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Forecasting Share Prices Accurately For One Month Using Geometric Brownian Motion

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ABSTRACT

Investment funds are growing in Malaysia since people are more knowledgeable about investments and aware of investment opportunities in order to secure good savings for the future. These investments include unit trusts, gold, fixed deposits, stock prices and property investments. It is essential for individuals or organisations to know the value of future share prices of their investment portfolio in order to predict the profit or loss in the future. The purpose of study is to identify the best duration of historical data and forecast days in order to accurately forecast share prices. The study uses Geometric Brownian Motion model in forecasting share prices of companies in Bursa Malaysia. This study focused on 40 listed companies in Bursa Malaysia from the top gainers list. It was found that 65 historical days could forecast the share prices for 21 days accurately.

Keywords: Forecast, investment, financial mathematics, Geometric Brownian Motion, share prices

INTRODUCTION

Bursa Malaysia acts as a stock exchange in Malaysia and operates a fully integrated exchange services that offers products like equities, derivatives, and exchange-related sevices, for example clearing, trading, depository and settlement. According to Bursa Malaysia (Bursa Malaysia, 2016), there are two markets in Bursa Malaysia that are Main Market and Ace Market, which currently have 808 companies and 113 companies, respectively as of 14th December 2016.

Siti Nazifah and Maheran (2012a) stated that Bursa Malaysia was a place for people who wanted to invest in stocks. Bourses are

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places where stocks, securities, options, and commodities are bought and sold under certain rules and regulations with organized guidelines. Some of the stocks that are traded in the Bursa Malaysia include share prices, warrants, indices, bonds and swaps. This study only focuses on the share prices.

Mohd Alias (2007) stated there were quantitative forecasting technique and qualitative forecasting technique. The quantitative forecasting technique is used based on the past available data or known as historical data. The qualitative technique depends on the accumulated experience of experts to make the possible outcome of future events (Lee, Song, & Mjelde, 2008; Omar & Halim, 2016).

Another method that is widely used to forecast share price is the Geometric Brownian Motion (GBM). Ladde and Wu (2009); Siti Nazifah and Maheran (2012a) and Wilmott (2007), used GBM to forecast share prices. Wilmott (2007) used the GBM in forecasting stock prices in the Buenos Aires Stock Exchange but did not discuss the accuracy of the model. Besides, Ladde and Wu (2009), proposed a modified version of the GBM model using different data partitioning, with and without jumps. At the end of the study, they found that data partitioning gave a good fit and the model with jumps gave a minimum mean square error (MSE) and minimum variance which implied that the best simulation produced better results than without jumps. They also stated that the nature of the GBM model did not reflect the true stock price movement except in very short terms. Meanwhile, Siti Nazifah and Maheran (2012a), used simple volatility in applying the GBM model in their study. They found the result to be highly accurate for a maximum of a two week investment period of time. In short, they had shown that the GBM model was highly accurate in forecasting the share price for short term investment.

LITERATURE REVIEW

The GBM model is a sort of continuous time model which is widely used to explain the stock price time series (Straja, 1997; Shakila, Noryati, & Maheran, 2017).

According to Wilmott (2007) and Bell (2016), the Brownian motion at time t denoted as $X(t)$ can be defined as the limiting process for this random walk as the time step goes to zero. The important properties of Brownian motion are as follows (Wilmott, 2007):

(i) Finiteness - any increment of scaling over time step in either a limit without any motion at all or a random walk leads to infinity in a finite time.

(ii) Continuity - The paths are continuous.

(iii) Markov property - The conditional distribution of $X(t)$ given information up until time $X(\tau)$ depends only on $X(\tau)$.

(iv) Martingale property - The information until time $\tau < t$, the conditional expectation of $X(t)$ is $X(\tau)$.

(v) Quadratic variation - Divide up the time 0 to t in a partition with n+1 partition points, $t_i = \frac{it}{n}$ then $\sum_{j=1}^{n} (X(t_j) - X(t_{j-1}))^2 \to t$

(vi) Normality - Normally distributed with mean zero and variance $t_i - t_{i-1}$.

Rathnayaka, Jianguo and Seneviratna (2014) prefered GBM as a model for share prices because the share prices fluctuated and showed linear and non-linear behaviours. GBM model deals with randomness, drift, volatility and returns (Siti Nazifah, 2014).

The returns at time i, where S_i is the price at the time i as a random variable drawn from a normal distribution is as follows (Siti Nazifah & Maheran, 2012a; Wilmott, 2007):

$$R_i = \frac{S_{i+1} - S_i}{S_i} \quad , \; i = 1, 2, 3, ..., n \tag{1}$$

The equation (1) can be defined as a growth of stock value at the time i. If the rate of return is negative, it shows that the closing price on the day t_{i+1} is lower than the closing price on day t_i. Conversely, a positive value indicates profit in the investment. The drift rate is the average rate of return at which the price of asset rises in a period of time (Bell, 2016; Wilmott, 2007). The formula of the drift rate μ is shown in equation (2).

$$\mu = \frac{1}{m\delta t} \sum_{i=1}^{m} R_i \tag{2}$$

where m is the number of daily returns while δt represents the timestep which is equal to the approximate number of 1/252. The value 252 is the approximate number of days trading in a year.

Based on Wilmott (2007), Abdul Rahim, Zahari and Shariff (2017), and Blyth (2014), the volatility σ refers to the fluctuation or movement of the share prices, where the prices of security move up or move down. There are four types of volatility mentioned by Wilmott (2007), but this study will use simple volatility because it is the easiest way to represent deviation from the mean value, as follows:

$$\sigma = \sqrt{\frac{1}{(m-1)\delta t} \sum_{i=1}^{m} (R_i - \overline{R})^2} \tag{3}$$

The quantity $\overline{R}$ is the mean of the returns. Siti Nazifah and Maheran (2012b) study the best volatility measurement in stock price forecasting in GBM. The result indicates higher lows-close volatility, which is closer to the actual prices proven by the MAPE value.

In this study, $S(t)$ is the stock price at time t, $X(t)$ is the random value at time t, the volatility is σ and the drift is μ will form the stochastic model as follows (Wilmott, 2007):

$$dS = \mu S dt + \sigma S dX \text{ with } F(S) = \ln S \quad (4)$$

By using Ito's Lemma (Wilmott, 2007):

$$dF = \frac{dF}{dS} dS + \frac{1}{2} \frac{d^2F}{dS^2} dS^2$$

$$dF = \frac{dF}{dS} [\mu S dt + \sigma S dX] + \frac{1}{2} \frac{d^2F}{dS^2} [\mu S dt + \sigma S dX]^2 \quad (5)$$

and

$$dX.dX = dt$$

$$dt.dt = dX.dt = dt.dX = 0$$

Simplify (5) to get

$$\frac{dF}{dS} = \frac{1}{S}, \frac{d^2F}{dS^2} = -\frac{1}{S^2} \quad (6)$$

Then by substituting $\frac{dF}{dS} = \frac{1}{S}, \frac{d^2F}{dS^2} = -\frac{1}{S^2}$ which is from (4) into (6), the following is obtained:

$$dF = \frac{1}{S} [\mu S dt + \sigma S dX] + \frac{1}{2} \sigma^2 S^2 (-\frac{1}{S^2}) dt$$

$$dF = \frac{1}{S} [\mu S dt + \sigma S dX] - \frac{1}{2} \sigma^2 dt$$

$$dF = \frac{1}{S} \mu S dt + \frac{1}{S} \sigma S dX - \frac{1}{2} \sigma^2 dt$$

$$dF = \mu dt + \sigma dX - \frac{1}{2} \sigma^2 dt$$

$$dF = \left(\mu - \frac{1}{2} \sigma^2 \right) dt + \sigma dX.$$

Integrate both sides,

$$\int dF = \int \left(\mu - \frac{1}{2}\sigma^2 \right) dt + \int \sigma dX$$

$$\ln S = \left(\mu - \frac{1}{2}\sigma^2 \right) t + \sigma (X(t) - X(0)) + c$$

$$e^{\ln S} = e^{\left(\mu - \frac{1}{2}\sigma^2 \right) t + \sigma (x(t) - x(0)) + c}$$

$$S = e^{\left(\mu - \frac{1}{2}\sigma^2 \right) t + \sigma (x(t) - x(0))} . e^{c}$$

Here $e^c = S(0)$ and with that, the equation of forecasting share prices is produced,

$$S(t) = S(0) e^{(\mu - \frac{1}{2}\sigma^2) t + \sigma (X(t) - X(0))} \quad (7)$$

where $S(t)$ is the price of stock at time *t*. In this study, this equation was used to forecast share prices of companies in Bursa Malaysia.

To know the accuracy of the forecast value, an accuracy test is essential. MAPE is widely used in order to evaluate the performance of the algorithm. Basically, MAPE is the average absolute error between the actual values and predicted values in percentage. Some of the researchers who used MAPE were Aslina and Maheran (2011), Gupta and Dhingra (2012), Hadavandi et al. (2010), Siti Nazifah and Maheran (2012a, 2012b), and Sonono and Mashele (2015).

In this study, the accuracy of the actual and forecast values can be measured by using MAPE. The formula for the MAPE, *E* is shown in equation (2.12) (Reid, 2013; Siti Nazifah & Maheran, 2012a),

$$E = \frac{\sum \left| \frac{Y_t - F_t}{Y_t} \right|}{n} \times 100\% \quad (8)$$

which involves time period *t*, the number of period forecast *n*, actual value in the time period at time *t*, Y_t and forecast value in time period *t*, F_t. In order to identify the accuracy of the model, Lawrance, Kimberg and Lawrence (2009) proposed a scale of judgement based on MAPE as in Table 1. The smaller the MAPE value, the more accurate is the forecasting model.

Table 1
A forecast accuracy scale of judgement

MAPE	Forecast Accuracy
Less than 10%	Highly accurate
11% to 20%	Good forecast
21% to 50%	Reasonable forecast
51% and above	Inaccurate forecast

Source: (Lawrence, Kimberg, & Lawrence, 2009)

METHODS

Data Collection

In Bursa Malaysia, the share prices are traded daily in two sessions on Monday to Friday. The first session is from 8.30 am until 12.30 pm while the second session is at 2.00 pm until 5.00 pm. The share prices change every time. To forecast the share price in one month's time, the data of the closing price were taken from the Bursa Malaysia list.

There are many companies that are listed on Bursa Malaysia. Based on Kanniainen and Keuschnigg (2003), a minimum number of companies to set up a portfolio was 5. Thus, the share prices of 5 companies were selected for each sector which meant there were 40 companies in eight sectors of Bursa Malaysia. The chosen companies were picked based on the Top Gainers list on the Bursa Malaysia website as of 13th November 2016.

In this study, the data were taken from 1st July 2015 until 30th September 2016. For forecasting the share prices, the historical data from 1st July 2015 until 30th June 2016 for each selected 40 companies were considered as input data. Data from 1st July 2016 until 30th September 2016 were used to make a comparison with the forecast value. The historical data were important as they determined the accuracy of the value and it was useful to see the pattern of future stock prices. As for the missing values, the average of the share price of the day before and the day after was calculated.

From the historical data, the study analysed its characteristics and performance of share prices in every company. The characters of the historical data were critical in determining the forecast value and also the pattern for future share prices.

The data played an important role in forecasting as accurately as possible when applying the GBM model. Thus, the data had to be sufficient and relevant in order to fulfill the objectives. According to the Wilmott (2007), the share price followed a random walk since the data changed every day and in fact every second.

Forecasting and Calculating Error

First and foremost, the value of return was calculated where the equation of rate of return (1) R_i for day 1 was used and next, the average of return distribution $\overline{R}$ was obtained. The

value m = 65 was the number of returns in the sample. Nur Aimi (2017) had tested with different number of return m=262, 130, 88 and 65. It is found that the error is small when m=65. The value of R_i and $\delta t = \frac{1}{252}$ for United Plantation Berhad is shown in Table 2 below.

Table 2
Return and average return value of for United Plantation Berhad with 65 input data

Number of Data	Date	Share Price, S_i	Return, R_i	$(R_i - \overline{R})^2$
	31/03/2016	26.50	-0.00528	0.0000295194852406
1	01/04/2016	26.36	-0.00228	0.0000058871300060
2	04/04/2016	26.30	0	0.0000000225494802
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
64	29/06/2016	26.62	0.00	0.0000000225494802
65	30/06/2016	26.62	0.00	0.0000000225494802
	Total Return		0.00976	-
	Average Return		0.00015	-
	Total $(R_i - \overline{R})^2$		-	0.010477362

The value of $\delta t = \frac{1}{252}$ that 252 was the total trading days of share prices in a year was set (Wilmott, 2007). The expected return or growth rate of an asset is called drift rate μ and was obtained by using equation (2). After finding the drift, calculate the volatility, σ using the equation (3).

The values of drift and volatility were obtained for all the 40 companies and are shown in Table 5. In order to find the forecast value of share prices, the equation (7) was used.

The accuracy of the forecast value was measured by using MAPE. Before getting the value of MAPE, the absolute percentage error, ε was calculated as shown below:

$$\varepsilon_1 = \left| \frac{Actual - Forecast}{Actual} \right| \times 100\%$$

The summation of 21 absolute percentage error of 21 forecast days was then divided by 21 to get the value of MAPE, *E* as in equation (8). The study crried out the same forecast calculation for all 40 companies.

The Microsoft Excel

The calculation in the study was done by using the Microsoft Excel. Figure 1 shows an example of the spreadsheet for the United Plantation Berhad company. The forecast value changed every time the enter key was used or the file was saved due to the presence of the generated random variable in the forecast formula by Microsoft Excel.

	G	H	I	J	K	L	M	N	O	P
1				t	No of Data	Date	Actual	Forecast	Absolute Percentage Error	MAPE
2	m	65				30/06/2016	26.62			
3	m-1	64		0.003968254	1	01/07/2016	26.62	26.95482173	1.257782615	5.817564111
4	Rbar	0.000150165		0.007936508	2	04/07/2016	26.62	28.69971381	7.812598835	
5	dt	0.003968254		0.011904762	3	05/07/2016	26.62	28.76311195	8.050758649	
6	Drift,μ	0.037841541		0.015873016	4	06/07/2016	26.62	27.84411906	4.598493858	
7	Volatility,σ	0.203112314		0.01984127	5	07/07/2016	26.62	25.60801372	3.801601355	
8				0.023809524	6	08/07/2016	27	25.49110179	5.588511894	
9	x(0)	0.409354393		0.027777778	7	11/07/2016	27	27.62721208	2.323007715	
10				0.031746032	8	12/07/2016	26.8	26.96402042	0.612016478	
11				0.035714286	9	13/07/2016	26.8	25.14158973	6.188098019	
12				0.03968254	10	14/07/2016	26.54	28.72445591	8.230805994	
13				0.043650794	11	15/07/2016	26.44	29.7637083	12.57075757	
14				0.047619048	12	18/07/2016	26.98	24.74141828	8.297189492	
15				0.051587302	13	19/07/2016	26.98	29.86550533	10.69497897	
16				0.055555556	14	20/07/2016	27.1	27.68007847	2.140510973	
17				0.05952381	15	21/07/2016	27.1	25.77675963	4.882805803	
18				0.063492063	16	22/07/2016	27.1	25.83793572	4.657063755	
19				0.067460317	17	25/07/2016	26.78	28.23718139	5.441304658	
20				0.071428571	18	26/07/2016	26.78	29.52669486	10.25651555	
21				0.075396825	19	27/07/2016	27.06	27.450646	1.443628966	
22				0.079365079	20	28/07/2016	27.06	28.36727699	4.831031003	
23				0.083333333	21	29/07/2016	26.54	28.79308256	8.489384186	
24									122.1688463	

Figure 1. Calculation of Forecast Share Price for United Plantation Berhad by using Microsoft Excel

Figure 1 shows how to evaluate the forecast share price by using an Excel template. Cell N3 is formulated to forecast the value of the share price as follows:

M2*EXP((H6-(1/2)*(H7^2))*J3 + (H7*(RAND()-H9)))

where the value of M2 was 26.62 meanwhile the forecast value at cell N3 was 26.9548. Random number was generated by Microsoft Excel using *RAND()* command.

The Accuracy for Duration of Data and Forecast Days

The aim at this stage was to find the best duration of data used in the GBM model for better forecasting. The difference in length of duration of input data and a number of forecast days used was essential in getting the smallest possible value of MAPE. The smaller the

MAPE, the more accurate it was to the actual price. Table 3 shows the starting and ending dates of daily data used for the duration for input data.

Table 3
The number of data for input duration and dates of daily data

Starting Date	Ending Date	Duration	Number of Data
1st July 2015	30th June 2016	12 months	262
1st January 2016	30th June 2016	6 months	130
1st March 2016	30th June 2016	4 months	88
1st April 2016	30th June 2016	3 months	65

The study was conducted on these durations of input data because the drift and volatility value were different at different duration. This certainly affected the forecast value.

The values of drift and volatility for a different number of historical data of 262 days, 130 days, 88 days and 65 days were calculated and presented in Table 5. With these different value of drift and volatility, the share price was forecast for all the 40 companies and for all the duration of historical data.

The MAPE was obtained in studying the error. The values MAPE are presented in Table 6 for the 4 different number of historical data which were 262 days, 130 days, 88 days, and 65 days for all the 40 companies. The three different numbers of forecast days, which were 66 days, 44 days, and 21 days. 66, 44 and 21 days represented 3 months, 2 months, and 1 month of forecast values respectively.

Table 4 shows the starting and ending dates of forecast duration. It also shows the duration and the number of forecast days.

Table 4
The number of data for forecast duration and dates of daily data

Starting Date	Ending Date	Duration	Number of Data
1st July 2016	30th September 2016	3 months	66
1st July 2016	31st August 2016	2 months	44
1st July 2016	29th July 2016	1 months	21

Knowing the forecast price of the shares for more than 1 month can definitely help the financial advisors and decision makers to plan and to invest better. The study obtained the duration of days that had the highly accurate forecast values when using equation (7). The results of this experiment can be found in Table 7.

RESULT AND DISCUSSION

This section discusses the findings of the study. This study experimented the duration of time that could give the smallest possible value of MAPE. The different durations of time were 262, 130, 88, and 65 days as in Table 4 for input data, while the different intervals of time for forecast data were 66, 44, and 21 days as presented in Table 5. The difference in the amount of historical data resulted in the difference in the value of drift and volatility. Hence, Table 5 below shows the value of the drift, μ and volatility, σ according to the respective number of historical data.

Table 5
The values of drift and volatility for different historical days

Sector	Companies Name	Drift and volatility for different no. of historical data							
		262		130		88		65	
		μ	σ	μ	σ	μ	σ	μ	σ
Plantation	United Plantation Berhad	0.01	0.19	0.11	0.17	0.08	0.18	0.4	0.20
	Kuala Lumpur Kepong Berhad	0.08	0.16	0.04	0.13	-0.07	0.10	-0.2	0.10
	Chin Teck Plantation Berhad	-0.13	0.18	-0.11	0.17	-0.09	0.18	-0.23	0.20
	Kim Loong Resources Berhad	0.18	0.23	0.18	0.23	0.21	0.24	-0.33	0.20
	Kwantas Corp. Berhad	-0.25	0.21	-0.25	0.21	-0.25	0.21	-0.37	0.20
Consumer Product	Nestle (Malaysia) Berhad	0.06	0.10	0.08	0.08	0.09	0.10	0.08	0.06
	Latitud Tree Holdings Berhad	-0.06	0.31	-0.60	0.31	-0.36	0.30	-0.04	0.25
	Kawan Food Berhad	0.43	0.32	0.07	0.29	0.11	0.26	0.31	0.26
	Lii Hen Industries Berhad	0.51	0.67	0.36	0.40	0.69	0.42	1.65	0.41
	Poh Huat Resources Holdings Berhad	-0.06	0.61	-0.50	0.32	-0.15	0.30	0.27	0.28
Industrial Product	Top Glove Corporation Berhad	-0.10	0.62	-1.67	0.77	-0.50	0.29	-0.28	0.24
	Kossan Rubber Industries Berhad	0.09	0.32	-0.54	0.33	0.18	0.24	0.55	0.19
	TA Ann Holdings Berhad	-0.10	0.34	-0.72	0.43	-1.25	0.46	-1.49	0.47
	Lysaght Galvanized Steel Berhad	-0.11	0.26	-0.15	0.20	-0.07	0.18	-0.05	0.20
	Focus Lumber Berhad	0.40	0.45	-0.75	0.45	-0.74	0.42	-0.32	0.43
Trading and Services	Pos Malaysia Berhad	-0.33	0.45	0.16	0.55	1.03	0.61	0.23	0.35
	Luxchem Corporation Berhad	0.41	0.35	-0.21	0.28	-0.65	0.22	-0.63	0.22
	Ipmuda Berhad	-0.19	0.46	-0.16	0.27	-0.14	0.12	-0.15	0.10
	Harrisons Holdings (Malaysia) Berhad	-0.17	0.20	0.02	0.16	-0.02	0.16	-0.01	0.16
	Petronas Dagangan Berhad	0.14	0.16	-0.11	0.16	-0.18	0.10	-0.11	0.10
Properties	IGB Corporation Berhad	-0.14	0.16	0.14	0.17	0.08	0.18	-0.06	0.18
	Selangor Dredging Berhad	0.01	0.30	0.03	0.25	0.05	0.19	0.02	0.22
	Crescendo Corporation Berhad	-0.43	0.25	-0.37	0.23	-0.43	0.24	-0.60	0.18
	Mah Sing Group Berhad	-0.06	0.25	0.05	0.23	0.31	0.21	0.10	0.21
	Amcorp Properties Berhad	0.06	0.39	-0.07	0.19	-0.06	0.15	-0.17	0.15

Table 5 *(continue)*

Sector	Companies Name	Drift and volatility for different no. of historical data							
		262		130		88		65	
		μ	σ	μ	σ	μ	σ	μ	σ
Construction	WCT Holdings Berhad	0.13	0.38	-0.09	0.29	-0.12	0.30	-0.50	0.32
	Kimlun Corporation Berhad	0.35	0.32	0.58	0.32	0.52	0.28	0.05	0.25
	Pesona Metro Holdings Berhad	-0.43	0.36	-0.23	0.24	-0.10	0.20	-0.30	0.19
	Zelan Berhad	-0.66	0.41	-0.88	0.38	-0.95	0.39	-1.31	0.41
	Ahmad Zaki Resources Berhad	0.03	0.36	0.09	0.30	0.36	0.33	-0.27	0.29
Finance	Aeon Credit Services M Berhad	-0.03	0.19	0.18	0.18	0.25	0.18	0.05	0.14
	Affin Holdings Berhad	-0.22	0.20	-0.18	0.16	-0.03	0.14	-0.36	0.13
	ELK-Desa Resources Berhad	-0.09	0.22	-0.06	0.12	-0.09	0.13	-0.12	0.11
	LPI Capital Berhad	0.13	0.11	-0.02	0.10	0.19	0.08	0.11	0.09
	Syarikat Takaful Malaysia Berhad	0.05	0.24	0.10	0.22	0.20	0.24	-0.03	0.20
Technology	Globetronics Technology Berhad	-0.49	0.38	-1.18	0.47	-1.35	0.51	-1.74	0.57
	JCY International Berhad	-0.10	0.36	-0.64	0.32	-0.36	0.28	-0.70	0.24
	Grand-FLO Berhad	-0.11	0.32	-0.11	0.30	-0.01	0.33	0.06	0.34
	Notion VTEC Berhad	0.07	0.42	-0.18	0.29	-0.09	0.23	-0.17	0.23
	Key Asic Berhad	1.63	1.58	0.44	0.88	-0.21	0.73	-0.99	0.73

Table 5 indicates the value of drift and volatility for different duration of input data which are 262 days, 130 days, 88 days and 65 days. Before setting which drift and volatility that could be used for the next step, the value of MAPE for different forecast days were taken into consideration. The different interval of forecast share price was calculated with the different interval of input data to get the MAPE results as in Table 6.

Table 6 presents the value of the MAPE of forecast prices when compared to the actual prices when using the GBM model for 40 companies. This means that the randomness of share prices are being considered in the equation used. Based on the average value obtained, the data with 65 historical days and 21 forecast days were the best data to be taken since the average MAPE was the lowest (8.74%) compared to the rest. Table 7 presents the actual and forecast values on the 21st day, which was on 29th July 2016 with MAPE values for the whole one month of forecasting.

In Table 7, the value of forecast and actual price for all the 40 companies did not show much difference. For example, the actual value of share price of the United Plantation Berhad company on 29th July 2016 was RM26.54, the forecast value was RM28.7931 which had a difference of RM2.2531. With MAPE, the value was 5.82% of the accuracy of GBM

Table 6
Values of MAPE for all companies involved with respective number of historical data and number of forecast day

Sector	Companies Name	MAPE Value of different number of Historical Data											
		262			130			88			65		
		Number of Forecast Days											
		66	44	21	66	44	21	66	44	21	66	44	21
Plantation	United Plantation Berhad	5.65	6.79	7.91	6.18	5.33	4.40	5.43	9.83	5.86	5.41	9.54	5.82
	Kuala Lumpur Kepong Berhad	4.29	4.23	6.69	4.38	3.41	4.70	7.02	2.97	3.54	6.50	3.47	3.29
	Chin Teck Plantation Berhad	11.12	6.98	4.27	9.04	7.27	7.46	7.39	5.68	7.48	10.07	4.68	6.01
	Kim Loong Resources Berhad	5.82	4.96	5.83	6.07	7.21	5.37	5.91	6.46	6.91	8.16	4.15	8.43
	Kwantas Corp. Berhad	7.25	6.35	8.55	6.37	6.08	5.34	7.41	7.20	6.83	5.92	6.90	10.95
Consumer Product	Nestle (Malaysia) Berhad	6.24	2.67	5.37	3.02	4.48	2.39	2.56	4.23	4.62	4.04	3.31	2.32
	Latitud Tree Holdings Berhad	11.07	8.61	7.88	8.06	8.37	13.58	7.68	9.25	16.01	15.06	9.81	6.67
	Kawan Food Berhad	8.36	9.49	15.24	10.45	8.75	14.58	11.63	6.81	6.44	13.77	10.79	7.51
	Lii Hen Industries Berhad	30.16	43.64	22.44	9.93	12.14	10.64	27.24	9.44	12.07	21.55	11.41	9.82
	Poh Huat Resources Holdings Berhad	17.52	16.16	27.75	11.18	10.49	8.27	8.63	9.36	10.51	14.07	13.56	6.54
Industrial Product	Top Glove Corporation Berhad	19.70	36.29	15.74	24.63	33.62	29.93	13.01	7.91	9.51	8.45	5.96	16.92
	Kossan Rubber Industries Berhad	11.54	13.36	9.89	9.62	14.96	12.31	6.61	6.58	8.92	8.75	9.69	7.99
	TA Ann Holdings Berhad	10.21	11.61	9.40	27.95	24.28	17.14	33.15	17.55	15.04	15.96	14.23	12.60
	Lysaght Galvanized Steel Berhad	10.46	10.75	10.31	6.69	10.25	6.51	5.06	5.59	7.58	5.38	5.24	6.02
	Focus Lumber Berhad	16.92	14.20	13.53	12.22	23.75	19.85	14.45	15.84	15.13	17.17	16.72	14.62
Trading and Services	Pos Malaysia Berhad	16.21	12.65	20.51	16.64	26.56	14.95	25.53	18.08	14.83	13.64	8.77	9.50
	Luxchem Corporation Berhad	18.65	11.82	15.27	12.77	15.06	8.06	20.13	20.29	8.04	13.47	20.31	11.95
	Ipmuda Berhad	17.31	27.28	19.32	13.54	9.13	11.83	3.24	5.80	4.36	3.95	5.86	2.64
	Harrisons Holdings (Malaysia) Berhad	8.08	14.44	5.02	6.23	4.57	4.12	5.52	4.98	4.34	9.99	4.98	5.29
	Petronas Dagangan Berhad	5.77	4.82	6.32	5.84	5.58	3.64	2.88	3.78	3.02	3.68	2.65	2.23

Table 6 *(continue)*

Sector	Companies Name	MAPE Value of different number of Historical Data											
		262			130			88			65		
		Number of Forecast Days											
		66	44	21	66	44	21	66	44	21	66	44	21
Properties	IGB Corporation Berhad	4.29	12.48	6.05	4.32	7.81	8.16	8.04	4.89	4.73	11.53	7.58	5.15
	Selangor Dredging Berhad	7.59	7.26	11.04	6.59	9.19	5.33	7.41	7.11	5.95	5.52	15.00	5.43
	Crescendo Corporation Berhad	15.86	11.01	10.36	6.72	7.43	6.36	7.20	7.12	7.73	11.89	5.48	6.38
	Mah Sing Group Berhad	14.61	12.71	7.60	11.19	12.19	8.25	5.87	6.79	7.53	7.59	6.44	7.22
	Amcorp Properties Berhad	13.59	12.54	10.75	9.34	8.31	5.15	7.12	8.35	4.93	6.65	8.07	6.10
Construction	WCT Holdings Berhad	13.17	9.62	6.76	8.72	7.88	6.31	10.90	10.72	6.74	18.70	13.10	9.38
	Kimlun Corporation Berhad	10.38	8.73	8.91	13.28	10.78	10.93	11.40	8.25	12.12	9.80	8.33	10.96
	Pesona Metro Holdings Berhad	12.59	17.17	9.44	11.78	9.98	8.03	12.87	15.69	7.86	12.06	12.88	6.04
	Zelan Berhad	27.76	16.53	9.69	23.09	17.10	25.63	37.41	17.58	17.51	36.29	29.11	24.06
	Ahmad Zaki Resources Berhad	14.79	13.02	14.47	9.54	12.62	14.79	11.36	10.20	10.21	12.56	7.87	17.16
Finance	Aeon Credit Services M Berhad	11.04	12.20	5.29	9.24	8.07	5.50	4.78	4.29	10.82	8.47	10.66	7.87
	Affin Holdings Berhad	6.02	6.02	5.35	5.04	7.04	4.47	5.35	3.67	8.22	6.92	3.98	6.67
	ELK-Desa Resources Berhad	6.96	7.74	9.02	7.12	3.06	3.12	5.40	4.55	3.24	6.66	4.53	3.53
	LPI Capital Berhad	3.13	3.73	2.76	4.05	2.87	2.65	4.42	2.15	2.79	2.87	3.08	2.69
	Syarikat Takaful Malaysia Berhad	12.57	13.65	9.61	7.62	4.62	7.04	8.46	6.78	7.60	11.37	6.44	6.07
Technology	Globetronics Technology Berhad	12.63	17.84	7.15	20.01	15.27	17.01	16.71	13.06	22.32	30.90	10.10	23.14
	JCY International Berhad	17.82	10.50	11.17	8.11	14.40	9.23	17.83	9.64	6.35	7.23	5.20	6.05
	Grand-FLO Berhad	29.90	16.03	9.81	14.66	10.44	7.47	30.79	19.80	7.27	16.78	26.15	12.58
	Notion VTEC Berhad	17.92	19.81	15.13	8.37	11.16	13.48	9.61	9.22	15.12	10.32	6.85	7.42
	Key Asic Berhad	42.80	34.30	78.77	34.17	25.94	52.56	22.31	37.94	53.94	25.96	16.08	18.43
	Average MAPE	13.44	13.25	12.16	10.84	11.19	10.66	11.64	9.64	9.85	11.63	9.47	8.74

Table 7
The values of actual and forecast for day 21st with MAPE value for 1 month

Sector	Companies Name	Actual (RM)	Forecast (RM)	MAPE (%)
Plantation	United Plantation Berhad	26.54	28.7931	5.82
	Kuala Lumpur Kepong Berhad	23.12	22.7404	3.29
	Chin Teck Plantation Berhad	7.41	6.3537	6.01
	Kim Loong Resources Berhad	3.3	3.3312	8.43
	Kwantas Corp. Berhad	1.21	1.1937	10.95
Consumer Product	Nestle (Malaysia) Berhad	79.00	78.8727	2.32
	Latitud Tree Holdings Berhad	5.25	5.5730	6.67
	Kawan Food Berhad	3.62	3.7274	7.51
	Lii Hen Industries Berhad	3.05	3.6817	9.82
	Poh Huat Resources Holdings Berhad	1.49	1.6842	6.54
Industrial Product	Top Glove Corporation Berhad	4.29	5.3456	16.92
	Kossan Rubber Industries Berhad	6.66	6.9338	7.99
	TA Ann Holdings Berhad	3.37	2.4256	12.60
	Lysaght Galvanized Steel Berhad	3.43	3.1194	6.02
	Focus Lumber Berhad	1.7	1.6907	14.62
Trading and Services	Pos Malaysia Berhad	2.85	2.9343	9.50
	Luxchem Corporation Berhad	1.52	1.1872	11.95
	Ipmuda Berhad	0.90	0.9302	2.64
	Harrisons Holdings (Malaysia) Berhad	2.95	2.9563	5.29
	Petronas Dagangan Berhad	23.26	23.6916	2.23
Properties	IGB Corporation Berhad	2.55	2.6684	5.15
	Selangor Dredging Berhad	0.895	0.8186	5.43
	Crescendo Corporation Berhad	1.57	1.5147	6.38
	Mah Sing Group Berhad	1.62	1.7002	7.22
	Amcorp Properties Berhad	0.91	0.8240	6.10
Construction	WCT Holdings Berhad	1.56	1.80	9.38
	Kimlun Corporation Berhad	1.78	1.703	10.96
	Pesona Metro Holdings Berhad	0.37	0.398	6.04
	Zelan Berhad	0.165	0.093	24.06
	Ahmad Zaki Resources Berhad	0.640	0.761	17.16
Finance	Aeon Credit Services M Berhad	14.20	12.3241	7.87
	Affin Holdings Berhad	2.13	1.91	6.67
	ELK-Desa Resources Berhad	1.21	1.1838	3.53
	LPI Capital Berhad	16.06	16.3010	2.69
	Syarikat Takaful Malaysia Berhad	4.01	3.5672	6.07
Technology	Globetronics Technology Berhad	2.91	3.2668	23.14
	JCY International Berhad	0.595	0.5533	6.05
	Grand-FLO Berhad	0.22	0.2404	12.58
	Notion VTEC Berhad	0.415	0.3848	7.42
	Key Asic Berhad	0.125	0.0989	18.43
Average MAPE				8.74

by using 65 historical days and 21 days of the forecast was highly accurate. There were some companies that produced higher MAPE such as Top Glove Corporation Berhad and Globetronics Technology Berhad with MAPE of 16.92% and 23.14% respectively. However, according to the scale of judgement of forecast accuracy, both companies were still considered as good forecast. Based on Table 7, the lowest MAPE value was from Nestle (M) Berhad with 2.32% was highly accurate. This meant that the forecast value was 2.32% different from the actual value. Meanwhile, the highest MAPE value went to Zelan Berhad with 24.06% which could be considered as a reasonable forecast. Most of forecast values were highly accurate. The random variable that are being considered in equation is able to give accurate forecast share prices.

CONCLUSION

To forecast share prices, the measurement of accuracy of the forecast share price is important. An experiment was done to find the best time interval of historical data and duration of forecast days in order to get the lowest MAPE which meant the high accuracy of the forecast value. The results of this experiment showed that the duration of 65 days of historical data could forecast the share prices for 21 days or one month accurately. With the average MAPE for all companies was 8.74%, these forecast value were highly accurate. With the high accuracy of forecast share prices, the financial institutions, organizations or individual investors will be able to make better decisions.

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