THE UNIVERSITY OF MELBOURNE

FNCE10002 Principles of Finance
Semester 1, 2019

An Introduction to Options
Suggested Answers to Study Questions for Week 12

If you are unsure of any answer you should check with a pit stop tutor, online tutor or me.

A. Short Answer Questions

A1. a) True. Buying call options allows the speculator to capture the potential increase in the share price. If the share price increases, the intrinsic value of the call option will increase. The intrinsic value of a call option is Max($S - X$, 0). The more that the share price increases above the exercise price, the higher the intrinsic value of a call option.

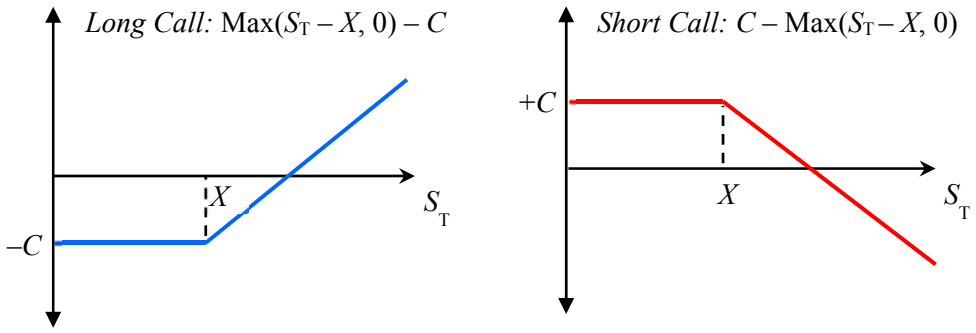
b) True. The strategy of buying put options will allow the investor to set a minimum sale price for ANZ Bank's shares. The exercise price of the put option will set this minimum sale price. If the share price falls below the exercise price the put option will have a positive payoff, that is, Max($X - S$, 0).

c) True. All other things remaining the same, as the share price increases, the (intrinsic) value of a put option, Max($X - S$, 0), will decrease. On the other hand, the intrinsic value of a call option, Max($S - X$, 0), will increase.

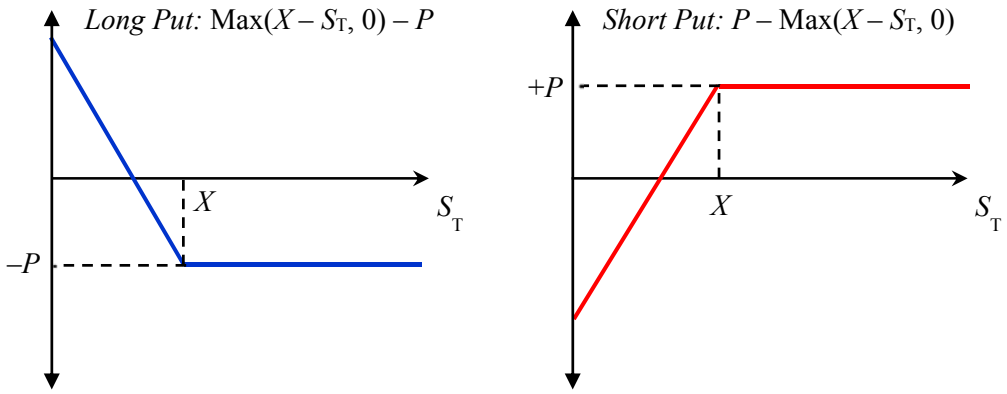
A2. The value of a call (put) option depends critically on the probability that the share price on the option's expiry date will be greater (less) than the exercise price. The higher the volatility of the underlying share, the more dispersed is the distribution thus increasing both probabilities. Hence, the prices of both put options and call options are positively related to the volatility of the underlying share.

As the time to expiration increases there is a higher probability that a call or put option will be in-the-money (if currently out-of-the-money) or more in-the-money (if already in-the-money). So, option prices are positively related to the time to expiration.

A3. a) The profit diagrams for a long and short call options are as follows. The breakeven point is where the profit is zero or where the line crosses the x-axis, that is, the exercise price plus the call option premium. The call buyer has a downside risk that is limited to the premium paid upfront. The call seller (or writer) has an unlimited downside risk because the seller has an *obligation* to sell the underlying shares if the option is exercised against the seller.



b) The profit diagrams for a long and short put options are as follows. The breakeven point is where the profit is zero or where the line crosses the *x*-axis, that is, the exercise price minus the put option premium. The put buyer has a downside risk limited to the premium paid upfront. The put seller (or writer) has an unlimited downside risk because the seller has an *obligation* to buy the underlying shares if the option is exercised against the seller. (Note that, strictly speaking, the downside risk is limited in the sense that the share price can only fall to zero. However, in practice the downside risk is unlimited in the sense that one can lose a lot of money and get wiped out if the price falls significantly before it reaches zero.)



A4. Refer to the profit diagrams in question A3. A long call and a short put position will benefit from a rise in the share price.

A5. Refer to the profit diagrams in question A3. A short call and a long put will benefit from a fall in the share price.

A6. We cannot say that. The shares of company A might be more volatile than the shares of company B, and that would justify a higher call price.

B. Problems and Case Studies

B1. a) If it is an American option, the option can be exercised at any time up to and including the expiration date.

b) If it is a European option, the option can be exercised only on the expiration date and not before.

c) The exercise price is \$6.00 and at present, the share price is \$5.50. So, the call certainly shouldn't be exercised today. However, the option is *not* worthless. At some future time (during the life of the option) the share price may exceed the exercise price. For example, if next week the share price increases to \$8.00 per share the holder of this call option will

be very happy. To put this another way, this option would be worthless only if (somehow) we knew for certain that the share price cannot exceed \$6.00 during the remaining life of the option. If there is some chance that the share price could exceed \$6.00 during this period, the option must be worth something.

B2. Profit on put option = Max($X - S$, 0) – P.

a) Profit on put option = Max(7.50 – 6.50, 0) – 0.25 = \$0.75 per share.

b) Profit on put option = Max(7.50 – 7.00, 0) – 0.25 = \$0.25 per share.

c) Profit on put option = Max(7.50 – 7.50, 0) – 0.25 = –\$0.25 per share.

d) Profit on put option = Max(7.50 – 8.00, 0) – 0.25 = –\$0.25 per share.

B3. Profit on call option = Max($S - X$, 0) – C.

a) Profit on put option = Max(8.50 – 10.00, 0) – 0.20 = –\$0.20 per share.

b) Profit on put option = Max(9.50 – 10.00, 0) – 0.20 = –\$0.20 per share.

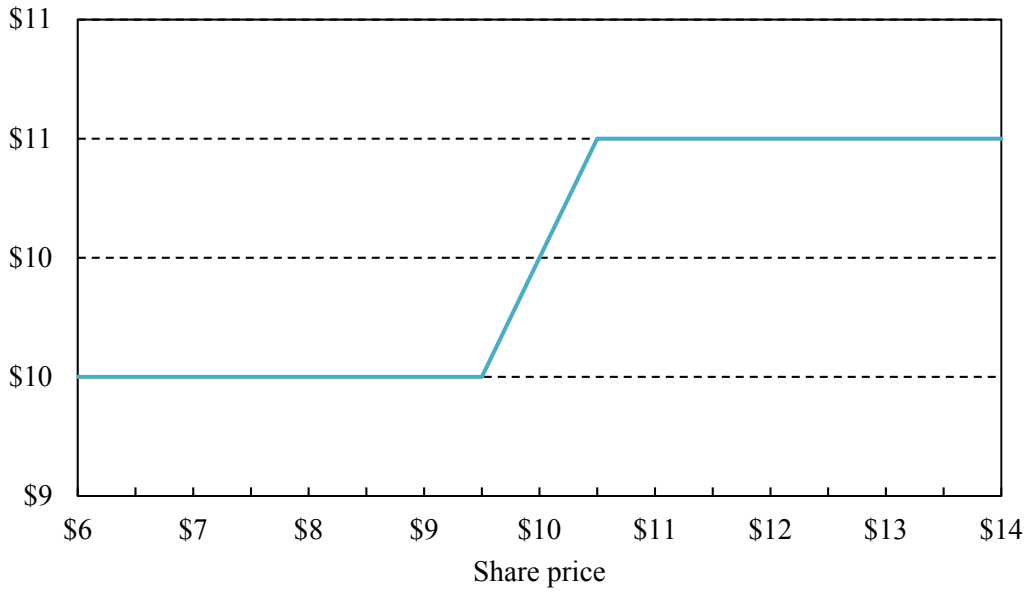
c) Profit on put option = Max(10.50 – 10.00, 0) – 0.20 = \$0.30 per share.

d) Profit on put option = Max(11.50 – 10.00, 0) – 0.20 = \$1.30 per share.

B4. Lisa has put a "collar" around her shares. The combined portfolio cannot be worth less than \$9.50, nor can it be worth more than \$10.50. The payoffs are as follows:

Share Price	**Shares** (S) (1)	**Short Call** –Max(S – 10.50, 0) (2)	**Long Put** Max(9.50 – S, 0) (3)	**Portfolio** (1 + 2 + 3)
\$6.00	\$6.00	\$0.00	\$3.50	\$9.50
\$6.50	\$6.50	\$0.00	\$3.00	\$9.50
\$7.00	\$7.00	\$0.00	\$2.50	\$9.50
\$7.50	\$7.50	\$0.00	\$2.00	\$9.50
\$8.00	\$8.00	\$0.00	\$1.50	\$9.50
\$8.50	\$8.50	\$0.00	\$1.00	\$9.50
\$9.00	\$9.00	\$0.00	\$0.50	\$9.50
\$9.50	\$9.50	\$0.00	\$0.00	\$9.50
\$10.00	\$10.00	\$0.00	\$0.00	\$10.00
\$10.50	\$10.50	\$0.00	\$0.00	\$10.50
\$11.00	\$11.00	–\$0.50	\$0.00	\$10.50
\$11.50	\$11.50	–\$1.00	\$0.00	\$10.50
\$12.00	\$12.00	–\$1.50	\$0.00	\$10.50
\$12.50	\$12.50	–\$2.00	\$0.00	\$10.50
\$13.00	\$13.00	–\$2.50	\$0.00	\$10.50
\$13.50	\$13.50	–\$3.00	\$0.00	\$10.50
\$14.00	\$14.00	–\$3.50	\$0.00	\$10.50

The payoff diagram for this collar is as follows:



B5. a) Based on the given exercise (exercise) prices, we have:

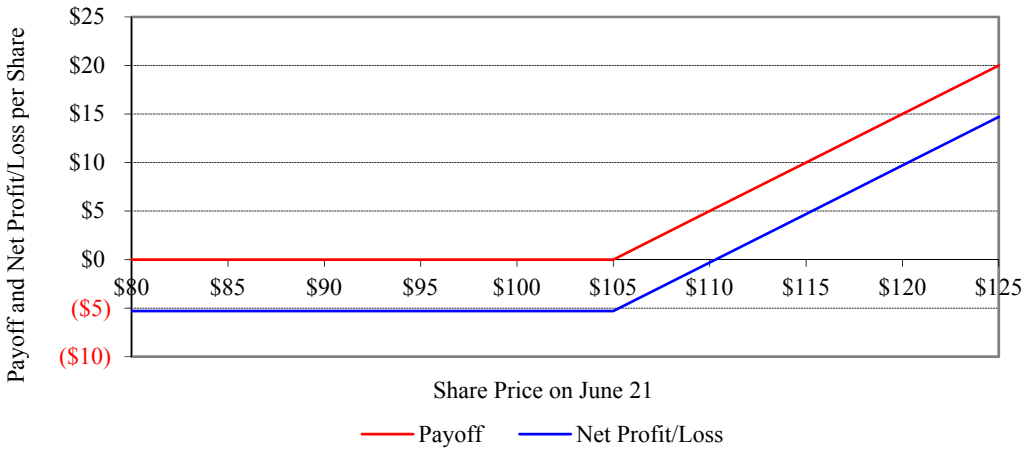
Exercise Price	Call Option	Put Option
$20	In-the-money	Out-of-the-money
$37	At-the-money	At-the-money
$50	Out-of-the-money	In-the-money

b) The call's intrinsic value is $3.00 (= $28 – $25) and its time value is $2.25 (= $5.25 – $3.00). The put's intrinsic value is $2.00 (= $30 – $28) and its time value is $1.10 (= $3.10 – $2.00).

B6. The table related to Strategy 2B is as follows.

Price on June 21	Payoff	Payoff Per Share	Net Profit/Loss	Net Profit/Loss Per Share	Percent Profit/Loss
$80	$0	$0.00	-$5,300	-$5.30	-100.0%
$85	$0	$0.00	-$5,300	-$5.30	-100.0%
$90	$0	$0.00	-$5,300	-$5.30	-100.0%
$95	$0	$0.00	-$5,300	-$5.30	-100.0%
$100	$0	$0.00	-$5,300	-$5.30	-100.0%
$105	$0	$0.00	-$5,300	-$5.30	-100.0%
$110	$5,000	$5.00	-$300	-$0.30	-5.7%
$115	$10,000	$10.00	$4,700	$4.70	88.7%
$120	$15,000	$15.00	$9,700	$9.70	183.0%
$125	$20,000	$20.00	$14,700	$14.70	277.4%

The main benefit of using this strategy is that it is lower cost as you're using an out-of-the-money option. The payoff and net profit/loss per share are as follows.



B7. The table related to Strategy 2B is as follows.

Price on June 21	Payoff	Payoff Per Share	Net Profit/Loss	Net Profit/Loss Per Share	Percent Profit/Loss
$80	$20,000	$20.00	$14,750	$14.75	281.0%
$85	$15,000	$15.00	$9,750	$9.75	185.7%
$90	$10,000	$10.00	$4,750	$4.75	90.5%
$95	$5,000	$5.00	-$250	-$0.25	-4.8%
$100	$0	$0.00	-$5,250	-$5.25	-100.0%
$105	$0	$0.00	-$5,250	-$5.25	-100.0%
$110	$0	$0.00	-$5,250	-$5.25	-100.0%
$115	$0	$0.00	-$5,250	-$5.25	-100.0%
$120	$0	$0.00	-$5,250	-$5.25	-100.0%
$125	$0	$0.00	-$5,250	-$5.25	-100.0%

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