

Exercises 3 - Binomial Model

1. A stock price is currently \$40. It is known that at the end of one month it will be either \$42 or \$38. The risk-free interest rate is 8% per annum with continuous compounding. Calculate the value of a one-month European call option with a strike price of \$39 using

—
(a) a risk-neutral approach

(b) a replicating portfolio approach

2. A stock price is currently \$50. It is known that at the end of six months it will be either \$45 or \$55. The risk-free interest rate is 10% per annum with continuous compounding. What is the value of a six-month European put option with strike price of \$50? Use a risk-neutral approach.
3. A stock price is currently £100. Over the next two six-month periods it is expected to go up by 10% or down by 10%. The risk free rate is 8% per annum with continuous compounding. What is the value of a one-year European call option with strike price £100?
4. A stock price is currently £25. It is known that at the end of two months it will be either £23 or £27. The risk-free rate is 10% per annum with continuous compounding. Suppose S_T is the stock price at the end of two months. What is the value of a derivative that pays S_T^2 at the end of two months?
5. A stock price is currently £50. Over each of the next two three-month periods it is expected to go up by 6% or down by 5%. The risk-free rate is 5% per annum with continuous compounding.
 - (a) Calculate the value of a six-month European call option with strike price £51.

- (b) Calculate the value of a six-month European put option with strike price £51.
- (c) Verify that put call parity holds.
- (d) When, if ever, would it be worth exercising a six-month American put option with strike price £51?
- (e) What is the value today of the six-month American put option with strike price £51?
- (f) What is the value today of the six-month American call option with strike price £51?

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