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FORECASTING MAXIS STOCK PRICE USING BOX-JENKINS METHODOLOGY

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1. Introduction

The Malaysian economy is significantly shaped by the telecommunications sector. One of the first providers of mobile communications in Malaysia, Maxis was founded in 1995. The business, which was among the first to offer 4G services in 2013, is constantly updating its business strategy. Maxis is the market leader in this space as its 4G service is available to 15% of Malaysia's population. Maxis Berhad is a Malaysian investment holding company that owns the Maxis Group, which is a telecommunications company (Ullah, 2021.). The company's primary business activities include mobile prepaid and post-paid services, fixed line services, network facilities, other convergent telecommunications, digital and related services, such as fixed wireless internet broadband services (Taghizadeh et al., 2014).

In the second quarter of 2021, Maxis Berhad generated a net profit of RM360 million as compared to RM342 million the year before. Due to increasing contributions from the post-paid and fibre sectors, the telecommunications business reported in a filing to Bursa Malaysia that revenue grew 5.3 percent to RM2.26 billion from RM2.15 billion earlier (Maxis, n.d). Maxis may accomplish this by employing forecasts to support the market's continued stability and profitability. Forecasts are crucial for all firms as they allow for the creation of data-driven strategies and the ability to make wise business decisions (Constangioara et al., 2009) . The stock market and the economy usually operate in sync. Therefore, a strong stock market usually indicates that the economy is expanding. Predicting stock prices is important for achieving a rising stock market, as companies affect not only the stock market but also their position in the industry (Gayathri & Kalaivani, 2014). As a result, a precise stock price projection is necessary to entice additional investors to invest in the company. Consequently, it is crucial to complete this investigation in order to identify the best model for predicting Maxis stock prices. The investing.com website was used to retrieve the monthly opening stock price from May 2019 to October 2021. The data is used to assess and predict the opening stock values from November 2021 to October 2022.

2. Box-Jenkins Methodology

Box-Jenkins's method is a widely used process to find out the best model for time series data. The term ARIMA is in the short, stands for the combination that comprises the Autoregressive Integrated Moving Average, model. The model, thus, obtained is represented in a general term as ARIMA (p, d, q) where the symbol 'd' denotes the number of times the variable stock prices need to be differenced to achieve stationary.

A simple model ARIMA (1,1,1) can be written as,

$$w_t = \mu + \phi_1 w_{t-1} - \theta_1 \varepsilon_{t-1} + \varepsilon_t \tag{1}$$

where $w_t = y_t - y_{t-1}$ represents the first difference of the stock price and is assumed stationary. In equation (1), the values of $p = 1$, $d = 1$ and $q = 1$. The values of p and q were the number of significant spikes in the Partial Correlation Function (PACF) and Autocorrelation Function (ACF), respectively.

Under Box-Jenkins methodology, the ARIMA model behaves on the assumption which the data series is stationary. When a data series is stationary, it means that it does not experience increase or fall over time, and vice versa for non-stationary data series (Palachy, 2019). If the assumption was false, it was crucial to carry out the necessary steps to transform the data and achieve stationarity before using ARIMA. A simple procedure for eliminating non-stationary is by performing differencing.

To reduce the likelihood of choosing the incorrect model structure during the model identification step, it was worthwhile to take a few viable models into consideration. The common statistical measures used to validate the best ARIMA models are the Akaike's Information Criteria (AIC) and the Bayesian Information Criteria (BIC). The lower the value of AIC and BIC, the model is said to be the best ARIMA model (Hyndman, 2018). Finally, the best model is selected based on the results of comparing their respective measures in which the model that produced the smallest value of Root Mean Square Error (RMSE). The model is ready to be used for forecasting when all criteria are fulfilled, and the model is significant.

3. Result and Discussion

The application of the Box-Jenkins lies in the assumption that the data series is stationary. A series of Maxis stock prices are stationary after taking the first order of differencing on the data set. The Augmented Dickey-Fuller test has a probability value of 0.000 which is less than 0.05, Hence, the series has been stationary after the first differencing. After a stationary condition has been achieved, the order of $d = 1$ for the ARIMA ($p, 1, q$) model. The next stage is to perform the model identification. The number of significant spikes that are near to the standard error line are depicted in Figure 1.
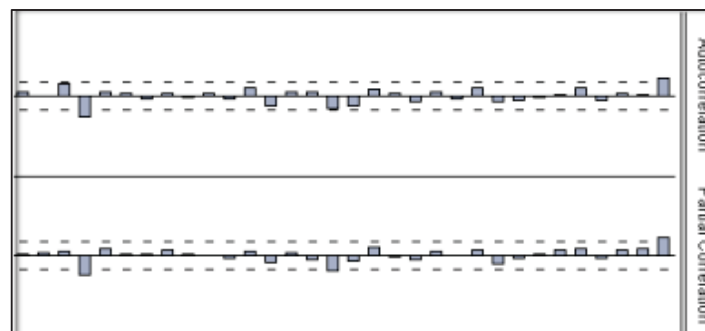

Figure 1: Correlogram After First Differencing

The following three models have been identified and estimated using EViews software. The models are ARIMA (2,1,2), ARIMA (2,1,1), and ARIMA (1,1,1). To choose the best ARIMA model, some statistical measures were applied.

Table 1. Comparison between ARIMA models.

Model	AIC	BIC	RMSE
ARIMA (2,1,2)	0.2158	0.3836	0.1655
ARIMA (2,1,1)	0.1950	0.3348	0.1651
ARIMA (1,1,1)	0.1754	0.2872	0.1650

This study used the AIC, BIC, and RMSE values used to rank the best of the three eligible ARIMA models. Based on Table 1, ARIMA (1,1,1) was selected as the best model because of its lowest AIC, BIC, and RMSE values compared to other models. The model then, was used to forecast the monthly opening stock price from November 2021 to October 2022 as shown in Figure 2.
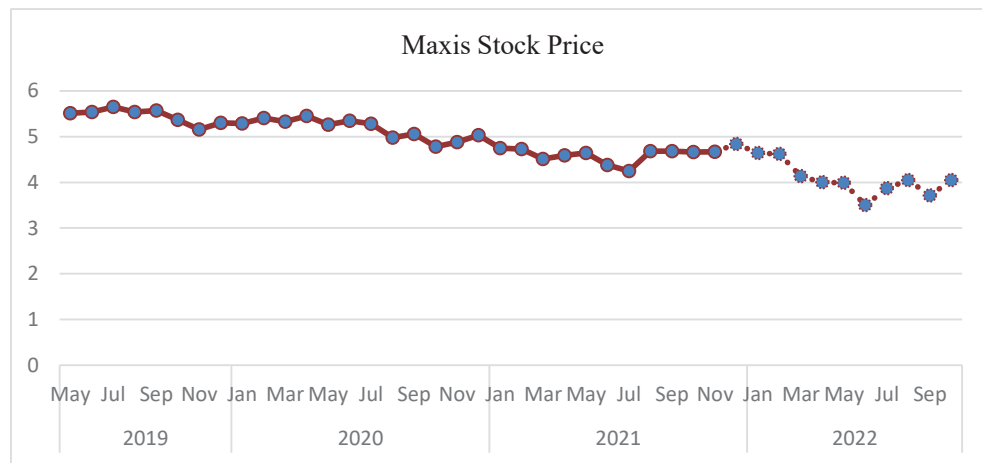

Figure 2. Graph for forecast stock price (Nov-21 to Oct-22).

Figure 2 shows a decreasing on forecast price for Maxis Stock Price from November 2021 until October 2022. The stock price the has been on a downward trend, hitting a low point of RM3.70 per unit in June 2022. The 12-months forecast is projected to help the company in planning and estimating the financial strategy.

4. Conclusion

An ARIMA model in Eq. 1 and differencing have been developed to forecast the monthly opening stock price of Maxis Berhad. In conclusion, ARIMA (1,1,1) is proposed as the best predictive model. From November 2021 to October 2022, the predicted price for the Maxis Stock Price is dropping. Based on Bakar and Rosbi (2020) article, the outbreak of COVID-19 has created problems among equities market investors. Therefore, the stock price indicated a greater decrease in value. Future researchers may use this research as a reference to improve the model accuracy and apply it to the other timeseries data.

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