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Evaluating Forecasting Method Using Autoregressive Integrated Moving Average (ARIMA) Approach for Shariah Compliant Oil and Gas Sector in Malaysia

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Abstract: Stock market is one of the most important indicators about the status of the economic for a country. Positive increment of dynamic movement for the share price indicates good performance of stock market in Malaysia. This paper investigates the reliability of ARIMA statistical method to forecast the share price performance for oil and gas sector in Malaysia Stock Exchange. In this research, one shariah-compliant company was selected, namely Sapura Energy Berhad. This company is one of the oil and gas companies that issued Initial Public Offerings (IPO) in year of 2012. In ex-post analysis, the forecasting model shows the Autoregressive Integrated Moving Average (ARIMA) (1, 1, 1) contributes 3.752% error between forecast value and actual value. Therefore, the results conclude that the performance of Sapura Energy Berhad can be forecast accurately using ARIMA model of (1, 1, 1). The value in February 2018 is forecasted as MYR 1.387169 for every share of Sapura Energy Berhad. The findings of this study will help investors to evaluate and forecast the performance of oil and gas sector in Malaysia. In addition, this study will help investors to manage and make their investment decision to increase profit and reduce the loss in investment. Furthermore, the findings from this study will help economists to evaluate the current economic condition of oil and gas in Malaysia. Then, preventive action can be implement to secure a good level of economic condition in Malaysia.

Keywords: ARIMA model, Initial public offerings, Malaysia Stock Exchange, Oil and gas sector

1 Introduction

Stock market is one of the most important indicators on how the economic are moving up. Positive increment of dynamic movement for the share price indicates good performance of stock market in Malaysia. Stability of economic is depending on the good performance of companies listed on the stock market. Therefore, stock market must be a good platform in order to manage the volatility of stock market effectively. Volatility is a measure for variation of price of a financial instrument over time, and as much the market is volatile, it creates risk which is associated with the degree of dispersion of returns around the average [1]. Lack of efficiency in monitoring, regulating and supervising would result with the collapse of stock market such as high volatility and bad company performance in term of revenue, dividend and etc.

Malaysian Stock Exchange (Bursa Malaysia) is a unique stock market due to offer two types of board known as shariah board and non-shariah board (Abu Bakar and Rosbi [2]). Shariah board is established for the shariah-compliant companies while non shariah board was established for non shariah-compliant companies. The shariah board is established to fulfill the needed of Islamic investors and companies in Malaysia and the rest of the world. The main feature of a shariah board is to provide an investment in line with Islamic law. A shariah board must represent an assertion of Islamic law where the market should be free from the prohibited element such as usury (riba), gambling (maisir), and uncertainties (gharar) [3]. Therefore, Malaysian Stock Exchange (MSE) must be a good platform in promoting Islamic investment in order to growth steadily. Shariah-compliant companies also must have a good performance in order to increase a market shares in the global rank.

The evolution of Islamic finance in Malaysia has followed in the wake of innovations in the global financial service industry (Mohd Zin et al., [4]). A nature evolution of Islamic financial industry is Islamic capital market (ICM). ICM was introduced in Malaysian market in June 1997 by the Securities Commission of Malaysia. The first Islamic equity index introduce in Malaysia is RHB Unit Trust Management Bhd in May 1996. Parts of ICM, Initial Public Offering (IPO) for shariah-compliant companies are important component in economic growth in Malaysia. IPO shares are issues by private companies for raising a capital for expand their business. This is important stage for small companies to expand their business. Whereas, investors have a big opportunities to invest their money in varies pool of investment. This situations can attracted a potential investors looking on the multiple capital markets as they are exposed to additional risk in IPO environment (internal (firm specific) and external uncertainties) which is affect the first day's initial returns (Sundarasen, et al., [5]).

Many methods are used in forecast the performance of Islamic share price. Worldwide researchers have conducted empirical investigations to model the volatility by applying various symmetric and asymmetric models such as ARCH, GARCH, IGARCH, EGARCH, GRCH-M, Q-GARCH, GJR- GARCH, PARCH and TARCH (Gupta and Kashyap [6]) in order to forecast the performance of their companies. Even, there are many methods used to forecast the performance of share price but still lack of researchers used ARIMA model in prediction the performance of Islamic share price. ARIMA is one of the models that develop based on the previous data to predict the future data. Therefore, it is important to forecast the performance of Islamic shares price in order to measure the dynamic behavior of Islamic share price in Malaysian market.

Many study found that ARIMA model is a good method to forecast the future value. ARIMA model are used in forecast data in varies areas such as in exchange rate, stock market, price index and others. Abu Bakar and Rosbi [7] analyzing the currency exchange rate between Malaysian Ringgit and United State Dollar and found that the ARIMA (1, 1, 1) is suitable for clustering the data between January 2010 until April 2017. Therefore this study try to fulfill this gap by investigates the reliability of ARIMA statistical method to forecast the share price performance for shariah-compliant company listed on the Malaysia Stock Exchange. This study was specifically investigate the performance of oil and gas sector in Malaysia. The main reason for examine the performance of oil and gas sector in Malaysia is due to more than 40 percent income of Malaysia is from oil and gas sector. Thus, Malaysian economy is highly depends on oil and gas sector.

2 Literature review

Going public is an important phase in the life cycle of a company during and beyond which it aspires to recycle more productively financial and physical resources ([8],[9]). There are many factors influence the performance of IPO companies. Even there are many factors influence the performance of IPO companies in Malaysia, but study that focus on shariah-compliant companies is still lack of investigation. The first study regarding IPO for shariah-compliant companies is Abdul Rahim and Yong (2010). They investigate the initial return patterns of Malaysian initial public offerings (IPOs) and whether shariah-compliant status would alter such patterns. This study found that the initial returns of Malaysian IPOs drop substantially from 94.91 percent reported from the pre-crisis period of 1990-1998 to 31.99 percent. This results show the performance of IPO in Malaysia is comparable to the reported in advanced markets worldwide. Then, Abu Bakar and Uzaki [10] investigate the performance of IPO for shariah-compliant companies and non shariah-compliant companies found that the average degree of IPO underpricing for shariah-compliant companies is 28.82 percent and a non shariah-compliant company is 26.63 percent. Current study regarding the performance of IPO (both companies: shariah-compliant and non shariah-compliant companies) in Malaysia market found that the average degree of IPO underpricing is 21.22 percent (Ammer and Ahmad-Zaluki, [11]).

Besides the study focus on IPO, study that investigate the shariah-compliant companies listed on the Malaysian Stock Exchange found the robust evidence. Wan Ismail, et al. [12] investigate the quality of report earnings in the corporate reports of shariah-compliant companies. They found that the Shariah-compliant companies have significantly higher earnings quality compared to other companies. The results provide support for the arguments that shariah-compliant companies supply a higher quality of report earnings in order to attract foreign investment. Shariah-compliant companies also have greater demand for high-quality financial reporting because of their shariah status. Then, shariah-compliant companies are great in scrutiny by regulators and institutional investors.

The method that used in this study is ARIMA model. The ARIMA approach has been widely used throughout the world for different types of investment time series analyses. The ARIMA approach has been widely used throughout the world for different types of agricultural and industrial time series analyses since its inception (Hossain, et. al, [13]). Stock market is a significant component of the nation's economy. Comparing the linear methods, the seasonal ARIMA model provides better estimates for short-term forecasts (Balli and Elsamadisy, [14]). Many study use ARIMA model in forecast the performance of their industry.

Asiri [15] examine the behaviour of stock prices in the Bahrain Stock Exchange (BSE), which is expected to follow a random walk. The study found that the random walk with no drift and trend is confirmed for all daily stock prices and each individual sector. Other tests, such as ARIMA (AR1), autocorrelation tests and exponential smoothing tests also supported the efficiency of the BSE in the weak-form. Besides that, Stevenson [16] examines issues relating to their application in a forecasting context. The results highlight the limitations in using the conventional approach to identifying the best-specified ARIMA model in sample, when the purpose of the analysis is to provide forecasts. The results show that the ARIMA models can be useful in anticipating broad market trends; there are substantial differences in the forecasts obtained using alternative specifications.

Jadevicius and Huston [17] investigate Lithuanian house price changes. As the results of the study suggest, ARIMA is a useful technique to assess broad market price changes. Government and central bank can use ARIMA modelling approach to forecast national house price inflation. Developers can employ this methodology to drive successful house-building programme. Investor can incorporate forecasts from ARIMA models into investment strategy for timing purposes.

Radha and Thenmozhi [18] develop an appropriate model for forecasting the short-term interest rates i.e., commercial paper rate, implicit yield on 91 day treasury bill, overnight MIBOR rate and call money rate. The short-term interest rates are forecasted using univariate models, Random Walk, ARIMA, ARMA-GARCH and ARMA-EGARCH and the appropriate model for forecasting is determined considering six-year period from 1999. The results show that interest rates time series have volatility clustering effect and hence GARCH based models are more appropriate to forecast than the other models. It is found that for commercial paper rate ARIMA-EGARCH model is most appropriate model, while for implicit yield 91 day Treasury bill, overnight MIBOR rate and call money rate, ARIMA-GARCH model is the most appropriate model for forecasting.

The literature above shows the ARIMA model used in many types of time series date either from stok market, interest rate house procing and others. Therefore this study used ARIMA model in order to investigates the reliability of ARIMA statistical method to forecast the share price performance for oil and gas sector in Malaysia Stock Exchange.

3 Research Methodology

The objective of this study is to develop forecasting model for oil and gas sector in Malaysia Stock Exchange. The importance of this research is to develop a robust and reliable statistical method in predicting the stock price in of a company namely Sapura Energy Berhad. Therefore, the research methodology in this study involved data selection process, Box-Jenkins statistical method and mathematical derivation of Autoregressive integrated moving average (ARIMA).

3.1 Data selection process

This study focused on the share price of companies that issued Initial Public Offering (IPO) in year 2012. In that year, there are two companies from oil and gas sector that issued IPO and comply with sharia-law. In this study, share price for Sapura Energy Berhad is selected from May 2012 until November 2017.The share price for Sapura Energy Berhad is collected daily using database of Datastream (Thomson Reuters). Then, the average share price for monthly is calculated.

3.2 Box-Jenkins statistical method

In time series, Box-Jenkins statistical method is autoregressive integrated moving average (ARIMA) models to find the best fit of a time-series model to past values of a time series (Verbeek, 2004). Figure 1 shows the flow of forecasting using Box-Jenkins approach.

The Box–Jenkins forecasting model development starts with identification of autoregressive integrated moving average (ARIMA) model. In developing ARIMA model, stationary test need to be performed. Stationary can be assessed from a run sequence plot. The run sequence plot should show constant location and scale. It can also be detected from an autocorrelation plot. Specifically, non-stationarity is often indicated by an autocorrelation plot with very slow decay. The Box-Jenkins methods implement differencing to achieve stationarity of data. A statistical stationary time series is one whose statistical properties such as mean, variance and autocorrelation are all constant over time.

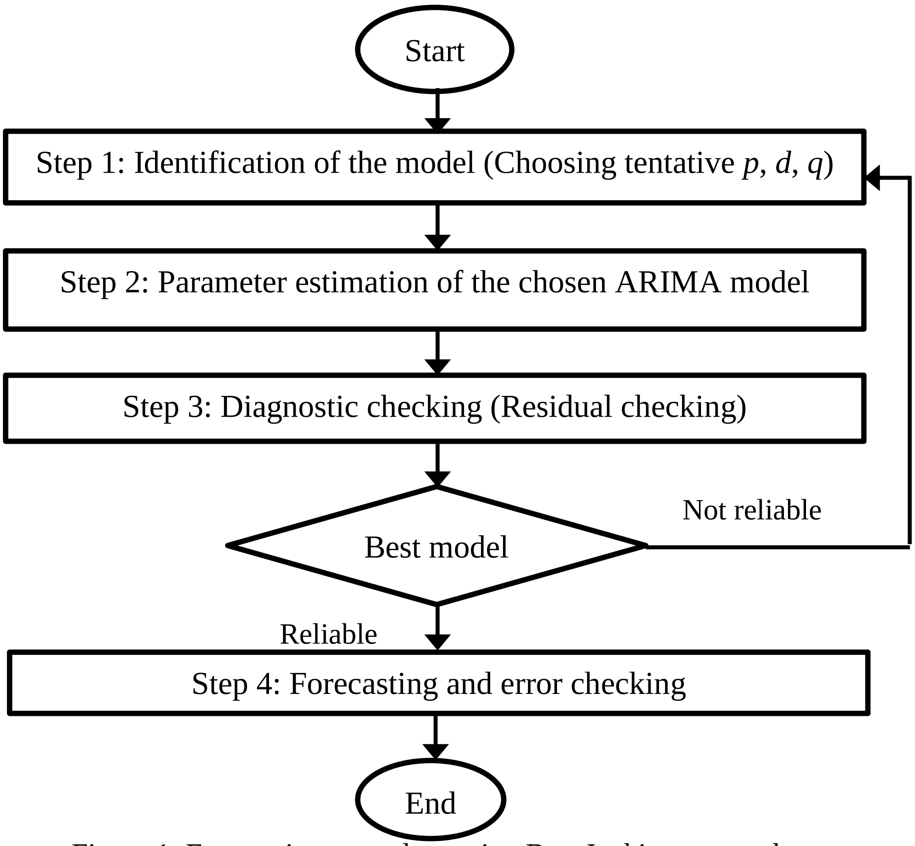


Figure 1: Forecasting procedure using Box-Jenkins approach

Then, after stationarity has been addressed, the next step is to identify the order of the autoregressive and moving average terms. The order of autoregressive is represented by *p*, moving average is represented by *q* and diffrencing order is represented by *d*.

Next, the diagnostics checking need to be performed related to R-squared (coefficient of determination), Akaike information criterion and residual checking.

Finally, the ARIMA model will be used for forecasting procedure. In the forecasting procedure, error diagnostics need to perform in data range that known. Then , the forecasting will be performed in the future target of forecasting range.

3.3 Mathematical derivation of autoregressive integrated moving average (ARIMA)

The derivation of ARIMA model is involving the mathematical derivation of autoregressive (AR), moving average(MA) and autoregressive–moving-average (ARMA).

Firstly, the notation of autoregressive, AR (*p*) indicates an autoregressive model of order *p*. The AR (*p*) model is defined as:

$$X_t = c + \varphi_1 X_{t-1} + \ldots + \varphi_p X_{t-p} + \varepsilon_t$$

$$X_t = c + \sum_{i=1}^{p} \varphi_i X_{t-i} + \varepsilon_t \qquad (1)$$

where $\varphi_i, \ldots, \varphi_p$ the parameters of the model, c is constant, and ε_t is white noise.

Secondly, the notation of moving average, MA *(q)* refers to the moving average model of order *q*:

$$X_t = \mu + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \ldots + \theta_q \varepsilon_{t-q}$$

$$X_t = \mu + \varepsilon_t + \sum_{i=1}^{q} \theta_i \varepsilon_{t-i} \qquad (2)$$

where μ is the mean of the series, $\theta_1, \ldots, \theta_q$ are the parameters of the model, and $\varepsilon_t, \varepsilon_{t-1}, \ldots, \varepsilon_{t-q}$ are white noise error terms. The value of *q* is called the order of the MA model.

Thirdly, the notation ARMA (*p, q*) refers to the model with *p* autoregressive terms and *q* moving-average terms. This model contains the AR (*p*) and MA (*q*) models,

$$X_t = c + \sum_{i=1}^{p} \varphi_i X_{t-i} + \varepsilon_t + \mu + \varepsilon_t + \sum_{i=1}^{q} \theta_i \varepsilon_{t-i}$$

where μ is the mean of the series is expected as zero,

$$X_t = c + \varepsilon_t + \sum_{i=1}^{p} \varphi_i X_{t-i} + \sum_{i=1}^{q} \theta_i \varepsilon_{t-i} \qquad (3)$$

where $\varphi_i, \ldots, \varphi_p$ the parameters of the AR model, $\theta_1, \ldots, \theta_q$ are the parameters of the MA model, c is constant, and ε_t is white noise. The white noise ε_t is independent and has identical probability normal distribution. The model is usually referred to as the ARMA (*p*,*q*) model where *p* is the order of the autoregressive (AR) part and *q* is the order of the moving average (MA) part.

Finally, the derivation of ARIMA model is described as below procedure.Given a time series of data X_t where t is an integer index and the X_t are real numbers. An ARMA (*p, q*) model is given by Equation (3).

$$X_t - \alpha_1 X_{t-1} - ... - \alpha_{p'} X_{t-p'} = \varepsilon_t + \theta_1 \varepsilon_{t-1} + ... + \theta_q \varepsilon_{t-q}$$

$$\left(1 - \sum_{i=1}^{p'} \alpha_i L^i\right) X_t = \left(1 + \sum_{i=1}^{q} \theta_i L^i\right) \varepsilon_t \quad (4)$$

where L is the lag operator, α_i are the parameters of the autoregressive part of the model, θ_i are the parameters of the moving average part and ε_t are error terms. The error terms ε_t are generally assumed to be independent, identically distributed variables sampled from a normal distribution with zero mean.

Referring to Equation (4), assume now that the polynomial $\left(1 - \sum_{i=1}^{p'} \alpha_i L^i\right)$ has a unit root (a factor $(1-L)$) of multiplicity *d*. Then it can be rewritten as:

$$\left(1 - \sum_{i=1}^{p'} \alpha_i L^i\right) = \left(1 - \sum_{i=1}^{p'-d} \alpha_i L^i\right) (1-L)^d \quad (5)$$

An ARIMA (*p,d,q*) process expresses this polynomial factorization property with *p = p′−d*, and is given by:

$$\left(1 - \sum_{i=1}^{p} \phi_i L^i\right) (1-L)^d X_t = \left(1 + \sum_{i=1}^{q} \theta_i L^i\right) \varepsilon_t \quad (6)$$

The Equation (6) can be generalized as follows,

$$\left(1 - \sum_{i=1}^{p} \phi_i L^i\right) (1-L)^d X_t = \delta + \left(1 + \sum_{i=1}^{q} \theta_i L^i\right) \varepsilon_t \quad (7)$$

This defines an ARIMA (*p,d,q*) process with drift *δ/(1 − Σφi).*

4 Result and Discussion

This section describes result of data stationary evaluation process, normality diagnostics, correlogram analysis, and forecasting method using Box-Jenkins approach.

4.1 Data stationary evaluation process

This study selected share price data of Sapura Energy berhad from May 2012 until November 2017. This selected period involved with 67 months after the Initial Public Offerings(IPO) are issued. Figure 2 shows dynamic behaviour of share price for Sapura Energy Berhad. In the first month, the value of share price is MYR 2.093. The maximum value of share price is MYR 4.635 in December 2013.The minimum value of share price is MYR 1.409 in November 2017.

Then, this study evaluate the stationarity of data using autocorrelation function (ACF) and partial autocorrelation function (PCF). Figure 3 shows ACF and PACF analysis for share price. ACF analysis shows slow decay of autocorrelation value. Therefore, this result shows the share price data is a non stationary.The non-stationary data ia a variable that possess variance and a mean that does not constant over time.

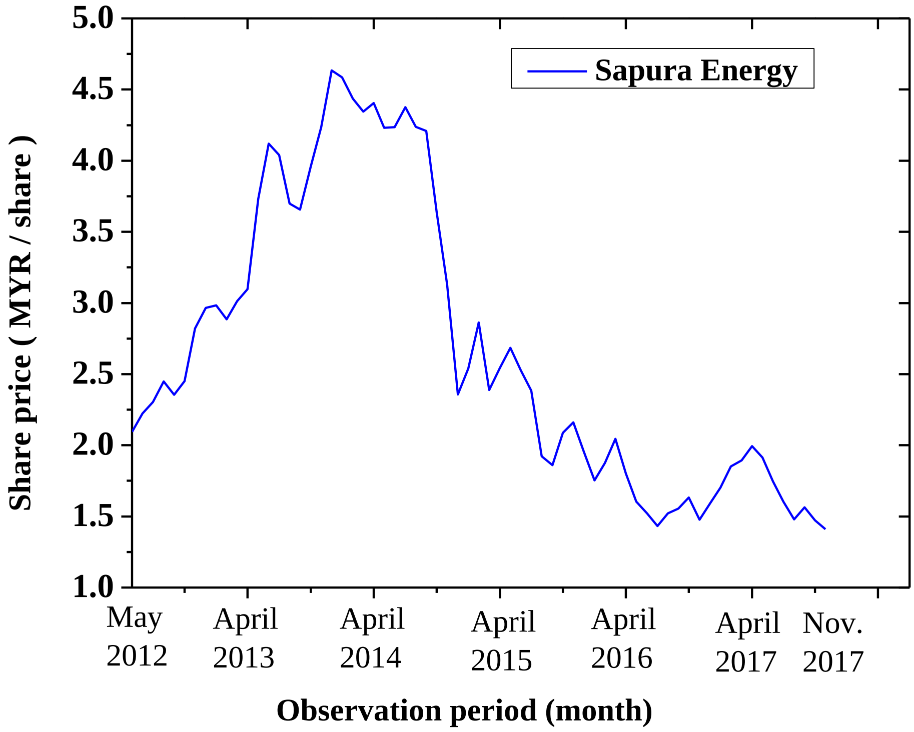
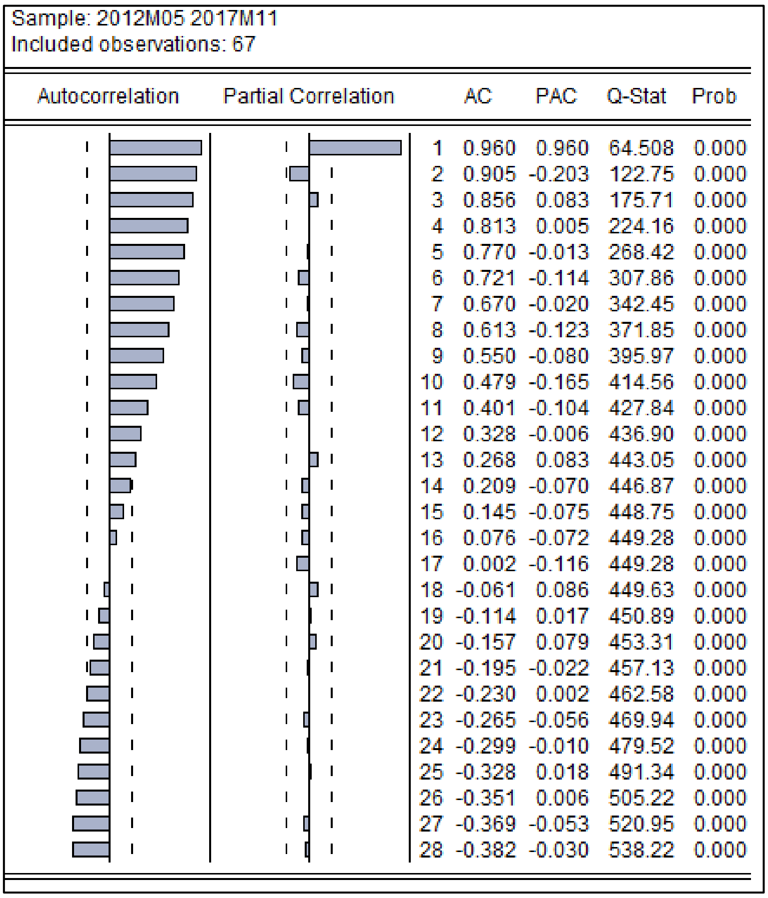


Figure 2: Dynamic movement of share price for Sapura Energy Berhad



Sample: 2012M05 2017M11
Included observations: 67

	AC	PAC	Q-Stat	Prob
1	0.960	0.960	64.508	0.000
2	0.905	-0.203	122.75	0.000
3	0.856	0.083	175.71	0.000
4	0.813	0.005	224.16	0.000
5	0.770	-0.013	268.42	0.000
6	0.721	-0.114	307.86	0.000
7	0.670	-0.020	342.45	0.000
8	0.613	-0.123	371.85	0.000
9	0.550	-0.080	395.97	0.000
10	0.479	-0.165	414.56	0.000
11	0.401	-0.104	427.84	0.000
12	0.328	-0.006	436.90	0.000
13	0.268	0.083	443.05	0.000
14	0.209	-0.070	446.87	0.000
15	0.145	-0.075	448.75	0.000
16	0.076	-0.072	449.28	0.000
17	0.002	-0.116	449.28	0.000
18	-0.061	0.086	449.63	0.000
19	-0.114	0.017	450.89	0.000
20	-0.157	0.079	453.31	0.000
21	-0.195	-0.022	457.13	0.000
22	-0.230	0.002	462.58	0.000
23	-0.265	-0.056	469.94	0.000
24	-0.299	-0.010	479.52	0.000
25	-0.328	0.018	491.34	0.000
26	-0.351	0.006	505.22	0.000
27	-0.369	-0.053	520.95	0.000
28	-0.382	-0.030	538.22	0.000

Figure 3: ACF and PACF analysis for share price

4.2 Data transformation

Next, this study performed the stationary transformation using difference transformation process.
The calculation of difference process is follow Equation (8).

$$\Delta SP_t = SP_t - SP_{t-1} \quad (8)$$

Where:
ΔSP_t is first difference of share price at period *t*;
SP_t is share price of Sapura Energy Berhad at period *t*, and
SP_{t-1} is share price of Sapura Energy Berhad at period *t*-1

Figure 4 shows the dynamic behaviour of first difference for share price. The maximum value of the first difference is 0.6344 in May, 2013. Meanwhile, the minimum value is -0.7736 in December,2014.

Then, this study validates the normality of data distribution using graphical approach. Figure 5 shows histogram of first difference for share price.The distribution of data is near to normal line. Therefore, the data distribution is follows normal distribution. The second graphical test is using normal probability plot. Figure 6 shows normal probability plot of first difference for share price. The distribution of data is close to normal straight line. This indicates the data distribution follows normal distribution.

Next, this study performed numerical statistical test to evaluate the normality of the data distribution. In this study, we implemented Shapiro-Wilk normality test. Table 1 shows the Shapiro-Wilk normality test for First difference of share price. The significant value is 0.035 that larger than 0.005. Therefore, Shapro-Wilk test concluded the distribution of first difference for share price follows normal distribution.

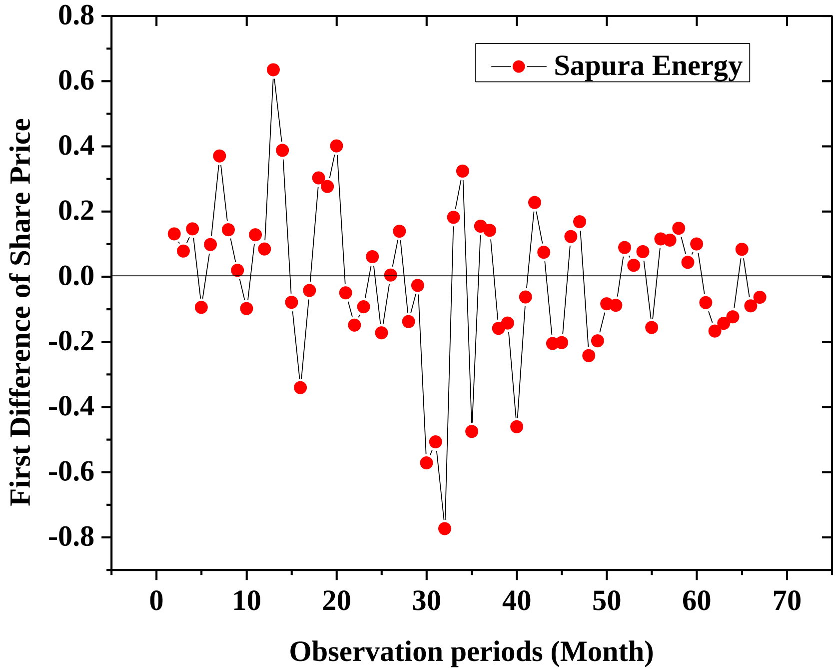


Figure 4: Dynamic behaviour of first difference for share price

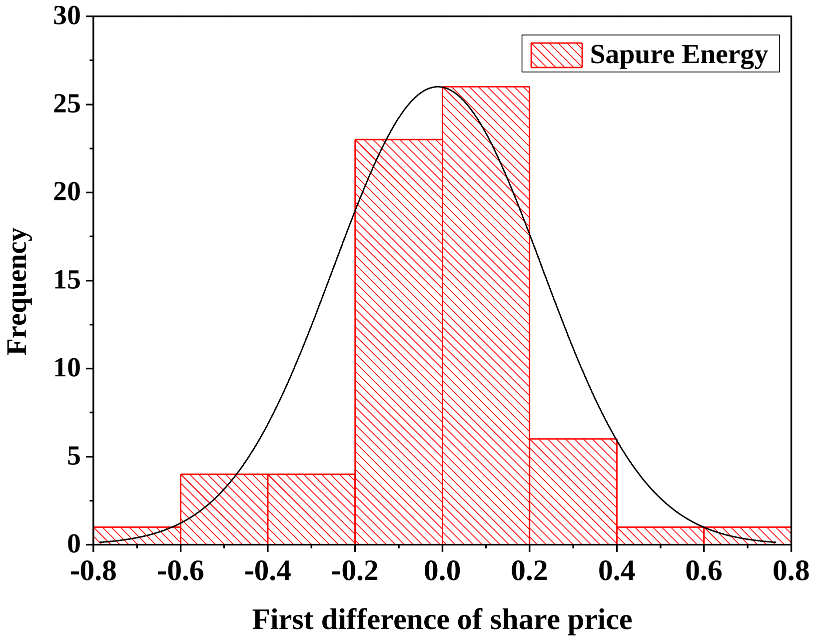


Figure 5: Histogram of first difference for share price

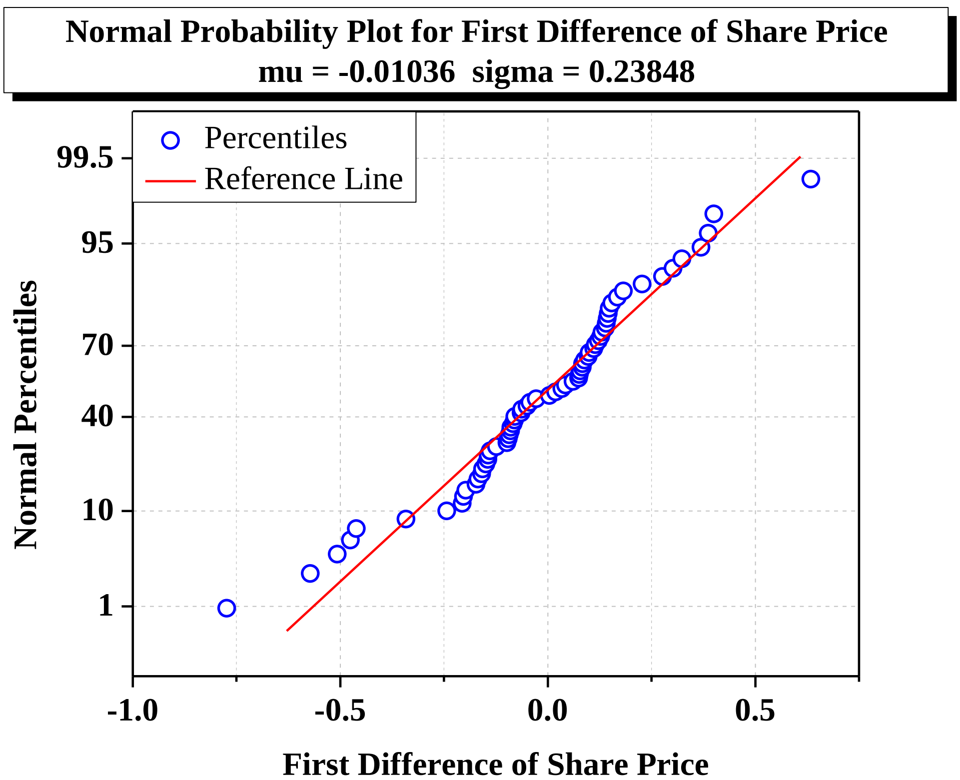


Figure 6: Normal probability plot of first difference for share price

Table 1: Shapiro-Wilk normality test

	Shapiro-Wilk normality test		
	Statistics	Degree of freedom (df)	Significant value
First difference of share price	0.961	66	0.035

4.3 Data stationarity andARIMA model parameter

This section describes the ARIMA model and the parameters. Figure 7 shows the Autocorrelation function (ACF) and partial autocorrelation function (PACF) for the first difference of share price. There is significant spike on autocorrelation function on level one. This result indicates the moving average(MA) is level one.Next, there is a significant spike on partial autocorrelation function of level one. Result indicated the data can be represented by ARIMA(1,1,1).Result also indicates the data of share price with first difference is a stationary data set.

Figure 8 shows the parameter of ARIMA (1,1,1). Therefore, the equation of ARIMA (1,1,1) can be represented by:

$$\Delta SP_t = -0.010040 - 0.537155\Delta SP_{t-1} + 0.859067\varepsilon_{t-1} + \varepsilon_t \tag{9}$$

The R-squared for ARIMA(1,1,1) is 0.1316 and the akaike info criterion is -0.0575.Therefore, this model is considered as a model with good fitness.

Sample: 2012M05 2017M11
Included observations: 66

Lag	AC	PAC	Q-Stat	Prob
1	0.309	0.309	6.6121	0.010
2	-0.073	-0.187	6.9878	0.030
3	-0.103	-0.020	7.7370	0.052
4	-0.004	0.030	7.7385	0.102
5	0.192	0.189	10.461	0.063
6	0.154	0.027	12.224	0.057
7	0.160	0.166	14.180	0.048
8	0.059	-0.001	14.447	0.071
9	0.136	0.199	15.904	0.069
10	0.081	-0.040	16.424	0.088
11	-0.117	-0.140	17.544	0.093
12	-0.183	-0.174	20.338	0.061
13	0.069	0.166	20.743	0.078
14	0.062	-0.202	21.071	0.100
15	0.019	0.031	21.103	0.134
16	0.054	0.039	21.369	0.165
17	-0.135	-0.119	23.050	0.148
18	-0.124	-0.054	24.496	0.139
19	-0.082	0.006	25.134	0.156
20	-0.013	-0.023	25.151	0.196
21	-0.139	-0.151	27.072	0.168
22	-0.091	0.028	27.912	0.179
23	0.070	0.058	28.421	0.200
24	-0.057	-0.083	28.774	0.229
25	-0.141	-0.069	30.956	0.190
26	-0.156	-0.033	33.692	0.143
27	-0.112	-0.001	35.141	0.135
28	-0.135	-0.140	37.290	0.113

Figure 7: Autocorrelation function (ACF) and partial autocorrelation function (PACF) for the first difference of share price

Sample: 2012M06 2017M11
Included observations: 66
Convergence achieved after 104 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.010040	0.036099	-0.278119	0.7818
AR(1)	-0.537155	0.201554	-2.665069	0.0098
MA(1)	0.859067	0.133124	6.453144	0.0000
SIGMASQ	0.048638	0.006175	7.876847	0.0000

R-squared	0.131637	Mean dependent var	-0.010361
Adjusted R-squared	0.089619	S.D. dependent var	0.238480
S.E. of regression	0.227543	Akaike info criterion	-0.057567
Sum squared resid	3.210095	Schwarz criterion	0.075139
Log likelihood	5.899708	Hannan-Quinn criter.	-0.005128
F-statistic	3.132896	Durbin-Watson stat	1.845665
Prob(F-statistic)	0.031778		

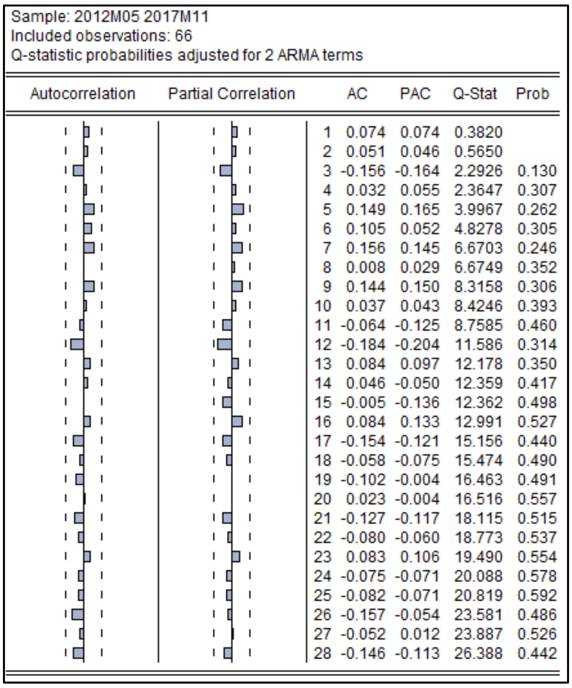
Inverted AR Roots	-.54
Inverted MA Roots	-.86

Figure 8 : Parameter of ARIMA (1,1,1)

4.4 Residual diagnostics checking

This section is for residual diagnostics checking in evaluating the validity of ARIMA (1,1,1) model. Diagnostics checking process is to prove this model adequately describes the time series under consideration by subjecting the calibrated model to a range of statistical tests.

Figure 9 shows the autocorrelation function (ACF) and partial autocorrelation function (PACF) for the residual of ARIMA(1,1,1) model. Result indicates ther is no significant spike.Therefore the residual is considered as white noise. This finding is validated with graphical approach in Figure 10. Figure 10 shows the residual plot for ARIMA (1,1,1). Result shows there is no significant pattern in residual plot. Therefore, the residual is validated as white noise. The model using ARIMA(1,1,1) is a valid model with good fitness.


Sample: 2012M05 2017M11
Included observations: 66
Q-statistic probabilities adjusted for 2 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.074	0.074	0.3820	
		2	0.051	0.046	0.5650	
		3	-0.156	-0.164	2.2926	0.130
		4	0.032	0.055	2.3647	0.307
		5	0.149	0.165	3.9967	0.262
		6	0.105	0.052	4.8278	0.305
		7	0.156	0.145	6.6703	0.246
		8	0.008	0.029	6.6749	0.352
		9	0.144	0.150	8.3158	0.306
		10	0.037	0.043	8.4246	0.393
		11	-0.064	-0.125	8.7585	0.460
		12	-0.184	-0.204	11.586	0.314
		13	0.084	0.097	12.178	0.350
		14	0.046	-0.050	12.359	0.417
		15	-0.005	-0.136	12.362	0.498
		16	0.084	0.133	12.991	0.527
		17	-0.154	-0.121	15.156	0.440
		18	-0.058	-0.075	15.474	0.490
		19	-0.102	-0.004	16.463	0.491
		20	0.023	-0.004	16.516	0.557
		21	-0.127	-0.117	18.115	0.515
		22	-0.080	-0.060	18.773	0.537
		23	0.083	0.106	19.490	0.554
		24	-0.075	-0.071	20.088	0.578
		25	-0.082	-0.071	20.819	0.592
		26	-0.157	-0.054	23.581	0.486
		27	-0.052	0.012	23.887	0.526
		28	-0.146	-0.113	26.388	0.442

Figure 9: Autocorrelation function (ACF) and partial autocorrelation function (PACF) for the residual of ARIMA (1,1,1) model

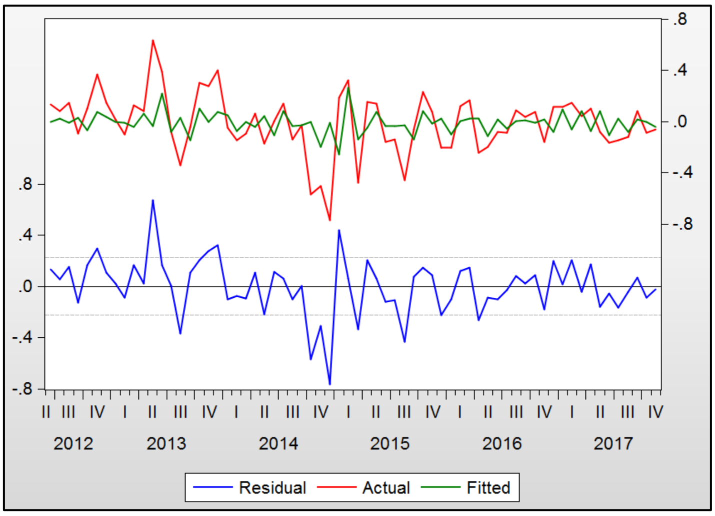


Figure 10 : Residual plot for ARIMA (1,1,1)

4.5 Ex-post data modeling and evaluation

This section decribes regarding validating the ARIMA(1,1,1) using existing data. Figure 11 shows the ARIMA(1,1,1) evaluation for data from June, 2012 until August, 2017. The ARIMA model can be represented by below equation:

$$\Delta SP_t = -0.009349 - 0.146407\Delta SP_{t-1} + 0.520176\varepsilon_{t-1} + \varepsilon_t \quad (10)$$

The fitness of this model is measured using R-squared value and Akaike info criterion. R-squared is a statistical measure of how close the data are to the fitted regression line. It is also known as the coefficient of determination. Meanwhile Akaike info criterion is based on information theory and act as an estimate of the relative information lost when a given model is used to represent the process that generated the data.

Figure 11 shows the R-squared value is 0.127604. Next, the Akaike info criterion is -0.009364. Both of these values indicates the selected ARIMA (1,1,1) is a model with good fitness.

Then, this study validated the error diagnostics for selected data from September 2017 until November 2017. The analysis indicates mean absolute percentage error is 3.752. This value is considered as small range of error. Therefore ARIMA (1,1,1) is a reliable model for forecasting method. Figure 12 shows the forecast value is in the statistical range. Graphical prove shows the ARIMA(1,1,1) is statistically a reliable forecast model.

Sample: 2012M06 2017M08
Included observations: 63
Convergence achieved after 109 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009349	0.040511	-0.230767	0.8183
AR(1)	-0.146407	0.212304	-0.689612	0.4931
MA(1)	0.520176	0.199695	2.604847	0.0116
SIGMASQ	0.050942	0.007612	6.692126	0.0000

R-squared	0.127604	Mean dependent var	-0.009742
Adjusted R-squared	0.083245	S.D. dependent var	0.243589
S.E. of regression	0.233229	Akaike info criterion	-0.009364
Sum squared resid	3.209363	Schwarz criterion	0.126708
Log likelihood	4.294962	Hannan-Quinn criter.	0.044154
F-statistic	2.876624	Durbin-Watson stat	1.981482
Prob(F-statistic)	0.043572		

Inverted AR Roots	-.15
Inverted MA Roots	-.52

Figure 11: Autocorrelation function (ACF) and partial autocorrelation function (PACF) for the residual of ARIMA (1,1,1) model

Table 2: Ex-post forecasting evaluation

Period	Actual share price (A)	Forecast share price (B)	Delta (A-B)	Error percentage(%)
September 2017	1.56286	1.44493	+0.11793	+8.2
October 2017	1.47318	1.43929	+0.03389	+2.4
November 2017	1.40952	1.42940	-0.01988	-1.4
Mean absolute percentage error (MAPE)				3.752

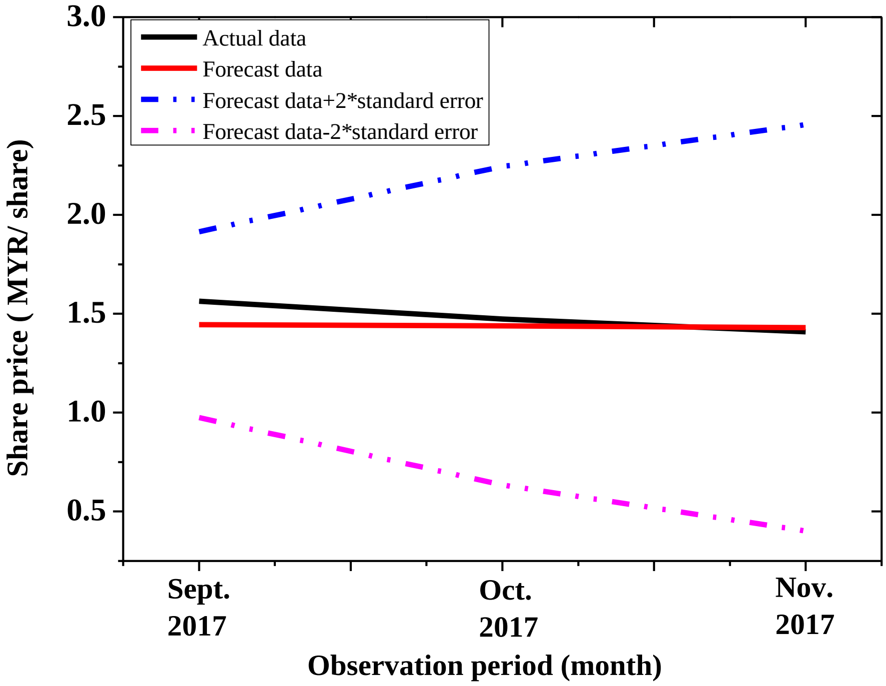


Figure 12: Forecast value of share price in ex-post analysis

4.6 Ex-ante forecasting data

This section describes the ex-ante foreacting data for December 2017, January 2018 and February 2018. Figure 12 shows forecast value of share price in ex-post analysis. The value of share is forecasted as MYR 1.409817 for every share in December 2017. Then, the value in February 2018 is forecasted as MYR 1.387169 for every shareof Sapur Energy Berhad.

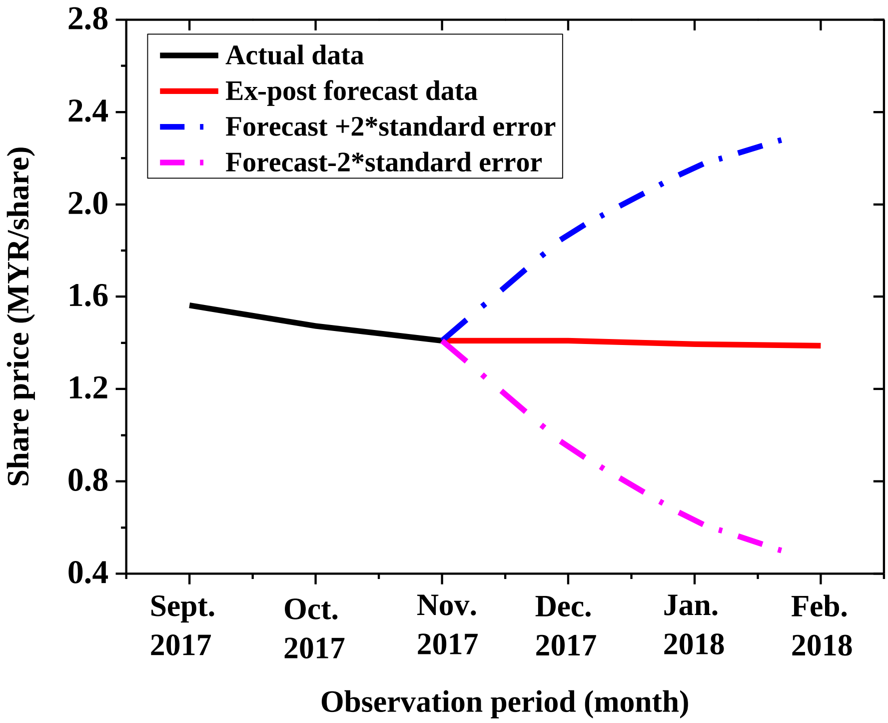


Figure 12: Forecast value of share price in ex-post analysis

5 Conclusion

The objective of this paper is to develop forecasting modelling using autoregressive integrated moving average (ARIMA) model. The selected data in this study is Sapura Energy Berhad that represents Oil and Gas sector that issued initial public offerings in year of 2012. The data recorded in this study is collected using Datastream(Thomson Reuters). Data selected in this study is started from May 2012 until November 2017.The main findings from this study are:

(a) This study evaluate the stationarity of data using autocorrelation function (ACF) and partial autocorrelation function (PCF). ACF analysis shows slow decay of autocorrelation value. Therefore, this result shows the share price data is a non stationary.The non-stationary data ia a variable that possess variance and a mean that does not constant over time.

(b) Next, this study performed the stationary transformation using difference transformation process.This study performed numerical statistical test to evaluate the normality of the data distribution. In this study, we implemented Shapiro-Wilk normality test for first difference of share price. The significant value is 0.035 that larger than 0.005. Therefore, Shapro-Wilk test concluded the distribution of first difference for share price follows normal distribution.In the same time, first difference of share price exhibits stationarity characteristics.

(c) Then, this study performed the analysis to describes the ARIMA model and the parameters. The Autocorrelation function (ACF) and partial autocorrelation function (PACF) performed for the first difference of share price. There is significant spike on autocorrelation function on level one. This result indicates the moving average(MA) is level one.Next, there is a significant spike on partial autocorrelation function of level one. Result indicated the data can be represented by ARIMA(1,1,1).

(d) Data selected for this study can be represented using equation of ARIMA (1,1,1) .

$$\Delta SP_t = -0.010040 - 0.537155\Delta SP_{t-1} + 0.859067\varepsilon_{t-1} + \varepsilon_t$$

The R-squared for ARIMA(1,1,1) is 0.1316 and the akaike info criterion is -0.0575.Therefore, this model is considered as a model with good fitness.

(e) Then,this research performed ex-post analysis. This study validated the forecasting error for selected data from September 2017 until November 2017. The analysis indicates mean absolute percentage error is 3.752. This value is considered as small range of error. Therefore ARIMA (1,1,1) is a reliable model for forecasting method.

(f) Finally, This section describes the ex-ante foreacting data for December 2017, January 2018 and February 2018. The value of share price is forecasted as MYR 1.409817 for every share price in December 2017. Then, the value in February 2018 is forecasted as MYR 1.387169 for every share of Sapur Energy Berhad.

The findings of this study will help investors to evaluate and forecast the performance of oil and gas sector in Malaysia. This study will help investors to manage and make their investment decision to increase profit and reduce the loss in investment. In addition, the findings from this study will help economists to evaluate the current economic condition of oil and gas in Malaysia. Then, preventive action can be implement to secure a good level of economic condition in Malaysia.

The further research of this study can be extending to examine the determinant factors that contributes to the dynamic behaviour of oil and gas sector in Malaysia. This study suggests to evaluate the correlation between world crude oil price with the share price movement.

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