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Error diagnostic for weighted moving average to forecast Sharia-compliant securities in Malaysian Stock Exchange

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Article Information

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Abstract

This paper forecast the share price for Sharia-compliant companies that issues Initial Public Offerings (IPO) in year 2012. This paper using forecasting methods which are simple moving average and weighted moving average. Then, these share prices are evaluated using three types of error, which are mean absolute deviation (MAD), mean squared error (MSE) and mean absolute percentage error (MAPE). The results show weighted moving average is more accurate than simple moving average. This result is to help investors to determine and select share price with higher return using an accurate method.

INTRODUCTION

Islamic capital market is one of the instruments in Islamic investment. Islamic capital market is defined as the activities concerned with the public offering and trading of securities with is in line with sharia law. Islamic capital market also defined as the market for a variety of long-term Islamic financial instruments that can be traded, either in the form of *sukuk* (Islamic bond) or Islamic equity capital (Astuty, 2015). Islamic capital market must signify with sharia law where the capital must be free from any prohibited element such as usury (*riba*), gambling (*maisir*), and uncertainties (*gharar*) (Abdul Rahim & Yong, 2010).

Initial Public Offerings (IPO) for sharia-compliant companies is part of Islamic equity capital. IPO for sharia-compliant companies is act as an alternative source for Islamic companies to raise a capital for expanse a business. IPO for sharia-compliant companies was issued by companies to the public investors. This activities was involved several legal institutional such as Ministry of International Trade and Industry (MITI), underwriter institution and Malaysian Stock Exchange.

A large number of studies have examined the performance of share price of IPO (Boulton, et al., 2010). This interest may be related to the importance of IPO market for economic growth and employment, but often the focus is on the tremendous profit opportunities that IPO frequently offer to investors (Bessler & Thies, 2007). In the same, the studies that focus on the performance of long-term IPO in Malaysia found evidence that long-term performances of IPO are performed better (How, et al., 2007). However, the area of forecasting for share price of sharia-compliant in Malaysia is still not enough.

Thus, this study tries to fulfill this gap by forecast the long-term performance of IPO for sharia-compliant companies using weighted moving average. Specifically, this study examine long term performance of IPO for

sharia-compliant companies using moving average methods and compare with weighted moving average. Next, this study performed the analysis of the error in the analysis.

LITERATURE REVIEW

Various studies investigated the long term performance of IPO market found IPO are underperformed their benchmark. Ritter (1991) examines long term performance of IPO in United States found the significant underperform their benchmark. Carter et al. (1998) also found IPO stocks are underperformed relative to the market over a three-year holding period is less severe for IPO handled by more prestige underwriters. The same result is reported by Chan, et al. (2004) in China. They found IPO in China is slightly underperformed. While, Lee, et al. (1996) report that Australian’s IPO significantly underperform market movements in the three-year period subsequent to list. Goergen, et al. (2007) discusses the long-run performance of UK IPO and found that the percentage of equity issued and the degree of multinationality of a firm are the key predictors of IPO performance in UK. Drobetz, et al. (2005) found long run underperformance to the fact that IPO firms tend to be small firms when used a small capitalization index as a benchmark.. Thus, underperformed of long term IPO are observed in various countries (Kirkulak & Davis, 2005).

Therefore, it is important to forecast the performance of share price to make sure that particular share can give high return. Stock markets are influenced by complex factors and nonlinear relationships among factors existed in different periods such that forecasting the future stock trends for investors are extremely difficult (Kluger & McBride, 2011). In addition, implementation of accurate forecasting methods is important in predicting stock prices since the stock market begins (Pavlov & Hurn, 2012). In this paper, we compare the simple moving average and weighted moving average. Then, three types of error are calculated. The three types of error are mean absolute deviation (MAD), mean squared error (MSE) and mean absolute percentage error (MAPE).

METHODOLOGY

In Malaysia Stock Exchange, there are 13 sharia-compliant companies that issues Initial Public Offering in year of 2012. Table 1 show the list of the companies. Then, for every sector, one representative is selected for the analysis. As shown in Table 1, Sentoria Group Company is selected for property sector, Globaltec Formation Berhad is selected for industrial products sector, Felda Global Venture Holding Berhad is selected for plantation sector, OCK Group Berhad is selected for trading/ service sector and Gabungan AQRS Berhad is selected for construction sector.

TABLE I : List of Sharia compliance companies that issues Initial Public Offerings (IPO) in year of 2012

No.	Stock Code	Company	Board	Sector
1	5213	SENTORIA GROUP BERHAD	MAIN MARKET	PROPERTY
2	5208	EITA RESOURCES BERHAD	MAIN MARKET	TRADING/SERVICES
3	5218	SAPURAKENCANA PETROLEUM BHD	MAIN MARKET	TRADING/SERVICES
4	5219	PESTECH INTERNATIONAL BERHAD	MAIN MARKET	TRADING/SERVICES
5	5220	GLOBALTEC FORMATION BERHAD	MAIN MARKET	INDUSTRIAL PRODUCTS
6	5209	GAS MALAYSIA BERHAD	MAIN MARKET	TRADING/SERVICES
7	5222	FELDA GLOBAL VENTURES HLDG BHD	MAIN MARKET	PLANTATION
8	0172	OCK GROUP BERHAD	ACE MARKET	TRADING/SERVICES
9	5225	IHH HEALTHCARE BERHAD	MAIN MARKET	TRADING/SERVICES
10	5226	GABUNGAN AQRS BERHAD	MAIN MARKET	CONSTRUCTION
11	0177	PASUKHAS GROUP BERHAD	ACE MARKET	TRADING/SERVICES
12	5216	DATASONIC GROUP BERHAD	MAIN MARKET	TRADING/SERVICES
13	0160	HIAP HUAT HOLDINGS BHD	ACE MARKET	INDUSTRIAL PRODUCTS

Then, this research analyse the movement of share price, starting from the first month until more than 50 months. The data are collected from Datastream (Thomson Reuters). Then, this research calculates two methods of forecasting. The first method is simple moving average and the second method is weighted moving average.

The calculation for simple moving average is as follows:

$$\text{Moving average} = \frac{\sum \text{demand in previous } n \text{ periods}}{n} \tag{1}$$

where n is the number of periods in the moving average. In this research, $n=3$ months is selected.

Next, the calculation for weighted moving average is as follows:

$$\text{Weighted moving average} = \frac{\sum (\text{Weight for period } n)(\text{Demand in period } n)}{\sum \text{Weights}} \tag{2}$$

where n is the number of periods in the moving average. In this research, $n=3$ months is selected. Weight for period 1, period 2 and period 3 is 0.05, 0.15 and 0.80. This setting is to make this forecasting method more responsive to changes because more recent periods are set to be more heavily weighted.

Then, to validate the robustness diagnostic of forecasting method, overall accuracy need to be determined. The forecast error can be determined by comparing the forecasted values with the actual or observed values. If F_t denotes the forecast in period t , and A_t denotes the actual value in period t , the forecast error is defined as:

$$\begin{aligned} \text{Forecast error} &= \text{Actual value} - \text{Forecast value} \\ &= A_t - F_t \end{aligned} \tag{3}$$

Then, to validate the robustness diagnostic of forecasting method, three types of error is introduced. The first measure of the overall forecast error for a model is the mean absolute deviation (MAD). This value is calculated by taking sum of the absolute values of the individual forecast errors and dividing by the number of periods of data (n):

$$\begin{aligned} \text{MAD} &= \frac{\sum_{t=1}^n |\text{Forecast error}|}{n} = \frac{\sum_{t=1}^n |\text{Actual-Forecast}|}{n} \\ &= \frac{\sum_{t=1}^n |A_t - F_t|}{n} \end{aligned} \tag{4}$$

Next, the second parameter for measuring overall forecast error is mean squared error (MSE). The MSE is average of squared differences between the forecasted and observed values. The formula for MSE is:

$$\begin{aligned} \text{MSE} &= \frac{\sum_{t=1}^n (\text{Forecast error})^2}{n} = \frac{\sum_{t=1}^n (\text{Actual} - \text{Forecast})^2}{n} \\ &= \frac{\sum_{t=1}^n (A_t - F_t)^2}{n} \end{aligned} \tag{5}$$

Then, the third parameter for measuring forecast error is mean absolute percentage error (MAPE). The MAPE is computed as the average of the absolute difference between the forecasted and actual values, expressed as a percentage of the actual values. The MAPE is calculated using next equation:

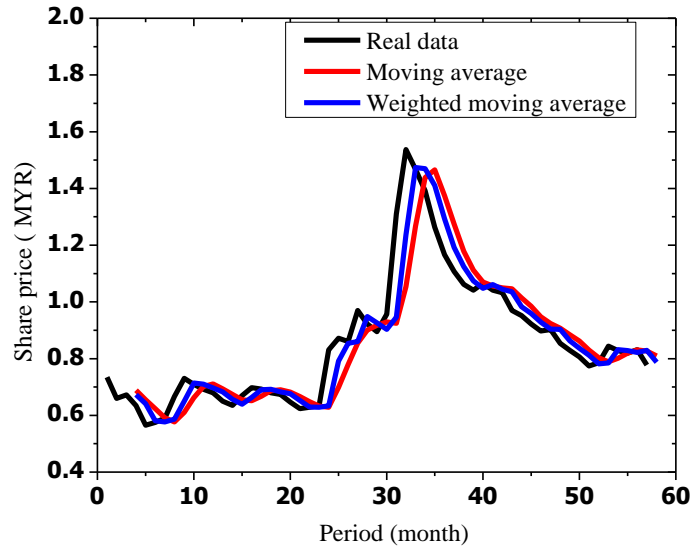
$$\begin{aligned} \text{MAPE} &= \frac{\sum_{t=1}^n 100|\text{Forecast error}| / \text{Actual}_t}{n} = \frac{\sum_{t=1}^n 100|\text{Actual}_t - \text{Forecast}_t| / \text{Actual}_t}{n} \\ &= \frac{\sum_{t=1}^n 100|A_t - F_t| / A_t}{n} \end{aligned} \tag{6}$$

As robustness for diagnostic error checking, three method of error calculation is compared to find the lowest error for forecasting methods. In this paper, the accuracy between simple moving average and weighted moving average are evaluated.

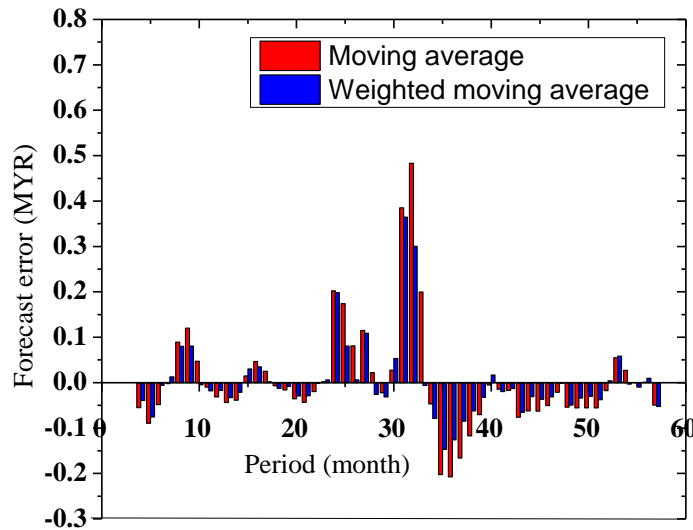
RESULT AND DISCUSSION

Property Sector

In the robust diagnostic analysis of errors, one company that represent the performance of property sector is selected. The company that shows the average performance of property sector is Sentoria Group Berhad.



(a)



(b)

Error evaluation	Moving average	Weighted moving average
Mean absolute deviation (MAD)	0.074	0.051
Mean squared error (MSE)	0.014	0.007
Mean absolute percentage error (MAPE)	7.71	5.373

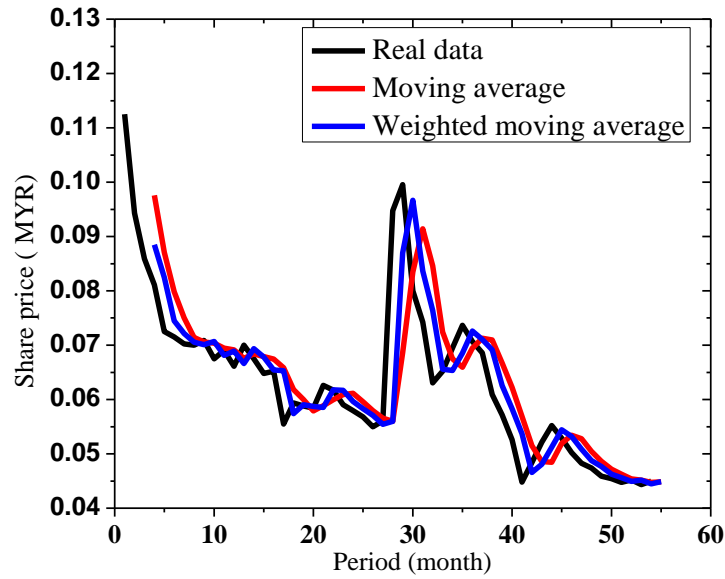
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Figure 1: Share price for Sentoria Group Berhad (a) Real dynamic movement of share price (b) Forecast error analysis (c) Evaluation for three types of error

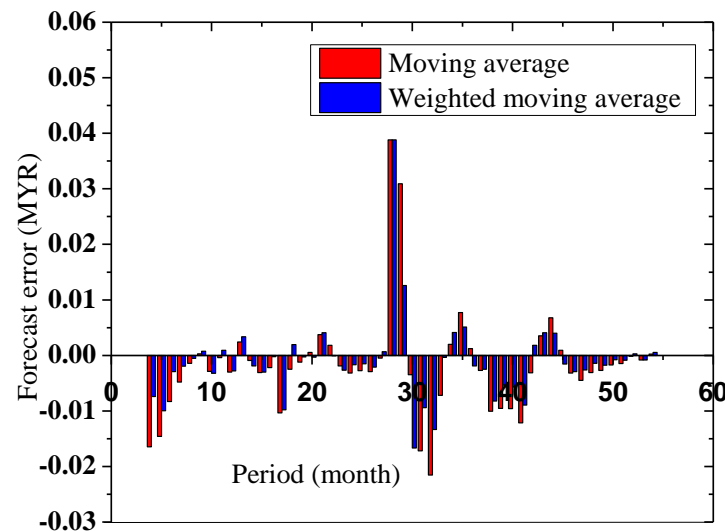
Figure 1(a) shows the movement of real share price for Sentoria Group Berhad . The maximum value is MYR 1.54 in September 2014 (32th month). The minimum value is MYR 0.566 in June 2012 (5th month). Figure 1(b) shows the forecast error from fourth month to 57th month. The result shows the forecast error for weighted moving average is lower than moving average. Figure 1(c) is the table that indicated the three types of errors. Result shows three types of errors in weighted moving average method are lower than moving average method. Therefore weighted moving average is more suitable for forecasting share price of company in property sector.

Industrial product sector

In the robust diagnostic analysis of errors, one company that represent the performance of industrial product sector is selected. The company that shows the average performance of industrial product sector is Globaltec Formation Berhad.



(a)



(b)

Error evaluation	Moving average method	Weighted moving average
Mean absolute deviation (MAD)	0.006	0.004
Mean squared error (MSE)	0.000	0.000
Mean absolute percentage error (MAPE)	8.738	6.409

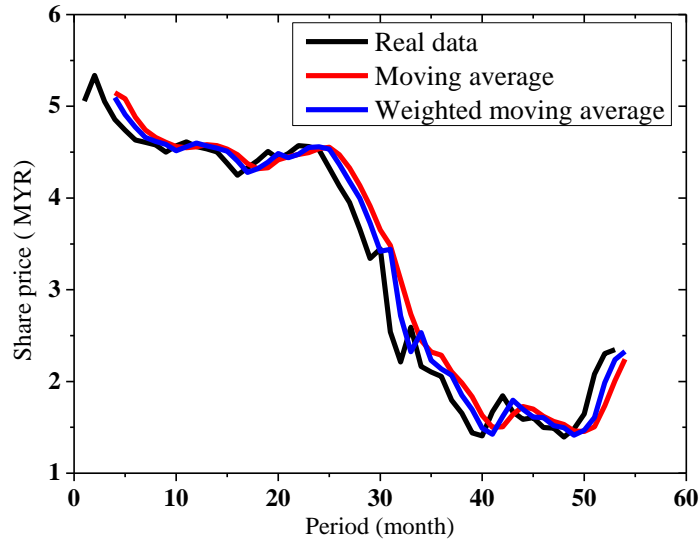
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Figure 2: Share price for Globaltec Formation Berhad (a) Real dynamic movement of share price (b) Forecast error analysis (c) Evaluation for three types of error

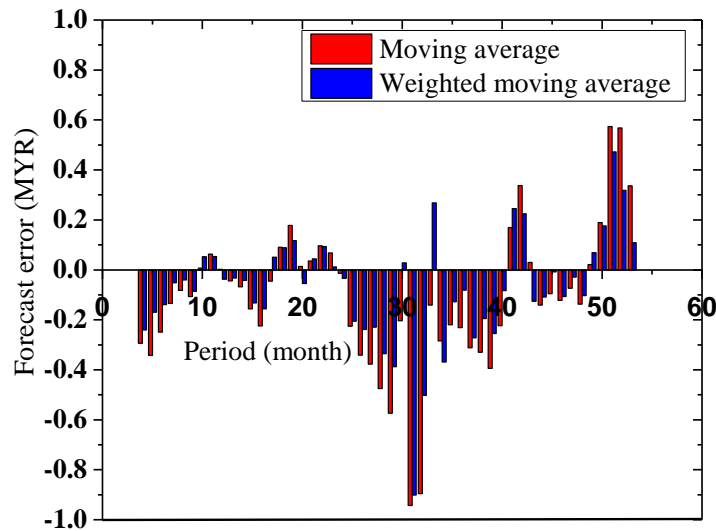
Figure 2(a) shows the movement of real share price for Globaltec Formation Berhad. The maximum value is MYR 0.113 in May 2012 (first month). The minimum value is MYR 0.044 in September 2016 (53th month). Figure 2(b) shows the forecast error from fourth month to 54th month. The result shows the forecast error for weighted moving average is lower than moving average. Figure 2(c) is the table that indicated the three types of errors. The MAD and MAPE of weighted moving average method are less than moving average method. Therefore weighted moving average is more suitable for forecasting share price of company in industrial product sector.

Plantation sector

In the robust diagnostic analysis of errors, one company that represent the performance of plantation sector is selected. The company that shows the average performance of plantation sector is Felda Global Ventures Holding Berhad.



(a)



(b)

Error evaluation	Moving average method	Weighted moving average
Mean absolute deviation (MAD)	0.226	0.166
Mean squared error (MSE)	0.093	0.053
Mean absolute percentage error (MAPE)	9.118	6.738

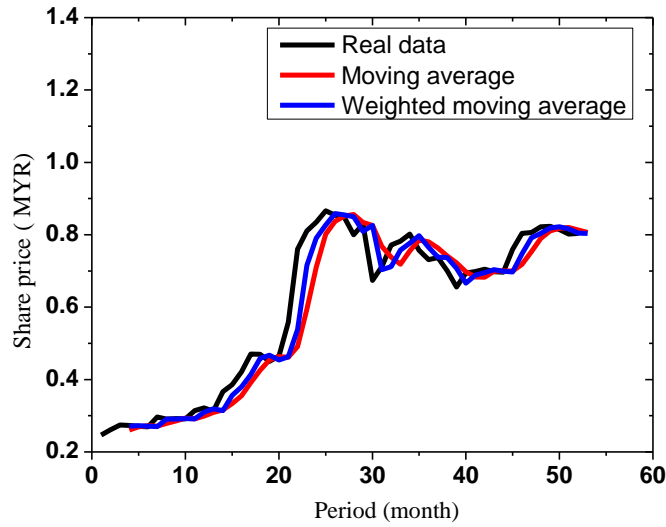
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Figure 3: Share price for Felda Global Ventures Holding Berhad (a) Real dynamic movement of share price (b) Forecast error analysis (c) Evaluation for three types of error

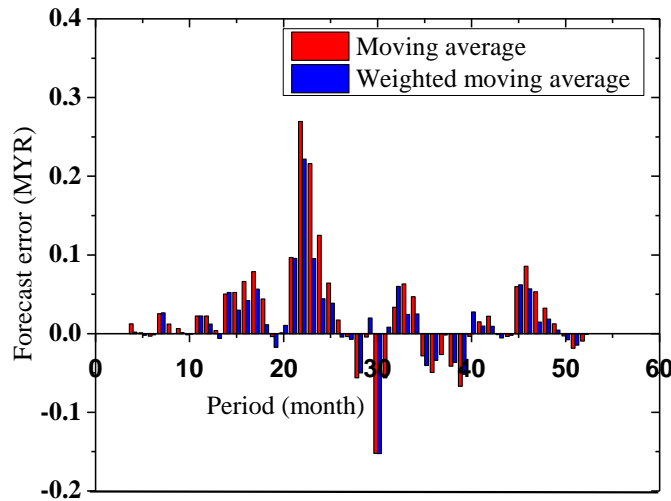
Figure 3(a) shows the movement of real share price for Felda Global Ventures Holding Berhad. The maximum value is MYR 5.338 in July 2012 (Second month). The minimum value is MYR 1.394 in May 2016 (48th month). Figure 3(b) shows the forecast error from fourth month to 53th month. The result shows the forecast error for weighted moving average is lower than moving average. Figure 3(c) is the table that indicated the three types of errors. Result shows three types of errors in weighted moving average method are lower than moving average method. Therefore weighted moving average is more suitable for forecasting share price of company in plantation sector.

Trading/service sector

In the robust diagnostic analysis of errors, one company that represent the performance of trading/service sector is selected. The company that shows the average performance of trading/service sector is OCK Group Berhad.



(a)



(b)

Error evaluation	Moving average method	Weighted moving average
Mean absolute deviation (MAD)	0.044	0.031
Mean squared error (MSE)	0.005	0.003
Mean absolute percentage error (MAPE)	6.913	5.029

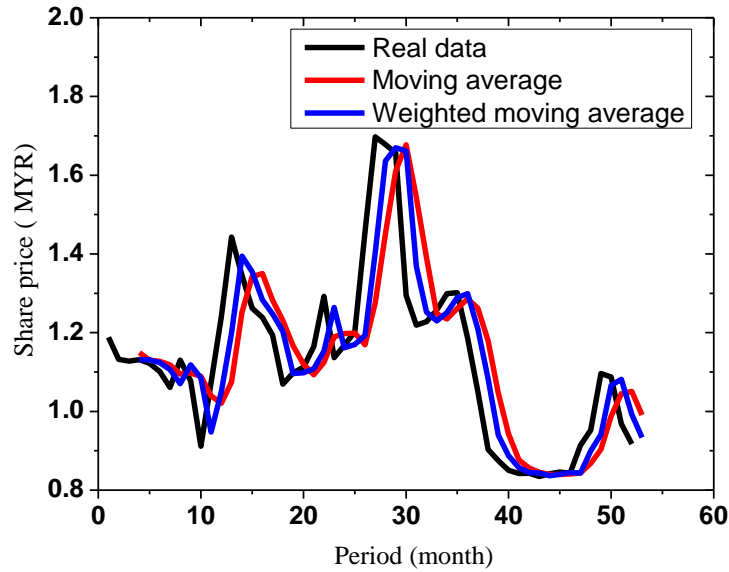
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Figure 4: Share price for OCK Group Berhad (a) Real dynamic movement of share price (b) Forecast error analysis (c) Evaluation for three types of error

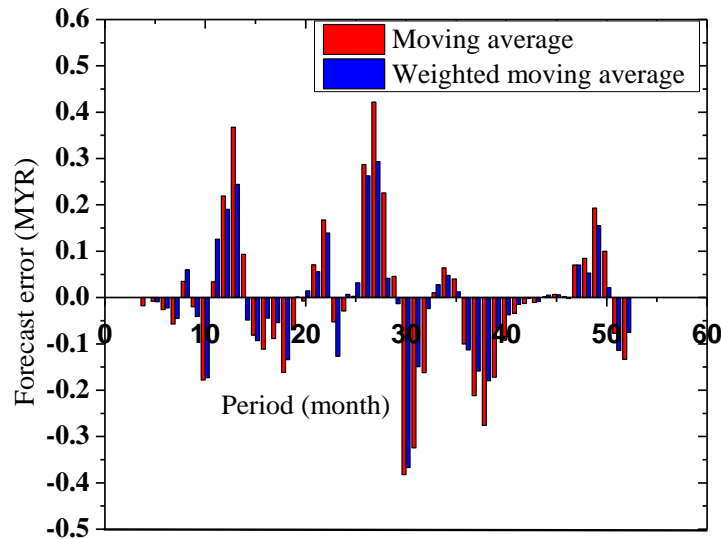
Figure 4(a) shows the movement of real share price for OCK Group Berhad. The maximum value is MYR 0.866 in July 2014 (25th month). The minimum value is MYR 0.247 in July 2012 (first month). Figure 4(b) shows the forecast error from fourth month to 52th month. The result shows the forecast error for weighted moving average is lower than moving average. Figure 4(c) is the table that indicated the three types of errors. Result shows three types of errors in weighted moving average method are lower than moving average method. Therefore weighted moving average is more suitable for forecasting share price of company in trading/service sector.

Construction sector

In the robust diagnostic analysis of errors, one company that represent the performance of construction sector is selected. The company that shows the average performance of construction sector is Gabungan AQRs Berhad.



(a)



(b)

Error evaluation	Moving average method	Weighted moving average
Mean absolute deviation (MAD)	0.111	0.081
Mean squared error (MSE)	0.024	0.014
Mean absolute percentage error (MAPE)	9.422	6.946

(c)

Figure 5: Share price for Gabungan AQRs Berhad (a) Real dynamic movement of share price (b) Forecast error analysis (c) Evaluation for three types of error

Figure 5(a) shows the movement of real share price for Gabungan AQRs Berhad. The maximum value is MYR 1.698 in September 2014 (27th month). The minimum value is MYR 0.835 in January 2016 (43rd month). Figure 5(b) shows the forecast error from fourth month to 52th month. The result shows the forecast error for weighted moving average is lower than moving average. Figure 5(c) is the table that indicated the three types of errors. Result shows three types of errors in weighted moving average method are lower than moving average method. Therefore weighted moving average is more suitable for forecasting share price of company in construction sector.

CONCLUSION

The objective of this research is to evaluate the forecasting method to predict the long term performance of share price. The share prices that involved in this research are sharia compliance companies that listed in Malaysian Stock Exchange in year of 2012. In this research, we analyzed the implementation of two methods of forecasting which are simple moving average and weighted moving average. From the result in Figure 1 until Figure 5, this research concludes that:

- (1) The value of share price is dynamically moving fluctuate according to market condition.
- (2) The evaluation of each forecasting method is evaluate thoroughly with respect to three measure of error calculation, which are mean absolute deviation (MAD), mean squared error (MSE) and mean absolute percentage error (MAPE).
- (3) The error value for each calculation is bigger if the volatility of error for the share price is higher.
- (4) The forecasting method of weighted moving average is better than simple moving average because of it is less error. Therefore, weighted moving average is more accurate in forecasting the dynamic behavior of share price.

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