

# MAF308 – Derivative and Fixed Income Securities

## Topic 1 – Introduction

### This Course Will Answer the Following Questions

- What are Fixed Income Securities?
  - How interest rate plays a role in determining their prices?
- What are Derivatives Securities?
  - Futures & Forwards
  - Options
  - Swaps
- What determines their prices?
- How can they be used for us to manage risk?

### Fixed Income Securities

- Type of Issuer
- Term-to-maturity
- Coupon and Principal
- Call and Refunding Provisions
- Sinking-Fund Provision
- Put Provisions
- Convertible or Exchangeable Debt
- Debt securities outstanding

### Risks Associated with Investment in Fixed Income Securities

- Market, or interest-rate, risk
- Reinvestment risk
- Call risk
- Credit risk
- Inflation, or purchasing-power, risk
- Liquidity risk
- Exchange-rate, or currency, risk
- Political or legal risk

### The Nature of Derivatives

- “**Derivatives**” are defined as substances that are created from others as defined in chemistry
- A **financial derivative** is an instrument whose value depends on the values of other more basic underlying assets or variables
  - Derivatives
    - Futures & Forwards
    - Options
    - Swaps
  - Underlying assets

### Examples of Underlying Asset/Variables

- Individual Equity (or call it Individual stock/ Single stock, simplest case, we will focus on)
- Equity index (e.g., ASX200)
- Interest rate (Fixed income securities)
- Commodity, e.g., oil, gold
- Weather, Energy, and Insurance
- Many others (e.g., volatility)
- Trading volume survey

## Introduction to Futures

- A futures contract is an agreement between two parties to BUY or SELL an asset at a **certain time in the future with a certain price agreed upon today.**
- The party that has **agreed to buy** has a **long** position
- The party that has **agreed to sell** has a **short** position
- Example
  - Buy 100 oz. of gold @ US\$1050/oz. in December
  - Sell £62,500 @ 1.5500 US\$/£ in March
  - Sell 1,000 bbl. of oil @ US\$75/bbl. in April
- A futures contract vs. A **spot** contract
  - A spot contract is an agreement to buy or sell the asset immediately within a very short period of time, (two business days)

## Forward VS. Futures

	FORWARDS	FUTURES
Market	Dealers (OTC)	Organized Exchange
	<b>Forwards</b>	<b>Futures</b>
Default Risk	Borne by Counterparty	Borne by Clearinghouse
What to Trade	Negotiable	Standardized
Where to Trade	Negotiable	Standardized
When to Trade	Negotiable	Standardized
The Forward/Futures Piece	Agree on which initiated; payment at contract termination	Agree on when initiated; then marked to market
Margin	Collateral is Negotiable	Required
Liquidity Risk	Cannot exit easily	Clearinghouse makes it easy to exit commitment
Typical Holding Period	Delivery Take Place	Offset Prior to Delivery

- Due to the daily realisation of profits/losses, a futures contract is basically a series of one day forward contracts

## Over the Counter (OTC) Markets

- The over the counter market is an important alternative to exchanges
  - It is a telephone and computer – linked network of dealers who do not physically meet
  - Trades are usually between financial institutions, corporate treasurers, and fund managers
    - Key Advantages
      - The Terms of a contract do not have to be those specified by an exchange
      - Market participants are free to negotiate any mutually attractive deal

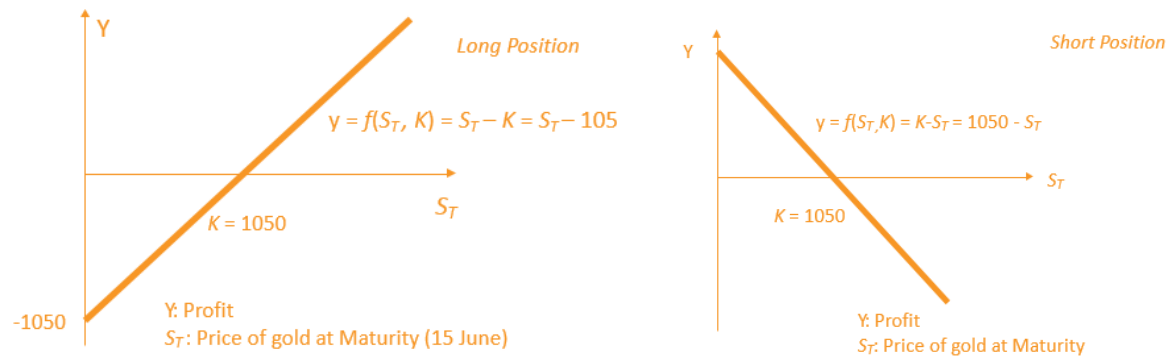
## Forward Contract Payoff at Maturity

- An agreement to buy or sell an asset for a certain price at a certain time in the future.
- Forward price "**F**": price to be paid for the underlying asset at contract maturity. When a contract is entered into, this becomes the delivery price ("**K**")
- Forward contract payoff at maturity : difference between the delivery price and the spot price at maturity
  - Long forward:  $S_T - K$
  - Short forward:  $K - S_T$

## Example

- An investor enters into a forward contract to buy 100 oz of gold in six months at \$1050 per oz.
  - What are the possible outcomes for the investor?
  - What are the possible outcomes for the investor taking the other side of the contract?
    - A zero-sum game

Example **What is your possible profit/loss in six months? What is your opponent possible profit/loss in 6 months?**



## Introductions to Options

- An “option” is a contract between two parties where **the buyer of the option has the right but not the obligation**
  - A **CALL** option is an option to **BUY** a certain asset by a certain date for a certain price (the strike price)
  - A **PUT** option is an option to **SELL** a certain asset by a certain date for a certain price (the strike price)
  - The *owner* of the option *pays a (cash) premium* to the option seller in exchange for the option
- The **BUYER** of an option is not obligated to buy or sell the underlying asset. However, if they do, then this is called **exercising the option**.
- It is not necessary to own the asset before acquiring **the right** to sell it

## Four Types of Position in Options Market

- Buyer of calls
  - Long calls
- Sellers of calls
  - Short calls/write calls
- Buyers of puts
  - Long puts
- Sellers of puts
  - Short puts/write calls

## American VS. European Options

- An **American** option can be exercised at **any time** before maturity
- An **European** option can be exercised **only at maturity**
- Exchange-traded stock options are generally
  - American rather than European

## Terminology

- Option Price/Premium
  - Option can be bought or sold. The **premium** is the purchase price of the option.
- Underlying asset
  - Generally, an **option is a contract with respect to a particular good** (e.g., a share of APPL). This good is called the **underlying asset**.
- Exercise Price
  - **An option gives you the right to buy or sell** an asset **at a certain price**. This price is called the **exercise price, or strike price**.
- Expiry date
  - An option has to be exercised by **a particular date**. This date is referred to as the **expiry date, or the maturity date, or the contracts terminal date**.

## Option Value

- **Notation used within this unit:**
  - $S_t$ : the stock price at time  $t$ .
  - $K$ : the strike price, sometimes  $X$
- The value of an option has two components
  - **Intrinsic value:**
    - Defined as the maximum of 0 and the value the option would have if it were exercised **immediately** at time  $t$
    - Call:
    - Put:
  - **Time value**
    - Often it is optimal for the holder of an in-the-money American option to wait rather than exercise immediately. The option is then said to have time value.
- The total value of an option can be loosely thought of as the sum of its intrinsic value and its time value.

## Terminology – Moneyness

- **At-the-money** option
  - **Near the money** means
- **In-the-money** option
  - **Call:**
  - **Put:**
    - An in the money option would be exercised if today,  $t$  were the maturity date.
    - **Deep in the money** means \_\_\_\_\_for a call, \_\_\_\_\_for a put.
- **Out-of-the-money** option
  - **Call:**
  - **Put:**

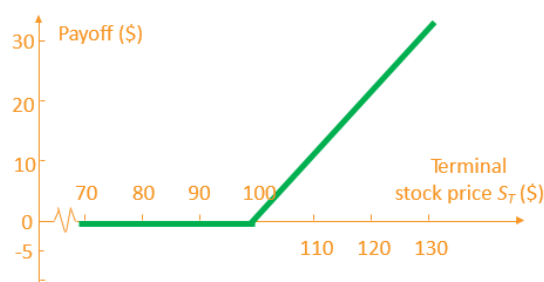
## Options Positions and European Option Payoff

- $T$ : the maturity **date**
- **Long** Position: you have bought the option
  - Long calls:
  - Long puts:
- **Short** Position: you have sold the option
  - Short calls:
  - Short puts:
  - The seller is also said to **write the option Sum-zero Game!**

## European Call Payoffs at Maturity

**Example:** Suppose you spend \$5 to **Long** a **European call** on ABC stock with a strike price of  $K = \$100$ . Find the payoff at maturity if the stock's price at maturity,  $S_T$ , is

Payoff at Maturity from longing one European Call – Option Price = \$5,  $K = \$$



- If you buy a call option, you hope the stock price goes *up*.
- Your minimum payoff is zero, your maximum payoff is unlimited