333-201 Business Finance

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Lecture 23:
Introduction to Derivative Securities II

Introduction to Options Contracts I

- Examine what options are and how they are traded
- Analyze the payoffs associated with purchasing a call option
- Analyze the payoffs associated with selling a call option
- Analyze the payoffs associated with purchasing a put option
- Analyze the payoffs associated with selling a put option

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Overview of Options Markets

- Option contracts are instruments that give the holder of the contract the right, but not the obligation, to buy or sell the underlying instrument at a prespecified price
  - Equity option contracts usually represent 1000 shares of the underlying stock
  - The exercise (or strike) price is the prespecified price for which the underlying security may be purchased or sold by the option buyer/holder if the option is exercised

- Equity option holders do not enjoy the rights due stockholders
  - For example, voting rights, regular dividends, etc

- In an exchange market, option prices are set in a competitive auction market among various buyers and sellers

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Overview of Options Markets

- Over-the-counter instruments
  - Contracts are privately negotiated and tailored to meet customer needs
  - Transactions occur off-market or outside registered exchanges
  - Counterparty risk is a major consideration
  - Products typically traded through commercial banks, investment banks and brokers

- Exchange traded instruments
  - Contracts are standardized
  - Clearinghouse acts as a middleman between the buyer and seller
  - Counterparty risk or the risk of default is quite low
  - Products are liquid and can be easily traded

The Australian Options Market

- The Australian options market was established in February 1976
  - First exchange traded options market outside North America
  - Initially traded call options on four stocks - BHP, Western Mining, CSR and Woodside Petroleum
  - Transition to electronic trading system from trading floors and the last day of floor trading occurred on January 30, 1998
  - Average volume now exceeds 100,000 contracts a day and represent a trading value over $250 billion per annum

The Australian Options Market

- The Options Clearinghouse
  - Wholly owned subsidiary of the ASX
  - Provides clearing and settlement facilities for members
  - Interposes itself between the option buyer and seller to reduce counterparty risk
  - Maintains a depository for lodgment of collateral used as cover by option writers

Call and Put Options

- An option gives the holder the right to buy or sell the underlying security at, or before, a specified expiration date, at a pre-specified exercise (or strike) price
  - To the buyer/holder the contract is an option and not an obligation (unlike forwards and futures contracts)
  - A call option gives the right to purchase the underlying security
  - A put option gives the right to sell the underlying security

- To the option writer (or seller) the contract is an obligation
  - The writer of a call option has the obligation to sell the underlying security
  - The writer of a put option has the obligation to purchase the underlying security

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Call and Put Options

Contract type	Buyer or Holder	Seller or Writer
Call option	*Right*, but no obligation, to *buy* the underlying security	*Obligation*, and not a right, to *sell* the underlying security if option exercised
Put option	*Right*, but no obligation, to *sell* underlying security	*Obligation*, and not a right, to *buy* the underlying security if option exercised

Is a bought call option the same as, or similar to, a sold put option?
Is a bought put option the same as, or similar to, a sold call option?

Call and Put Options

- American versus European options
  - An American option can be exercised at any time up to and including the expiration date
  - A European option can be exercised only at expiration
- American options are more common than European ones
- All else being the same, which option would you value more?

Payoff and Profit on Call Options

- The payoff to a call option buyer is: $\text{Max}(S_T - X, 0)$
  - S_T = Stock price at expiration
  - X = Exercise (or strike) price of the option

- The profit to a call option buyer is: $\text{Max}(S_T - X, 0) - C$
  - C = Call option price (or premium)

- $\text{Max}(S_T - X, 0)$ means…
  - If $S_T - X > 0$ then $\text{Max}(S_T - X, 0) = S_T - X$
  - If $S_T - X$ 0 then $\text{Max}(S_T - X, 0) = 0$
  - The payoff from an option cannot be negative!

Note that the payoff and profit to a call option seller (or writer) are the negatives of the above

Payoff and Profit on Put Options

- The payoff to a put option buyer is: $\text{Max}(X - S_T, 0)$
  - S_T = Stock price at expiration
  - X = Exercise (or strike) price of the option

- The profit to a put option buyer is: $\text{Max}(X - S_T, 0) - P$
  - P = Put option price (or premium)

- $\text{Max}(X - S_T, 0)$ means…
  - If $X - S_T > 0$ then $\text{Max}(X - S_T, 0) = X - S_T$
  - If $X - S_T$ 0 then $\text{Max}(X - S_T, 0) = 0$
  - The payoff from an option cannot be negative!

Note that the payoff and profit to a put option seller (or writer) are the negatives of the above

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Moneyness of Options

- At-the-money option: Current spot price, S_t = Exercise price (X)

- In-the-money option: If profitable to exercise at the spot price
  - Call option: Current spot price, S_t > Exercise price (X)
  - Put option: Current spot price, S_t < Exercise price (X)

- Out-of-the-money option: If unprofitable to exercise at the spot price
  - Call option: Current spot price, S_t < Exercise price (X)
  - Put option: Current spot price, S_t > Exercise price (X)

- Breakeven prices are where the profit to the buyer is zero
  - Call option: Exercise price (X) + Option premium (or price, C)
  - Put option: Exercise price (X) – Option premium (or price, P)

Payoff and Profit on Long Call Options

Example: You purchase a call option on ANZ Bank shares expiring in three months' time at a premium of $0.50. The exercise price of the call is $27 per share. What is the payoff and profit to the buyer if the price of ANZ's shares in three months is $25, $26, $27, $28 and $29?

Payoff to call option buyer = $\text{Max}(S_T - X, 0)$
Profit to call option buyer = $\text{Max}(S_T - X, 0) - C$

Spot Price in 3 Months	Payoff	Profit
$25	$0.00	-$0.50
$26	$0.00	-$0.50
$27	$0.00	-$0.50
$28	$1.00	$0.50
$29	$2.00	$1.50

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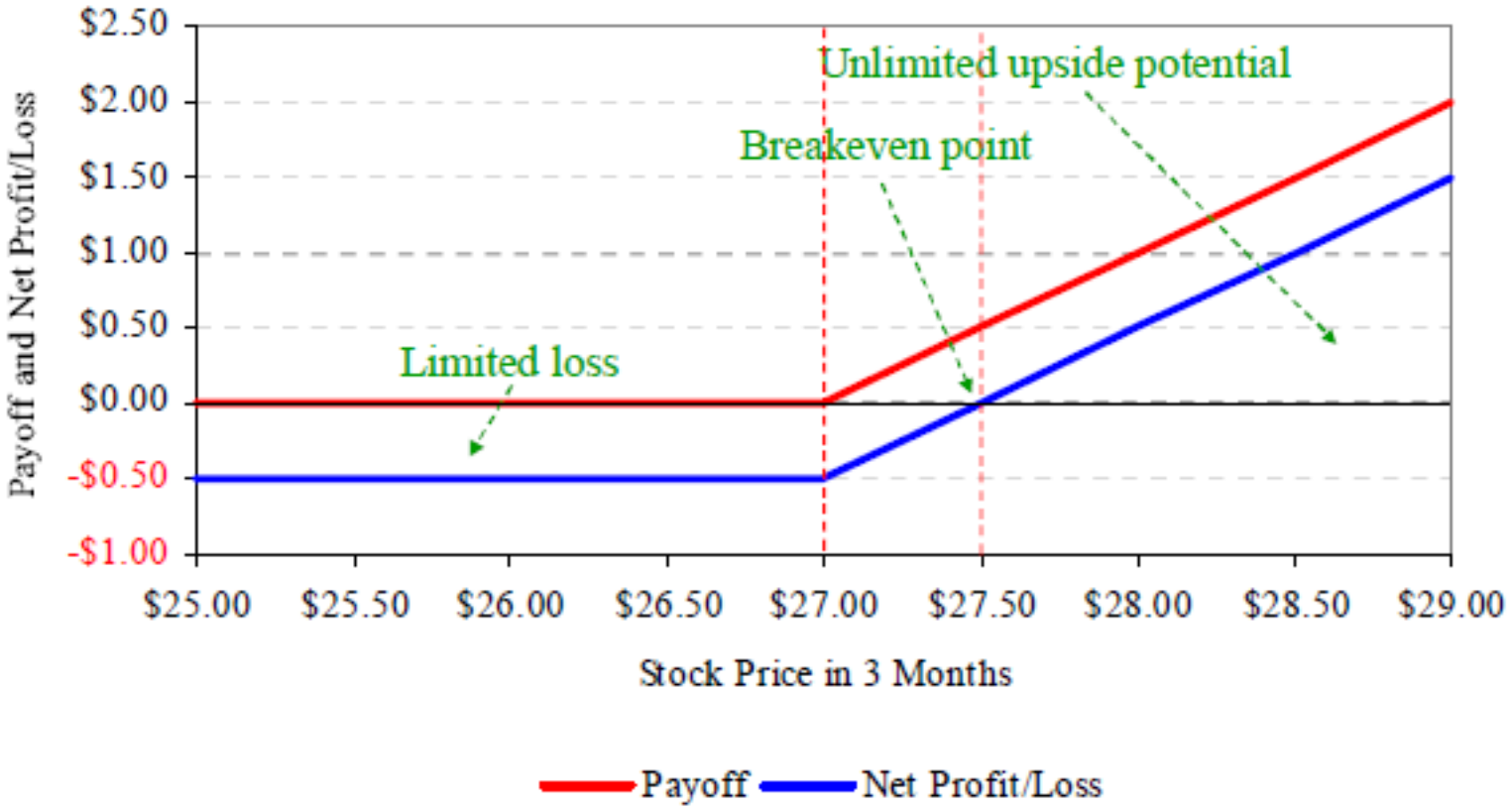
Payoff and Profit on Long Call Option



What are your expectations regarding the future price of ANZ shares?

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Payoff and Profit on Short Call Option

Example (continued): If you are the seller of the call option in the previous example what would your payoff and profit be if the price of ANZ's shares in three months is \$25, \$26, \$27, \$28 and \$29?

Payoff to call option seller = $-\text{Max}(S_T - X, 0)$
Profit to call option seller = $C - \text{Max}(S_T - X, 0)$

Spot Price in 3 Months	Payoff	Profit
\$25	\$0.00	\$0.50
\$26	\$0.00	\$0.50
\$27	\$0.00	\$0.50
\$28	-\$1.00	-\$0.50
\$29	-\$2.00	-\$1.50

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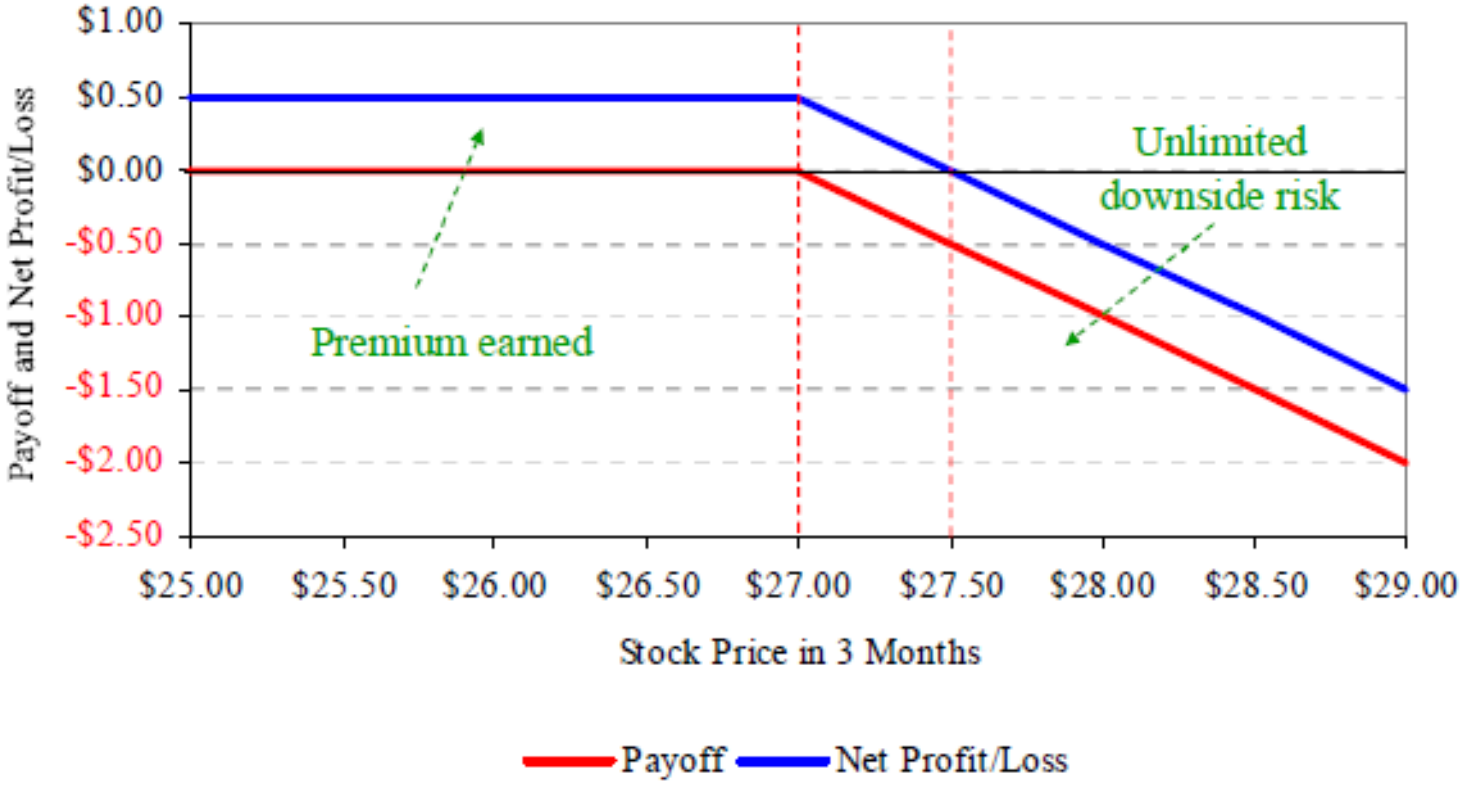
Payoff and Profit on Short Call Option



What are your expectations regarding the future price of ANZ shares?

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Payoff and Profit on Long Put Option

Example: You purchase a put option on ANZ Bank shares expiring in three months' time at a premium of \$0.50. The exercise price of the put is \$26.00 per share. What's the payoff and profit to the buyer if the price of ANZ's shares in three months is \$24, \$25, \$26, \$27 and \$28?

Payoff to put option buyer = $\text{Max}(X - S_T, 0)$
Profit to put option buyer = $\text{Max}(X - S_T, 0) - P$

Spot Price in 3 Months	Payoff	Profit
\$24	\$2.00	\$1.50
\$25	\$1.00	\$0.50
\$26	\$0.00	-\$0.50
\$27	\$0.00	-\$0.50
\$28	\$0.00	-\$0.50

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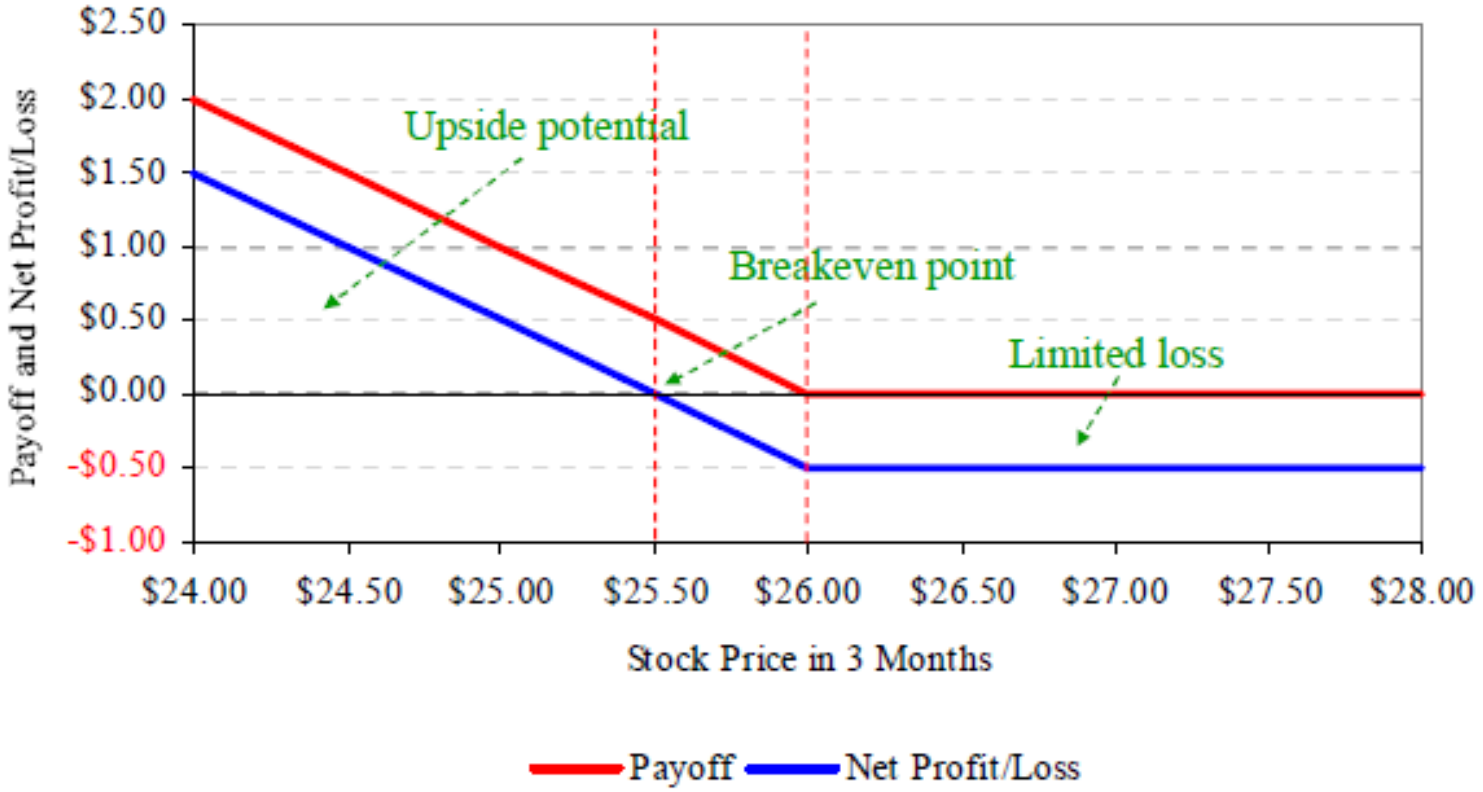
Payoff and Profit on Long Put Option



What are your expectations regarding the future price of ANZ shares?

Payoff and Profit on Short Put Option

Example (continued): If you are the seller of the put option in the previous example what would your payoff and profit be if the price of ANZ's shares in three months is \$24, \$25, \$26, \$27 and \$28?

Payoff to put option seller = $-\text{Max}(X - S_T, 0)$
Profit to put option seller = $P - \text{Max}(X - S_T, 0)$

Spot Price in 3 Months	Payoff	Profit
\$24	-\$2.00	-\$1.50
\$25	-\$1.00	-\$0.50
\$26	\$0.00	\$0.50
\$27	\$0.00	\$0.50
\$28	\$0.00	\$0.50

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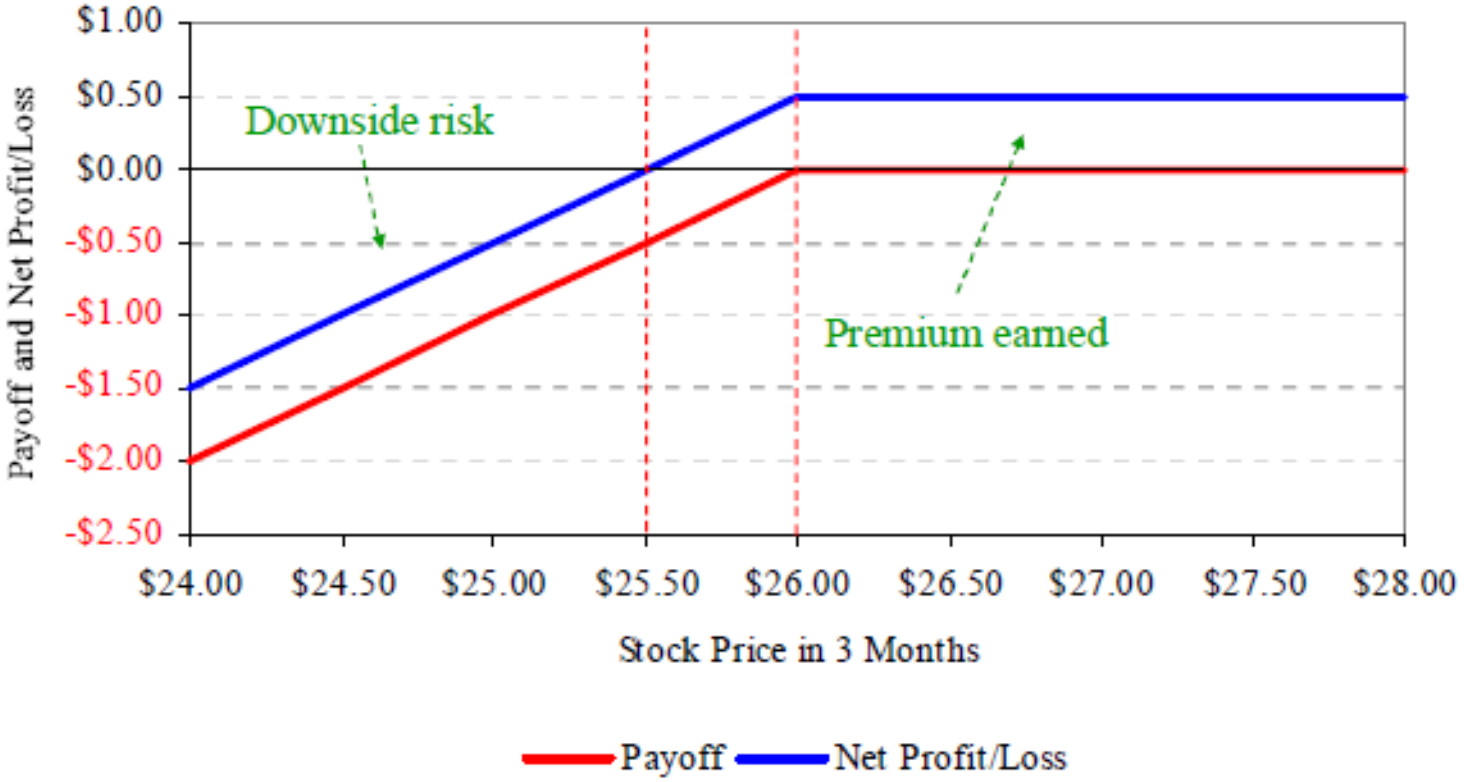
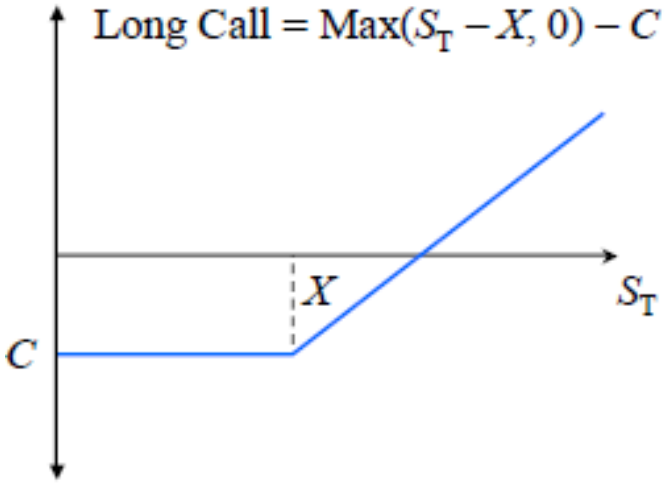
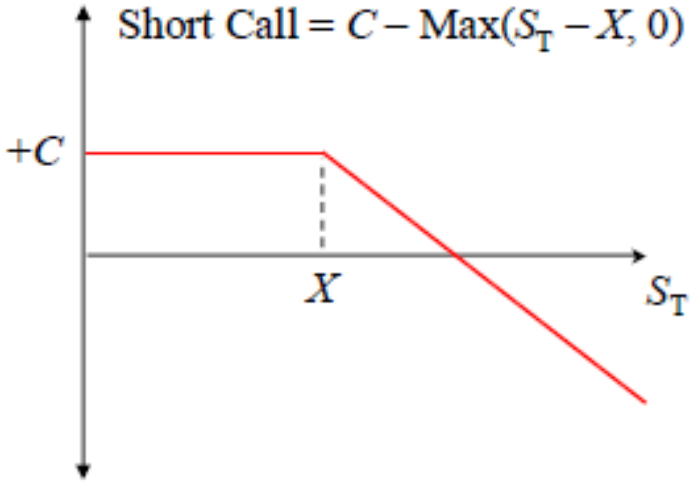
Payoff and Profit on Short Put Option

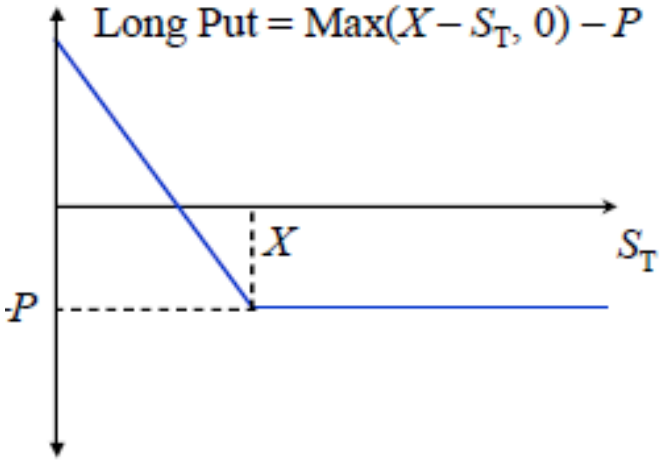


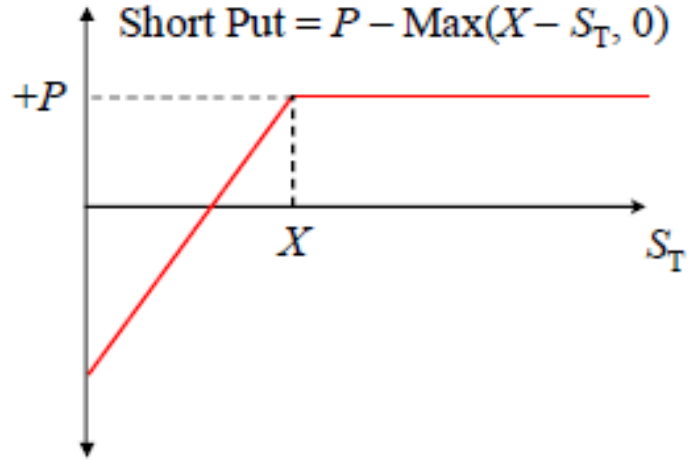
What are your expectations regarding the future price of ANZ shares?

Summary of Profits on Option Contracts









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Call Option Quotes

Call options traded on CSL Ltd
Last sale price on CSL shares on October 15, 2008: $38.38

Series	Exercise price	Last sale	Volume (1000s)	Open interest
Oct 08	$39.00	$0.92	1	169
Oct 08	$40.00	$0.69	5	180
Nov 08	$39.00	$2.17	18	65
Nov 08	$40.00	$1.51	14	64
Dec 08	$39.00	$2.38	1	70
Dec 08	$40.00	$2.17	10	148

Source: Adapted from the *Australian Financial Review*, October 16, 2008

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Put Option Quotes

Put options traded on CSL Ltd
Last sale price on CSL shares on October 15, 2008: $38.38

Series	Exercise price	Last sale	Volume (1000s)	Open interest
Oct 08	$39.00	$1.63	12	37
Oct 08	$40.00	$2.40	1	73
Nov 08	$32.00	$0.45	2	113
Nov 08	$44.00	$5.95	10	--
Feb 09	$40.00	$4.35	1	8

Source: Adapted from the *Australian Financial Review*, October 16, 2008

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Key Concepts

- An option gives the holder the right to buy or sell the underlying security at, or before, a specified expiration date, at a pre-specified exercise (or strike) price

- A call option gives the right to purchase the underlying security

- A put option gives the right to sell the underlying security

- To the option writer (or seller) the contract is an obligation

- American options can be exercised at any time up to and including the expiration date while European option can be exercised only at expiration

- In the money options are profitable to exercise now while at or out of the money options are not profitable to exercise now

Key Relationships/Formula Sheet

Payoff to a call option buyer: $\text{Max}(S_T - X, 0)$

Profit to a call option buyer: $\text{Max}(S_T - X, 0) - C$

Payoff to a put option buyer: $\text{Max}(X - S_T, 0)$

Profit to a put option buyer: $\text{Max}(X - S_T, 0) - P$

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