CHAPTER 2

LITERATURE REVIEW

2.1 Overview

As explained in the last chapter, forecasting is an extremely important tool for effective planning, particularly in economics and business organizations where decision-making is very important. By using time series forecasting methods such as the Auto-Regressive Integrated Moving Average (ARIMA), Seasonal-ARIMA, Holt-Winters, and Single Exponential Smoothing, the zakat institutions responsible for collecting zakat can indicate a reasonable target for future zakat collection. They can also plan to distribute zakat based on their goals. Moreover, the information supplied indirectly increases the efficiency of handling zakat collection.

In this chapter, the different types of forecasting models have been introduced and explained. Other than that, a literature foundation on the study is reviewed based on literature studies.

2.2 Application of forecasting method in zakat collection from previous studies

Various studies have shown that ARIMA and Holt's Exponential Smoothing (HES) are better predictive models in forecasting zakat collection than econometric or other time-series models. The research shall include, Akbarizan et al. (2016) that shows that Holt's exponential smoothing is best suited for zakat time series data and is therefore ideal for zakat collection prediction. Because of its minor differences in mean

absolute percentage error and mean square error, HES has similar predictive power as the ARIMA method. In addition, these models can be used to help zakat management based on the number of mustahiq (zakat payer) registered.

Md Razak et al. (2013) study showed concern about the trend in the collection of zakat from Pusat Zakat Melaka (PZM) by using Polynomial Model, Exponential Model, and Discrete Malthusian Growth Model. Then, the Discrete Malthusian Growth Model is the best model to be used for the prediction of the total collection for the following years, since it has the smallest sum square error (SSE) compared to the other two models. The models are more effective for zakat institutions in predicting future trends of zakat collection and consequently can be used for zakat allocation planning for eligible asnaf.

Ahmad Ubaidillah and Sallehuddin (2013) discussed on forecasting model for Pusat Zakat Pahang (PZP) to estimate more accurately the total amount of zakat collection. Two different Artificial Neural Network (ANN) models are developed using two different learning algorithms which are Back Propagation (BP) and Levenberg-Marquardt (LM). In terms of their accuracy, both models are built and compared. The best model is determined by the lowest mean square error. The BP neural network is recommended as a forecasting model for forecasting the zakat collection for PZP. Since accurate forecasting improved the management of the zakat institution, the study suggests that research should be done on how to obtain a more accurate forecasting model by hybridizing the ANN model with other models such as ARIMA, Regression, and so on.

Ilyas et al. (2017) mentioned the forecast and compared the yearly zakat collection of Indonesia, Malaysia and Brunei in 2014. The study uses Holt's exponential smoothing, and single exponential smoothing (SES) model to forecast the countries zakat collection for Indonesia, Malaysia, and Brunei. The study found that Holt's model performs better than the SES model because the data observed a trend but no seasonality. However, the SES model is the best model for characteristic data with constant level and no seasonality like the zakat collection in Brunei. Hence, the zakat institutions can put a reasonable target for the zakat collection to be obtained in the future.

Al Parisi (2017) made an exhaustive that there are various forms of zakat schemes used in Muslim countries. Indonesia uses a voluntary zakat scheme that could have an effect on the amount of zakat received. The results of this study are intended to educate policymakers on the management of the collection of zakat.

The issue of a surplus of zakat funds (tawaqquf) that are not allocated to eligible recipients has been debated among the public, academics, and zakat institutions but few studies have been carried out to examine the issue empirically. Therefore, Saad et al. (2016) identified factors that lead to zakat surplus and examine the current practice of Malaysian zakat institutions in managing the zakat surplus fund. Data was collected through semi-structured interviews and documentation review. First, this study finds that there are three main factors that lead to zakat surplus which are unmatched amount of zakat collection and zakat distribution, late zakat payment, and difficulty in identifying eligible zakat recipients. Secondly, evidence suggests that the common way used by zakat institutions to manage the zakat surplus is by investing the surplus in short to medium-term investment. Kahf (1999) mentioned Amil who had been hired and immediately dispersed all the zakat funds after they had been collected leaving no

surplus or balance. It seems that the zakat funds collected were rapidly and efficiently distributed to the recipients in the era of Prophet Muhammad (PBUH). Zainal et al. (2016) reported that when zakat surplus no longer exists in society, poverty decreased in Malaysia, which coincided with a crime reduction.

2.3 Application of ARIMA forecasting method from previous studies in other area

The ARIMA model has been used to forecast in a variety of fields, including medical research, macroeconomic variables, commodity price, weather, stock price and tourism arrival. According to Anokye et al. (2018), the time series model developed to estimate the number of monthly cases of malaria incidence in the Kumasi Metropolis was ARIMA (1, 1, 2) while the quadratic model was used to forecast the half-year malaria incidence . This means that ARIMA (1, 1, 2) can be used as a predictive model to estimate future values of a sequence based entirely on its inertia. However, this should be updated with the incorporation of current data from time to time. Benvenuto et al. (2020) discussed about Auto Regressive Integrated Moving Average (ARIMA) model prediction on the Johns Hopkins epidemiological data to predict the epidemiological trend of the prevalence and incidence of COVID-2019.

The ARIMA model was also applied to macroeconomic variables such as the consumer price index (CPI), inflation, Foreign Direct Investment (FDI) and exchange rates. Ahmar et al. (2018) predicted the future of for the Indonesian consumer price index (CPI) after applying various diagnostic tests the ARIMA model with (1,0,0) was obtained in the study concerned to be the best fitting models. Nyoni (2018) were

concluded and finalized that the ARIMA model with (1,1,1) was obtained as optimal model to forecast Foreign Direct Investment (FDI).

The ARIMA model was also applied to commodity price such as rice, gold and so on. Ohyver and Pudjihastuti (2018) utilized ARIMA model to forecast the value of the rice price. The study expected a rise in price patterns in the future. The implication of such study allowed our government to get a picture of the rice price situation in the state so that they can make a good decision about the future. Bandyopadhyay (2016) This study focused on the World Gold Council's gold price figures from July 2013 to June 2018, with the objective of forecasting and analyzing the daily gold price of USD in the first half of July 2018 using the ARIMA model. The results show that ARIMA (3, 1, 2) is the best model for predicting the USD gold price. The ARIMA Model's estimated outcomes are important for people to understand the efficiency of gold prices and make wise investment decisions.

Graham et al. (2017) used Box –Jenkins methodology to obtain a best fit ARIMA model to forecast rainfall for Allahabad region using time series observations for the period 1985 to 2015. A mean error in absolute percentage terms was used to find the efficacy of the model. Seasonal ARIMA model (0, 0, 0) (0, 1, 0) for rainfall was identified the best model to forecast rainfall for next 5 years with confidence level of 95 percent. Yatiyana et al (2018) studied hybrid ARIMA-based forecasting method to adopt more seasonal and trend-setting changes. A single model for combining wind speed and direction can also be built to improve the accuracy of power forecasting, as has been explored in future.

Qonita et al. (2017) observed that ARIMA is a feasible method of predicting the value of rupiah against the US dollar, where the study results indicated that the rupiah

exchange rate against the dollar decreased slightly for 30 days as of June 25, 2016. Nyoni et al. (2019) used two forecasting models namely Autoregressive Integrated Moving Average (ARIMA) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) time series method to predict inflation rates in Nigeria from 1960 to 2016. The study concluded that the ARIMA (1,0,2) model could be used precisely to forecast inflation. Ghosh (2017) used the Autoregressive Integrated Moving Average (ARIMA) to forecast short run cotton exports for five period ahead in India using 63 monthly observations. Because it has two parameters and follows the principle of parsimony, the model ARIMA (1,1,0) is chosen.

Madhavi (2018) forecasted the return values of S&P Bombay Stock Exchange (BSE) Sensex index. The Auto Regressive Integrated Moving Average (ARIMA) method is used to forecast the future returns. Different investors can choose stock based on companies return expectations based on the forecasting analysis. Zhang and Sun (2018) utilized ARIMA model to predict the daily closing price of CSI 300 stock index futures. This study presents a trading strategy based on the model's prediction results. The profit margin for the operation strategy is high, indicating that the trading strategy's impact is positive.

Petrevska (2017) forecasted international tourism demand in F.Y.R. Macedonia using ARIMA. The study concluded that the best model is ARIMA (1,1,1). According to the findings, international tourist arrivals are expected to increase by 13.9 percent by 2018. The chosen model's forecasted values can help mitigate any potential negative effects as well as develop a tourism development plan for the country.

2.4 Application of Exponential Smoothing forecasting method from other areas.

The Exponential Smoothing model has been used to forecast in a variety of fields, including tourist arrivals, agriculture, commodity price and medical research. Jere et al. (2019) studied extensively on annual international tourist arrivals in Zambia from 1995 to 2014. The Auto-Regressive Integrated Moving Average (ARIMA) and Holt Winters exponential smoothing (HWES) models were evaluated in this study. The HWES (α = 1, β = 0.1246865) showed smallest error than those of the ARIMA (0, 1, 2) models. Hence, the HWES (α = 1, β = 0.1246865) can be used to model annual international tourist arrivals in Zambia. Safitri et al. (2017) predicted the future of the number of foreign tourist arrivals to Bali Ngurah Rai through the 2010-2015 entrance after applying various models. The exponential Holt-Winters smoothing is the best method for forecasting because it produces a smaller MAPE value. Roshan and Jahufer (2018) used Holt- Winter's Method and Seasonal Autoregressive Integrated Moving Average (SARIMA) method to forecast tourist arrivals in Sri Lanka. ARIMA(2, 1, 3) $(1, 0, 0)_{12}$ is the best model to sketch and forecast the monthly tourist arrival pattern in Sri Lanka because it has the least RMSE and MAD and satisfies the model assumptions to a very precise extent. Lwesya and Kibambila (2017) forecasted the tourist arrivals in Tanzania using the Seasonal ARIMA and Exponential Smoothing methods. This indicates that the Holt-Winters multiplicative smoothing method with Alpha (0.01), Delta (0.11), and Gamma (0.11) is more effective in forecasting tourist arrivals in Tanzania in the short term and can be used to aid tourism planning processes.

Li et al. (2021) found a Holt-Winters Model to predict the gross output value of Guangxi's agriculture and forestry from the 1st quarter of 2012 to 2nd quarter of 2020. Finally, data from the first quarter of 2012 to the second quarter of 2020 is used to fit

and forecast the gross output value of Guangxi agriculture and forestry in the coming two years. Sabu and Kumar (2020) examined different forecasting techniques for the price of arecanuts in Kerala. The SARIMA, Holt-Winters Method and the Long Short-Term Memory (LSTM) neural network were used in this study. The best model that fits the data was found to be the LSTM neural network model. Ardie, Mukhtar, Santosa, Sholih & Nana (2021) pointed out that the Autoregressive integrated moving average (ARIMA) model is the most widely used model for forecasting time series. It aims to forecast corn production and consumption in Indonesia for the next five years (2018-2022), as well as the implications for Indonesia's corn self-sufficiency. According to the findings, Indonesia has a corn surplus until 2022, which the government must be able to maintain. Thitima and Apidet (2017) used three forecasting methods namely Simple Double and Triple Exponential Smoothing to predict future lime price in Thailand. the Simple Exponential Smoothing (SES) and the Double Exponential Smoothing (DES) methods with designed input data show a smaller Mean Absolute Percentage Error MAPE.

Siregar, Butar-Butar, Rahmat, Andayani and Fahmi (2016) mentioned that the use of Double Exponential Smoothing method to predict future palm oil production is not appropriate because the observation data has a seasonal component. Forecasts for the data containing seasonal components should be solved by using the method of Triple Exponential Smoothing. Silitonga, Himawan & Damanik (2020) forecasted the number of new student admissions in a study program at a university by using the double exponential smoothing method. The best forecasting value is obtained using the parameters $\alpha = 0.8$ and $\beta = 1$, with a Mean Percentage Error (MPE) value of 0.1172. Suppalakpaya, Nikhom, Apidet & Thitima (2019a) and (2019b) studied extensively on

several exponential smoothing methods for forecasting crude palm oil productions in Thailand. The study also indicates that both the Additive Holt-Winters (AHW) and the Extended Additive Holts-Winters (EAHW) methods significantly show accurate forecast results when 12-year input data are applied. The study shows that the EAHW method forecasts crude palm oil production and prices with reasonable accuracy. Karadas, Celik, Eyduran & Hopoglu (2017) discussed on forecasting annual production of some oil seed crops (sesame, sunflower and soybean) in Turkey. They used Holt exponential smoothing method with two parameters, which yielded the best result among exponential smoothing methods. The forecasting results obtained are expected to serve as a useful reference for both farmers and policymakers in the future.

However, the literature shows that there is no single model which consistently outperforms other models in all situations. Therefore, this study seeks to compare the ARIMA and Holt-Winters model to arrive at the best method that can be used for forecasting the collection of zakat in the particular zakat institutions in Malaysia.