FINA2204 Tutorial 1: Introduction

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Information

- Tutorial: one hour per week, weeks 2 – 12 (study break: week 6)
- Assessment: 10% (tutorial participation)
- Final mark is based on your best eight tutorial marks
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Agenda

- Problem 1.2
- Problem 1.4
- Problem 1.7
- Problem 1.20
- Problem 1.29
- Problem 1.33
- Additional problems 1-3

Knowledge review: derivative

- A derivative contract is an instrument whose value depends on, or is derived from, the value of another asset (aka the underlying asset).
- Examples include **forwards**, **futures**, **options** and **swaps**.

Jack: farmer
Lily: Baker

Traders

Three broad categories of traders:

- **hedgers** – use derivatives to reduce or eliminate price risks they face
- **speculators** – use derivatives to bet on the future movement of market prices
- **arbitrageurs** – take offsetting positions in derivatives and the underlying to lock in a riskless profit

Knowledge review: hedging

Example 1.1 Hedging with forward contracts

It is May 13, 2015. ImportCo must pay £10 million on August 13, 2015, for goods purchased from Britain. Using the quotes in Table 1.1, it buys £10 million in the three-month forward market to lock in an exchange rate of 1.5742 for the pounds it will pay.

ExportCo will receive £30 million on August 13, 2015, from a customer in Britain. Using quotes in Table 1.1, it sells £30 million in the three-month forward market to lock in an exchange rate of 1.5736 for the pounds it will receive.

Table 1.1 Spot and forward quotes for the USD/GBP exchange rate, May 13, 2015 (GBP = British pound; USD = U.S. dollar; quote is number of USD per GBP)

	Bid	*Offer*
Spot	1.5746	1.5750
1-month forward	1.5742	1.5747
3-month forward	1.5736	1.5742
6-month forward	1.5730	1.5736

Source: textbook, p.31

Knowledge review: speculation

Options can also be used for speculation. Suppose that it is October and a speculator considers that a stock is likely to increase in value over the next two months. The stock price is currently $20, and a two-month call option with a $22.50 strike price is currently selling for $1. Table 1.5 illustrates two possible alternatives assuming that the speculator is willing to invest $2,000. One alternative is to purchase 100 shares.

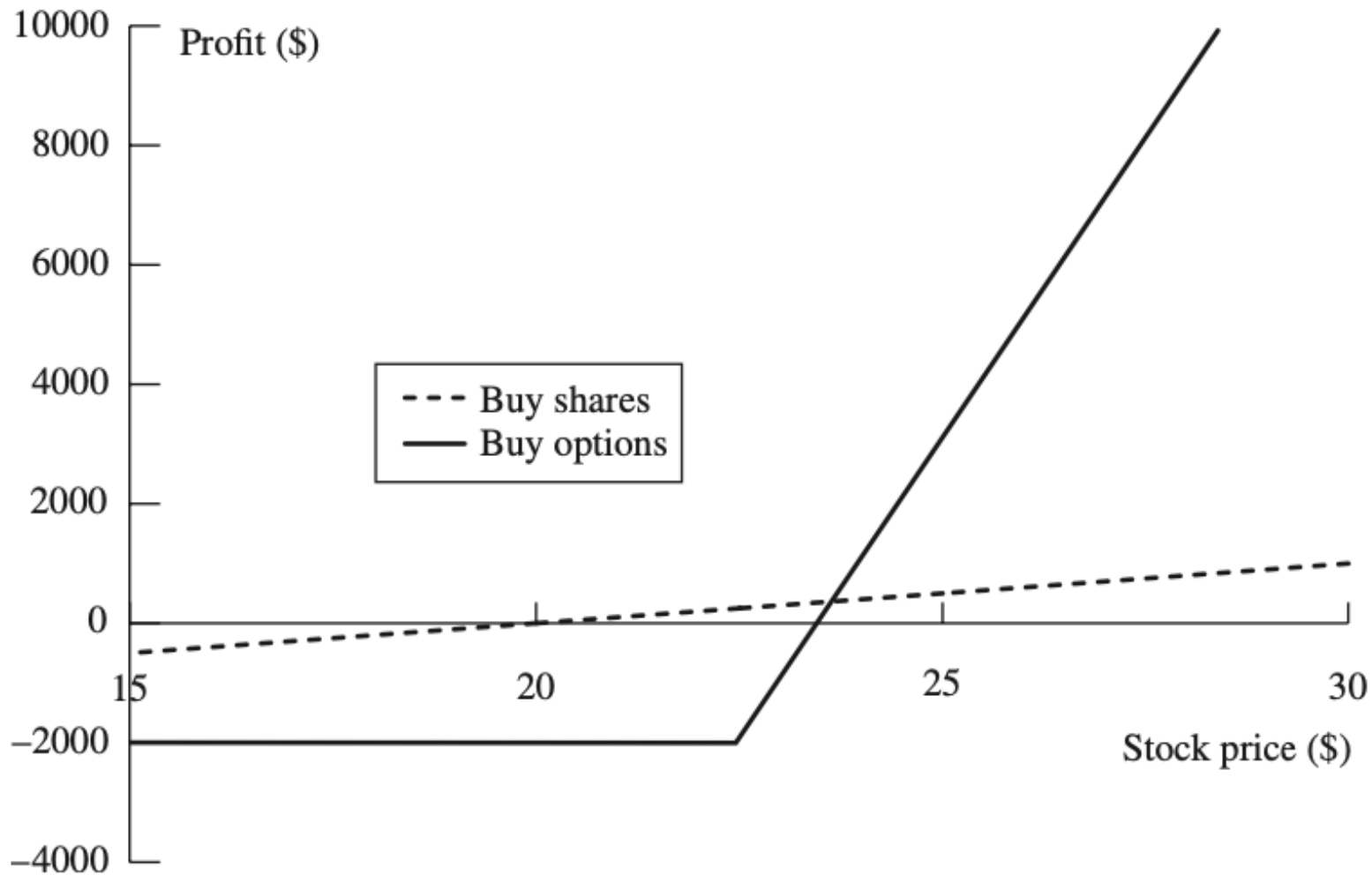
Table 1.5 Comparison of profits from two alternative strategies for using $2,000 to speculate on a stock worth $20 in October

Speculator's strategy	*December stock price*	
	$15	*$27*
Buy 100 shares	–$500	$700
Buy 2,000 call options	–$2,000	$7,000

Source: textbook, p.33

Knowledge review

- This example compares two speculation strategies: buying shares directly or buying call options.
- If the stock rises to $27, buying shares yields a profit of $700 ((27-20)*100), whereas buying call options yields $7,000 ((4.5*2000)-2000) because each option has a payoff of $4.50.
- However, if the stock falls to $15, the share investment loses $500 ((15-20)*100), while the options expire worthless, resulting in a $2,000 loss.


10000
Profit ($)
8000
6000
4000
2000
0
–2000
–4000
Buy shares
Buy options
15
20
25
30
Stock price ($)

Knowledge review

- Takeaway: Options like futures provide a form of leverage. For a given investment, the use of options magnifies the financial consequences. Good outcomes become very good, while bad outcomes result in the whole initial investment being lost.

Knowledge review: arbitrage

Example 1.3 An arbitrage opportunity

A stock is traded in both New York and London. The following quotes have been obtained:

New York: \$152 per share
London: £100 per share
Value of £1: \$1.5500

The stock is more expensive in London

A trader does the following:

1. Buys 100 shares in New York
2. Sells the shares in London
3. Converts the sale proceeds from pounds to dollars.

This leads to a profit of

$$100 \times [(\$1.55 \times 100) - \$152] = 300$$

Source: textbook, p.35

Problem 1.3

- *Explain carefully the difference between: (a) hedging, (b) speculation, and (c) arbitrage.*

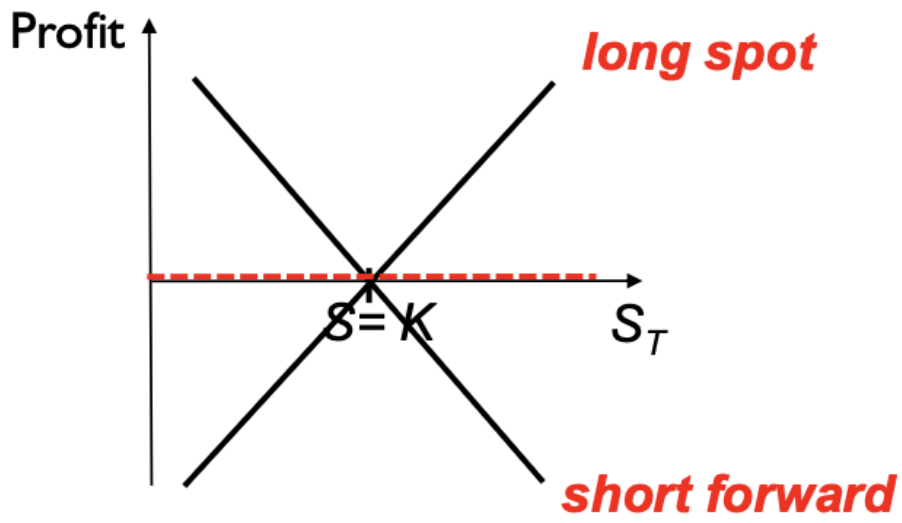
Answer 1.3

- A company is ***hedging*** when it has an exposure to the price of an asset and takes a position in futures or options markets to offset the exposure.
- In a ***speculation*** the company has no exposure to offset. It is betting on the future movements in the price of the asset.
- ***Arbitrage*** involves taking a position in two or more different markets to lock in a profit.

Knowledge review

Profit on short forward = $-(S_T - K)$
Profit on long spot = $(S_T - S)$
Overall profit = 0 (if S = K)

K = delivery price under forward contract
S_T = spot price of underlying asset at maturity



Problem 1.4

- *An investor enters into a short forward contract to sell 100,000 British pounds for Australian dollars, at an exchange rate of 1.6400 Australian dollars per pound. How much does the investor gain or lose if the exchange rate at the end of the contract is: (a) 1.6000, (b) 1.7000?*

Answer 1.4

- The investor is obligated to sell 100,000 pounds for $1.6400 when they are worth $1.6000.
- The gain is 100,000 x $0.04 (-(1.6-1.64)) = $4,000.
- The investor is obligated to sell 100,000 pounds for $1.6400 when they are worth $1.7000.
- The gain is 100,000 x -$0.06 (-(1.7-1.64)) = -$6,000 (i.e. loss).

Problem 1.7

- *What is the difference between the over-the-counter and the exchange-traded market? What are the bid and offer of a market-maker in the over-the-counter market?*

Answer 1.7

- The **over-the-counter market** is a telephone- and computer-linked network of financial institutions, fund managers and corporate treasurers where two participants can enter into any mutually acceptable contract.
- An **exchange-traded market** is a market organised by an exchange where traders either meet physically or communicate electronically and the contracts that can be traded have been defined by the exchange.
- When a market maker quotes a bid and an offer, the bid is the price at which the market maker is prepared to buy and the offer is the price at which the market maker is prepared to sell.

Problem 1.20

- *A trader enters into a short forward contract on 100 million yen. The forward exchange rate is $0.0080 per yen. How much does the trader gain or lose on the forward contract if the exchange rate at the end of the contract is (a) $0.0074 per yen; (b) $0.0091 per yen?*

Answer 1.20

- The trader sells 100 million yen for $0.0080 per yen when the exchange rate is $0.0074 per yen. The gain is 100 x 0.0006 (-(0.0074-0.0080)) millions of dollars or $60,000.
- The trader sells 100 million yen for $0.0080 per yen when the exchange rate is $0.0091 per yen. The loss is 100 x 0.0011 (-(0.0091-0.0080)) millions of dollars or $110,000.

Problem 1.29

- *What is arbitrage? Explain the arbitrage opportunity when the price of a dually listed mining company stock is $50 (USD) on the New York Stock Exchange and $60 (CAD) on the Toronto Stock Exchange. Assume that the exchange rate is such that 1 USD equals 1.18 CAD. Explain what is likely to happen to prices as traders take advantage of this opportunity.*

Answer 1.29

- Arbitrage involves carrying out two or more different trades to lock in a profit. In this case, traders can buy shares on the NYSE (at a price of $50 USD and sell them on the TSX (at a price of $60 CAD/1.18 = $50.85 USD) to lock in a USD profit of $60/1.18 – $50 = $0.85 per share. As they do this the NYSE price will rise and the TSX price will fall so that the arbitrage opportunity disappears

Problem 1.33

- *The price of gold is currently $1,200 per ounce. Forward contracts are available to buy or sell gold at $1,400 per ounce for delivery in one year. An arbitrageur can borrow money at 5% per annum. What should the arbitrageur do? Assume that the cost of storing gold is zero and that gold provides no income.*

Answer 1.33

- The arbitrageur should borrow money to buy a certain number of ounces of gold today and short forward contracts on the same number of ounces of gold for delivery in one year. This means that gold is purchased for $1,200 per ounce and sold for $1,400 per ounce. The cost of the borrowing is $60 per ounce ($1,200 x 0.05 = $60). A riskless profit of $140 per ounce is generated.

Additional problem 1

- *A wheat farmer enters into a short forward contract to sell 3,000 metric tonnes of wheat at a forward price of $300 per metric tonne. How much does the farmer gain or lose if the spot price of wheat at the end of the contract is: (a) $270, (b) $350 per metric tonne?*

Answer A1

- The farmer is obligated to sell 3,000 metric tonnes for $300/mt when they are worth $270. The gain is 3,000 x $30 = $90,000.
- The farmer is obligated to sell 3,000 metric tonnes for $300/mt when they are worth $350. The gain is 3,000 x -$50 = -$150,000.

Additional problem 2

- *A wheat farmer enters into a short forward contract to sell 2,000 metric tonnes of wheat at a forward price of $300 per metric tonne. What will be likely consequences for the farmer if drought reduces his harvest to 1,500 metric tonnes and the spot price of wheat is $350 per metric tonne at the end of the contract?*

Answer A2

- In the event that the farmer cannot deliver the contracted grain he will be liable to the counterparty for a payment of liquidated damages called a "**washout amount**" This is calculated as the current value of the delivery shortfall ($175,000) i.e. 500 metric tonnes times the current spot price of $350 or $175,000. This represents the cost to the buyer of being forced to replace the missing tonnage at current market prices.
- $Washout\ loss = -(500 \times 350 - 0 \times 300) = -175{,}000$
- $Opportunity\ loss = -(1500 \times 350 - 1500 \times 300) = -1500 \times (350 - 300) = 75{,}000$
- $Total = -175{,}000 - 75{,}000 = 250{,}000$

Answer A2 (con’t)

- Forward contracts are for the physical delivery of grain. There is a risk that at harvest the farmer may not have sufficient grain (or grain of the contracted quality) to fulfil his obligations under the forward contract. The risk of production failure lies with the farmer and not the counterparty.

Knowledge review: valuing

What is the **value** of a **long position** in a forward contract?

At initiation, a position in a forward contract has a value of 0. i.e.

$$f = 0 \text{ at time 0.}$$

At any subsequent time before maturity,

$$f = (F_0 - K)e^{-rT}$$

where F_0 is the current forward price, K is the initial forward price and T is the remaining time to maturity (in years).

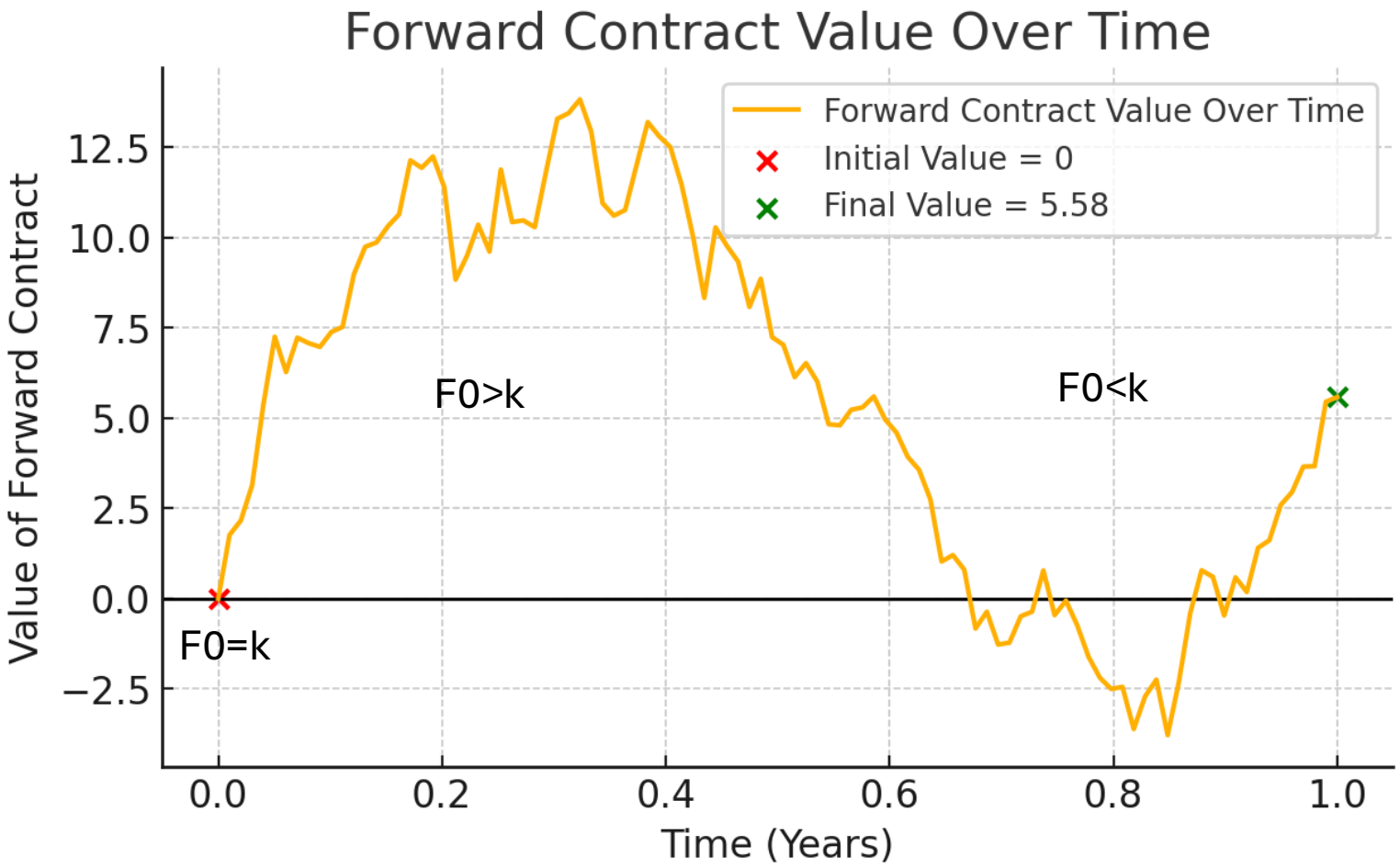
Similarly, the subsequent value of a **short position** in a forward contract is:

$$f = -(F_0 - K)e^{-rT} \; or \; (K - F_0)e^{-rT}$$

Knowledge review: valuing

FV of amount *A*, invested @ *R*% for *n* years (compounded annually)	$FV = A(1+R)^n$	
FV of amount *A*, invested @ *R*% for *n* years (compounded *m* times p.a.)	$FV = A\left(1+\frac{R}{m}\right)^{mn}$	(4.1)
FV of amount *A*, invested @ *R*% for *n* years (cont. compounded)	$FV = Ae^{Rn}$	(4.2)
PV of amount *A*, discounted @ *R*% for *n* years (cont. compounded)	$PV = Ae^{-Rn}$	
Converting from periodic compounding (R_m) to cont. compounding (R_c)	$R_c = m \times ln\left(1+\frac{R_m}{m}\right)$	(4.3)
Converting from cont. compounding (R_c) to periodic compounding (R_m)	$R_m = m \times \left(e^{R_c/m} - 1\right)$	(4.4)

One possible path (long position)



Additional problem 3

- *In June a wheat farmer enters into a six-month short forward contract to sell 1,000 metric tonnes of wheat in December at a forward price of $300 per metric tonne. What is the value of the farmer's short forward position in September if the forward price for December delivery is now $330 per metric tonne and the three-month risk-free rate is 4% p.a. (c.c.)?*

Answer A3

- The original delivery price is $300 and the current delivery price is $330. The value of the short forward contract, *f* , is given by
- $f = 1000 \times -(330 - 300)e^{-0.04 \times 0.25} = -29{,}701$