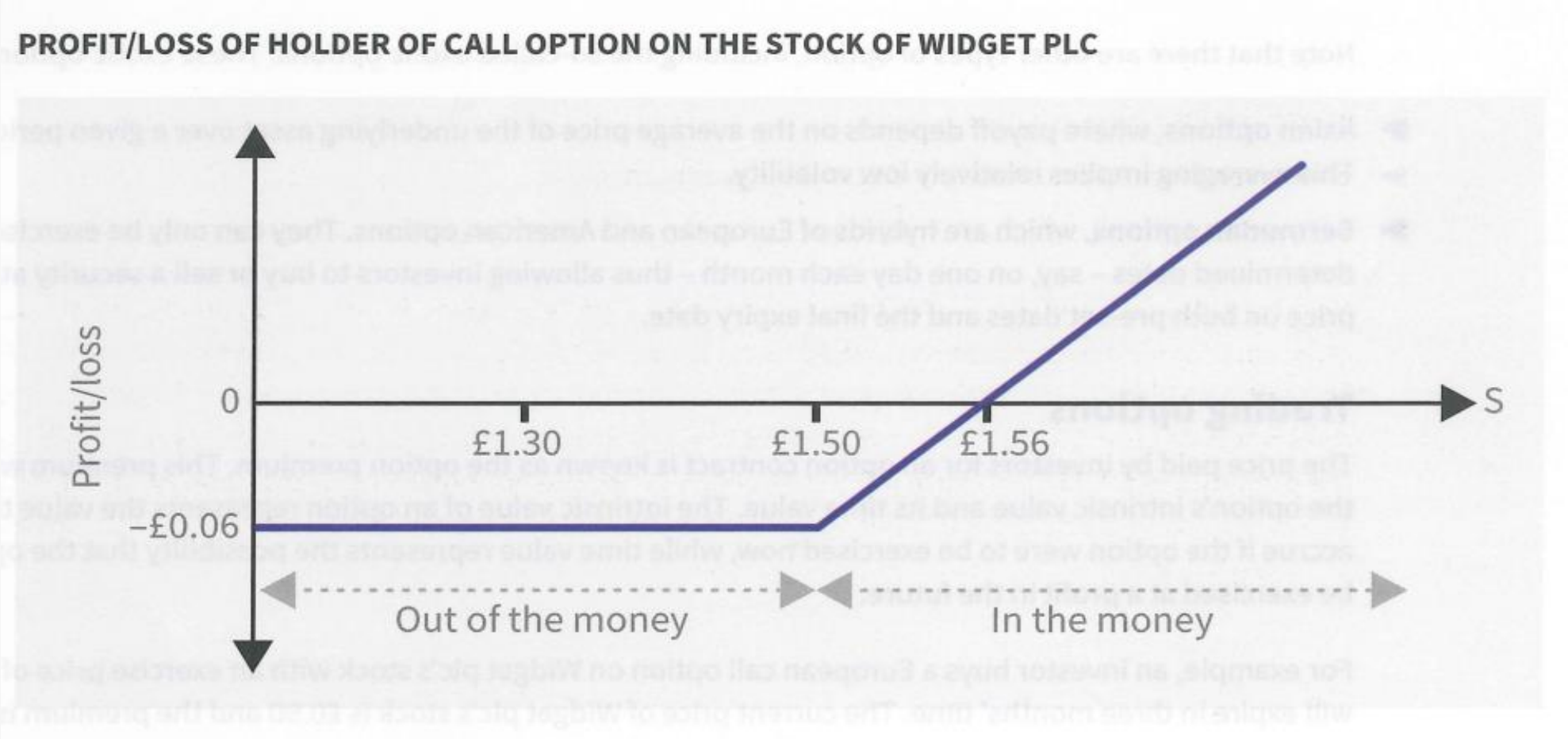
Derivatives

Trading Options: Intrinsic and Time Value of options

Call Option Premium: $4; Strike Price: $90; Spot Price: $85	**Put Option** Premium: $8; Strike Price: $110; Spot Price: $115
Call Option Premium: $11; Strike Price: $150; Spot Price: $155	**Put Option** Premium: $17; Strike Price: $320; Spot Price: $310

Derivatives

Trading Options: Long Call: Premium: £0.06; Strike Price: £1.50



Derivatives

Trading Options: Long Call: Premium: £0.06; Strike Price: £1.50

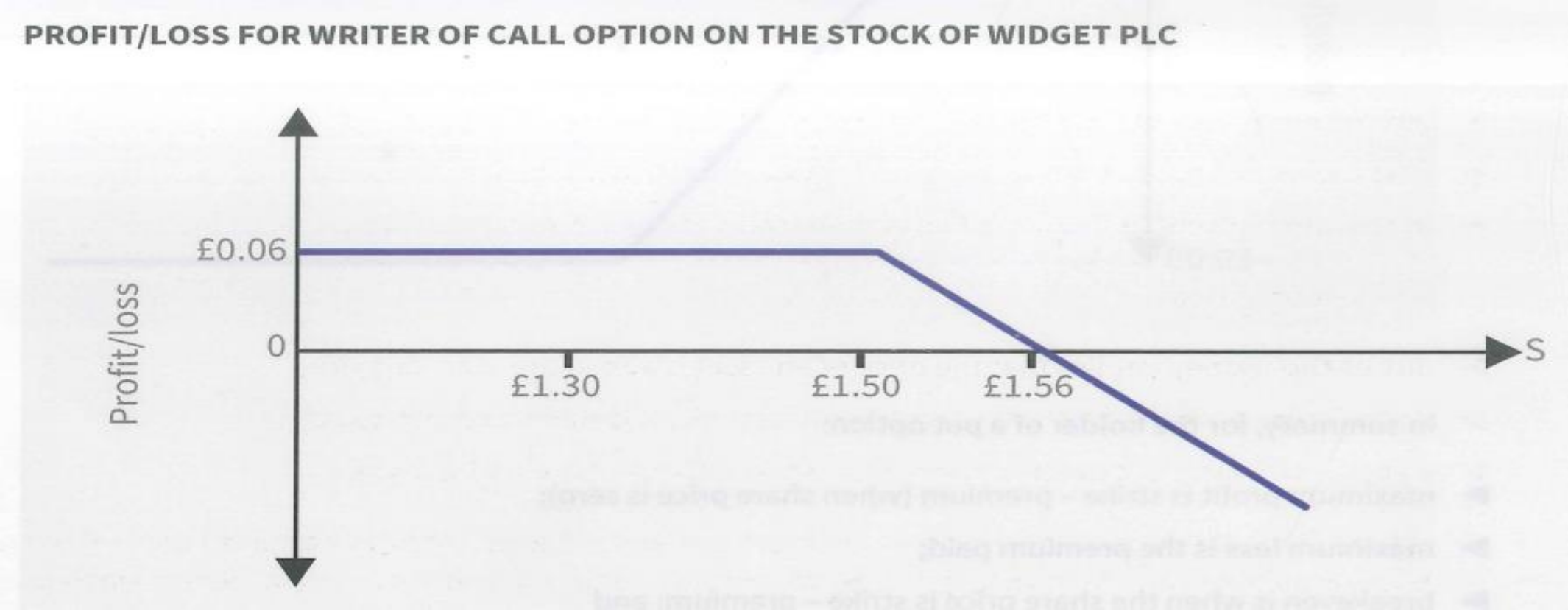
- limits their loss to £0.06 per contract, but does not limit their possible gain;
- will exercise the option as long as the spot price is greater than the strike price (a bullish motivation); and
- will break even when the strike price plus the premium equals the spot price.

In summary, for the holder of a call option:

- maximum profit is potentially unlimited;
- maximum loss is the premium paid;
- breakeven is when the share price is strike + premium; and
- motivation for the trade: bullish (expecting market to rise).

Derivatives

Trading Options: Short Call or Writing Call: Premium: £0.06; Strike Price: £1.50



Derivatives

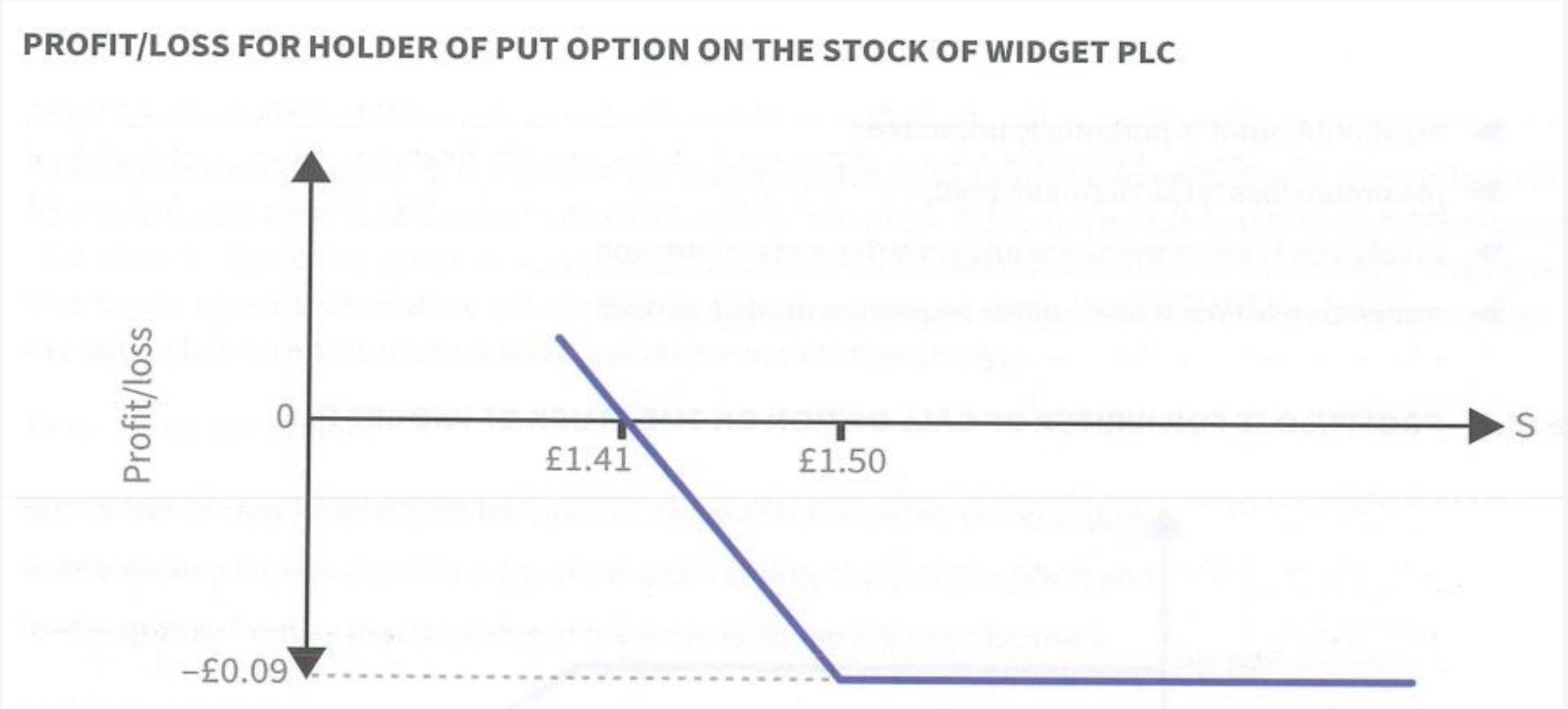
Trading Options: Short Call or Writing Call: Premium: £0.06; Strike Price: £1.50

In summary, for the writer of a call option:

- maximum profit is the premium earned;
- maximum loss is potentially unlimited;
- breakeven is when the share price is strike + premium; and
- motivation for the trade: bearish/neutral (expecting market to fall or remain static).

Derivatives

Trading Options: Long Put: Premium: £0.09; Strike Price: £1.50



Derivatives

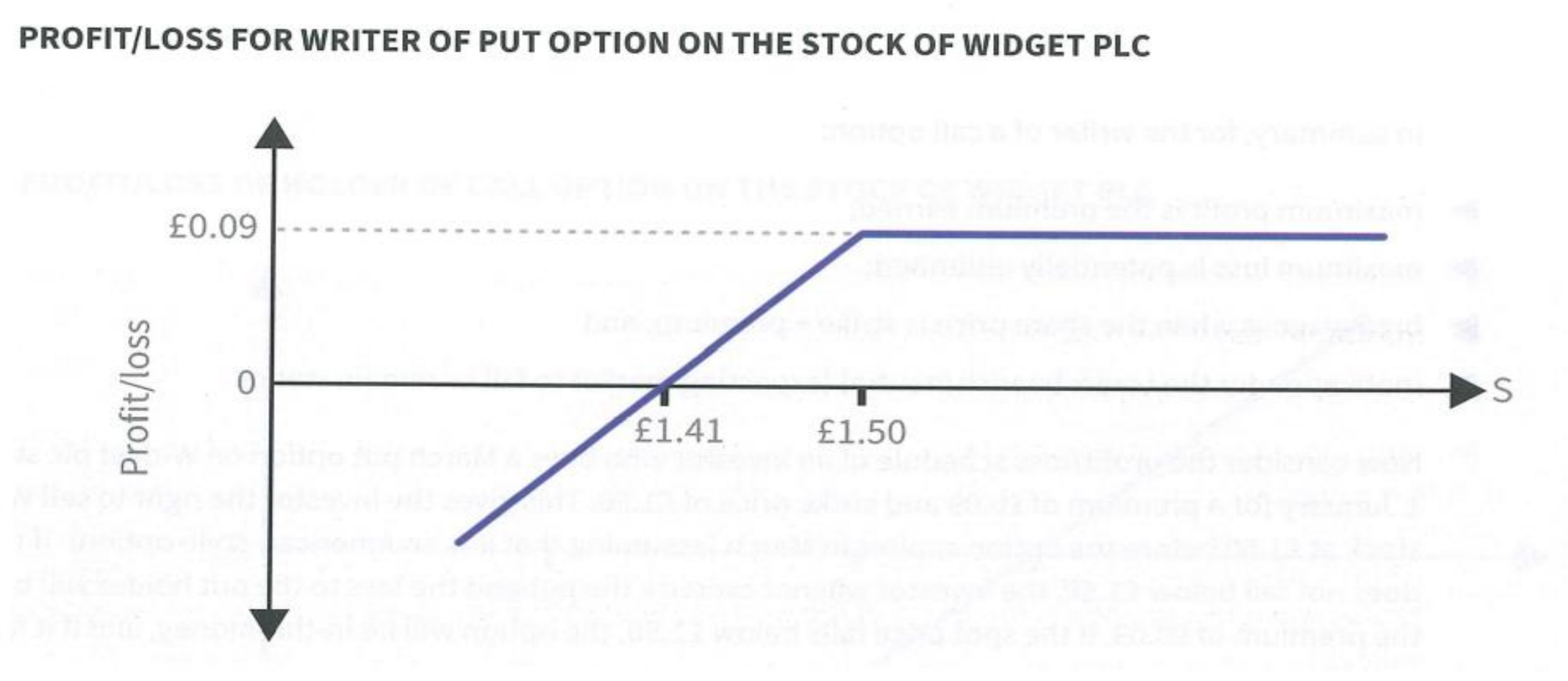
Trading Options: Long Put: Premium: £0.09; Strike Price: £1.50

In summary, for the holder of a put option:

- maximum profit is strike – premium (when share price is zero);
- maximum loss is the premium paid;
- breakeven is when the share price is strike – premium; and
- motivation for the trade: bearish.

Derivatives

Trading Options: Short Put or Writing Put: Premium: £0.09; Strike Price: £1.50



Derivatives

Trading Options: Short Put or Writing Put: Premium: £0.09; Strike Price: £1.50

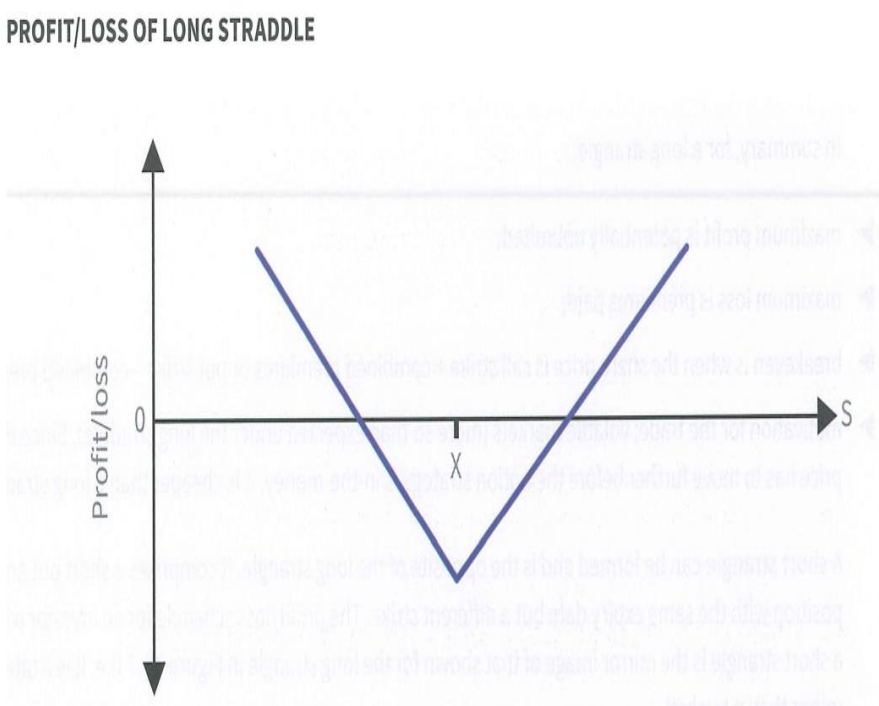
In summary, for the writer of a put option:

- maximum profit is premium earned;
- maximum loss is strike – premium (when share price is zero);
- breakeven is when the share price is strike – premium; and
- motivation for the trade: bullish/neutral.

Derivatives

Trading Options: Combining Options

- **Long Straddle**: Buy Call and Buy Put at **same strike** and same expiry date



In summary, for a long straddle:

- maximum profit is potentially unlimited;
- maximum loss is the total premiums paid (for call + put);
- breakeven is when the share price is strike ± premiums; and
- motivation for the trade: volatile markets (the investor thinks the market is unstable but is not sure which way the prices will go).

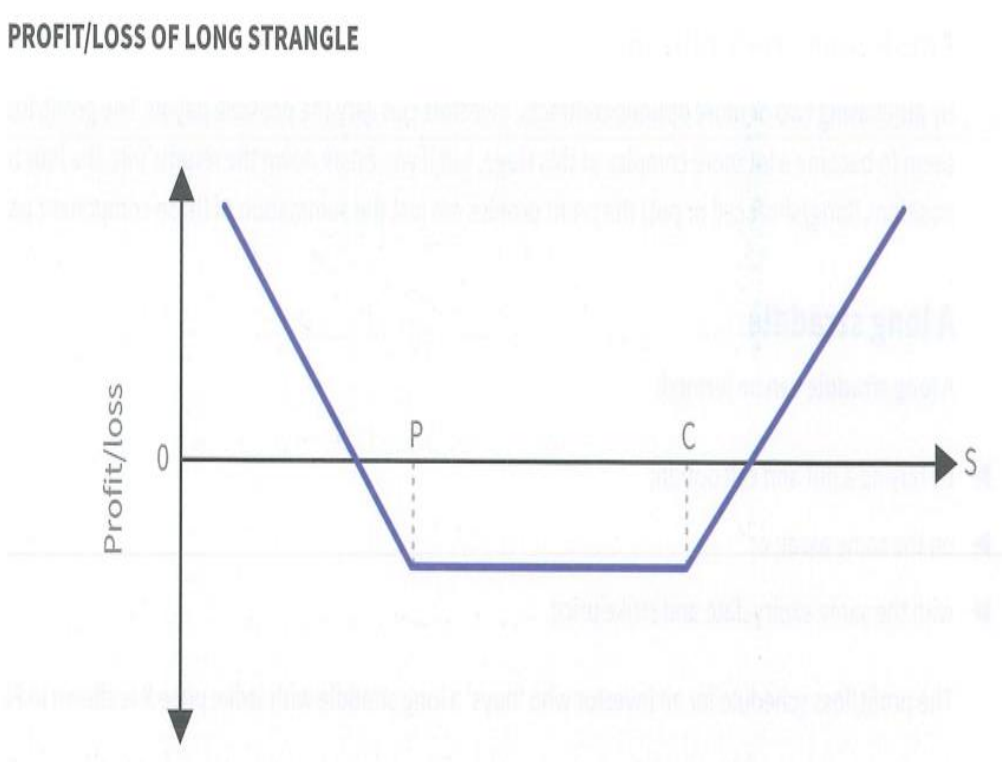
Trading Options: Combining Options

- **Short Straddle**: Sell Call and Sell Put at **same strike** and same expiry date

The maximum profit is the sum of the premiums; the maximum loss is potentially unlimited, and the breakeven is the same as that of the long straddle. The motivation would be the opposite for that of the long straddle – i.e. static markets. The investor believes that markets are not going to move much above or below the strike.

Trading Options: Combining Options

- **Long Strangle**: Buy Call and Buy Put at **different strike** and same expiry date



In summary, for a long strangle:

- maximum profit is potentially unlimited;
- maximum loss is premiums paid;
- breakeven is when the share price is call strike + combined premiums or put strike – combined premiums; and
- motivation for the trade: volatile markets (more so than expected under the long straddle). Since the share price has to move further before the option strategy is in-the-money, it is cheaper than a long straddle.

Trading Options: Combining Options

- **Short Strangle**: Sell Call and Sell Put at **different strike** and same expiry date

The maximum profit is the combined premiums paid, and the maximum loss is potentially unlimited (if the share price goes high enough). The breakeven is the same as that of the long strangle. The motivation for the trade is the opposite to that of the long strangle, i.e. a stable market is expected. The investor thinks that the market is a little less stable than expected with the short straddle, so they make sure that the share price has to move further before either option is in-the-money. So the premium income is lower than that for a short straddle.

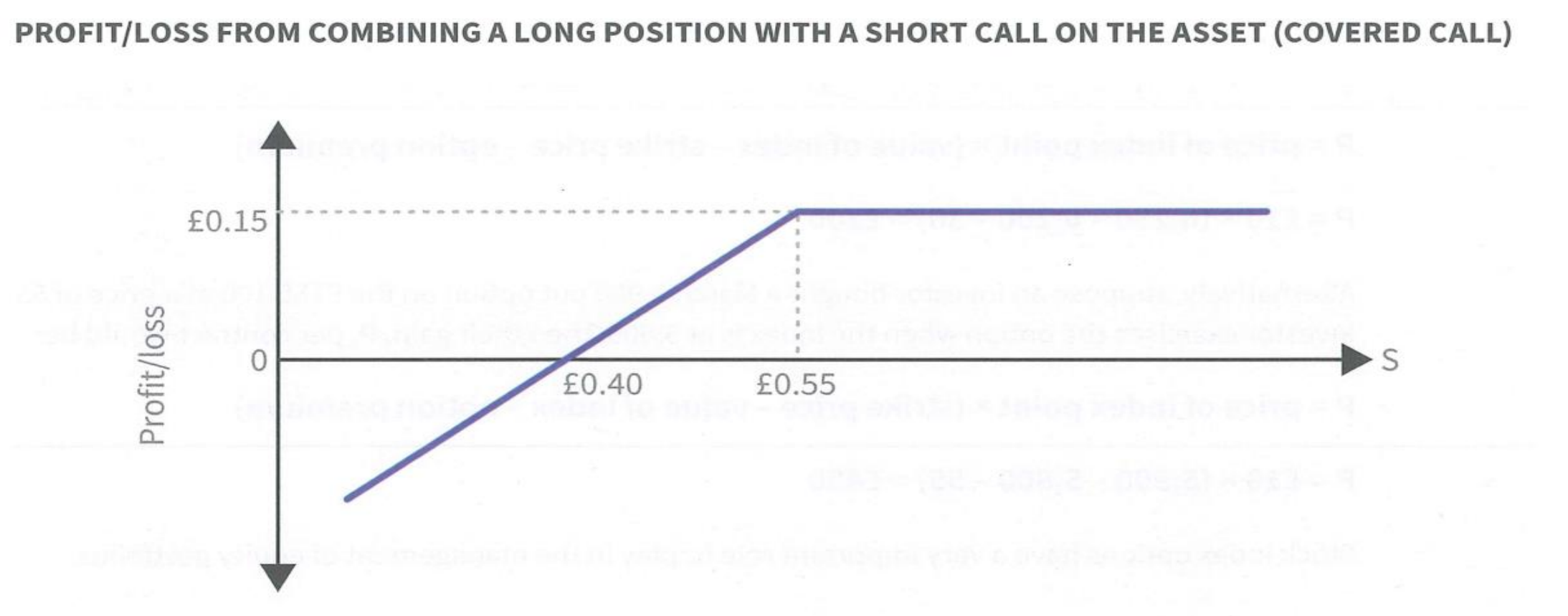
Derivatives

Trading Options: Combining Options with underlying asset

- **Covered Call**: Buy Stock and Sell Call
- Example: An investor buys stock at £0.50 and sells a call option with a strike of £0.55 for a premium of £0.10.
  - This provides a protection from fall in stock price till £0.40
  - Maximum gain is £0.15

Trading Options: Combining Options with underlying asset

- **Covered Call**: Buy Stock and Sell Call



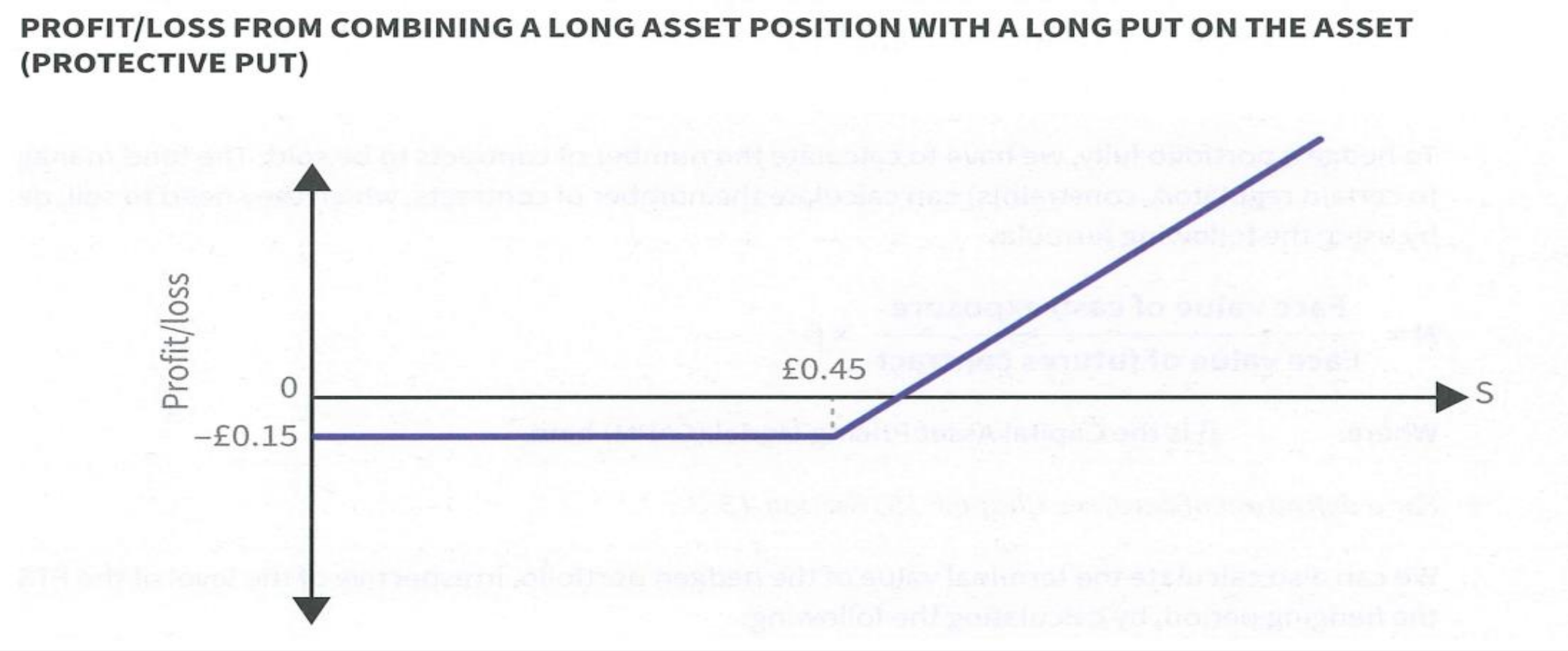
Derivatives

Trading Options: Combining Options with underlying asset

- **Protective Put**: Buy Stock and Buy Put
- Example: An investor buys stock at £0.50 and buys a put option with a strike of £0.45 for a premium of £0.10.
  - This provides full protection from fall in stock price
  - Maximum loss is £0.15
  - Maximum gain is unlimited

Trading Options: Combining Options with underlying asset

- **Protective Put**: Buy Stock and Buy Put



Trading Options: Stock Index Options

- Index options are traded in most of the exchanges.
- In ICE Futures, FTSE 100 is the index option that is cash settled.
  - Each point on index is valued at £0.10.

Trading Options: Stock Index Options

The premium of ICE Futures Europe stock index option is quoted in index points. For example, suppose an investor purchased a March 6,200 call option on the FTSE 100, at a price of 30. This means that the investor will exercise the option if the index rises above 6,200 before expiry in March, where the price of the option is £300 (30 × £10). If the investor exercises the option when the index is at 6,250, then their gain, P, per contract would be:

$$P = \text{price of index point} \times (\text{value of index} - \text{strike price} - \text{option premium})$$

$$P = £10 \times (6{,}250 - 6{,}200 - 30) = £200$$

Trading Options: Stock Index Options

Alternatively, suppose an investor bought a March 5,900 put option on the FTSE 100 at a price of 55. If the investor exercises the option when the index is at 5,800, then their gain, P, per contract would be:

P = price of index point × (strike price – value of index – option premium)

P = £10 × (5,900 – 5,800 – 55) = £450

Stock index options have a very important role to play in the management of equity portfolios.

Derivatives

Role of Derivatives in Portfolio Management: Hedging with Futures

- An equity portfolio manager can hedge a portfolio of UK equities by **selling** FTSE 100 stock index futures.
- The **number of contracts to sell** to hedge a portfolio can be calculated as follows:

$$N = \frac{\text{Face value of cash exposure}}{\text{Face value of futures contract}} \times \beta$$

- The terminal value of the hedged portfolio is calculated as follows:

$$TV_1 = MV_0 \times \left[1 + \left[\frac{P^f - P^s}{P^s} \times \beta\right]\right]$$

Where:

TV_1 is the terminal value of the portfolio;

MV_0 is the initial value of the portfolio; and

P^f and P^s are the current (at inception) prices of the futures contract and the spot index, respectively.

Derivatives

Role of Derivatives in Portfolio Management: Hedging with Futures

- We can calculate hedge efficiency to know how effective was hedge:

$$\text{Hedge efficiency} = \frac{\text{Absolute gain/loss from futures position}}{\text{Absolute gain/loss from cash market}} \times 100\%$$

Derivatives

Role of Derivatives in Portfolio Management: Hedging with Options

- An equity portfolio manager can hedge a portfolio of UK equities by **buying** FTSE 100 stock index puts.
- This has the advantages that
  - It protects from downside
  - It allows to benefit from upside
- Number of puts to be used for hedging are calculated as follows:

$$N = \frac{\text{Face value of cash exposure}}{\text{Face value of index option}} \times \beta$$

Derivatives

Determinants of Option Premium

	Call Option	Put Option
Spot Price	Direct	Inverse
Exercise Price	Inverse	Direct
Time to Expiry	Direct	Direct
Volatility of share price	Direct	Direct
Discount rate (Interest rate)	Direct	Inverse

Derivatives

Delta and Other Greeks

Delta	Measures sensitivity of option price to the underlying asset price
Theta	Measures sensitivity of option price to the passage of time
Vega	Measures sensitivity of option price to the change in the volatility of the underlying asset
Rho	Measures sensitivity of option price to the change in interest rates

Selling Short, Stock Lending and Contract for Differences

Selling short, Stock lending and Contract for Differences (swaps)

Learning Outcomes……..

- **Explain** the role of stock lending in the markets and the benefits to the participants
- **Explain** the mechanics and uses of short selling
- **Explain** the nature of, and motivations behind, interest rate swaps, currency swaps, equity swaps and inflation swaps

Selling short, Stock lending and Contract for Differences (swaps)

Stock Lending

- Lender temporarily transfers securities to borrower.
- The borrower returns securities at agreed time or on demand by the lender.
- Borrower also provides suitable assets as collateral.
- In case of UK law, legal title of securities transfers to the borrower who receives income on securities such as dividends, coupons etc.
- Hence lending agreement requires borrower to make payments equivalent to income received to the lender. These are called manufactured payments or manufactured dividends.

Selling short, Stock lending and Contract for Differences (swaps)

Stock Lending

- Most common reason for securities borrowing is covering a **short position** or **short selling**.
- Lenders include
  - Pension funds, insurance companies, mutual funds and unit trusts
- Lenders ensure they get manufactured income and also receive a fee for lending for securities which are otherwise possive.

Selling short, Stock lending and Contract for Differences (swaps)

Short Selling

- Involves borrowing securities in order to sell them in market at today's price in the expectation that the price will fall in the future.
- Short selling is a high-risk strategy generally undertaken by hedge funds and other alternative funds.
- During certain time periods, regulators have put ban or restrictions on short selling since it was believed to contribute to equity market decline.
- **Short Squeeze**: This may occur is there are huge short selling positions and unexpectedly stock price starts going up either due to good news or buying pressure created by investors.

Selling short, Stock lending and Contract for Differences (swaps)

Contracts for Differences

A **contract for difference (CFD)** is an agreement between two parties to exchange the difference between the opening price and the closing price of a contract, at the close of the contract, multiplied by some underlying specified size of contract.

- CFDs allow investors to create long and short positions in cost effective and simpler manner.
- CFDs can be traded on any financial asset, including stocks, indices, interest rates, bonds and commodities.
- Swaps are CFDs that are traded OTC.

Selling short, Stock lending and Contract for Differences (swaps)

Equity Swaps

- Equity swap is a CFD where one party agrees to pay to another the return on underlying equity over some specified time.
- So, Party A pays equity return i.e. difference between closing and opening price of the underlying equity to Party B. Party B in return pays some fixed rate of interest to Party A.
- The cash settlement finally happens based on agrees underlying nominal value, say £10 m. This value is only notional and is used to calculate the return to be exchanged between the two parties.
- Net settlement takes place.

Selling short, Stock lending and Contract for Differences (swaps)

Equity Swaps

- Equity swap is an effective way to increase or decrease exposure to equities.
- At the same time, there is no requirement to directly buy or sell stocks.
- The trader or investor can also avoid price impact of larger trades.

Selling short, Stock lending and Contract for Differences (swaps)

Interest rate Swaps

- Interest rate swap involves periodic net settlement between two parties where one party pays a fixed rate of interest while the other party pays a variable rate of interest (say Libor).
- Interest payments are linked to a notional principal which is never exchanged.
- The fixed rate payer is called **buyer of the swap** while variable rate payer is a **seller of the swap**.
- Net settlements take place regularly at the end of specified time periods, say every quarter.

Selling short, Stock lending and Contract for Differences (swaps)

Interest rate Swaps

- At the swap initiation, there is no cash inflow or outflow for any party.
- Later either party may benefit or lose from the swap depending upon interest rate movements
- These swaps may be entered into for hedging or trading purposes.

Selling short, Stock lending and Contract for Differences (swaps)

Currency Swaps

- In currency swap, both the parties exchange interest payments but in different currencies.
- For example, one party pays fixed or variable interest in USD to the other party who in tern pays fixed or variable interest in GBP.
- Generally, currency swap involves the following: (assuming swap involving USD and GBP)
  - Initially Party A transfers 1.21 mln USD to Party B who transfers 1 mln GBP to Party A.
  - Party A keeps paying interest on GBP to Party B who pays interest on USD.
  - Finally, re-exchange of principals takes place to close the swap.

Selling short, Stock lending and Contract for Differences (swaps)

Currency Swaps

- Currency swaps may be undertaken to exploit comparative advantage and reduce borrowing costs

Selling short, Stock lending and Contract for Differences (swaps)

Inflation Swaps

- Inflation swaps are used to transfer inflation risk between counterparties.
- They include real rate swaps, where TIPS or IGLs can be swapped.
- Swapping involves swapping of real rate coupon vs. floating and also involves redemption enhancement at maturity.

Selling short, Stock lending and Contract for Differences (swaps)

Inflation Swaps

Inflation swaps are typically priced at a zero-coupon bond basis, with payment exchanged at the end of the term: one party pays the compounded fixed rate, while the other pays the actual inflation rate for the term. They can also be paid on a year-on-year basis where the year-on-year change in the price index is paid.

Options on inflation, including caps, flows and straddles, can also be traded and are usually priced against year-on-year swaps.

Inflation swaps also exist where the coupon payment of the index-linked bond, as well as the redemption pick-up at maturity, is exchanged for interest rate payments expressed as a premium or discount to LIBOR for the relevant bond coupon period.

Real rate swaps are the nominal interest rate swap less the corresponding inflation swap.

Convertibles and Warrants

Convertibles and Warrants

Learning outcomes……..

- **Explain** the nature of convertible bonds and convertible preference shares
- **Calculate** a conversion price, conversion value and conversion premium
- **Explain** the component parts of the valuation of a convertible bond (namely straight bond value, call option value, dilution effect and conversion ratio)
- **Distinguish** between a warrant and a call option
- **Explain** the key features of covered warrants

Convertibles and Warrants

Convertibles

- Could be a convertible bond or convertible preference share
- A convertible allows investors to convert their holding of debt for a pre-specified amount of firm's equity on or before a prespecified date.
- Investors may choose for conversion if ordinary equity is doing well i.e. share price is going up.
- Since there is a potential for higher returns in case of convertible bonds, firms can issue convertible bonds at **a lower rate** compared to an equivalent non-convertible issue.
- Hence it may represent **a cheaper way** of raising capital.

Convertibles and Warrants

Convertibles: Important Terms

- **Conversion Ratio**: Number of new shares that will be exchanged for one convertible bond

$$\text{Conversion price} = \frac{\text{Par value of convertible}}{\text{Conversion ratio}}$$

$$\text{Conversion value} = \text{current share price} \times \text{conversion ratio}$$

Convertibles and Warrants

Convertibles: Important Terms

- **Convertible Price**: The general formula is

$$C = P_b + \frac{A^c}{(1+q)} \times CR$$

Where:

P_b is the price of a similar bond without the convertible option;

A^c is the value of an American call option on the firm's ordinary shares, with the same expiry date and exercise price; and

q is the percentage change in outstanding shares if all bonds are converted.

- A convertible bond will at least have a price equal to an equivalent non-convertible bond.

Convertibles and Warrants

Convertibles: Example:

- Convertible bond par value: £100; Each bond can be converted into 25 shares (CR)
  - This gives us Conversion Price of 100 / 25 = 4
- Suppose current share price is £2.
  - Conversion value = £2 * 25 = £50

Convertibles and Warrants

Convertibles: Example:

The price of a similar bond, P_b, is £60; the value of an American call with the same expiry date and with an exercise price equal to the conversion price is £1.80; and if all the bonds are converted, the number of outstanding shares would rise by 30%. The theoretical price of the convertible is therefore:

$$\text{Convertible price} = £60 + ((£1.80 \div 1.3) \times 25) = £94.62$$

The difference in the price between the non-convertible bond and the convertible bond reflects the value of the conversion feature to the investor and is valued as an option.

Note that the term 'conversion premium' refers to the amount by which the price of a convertible security exceeds the current market price of the stock into which it may be converted.

Convertibles and Warrants

Warrants

- Corporations issue warrants on their own stock which are like call options.
- Warrant give the holders right to **buy a certain number of shares** of the issuing firm at a **fixed price** before expiry.
- Warrant holders **are not entitled** to the rights of equity shareholders.
- Differences between warrants and traded call options:
  - Warrants are generally long term with typical maturity of 5 years
  - Unlike traded options, exercise of warrants results in increased number of shares and the company receives funds.

Convertibles and Warrants

Warrants

- A warrant has following values:
  - **Intrinsic value**, also called **Formula value:** This is minimum of zero or the difference between spot price of shares and exercise price
  - **Time value** or **Premium**: It declines as warrant reaches expiry.
- Value of a warrant can be derived based upon the value of an American call option on stock as follows:

$$W = \frac{A^c}{(1 + PC)} \times N$$

Where: A^c is the value of an equivalent American call option; and

PC is the percentage increase in new shares if all the warrants are exercised.

Convertibles and Warrants

Warrants

Consider the following information about a warrant:

- The current stock price (S) = £1.90.
- The exercise price (X) = £1.50.
- The number of new shares created by each warrant (N) = 2.

The formula value (intrinsic value) of the warrant is given as:

Formula value (FV) = (S – X) × N

Formula value (FV) = (£1.90 – £1.50) × 2 = £0.80.

Convertibles and Warrants

Warrants

The percentage premium (PP) of an in-the-money warrant is given by the formula:

$$PP = \frac{\text{Warrant price} - \text{formula value}}{\text{Number of new shares issued if warrant exercised} \times \text{stock price}}$$

If the warrant is trading in the market at £0.90, then:

$$PP = \frac{£0.90 - £0.80}{2 \times £1.90} = 2.63\%$$

Convertibles and Warrants

Warrants

Suppose that the total number of issued ordinary shares in a company is currently one million. The firm has issued 100,000 warrants where each warrant will create four new shares, and therefore PC equals 40%. The value of an equivalent American call option is £1.60. The value of the warrant, W, is:

$$W = \frac{£1.60}{1.40} \times 4 = £4.57$$

Convertibles and Warrants

Covered Warrants

- A covered warrant given an investor right to buy or sell an asset at a specific price and within a specified time.
- These are long dated options (typically 6 to 12 months, but can go up to 6 years), listed on LSE and settled through CREST.
- Covered warrants are issued by **investment banks**. They are called covered because investment banks cover their positions by buying or selling in open market.
- Covered Warrants can be of American or European type.
- Majority of them are **cash–settled**, saving stamp-duty for investors.
- Covered warrants can be used by the investors for defensive (hedging) purposes or speculative (trading) purposes.

Convertibles and Warrants

Covered Warrants

The attraction of covered warrants in terms of speculative strategies is the gearing element – for example, if a stock is trading at 100p and an investor believes the price will increase to 150p. If the shares are bought, the maximum gain is 50%. However, a three-month 100p call warrant on the share may cost 15p, and when it expires it is worth 50p. This represents a gain of 233%. This leverage effect implies higher risk, although the maximum loss that can be incurred is the initial outlay.

Convertibles and Warrants

Covered Warrants

- In UK, covered warrants are available for retail investors.
- Financial Conduct Authority (FCA) regulates the market.
- Underlying stocks can be UK or international, but the pricing is in sterling.

Credit Derivatives

Credit Derivatives

Learning outcomes……..

- **Identify** the main purposes, mechanics and implications of a credit default swap
- **Identify** the main risks to the financial system resulting from credit derivatives

Credit Derivatives

Types of Credit Derivatives

- **Unfunded:** Contract between two parties where each is responsible for making payments and any cash or physical settlement under the contract is without recourse to other assets.
  - Include Credit Default Swaps (CDS), Total Return Swaps, Constant maturity CDSs
- **Funded:** Payments under credit derivatives are funded such that a debt obligation is issued by a financial institution to suppose these obligations.
  - Include Credit Linked Notes and Synthetic CDOs

Credit Derivatives

Credit Default Swaps (CDS)

- In CDS, a protection buyer pays premium to protection seller to cover the risk of default.
  - Suppose an investor holds a five-year bond and is worried about the default. He can go for CDS on this bond. He pays premium to protection seller. There are two possibilities:
    - **Bond does not default**: Protection seller keeps the premium and pays nothing to protection buyer.
    - **Bond defaults**: Protection buyer delivers the bond to protection seller, who pays the face value of the bond to protection buyer

Credit Derivatives

Credit Default Swaps (CDS)

- The CDS premium which the protection buyer needs to pay depends upon the underlying issuer's credit quality (bond issuer's yield over government bond yield) and is quoted in basis points.

- For example, if the spread is 80 bps, then the investor holding £10 mln of bond will pay £80,000 a year for say 5 years to the seller of CDS.

- A buyer of CDS may take a speculative position and may not hold the bonds.

Credit Derivatives

CDS Indices

- The Markit CDX North American investment-grade index tracks the cost of debt insurance for a portfolio of investment-grade companies in the USA.
- The Markit CDX Emerging Markets Index is composed of 15 sovereign reference entities that trade in the CDS market.
- The Markit CDX Emerging Markets Diversified Index with 40 equally weighted sovereign and top quality emerging market corporates.
- The Markit iTraxx Europe Crossover index tracks mostly junk-rated European corporate names.

Credit Derivatives

CDSs comprise of

- A single entity – the most common type of CDS.
- A basket of entities – similar to a single entity but refers to a basket of reference entities, so that if any one of them default this is a credit event.
- Credit default index swaps – a portfolio of single entity CDSs where, once any entity defaults, the notional is reduced by the amount of the defaulted entity and the buyer gets appropriate compensation. The protection of the new amount may then continue. The most popular credit default index swaps are standardised contracts with homogeneous notional amounts and recovery rates known as the CDX index and the iTraxx index.
- First-loss and tranche-loss credit default swaps – these protect the buyer from losses of a reference pool due to credit events up to a certain notional value of the reference pool.

Credit Derivatives

Collateralized Debt Obligations (CDOs)

- Issuers of CDOs package a collection of revenue generating assets (such as bank loans, bonds etc.) and issue bonds backed by these assets.
- CDOs can be sliced into various tranches as per the credit risk.
- A **synthetic CDO** is made up of credit derivatives.
- Banks, insurance companies, Hedge funds and Pension funds are buyers and sellers of CDOs.
- Whether credit derivatives increase or decrease risk in financial system is always debated.

Credit Derivatives

Total Return Swap (TRS)

- A party transfers total economic exposure including both credit and market risk of underlying asset to counterparty without selling it.
- The counterparty creates this exposure without buying it.
- Corporate bonds, equities, loans can be the underlying assets.

Constant Maturity Default Swaps

Constant maturity default swaps are different from a standard CDS. The premium payment of the swap does not pay a fixed, pre-agreed amount, but a floating spread using a traded CDS as a reference index for payment. So, for a given preset time-to-maturity, the payment at each point is indexed to a traded CDS spread on the same reference credit existing in that moment for the pre-assigned time to maturity. Hence the 'constant maturity' prefix.

Credit Derivatives

Credit Linked Notes

- These are fixed or floating rate notes where principal and or coupon payments are referenced to a credit or basket of credits.
- If there are no credit events: Coupons and principles can be paid the normal way.
- If there are credit events: Coupons and principal payments will get reduced.
- What are the possible credit events: Given on next slide:
  - ISDA committee decides whether credit event has taken place or not

Credit Derivatives

Credit Events

The reference events could be:

- bankruptcy of the reference entity;
- default on an obligation;
- failure to pay in relation to an obligation; or
- a restructuring of an obligation.

- In case of physical settlement: Buyer delivers the defaulted obligation and receives face value.
- In case of cash settlement: Buyer receives face value less current value of obligation.

Credit Derivatives

Pricing of credit derivatives: Key determinants

- Default probability of entity being insured
- Recovery amount, in case of default happens

Credit Derivatives

Financial Stability and Credit Derivatives

- Credit derivatives according to some people add to financial market instability
- Credit derivatives allow building up of speculative positions since they allow substantial leverage possibilities
- Since institutions can hedge credit risk, they may be inclined to take more risk than optimal
- These instruments are traded OTC and hence lack transparency and market history
- Regulators now require these instruments to be centrally cleared so that information about these products becomes available