Put-Call Parity

Put-Call Parity #Question 11.12

- The price of a non-dividend-paying stock is $19 and
- the price of a 3-month European call option on the stock with a strike price of $20 is $1.
- The risk-free rate is 4% per annum.
- What is the price of a 3-month European put option with a strike price of $20?

Put-Call Parity #Question 11.19

- The price of a European call that expires in 6 months and has a strike price of $30 is $2.
- The underlying stock price is $29, and
- a dividend of $0.50 is expected in 2 months and again in 5 months.
- Risk-free interest rates (all maturities) are 10%.
- What is the price of a European put option that expires in 6 months and has a strike price of $30?

Put-Call Parity #Question 11.20

- Explain the arbitrage opportunities in Problem 11.19 if the European put price is $3.

Put-Call Parity #Question 11.13

- Explain why the arguments leading to put–call parity for European options cannot be used to give a similar result for American options.

Put-Call Parity #Question 11.28

- Calls were traded on exchanges before puts.
- During the period of time when calls were traded but puts were not traded,
- how would you create a European put option on a non-dividend-paying stock synthetically?

Put-Call Parity #Question 11.29

- The prices of European call and put options on a non-dividend-paying stock with an expiration date in 12 months and a strike price of $120 are $20 and $5, respectively.
- The current stock price is $130.
- What is the implied risk-free rate?

Put-Call Parity #Question 11.30

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- A European call option and a put option on a stock both have a strike price of $20 and an expiration date of 3 months.
- Both sell for $3.
- The risk-free interest rate is 10% per annum,
- the current stock price is $19, and a $1 dividend is expected in 1 month.
- Identify the arbitrage opportunity open to a trader.

Lower Bounds

Lower Bounds #Question 11.7

- What is a lower bound for the price of a 4-month call option on
- a non-dividend-paying stock
- when the stock price is $28,
- the strike price is $25, and
- the risk-free interest rate is 8% per annum.

Lower Bounds #Question 11.8

- What is a lower bound for the price of a 1-month European put option
- on a non-dividend-paying stock
- when the stock price is $12,
- the strike price is $15, and
- the risk-free interest rate is 6% per annum?

(skip) 11.14, 11.15

Lower Bounds #Question 11.16

- A 4-month European call option on a dividend-paying stock is currently selling for $5.
- The stock price is $64,
- the strike price is $60, and
- a dividend of $0.80 is expected in 1 month.
- The risk-free interest rate is 12% per annum for all maturities.
- What opportunities are there for an arbitrageur?

Lower Bounds #Question 11.17

- A 1-month European put option on a non-dividend-paying stock is currently selling for $2.50.
- The stock price is $47,
- the strike price is $50, and
- the risk-free interest rate is 6% per annum.
- What opportunities are there for an arbitrageur?

(skip) 11.26

American Option

American Option #Question 11.9

- Give two reasons why the early exercise of an American call option on a non-dividend-paying stock is not optimal.
- The first reason should involve the time value of money.
- The second should apply even if interest rates are zero.

American Option #Question 11.10

- “The early exercise of an American put is a trade-off between the time value of money and the insurance value of a put.”
- Explain this statement.

American Option #Question 11.11

- Why is an American call option on a dividend-paying stock always worth at least as much as its intrinsic value.
- Is the same true of a European call option?
- Explain your answer.

American Option #Question 11.18

- Give an intuitive explanation of
- why the early exercise of an American put becomes more attractive as the risk-free rate increases and volatility decreases.

American Option #Question 11.21

- The price of an American call on a non-dividend-paying stock is \$4.
- The stock price is \$31, the strike price is \$30, and the expiration date is in 3 months.
- The risk-free interest rate is 8%.
- Derive upper and lower bounds for the price of an American put on the same stock with the same strike price and expiration date.

American Option #Question 11.22

- Explain carefully the arbitrage opportunities in Problem 11.21
- if the American put price is greater than the calculated upper bound.

American Option #Question 11.23

- Prove the result in equation (11.7).
- (Hint: For the first part of the relationship, consider
- (a) a portfolio consisting of a European call plus an amount of cash equal to K, and
- (b) a portfolio consisting of an American put option plus one share.)

American Option #Question 11.24

- Prove the result in equation (11.11).
- (Hint: For the first part of the relationship, consider
- (a) a portfolio consisting of a European call plus an amount of cash equal to $D + K$, and
- (b) a portfolio consisting of an American put option plus one share.)

Miscellaneous

Miscellaneous #Question 11.25

- Consider a 5-year call option on a non-dividend-paying stock granted to employees.
- The option can be exercised at any time after the end of the first year.
- Unlike a regular exchange-traded call option, the employee stock option cannot be sold.
- What is the likely impact of this restriction on the early-exercise decision?

Miscellaneous #Question 11.27

- What is the impact (if any) of negative interest rates on:
- (a) The put–call parity result for European options
- (b) The result that American call options on non-dividend-paying stocks should never be exercised early
- (c) The result that American put options on non-dividend-paying stocks should some- times be exercised early.
- Assume that holding cash earning zero interest is not possible.

Miscellaneous #Question 11.31

- Suppose that c1, c2, and c3 are the prices of European call options with strike prices K1, K2, and K3, respectively, where K3 > K2 > K1 and K3 - K2 = K2 - K1.
- All options have the same maturity.
- Show that c2 $\leq$ 0.5(c1 + c3)
- (Hint: Consider a portfolio that is long one option with strike price K1, long one option with strike price K3, and short two options with strike price K2.)

Miscellaneous #Question 11.32

- What is the result corresponding to that in Problem 11.31 for European put options?