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Black-Scholes pricing model and Tepix of Iran

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Abstract. Many classic finance, such as the Black-Scholes option pricing model, has its origins equation:

$$\frac{1}{P}dP = \mu dt + \sigma dW.$$

In this article, we try to review this model on the Iran Stock Exchange index in 1399. This led to finding relation to model the future forecast of the Tepix of Iran.

Keywords: Financial markets, Black-Scholes pricing model, Tepix of Iran.

AMS Mathematics Subject Classification [2020]: 37C05, 37H99

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1. Introduction

Block-chain technology enables a large number of traders to conduct electronic transactions. In fact, a new set of currencies called cryptocurrencies, in recent years, has attracted the attention of many traders. The price of Bitcoin focused the spotlight of public attention on cryptocurrencies that evolved into a new asset class. Following the pattern of other nascent assets, speculators dominated trading and pushed prices toward a bubble. Directly without intermediaries, and in recent years has led to a new form of payment. Financial markets in the world today, whether forex or cryptocurrencies like Bitcoin or in general, all financial markets have very complex fluctuations. But with all these fluctuations that are practically a kind of chaotic property for such markets, by considering these markets as a category of dynamic systems in order to model and formulate such markets can be done.

Black and Scholes attempted to apply the formula to the markets, but incurred financial losses, due to a lack of risk management in their trades. In 1970, they decided to return to the academic environment. Scholes received the 1997 Nobel Memorial Prize in Economic Sciences for his work, the committee citing their discovery of the risk neutral dynamic revision as a breakthrough that separates the option from the risk of the underlying security. Many classic finance, such as the Black-Scholes option pricing model, has

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its origins equation:

$$\frac{1}{P}dP = \mu dt + \sigma dW,$$

for the change in the relative price P^1dP in terms of the expected return, μ, the standard deviation of the return, σ, and independent increments of Brownian motion, dW. The SDE can solved this equation analytically and the solution has the form:

$$P(t) = P(0)exp([\mu - \frac{\sigma^2}{2}]t + \sigma W(t)),$$

where $(W(t))_{t\geq 0}$ is a Brownian motion.

In fact, Black-Scholes is a pricing model used to determine the fair price or theoretical value of a buy or sell option based on six variables such as fluctuations, type of option, stock price, time, strike price and risk-free rate. Quantum is more speculation about stock market derivatives, and therefore proper pricing of options eliminates the possibility of any arbitrage. There are two important models for option pricing, the binomial model and the Black Scholes model. This model is used to determine the price of a European purchase option, which simply means that this option is only valid on the expiration date. For more information in this regard, we refer dear readers to references [1], [2], [3], [4], [5] and [6].

2. Main results

In this article, we intend to examine the effects of the Black-Scholes model on the total index of Iran Stock Exchange. Table (1) contains the monthly information of the total index of Iran Stock Exchange based on the closing number of the monthly candlestick. We get data through the Tse Clint software.

Table 1. Your table's caption

Month	Monthly Tepix of Iran	Returns
1	741960	
2	986759	0.329935576
3	1419453	0.438500181
4	1901147	0.339351849
5	1718783	-0.095923145
6	1611582	-0.062370293
7	1288330	-0.200580548
8	1367248	0.061256045
9	1447915	0.058999538
10	1183978	-0.182287634
11	1205832	0.018458113
12	1294521	0.073550047

Therefore, we have $\mu = 0.070808157$ and $\sigma = 299957.6543$.

Notice that

$$dP = \mu P dt + \sigma P dW.$$

So, in the interval $[a, b]$, we have

$$\int_a^b dP = \int_a^b \mu P dt + \int_a^b \sigma P dW.$$

Therefore, considering the numerical approximation $\int_a^b f(t) = f(a)(b-a)$, we have $P(b) = (1+\mu)P(a) + \sigma P(a)(W(b) - W(a))$. We know that $W(t)$ is a Brownian motion. Therefore,

$$W(b) - W(a) \sim N(0, b-a).$$

Thus,

$$P(b) = (1+\mu)P(a) + \sigma P(a) N(0, b-a)).$$

Hence, if we use Table 1, we can get the following relation beyond the total index of Iran Stock Exchange.

$$P(1) = (1+\mu)P(0) + \sigma P(a)N(0,1)) = P(0)((1.070808157) + 299957.6543N(0,1)).$$

When $P(1)$ is the Tepix of Iran for one year later. This relation can be used as a approximation method using numerical methods and can practically be considered as one of the available approximate methods to predict the future trend of the Iranian stock market.

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