

Problem Set: The Black and Scholes model.

1. What is the price of a European call option on a non-dividend-paying stock when the stock price is £52, the strike price is £50, the risk-free interest rate is 12% per annum, the volatility is 30% per annum, and the time to maturity is three months?

2. A call option on a non-dividend-paying stock has a market price of £2.5. The stock price is £15, the exercise price is £13, the time to maturity is three months, and the risk-free interest rate is 5% per annum. What is the implied volatility?

3. Consider an option on a non-dividend paying stock when the stock price is £30, the exercise price is £29, the risk-free interest rate is 5% per annum, the volatility is 25% per annum, and the time to maturity is 4 months.

(a) What is the price of the option if it is a European call?

(b) What is the price of the option if it is an American call?

(c) Use the put-call parity to calculate the price of the option if it is a European put.

4. Calculate the premium of a one-month European call on a non-dividend paying stock when the stock price is £40, the exercise price is £40, the risk-free interest rate is 5% per annum, the volatility is 20% per annum, and the time to maturity is 0.0833 of a year. Use the put-call parity formula to compute the corresponding put's value. Explain why the European call premium exceeds the European put premium.

5. Suppose that you want to use the BS formula to value a European call on a non-dividend-paying stock which matures in three months. The discrete annualized rate on a 3-month T-bill is 6%. What is the interest rate that you need to insert in the BS formula?