

# CFA® Exam Navigator Plus



The



CFA® Level 1

Exam Navigator Plus

Level 1

Derivatives FISCAL POLICY probability derivatives  
LIFO Fixed income ETHICS IFRS DCF FIFO RATIOS  
professional standards US GAAP Financial Reporting Analysis  
equity investments

# Derivatives

Study session

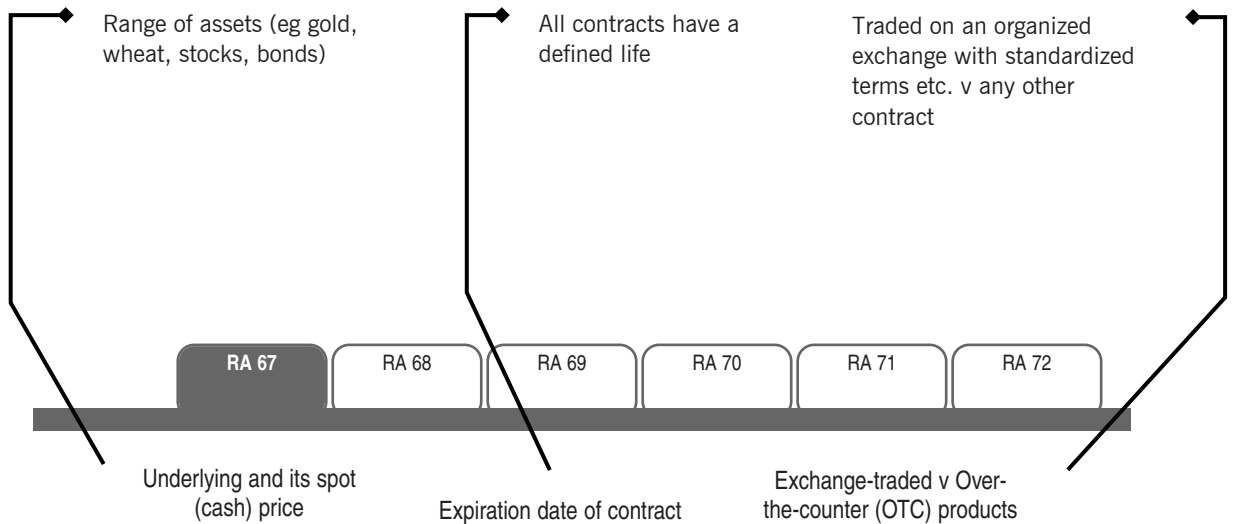
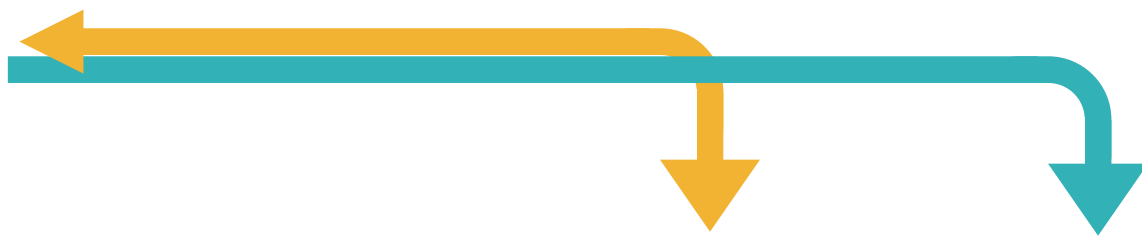
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## Readings

- 67 Derivative markets and instruments
- 68 Forward markets and contracts
- 69 Futures markets and contracts
- 70 Option markets and contracts
- 71 Swap markets and contracts
- 72 Risk management applications of option strategies

Many candidates are nervous about derivatives, but at Level 1, this is not justified. For the most part, calculations are simple and you only need to know the mechanics of the derivatives in the CFA Program: forwards, futures, options and swaps. The pricing and valuing of derivatives will take place at Level 2.

Some basic features of a derivative contract



**DERIVATIVE - Definition**  
 Financial instrument that offers a return based on the return of some other underlying asset

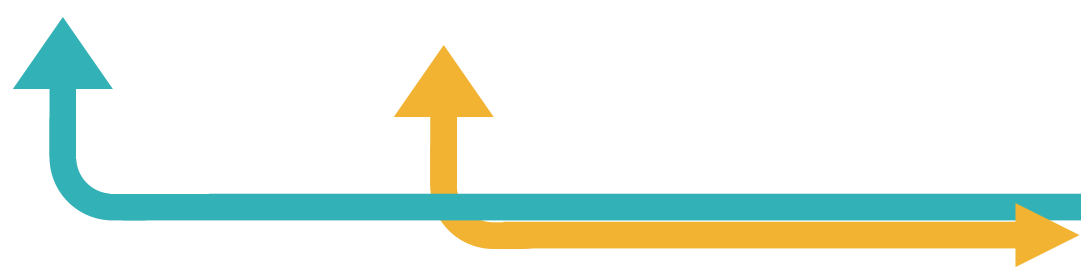
**Forward commitments**  
 Transaction and its related pay-off will occur at future date, eg forward contract

**Contingent claims**  
 Transaction and its related pay-off only occur if a specific event happens in the future, eg options

If you enter into a contract to buy something in the future, you must complete the contract even if it is unfavourable

You only exercise an option if it is favourable to do so

Two general categories of derivative contracts



### Tutor note

The first assigned reading on derivatives is a general overview of derivatives. Most points in it are covered in more detail in later readings.

### Learning objectives

- Define a derivative
- Differentiate between exchange traded and OTC contracts
- Define a forward commitment and a contingent claim

### Concept checker questions

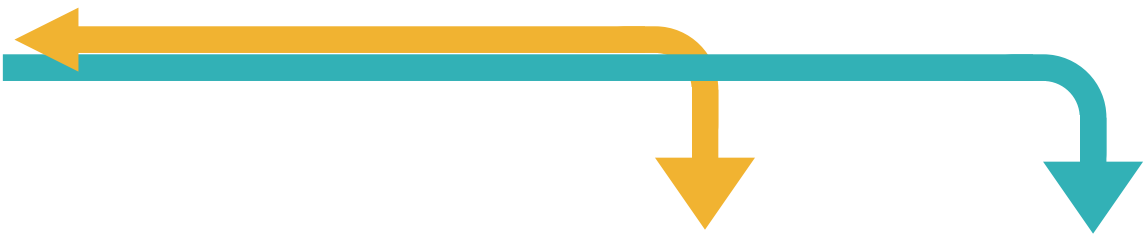
The IBM stock price is currently \$50. You enter into a forward contract to buy 100 shares in three months' time at a price of \$51. You also take out an option to buy 200 shares in IBM in three months' time at a price of \$51.

In three months' time the IBM stock price is \$49. What will you do?

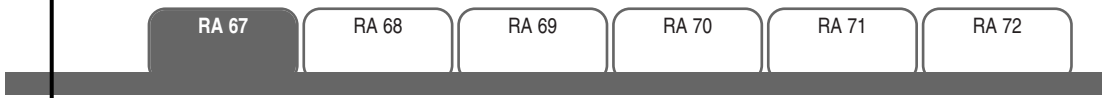
### Solutions

You will have to buy 100 shares @ \$51 under the forward contract. It is a commitment. You will not buy the 200 shares at \$52, since you are not obliged to do so.

# Forward commitments



- Asset and its quality
- Quantities
- Delivery dates



## FORWARD COMMITMENTS

### Futures contracts

Exchange traded forward contract (standardized terms)

Major difference = Default risk

Futures are 'marked to market'

Ability to offset contracts

If you have an open position in a contract you can take out a matching contract to cancel each other out – covered in more detail later

### Futures contracts (OTC products)

One party agrees to buy the underlying from another party at an agreed price on an agreed date

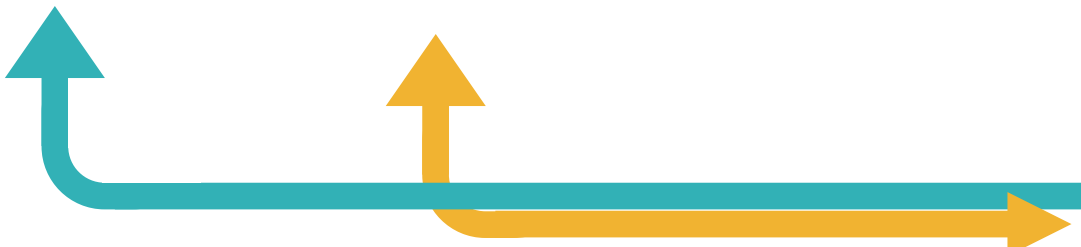
Private contracts with little regulation

In futures markets counterparty that is making losses has to make payments to the exchange on a daily basis to cover these losses – covered in more detail later

### Swaps (OTC products)

Equivalent to a series of forward contracts

See Example



## Tutor note

Suggested order of teaching is (1) forward contracts (2) futures contracts (3) swaps.

## Learning objectives

- Describe the basic features of:
  - forward contracts
  - futures contracts
  - swaps

## Examples

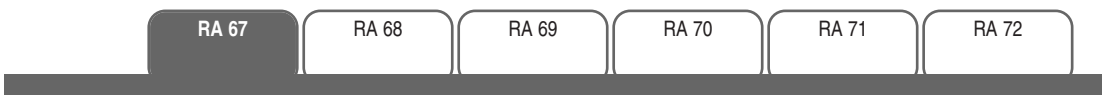
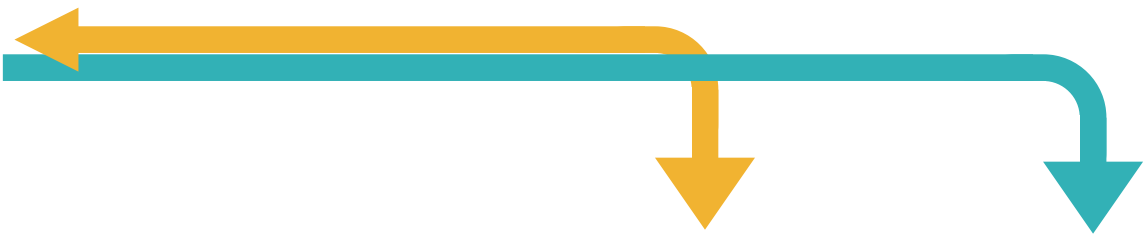
### Forward contracts

- 1 Agree to buy 329 shares in IBM Inc at a price of \$55 per share, delivery and payment to take place in 47 days' time.  
  
(If price of IBM shares is above \$55 in 47 days' time, the buyer makes a profit. If it is below \$55, the buyer makes a loss.)
- 2 Agree to pay a fixed rate of interest (5%) on an agreed notional principal amount (\$1 million) and receive a floating rate of interest (one year US dollar LIBOR) on the same notional principal, in 39 days' time.  
  
(If one year US dollar LIBOR is above 5% in 39 days' time, the fixed rate payer wins. If it is below 5%, the fixed rate payer loses.)

### Swap

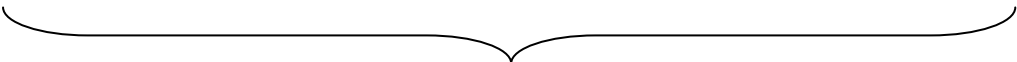
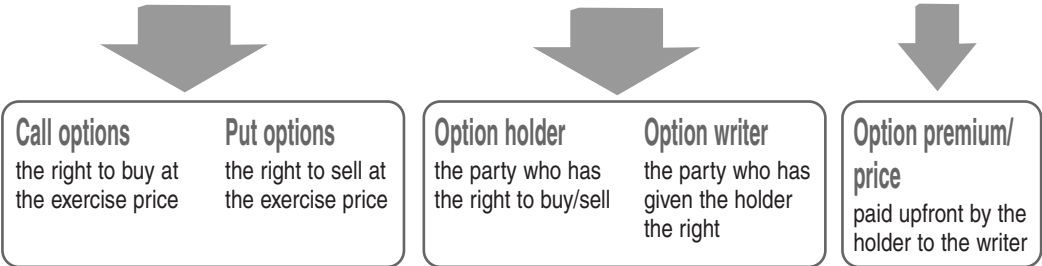
- 1 Agree to pay a fixed rate of interest (5%) on an agreed notional principal amount (\$1 million) and receive a floating rate of interest (one year US dollar LIBOR) on the same notional principal, with payments taking place on 25 January every year for the next five years (ie just like five separate forward contracts combined together).

Note: Need to explain that the notional principal does not change hands, it is just used as the basis for calculating the amount of any interest payments under the swap or forward contract.

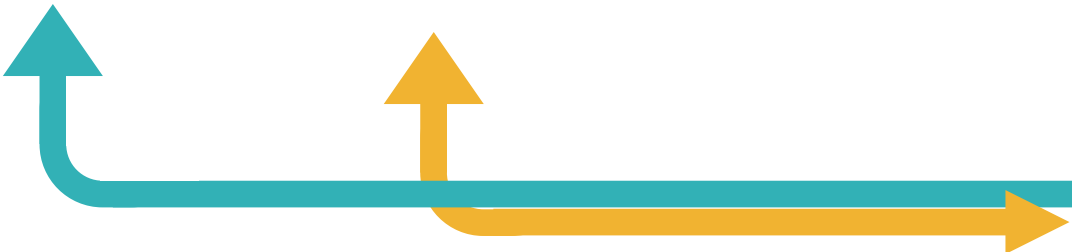


### CONTINGENT CLAIMS - OPTIONS (OTC and exchange traded)

A financial instrument that gives one party the right (but not the obligation) to buy or sell the underlying from or to another party at an agreed price (the strike or exercise price) on or before a specified date.



Basic option jargon – use concept checker questions to test understanding of basic characteristics



## Learning objectives

- Describe the basic features of a call option and a put option.

## Example

### Options

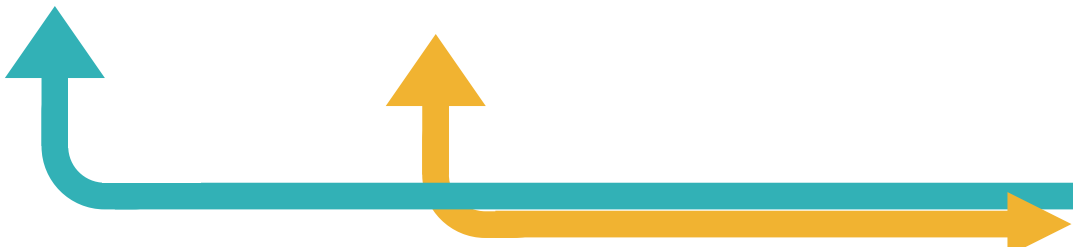
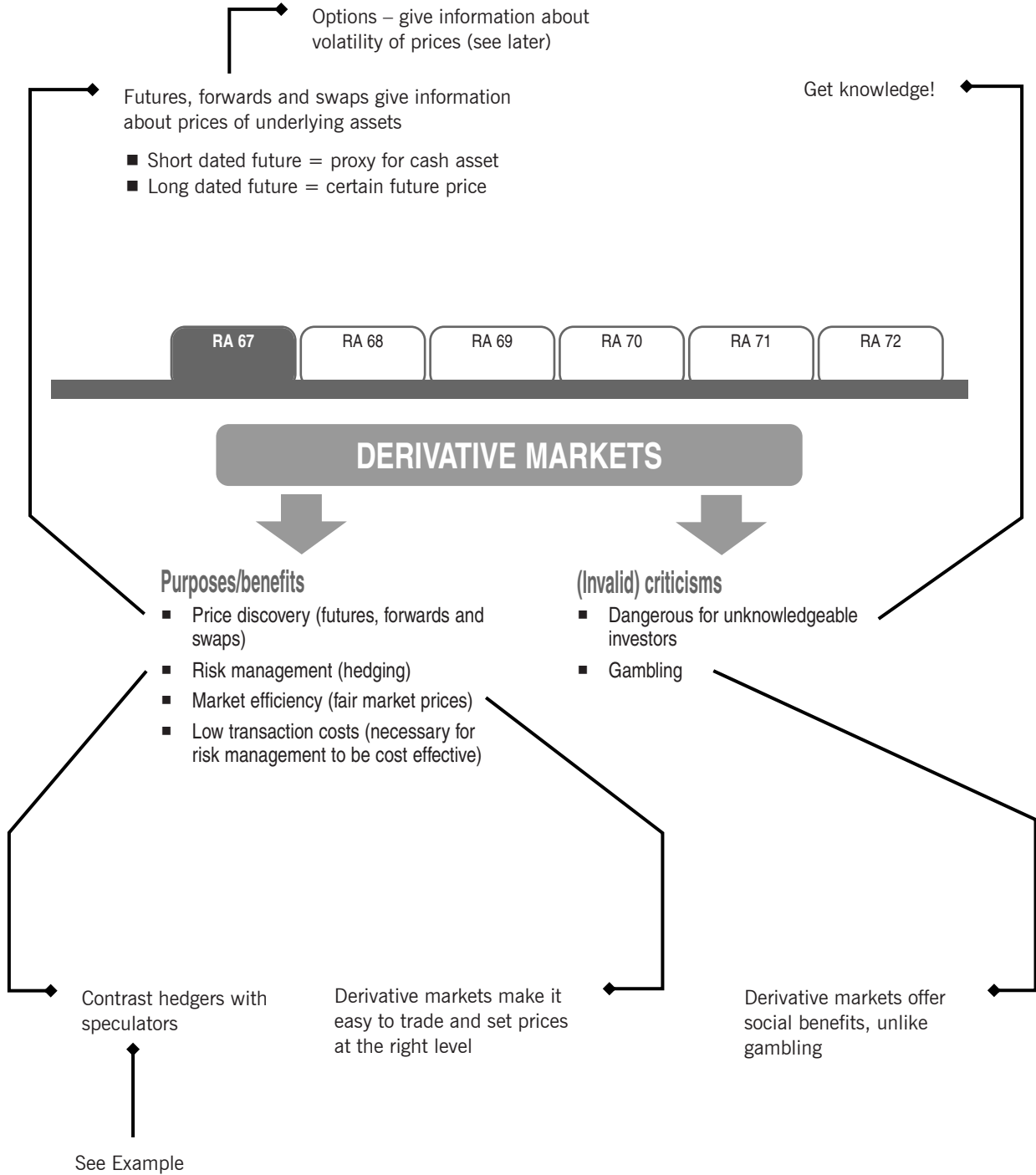
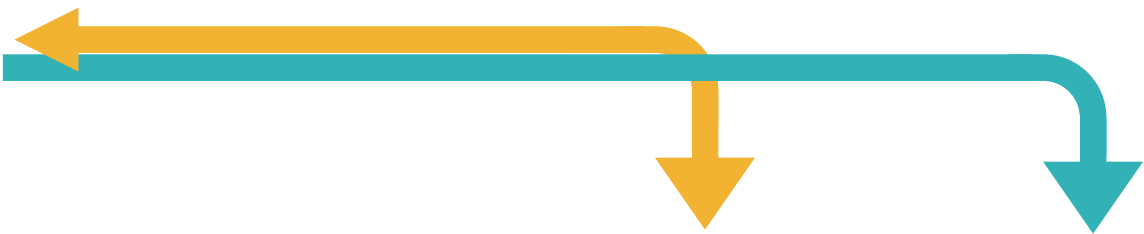
- An investor holds a call option, giving him the right to buy 1,000 IBM shares at a price of \$60 a share, at any time in the next three months.  
If the stock price goes above \$60, the option holder can exercise the option and make a profit. If the stock price falls below \$60, the option holder does not exercise the option.
- Callable bonds: a company has issued a bond, but has the right to buy the bond back at a specified price. (When would a company wish to do this?)
- Prepayment option on a mortgage: a houseowner takes out a fixed rate mortgage, but has the right to pay off the mortgage early. He may do this if mortgage interest rates fall and he can borrow the money at a cheaper rate elsewhere (i.e. just like a company with a callable bond).

## Concept checker questions

- You hold a put option for which the premium was \$2 per share. The option is on 1,000 GM shares, with a strike price of \$30 per share. Calculate your overall profit or loss if the GM price on the expiration date of the contract is (i) \$25, (ii) \$29, (iii) \$35.
- Which of the following is potentially most exposed to default risk from their counterparty?
  - Exchange traded option writer
  - Exchange traded option holder
  - OTC option writer
  - OTC option holder

## Solutions

- Profit on exercise =  $30 - 25 = 5$   
Option premium = 2  
Overall profit = \$3 per share, ie \$3,000 in total
  - Profit on exercise =  $30 - 29 = 1$   
Option premium = 2  
Overall loss = \$1 per share, ie \$1,000 in total  
  
(Note that it is best to exercise the option, even though there is still an overall loss, since exercising reduces loss.)
  - Don't exercise  
Overall loss = premium = \$2 (maximum loss) ie, \$2,000 in total  
What is maximum profit?  
When stock price = zero  
Profit on exercise =  $30 - \text{nil} = 30$   
Overall profit =  $30 - 2 = \$28$  per share
- Exchange traded option writer     ×     marketing to market
  - Exchange traded option holder     ×     reduces default risk
  - OTC option writer     ×     receives premium up front
  - OTC option holder     ✓     the writer may default



## Tutor note

The assigned reading discusses the origins, history and size of derivative markets at length, but the learning outcomes are restricted to the two points below.

## Learning objectives

- Discuss the purposes of derivative markets
- Discuss the criticisms of derivative markets

## Example

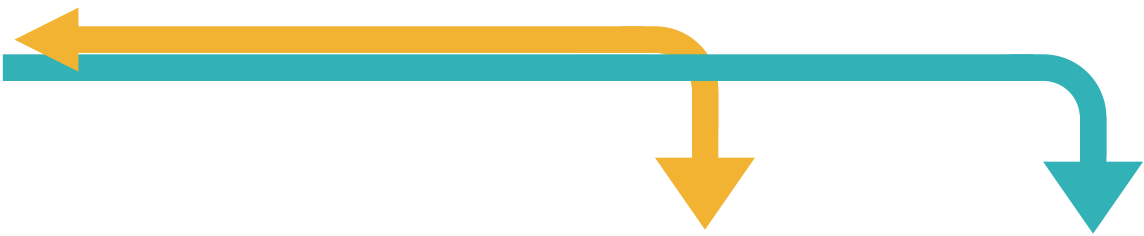
### Risk management

Wheat farmer wants to guarantee a price for his wheat in the future. He sells wheat futures now (Hedger).

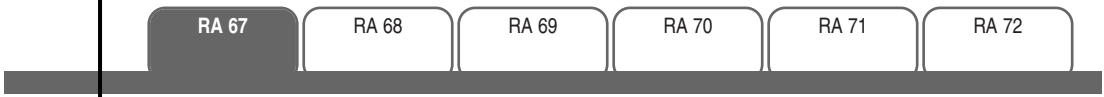
Bread maker wants to guarantee a price for buying wheat in the future. He buys wheat futures now (Hedger).

Speculators who believe the price of wheat will rise can buy wheat futures (easier than buying wheat). If they believe the price of wheat will fall, they can sell wheat futures (even if they do not own any wheat).

Note that all the above are taking a market view. If the price of wheat rises, the farmer loses out by hedging. If the price of wheat falls, the bread maker has to pay over the market price for the wheat because he has locked into a higher price.



See Example



### ARBITRAGE AND PRICING

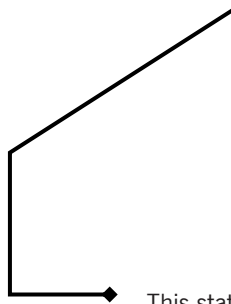
An investor buys an asset/combination of assets at one price and simultaneously sells them at a higher price in a different market

Risk free profit

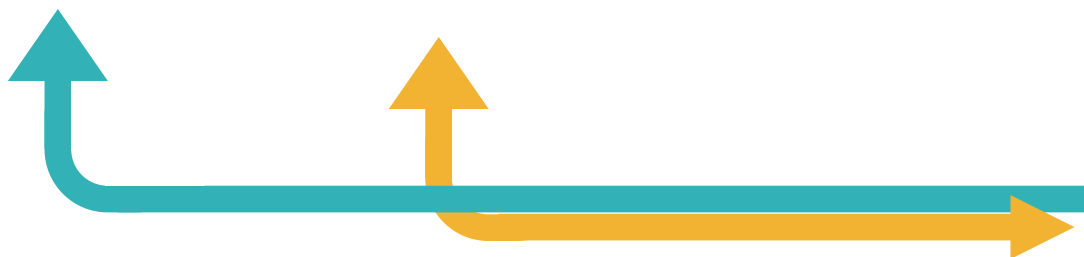
Investors quickly act on arbitrage opportunities

Prices adjust to eliminate opportunity (law of one price)

Markets quickly become more price efficient



This states that arbitrage opportunities should not exist



## Learning objectives

- Explain arbitrage and its role in setting prices and assisting in market efficiency.

## Examples

### 1 Example of arbitrage opportunity

Osaka market

Singapore market

Nikkei future price = 8010

Nikkei future price = 8040

Buy the future in Osaka and simultaneously Sell the future in Singapore

### 2 Example of arbitrage opportunity

IBM stock price is currently \$100.

It will not pay a dividend over the next year.

A one year future on IBM shares is currently priced at \$105.

The cost of borrowing money is 4%.

An investor borrows \$100 now and buys an IBM share. He simultaneously sells the share for \$105 in the futures market.

In one year's time, he receives \$105 when he sells the share, repays \$100 borrowing + \$4 interest, making a \$1 profit.

This shows how arbitrage can be used to price derivatives – if the future was trading at its fair price of \$104, no arbitrage profit would be available.

## Concept checker questions

- 1 It costs \$50 per bushel to buy/sell wheat in France. It costs \$51 per bushel to buy/sell wheat in Spain. It costs \$2 per bushel to transport wheat between France and Spain. Is there an arbitrage opportunity?
- 2 You can buy gold for \$200 per troy ounce. It costs \$15 to hold gold for a year (the cost of borrowing money, storage etc). What is the arbitrage-free price for a one year gold forward?

## Solutions

- 1 No. The costs of transportation outweigh the difference in prices. The prices can vary by up to \$2 before arbitrage becomes possible.
- 2  $200 + 15 = \$215$