MFE5130 – Financial Derivatives

Class Activity (15-November-2018) (Solution)

Important Notes:

1. This class activity is counted toward to your class participation score. **Fail** to hand in this class activity worksheet in the class will receive **0 score** for that class.
2. **0 mark** will be received if you leave the solution blank.

Name:	Student No.:

Problem 1

For a straddle, you are given:

i. The straddle can only be exercised at the end of one year.

ii. The payoff of the straddle is the absolute value of the difference between the strike price and the stock price at the expiration date.

iii. The stock currently sells for \$100.

iv. The straddle has a strike price of \$105.

The continuously compounded risk-free interest rate is 10%. The stock pays continuously compounded dividends at a rate of 5%.

The 1-year European call option on the stock has a strike price of \$105. The theta of the call option is –7.16.

Calculate the theta of the straddle.

Solution

We can take the derivative of both sides of the put-call parity equation and solve for the theta of the put option:

$$C\left(S_t, K, T-t\right) + Ke^{-r(T-t)} = S_t e^{-\delta(T-t)} + P\left(S_t, K, T-t\right)$$

$$\theta_{Call} + \frac{\partial\left[Ke^{-r(T-t)}\right]}{\partial t} = \frac{\partial\left[S_t e^{-\delta(T-t)}\right]}{\partial t} + \theta_{Put}$$

$$\theta_{Call} + rKe^{-r(T-t)} = \delta S_t e^{-\delta(T-t)} + \theta_{Put}$$

$$-7.16 + 0.1\times 105e^{-0.1(1)} = 0.05\times 100e^{-0.05(1)} + \theta_{Put}$$

$$\theta_{Put} = -2.4154.$$

A straddle consists of a put and a call. Therefore, the theta of the straddle is the sum of the theta of the put plus the theta of the call:

$$\theta_{Call} + \theta_{Put} = -2.4154 - 7.16 = -9.5754.$$