CLASS 12

**I**

Coca-Cola is presently pricing at $65.77, and the risk free rate is at +1.55% per year. The implied volatility observed in the options series is close to 12% and the market is expecting the firm to pay a dividend yield of 2.5%.

1. Using the Black-Scholes-Merton equation adjusted for dividends:
   1. What should be the fair price for an at-the-money European put option on Coca-Cola maturing on January 2021 (1 year to maturity)? **(1.0 points)**
   2. What is the risk neutral probability of the January 2020 European put option estimated at question 1a) to mature in-the-money? **(1.0 points)**
   3. What is the delta of the European put option estimated at question 1a)? **(1.0 points)**
   4. If the Coca-Cola shares increase $2.00 what is the expected put option price change (estimated at question 1a)? Please use the delta estimated above. **(1.0 points)**

**II**

Eurex, the European derivatives exchange is trading Options on the index Euro Stoxx 50 with the following maturity and prices:

|  |  |  |
| --- | --- | --- |
|  | **Expiry: Dec 21** | |
| **Strike Price** | **Calls** | **Puts** |
| 4,000 points | 62.00 points | 575.00 points |
| 3,500 points | 275.00 points | 281.00 points |

We are presently in the early days of February 2021 (11 months to maturity of the December 2021 contract) and the Euro Stoxx 50 is presently at 3,533.00 points. The Euro Stoxx 50 dividend yield is estimated to be 2.15% for this coming year and the risk free rate is assumed to be -0.50%. The volatility of the index is assumed to be 15%.

The contract specifications establishes 1 index point = €10 for both options and futures.

1. What is the fair price for an European 3,500.00 Put option on the Euro Stoxx 50, maturing on December 2021 (11 months to maturity)? **(1.0 points)**
2. Assuming that the put-call parity holds what should be the fair price of the corresponding European Call? Please refer to the previous question. **(1.0 points)**
3. What is the probability of the index to be between 3,500 and 4,000 points in December 2021? **(1.0 points)**