Q1-B

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Question - Buycoins Inc is listed on the LSE with a stock price of £12.75 - the company is not known to pay dividends. We need to price a put option with a strike of $10 maturing in 6 months. The continuously-compounded risk-free rate is 2.75%/year, the mean return on the stock is 6%/year, and the standard deviation of the stock return is 20%/year. What is the Black-Scholes put price?

Answer –

The Black Scholes Put (P) and Call (C) Option pricing models are given by the formulas

$$C = S_0 e^{-qt} N(d_1) - X e^{-rt} N(d_2)$$

$$P = X e^{-rt} N(-d_2) - S_0 e^{-qt} N(-d_1)$$

Where

$$d_1 = \frac{ln\left(\frac{S_0}{X}\right) + t(r - q + \frac{\sigma^2}{2})}{\sigma\sqrt{t}}$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

Where $N(x)$: is the standard normal cumulative distribution function at x.

S_0: underlying price (per share) = £ 12.75

X: strike price (per share) = £ 10 (I am assuming that the dollar is an oversight because the Black- Scholes model is not suitable for American style options, but best suited for the European style options)

σ: volatility or standard deviation (% p.a) = 20% per year = 0.2

r: continuously compounded risk-free interest rate (% p.a) = 2.75% per year = 0.0275

q: continuously compounded dividend yield (% p.a) = 0 (since the company is not known to pay dividends)

t: time to expiration (% of year) = 6 months = 0.5 year

Calculating the term d_1

$$d_1 = \frac{\ln\left(\frac{12.75}{10}\right) + 0.5(0.0275 - 0 + \frac{0.2^2}{2})}{0.2\sqrt{0.5}} = 1.88582$$

Calculating the term d_2

$$d_2 = 1.88582 - 0.2\sqrt{0.5} = 1.74441$$

Calculating P

$$P = 10 * e^{-0.0275*0.5} * N(-1.74441) - 12.75 * e^{-0*0.5} N(-1.88582) = £\,0.022$$

$\therefore The\ Black - Scholes\ Put\ price =$ **£ 0.022**

Verification Step

$$C = 12.75 * N(1.88582) - 10 * e^{-0.0275*0.5} * N(1.74441) = £\,2.9075$$

$\therefore The\ Black - Scholes\ Call\ price = £\,2.9075$

Using the **Call-Put Parity,**

1. $C + Xe^{-rt}$
2. $P + S_0 e^{-qt}$

To be sure we have done the right calculations, 1 and 2 must be equal.

1. $= 2.9075 + 10 * e^{-0.0275*0.5} = 12.77$
2. $= 0.022 + 12.75e^{-0*0.5} = 12.77$

Since 1 = 2, we are sure that the $Black - Scholes\ Put\ price =$ **£ 0.022**

Q1-A

Binance Smart Chain (BSC) is a modified Ethereum fork that's compatible with the Ethereum Virtual Machine (EVM), capable of executing smart contracts, and decentralized applications (DApps). BSC complements Binance Chain. Ethereum (ETH) is the unquestionable King when it comes to smart contract.

One of the short term implication of adopting BSC over Ethereum is an increase in the usage on the BSC ecosystem especially from Ethereum users, especially those interested in decentralized finance (DEFI), due to low cost of transaction (gas price), with an average of $ 0.15 when compared to ETHEREUM's over $ 10, not forgetting the ease of moving projects/tokens from other block-chain network, ETHEREUM inclusive to the BSC network. Ideally, this should increase the number of nodes on BSC's network, but the reverse happens because BSC only accepts 21 validators or nodes, few in comparison to ETHEREUM's 77800 validators. This leads the first long term implication, "centralized decentralization". BSC with its fewer validators and semi-autonomy implies that it's not fully decentralized, making it prone to system attacks, hacks, and even regulatory compliance. This is a trade off the user has to make, cheaper price or decentralization.

Another short term implication is a reduction in innovation on the BSC network and the block-chain industry in general. A cursory look into the BSC network and it's not hard to see that most projects on this network are copies of the projects on the Ethereum network, not forgetting that Binance predominantly recruits developers that already play active roles in the Ethereum developer community, the biggest community in block-chain. Since BSC runs on the EVM, on the long run, the BSC ecosystem inherits the main vulnerabilities such as oracle flaws, smart contract flaws, etc. from EVM, making it more susceptible to attacks. On the long run, adopting the BSC over the ETHEREUM ecosystem will breed more competitors that are willing to make more extreme versions of the trade off, compromising on censorship resistance and decentralization for cheaper transactions. Because of it few validators/nodes, adopting the BSC over the ETHEREUM implies on the long run difficulty in becoming a node operator and validator becomes complicated and resource consuming due to the high volume of transactions to be validated.

As an improvement, to mitigate the reduction in innovation, Binance Smart Chain needs to establish its own developer community independent of Ethereum. An increase in the number of validators is also needed as it improves the decentralization which is the very foundation on which block-chain was built on. Lastly, since BSC is dependent on the EVM, care must be taken to block every loophole to avoid security breach which will spell doom for Binance and by extension the Binance Smart Chain.