Dynamic Forecasting of Government Foreign Debt: Case of Indonesia

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Abstract

This study aims to forecast the value of the Indonesian government foreign debt in 2020-2024. The secondary data of time series during the period of 2010-2019 on Indonesian government foreign debt are used as the basis of forecasting for the next five years by using ARIMA (Autogressive Integrated Moving Average). The results show that the selected ARIMA models for forecasting are ARIMA (3,1,3) after the unit root test is carried out and 16 ARIMA models are tested. The value of government foreign debt is predicted to keep increasing from 2020 to 2024 amounted to USD 253.01. Then, compared to government debt in January 2010, within 11 years, government foreign debt is predicted to rise by 169.6%.

Key words : Debt Ratio to GDP, Foreign Debt, Indonesian Government, ARIMA Model, Unit Root Test

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INTRODUCTION

The need for development programs in Indonesia is increasing every year. Consequently, the government should provide sufficient funding to finance all programs for improving people's welfare. To finance the activities, the government has two main sources; taxation and debt issuance for example through government bonds (DiPeitro & Anoruo, 2012). Government debt is closely related to government expenditure and tax revenue (Chatterjee, et al, 2019). Meanwhile, the tax revenues, most of the time, are not in line with what has been targeted causing the government to take debt as the only option.

Charles & Shon (2018) stated that each year, the central and regional governments collect funds for capital projects. However, it is in letting debt grow out of control. Chronic budgeting and funding problems in a country, including huge investments in large infrastructure and increased social spending will lead to greater dependence on foreign loans (Strizzi & Kindra, 1998).

In the beginning of 1980s and 1990s, many the emerging markets had extremely high amounts of foreign debt and the possibility of default (Choi & Luo, 2019). Culpeper & Kappagoda (2016) state that the impact of the financial crisis in many Asian countries in the late 1990s raised awareness about issues on the accumulation of domestic debt, short-run debt and private debt that are not guaranteed. Asian countries especially Southeast Asia have been piling up for foreign loan causing a degree of vulnerability due to foreign debt crisis.

The emergence of government debt indicates the existence of the most extraordinary modern financial developments, then the government can increase their resources with credit (García, 2008). De Luca (2008), in a means of

redistribution and strengthening assets, investing in public debt is carried out. Public debt allows the government to invest in areas that are considered important for the economy due to the inadequate tax revenue to finance the project (Ncanywa & Masoga, 2018). The purpose of public debt is to stimulate economic sectors by investing funds from foreign investors in domestic economic activities (Mhlaba & Phiri 2019). A large amount of foreign debt was caused by funding various government programs such as the industry, energy, transportation, communication, education and agriculture sectors (Jilenga, et al, 2016).

Ricardian equivalence theory states that the issuance of public debt today is basically the same as tax collection in the future (Odom, 2018). If the public debt is forced by the government today, future generations will bear the burden of the debt. To pay the tax burden in the future, consumers will reduce consumption in the present (Mosikari & Eita, 2017). Odom (2018) states that if public debt will be beneficial if used carefully, it can result in the transfer of wealth from the future to the present. A study from Martinez (2015) makes comparisons of annual forecasting for the next one year and the next five years from government agencies for US federal debt and gross deficits.

Indonesia is a developing country having considerable foreign public debt. A country's debt problems can be seen from the ratio of debt to GDP. Indonesia's debt ratio tends to increase significantly from 2010 until the second quarter of 2019. It is reported that the debt ratio reached 26.55% in 2010, and then it decreased to 25.03%. In 2017, its increase reached 27.41% and continued to rise by 36.79% until the second quarter of 2019. According to Žaja, et al (2018), the government's gross debt to GDP should not be higher than 60%, and in fact, Indonesia's debt ratio is still below 60% of GDP. However, with the tendency of increasing debt value, anticipation should be made related to the

ability to pay off the debt. The condition of the increasing debt to GDP ratio occurs in many countries. The ratio of public debt to GDP in Asia tends to increase after 2010 (Bui, 2019).

The Central Bank of Indonesia divides the classification of borrowing groups into two groups, namely the government (including the central bank) and the private sector. The value of the Indonesian government debt rises every year from 2010 to 2019. According to data from the Central Bank of Indonesia, in 2010, Indonesia's debt amounted to USD 106.86 billion. Then, at the end of 2019, Indonesia's total debt grew 46.35% to USD 199.17 billion.

The increasing foreign debt of the Indonesian Government has been caused by a deficit of the Indonesian State Budget in the past 10 years. Average of the Indonesian State Budget's deficit is 1.9% during the period of 2010-2019. In fact, the budget deficit in GDP must not exceed 3% at the end of the previous fiscal year (Žaja et al, 2018). Budget deficits and surpluses are associated with an increase or a decrease of public debt. Thus, if the government has a budget deficit, it will take loan equal to the amount of the deficit (Apergis & Apergis 2019).

Although there is a concern about the failure in paying off the debt, productive foreign debt which is rightly targeted and efficient can provide a stimulus for the economic condition. Ramzan & Ahmad (2014), state that to smitulates economic growth with infrastructure and human capital resources, development in the developing countries can be financed by the foreign debt. The increase of the debt ratio to GDP and the value of government debt is the main problem in this study. Consequently, estimating or forecasting government debt can be a significant step in anticipating uncontrolled debt. Therefore, the purpose of this research paper is to forecast the value of Indonesian government foreign debt over the next five years from 2020 to 2024. The paper is structured as follows. Section 2 provides a literature review on government foreign debt. The third offers details on data and methodology, the the fourth secation provides results and discussions. The last section provides conclusion and the policy recommendations.

METHOD

This study uses secondary data which are the data of government debt and the state budget deficit. Government debt data are obtained from the Indonesian Financial Economics Statistics (SEKI) of Bank Indonesia, while the state budget deficit data are collected from the Ministry of Finance. The range of data from 2010-2019 is the basis for forecasting government debt during the period of 2020-2024. To forecast correctly, the ARIMA (Autoregressive Integrated Moving Average) Model is applied.

Jadevicius & Huston (2015) defined ARIMA Model as an econometric specification that combines autoregressive (AR) p, d-th difference, and moving average (MA) q. The AR component of the specification implies that the future value of the time-series can be estimated and predicted from the current and past values of the time-series. The MA component considers the current and past effects of random shock.

The basic equation of the AR framework is as follows (Jadevicius and Huston, 2015; Stevenson, 2007; Al-Shiab, 2006; Balli and Mousa Elsamadisy, 2012):

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + ... + \beta_p Y_{t-p} + e_t \qquad (1)$$

Where; Y_{t-1} dependent variable; $Y_{t-1}, Y_{t-2}, Y_{t-p}$ independent variables of the lag (lag) of the dependent variable; e_t error term; p, AR level.

The basic equation of the MA framework is written as follows (Jadevicius & Huston, 2015; Al-Shiab, 2006; Balli & Mousa Elsamadisy, 2012):

$$Y_t = \beta_0 + \beta_1 e_{t-1} + \beta_2 e_{t-2} + ... + \beta_q e_{t-q} + e_t \qquad (2)$$

where; e_{t-1} is dependent variable; e_{t-1}, e_{t-2}, e_{t-3} ; independent variable of lags (lag) of the dependent variable; e_t error term ; q, MA level

The ARIMA model combines the AR and MA models in the following equations (Jadevicius & Huston, 2015; Stevenson, 2007; Al-Shiab, 2006; Iskandar, et al, 2018; Balli & Mousa Elsamadisy, 2012):

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + ... + \beta_p Y_{t-p} + e_t + \beta_1 e_{t-1} + \beta_2 e_{t-2} + ... + \beta_q e_{t-q} + e_t \qquad (3)$$

RESULTS AND DISCUSSION

Table 1. Unit-root test results at Level

Series	ADF	PP
Monthly data Government debt	0.579517 (Prob. 0.9936) (-3.488063)* (-2.886732)* (-2.580281)*	0.792749 (Prob. 0.9936) (-3.488063)* (-2.886732)** (-2.580281)***

Note : * critical value α 1 %, ** critical value α 5% , *** critical value α10 %

The initial step in using the ARIMA model is to test stationarity (Jadevicius & Huston 2015) and the unit-root test is applied. Table 1 shows the unit-root test results for the government debt data series at the level. It shows that the data series is not stationary on the level using test types of Augmented Dickey-Fuller (ADF) and Philips-Perron (PP).

Table 2 demonstrates that the data series of government debt have already had stationary at level 1 based on unit-root tests using Augmented Dickey-Fuller (ADF), and Philips-Perron (PP) with a probability of both 0.000 at first difference

Table 2. Unit-root test results on First Difference

Series	ADF	PP
Monthly Data Government Debt	-11.11191 (Prob. 0.0000) (-3.488585)* (-2.886959)** (-2.580402)***	-11.14034 (Prob. 0.0000) (-3.488585)* (-2.886959)** (-2.580402)***

Note : * critical value α 1 %, ** critical value α 5% , *** critical value α10 %

The next step is to estimate the ARIMA model by considering the coefficient of determination (R2) and Akaike Info Criterion (AIC), t-statistics and probability by using the 16 ARIMA models as in table 3.

Table 2 indicates 3 ARIMA models that can be considered as the best model, namely ARIMA (1,1,1), ARIMA (3,1,3) and ARIMA (4,1,4). Based on the coefficient of determination R2, the ARIMA model (4,1,4) is the best among the other two ARIMA models. However, from the AIC value, the ARIMA model (3,1,3) is recommended as the best model. In addition, both AR and MA variables in the ARIMA model (3,1,3) are significant at α5%. Therefore, the ARIMA model (3,1,3) is used to forecast government debt for the next 60 months from 2020 to 2024.

Table 3. Statistical Estimation of the ARIMA Fit Model

ARIMA Model	R²	AIC	t-statistics	Prob.
1,1,1	0.037209	0.037209	-8.884952 (AR1)	0.0000** (AR1)
			0.003873 (MA1)	0.9969 (MA1)
1,1,2	-0.129397	46.15777	-0.395773 (AR1)	0.6930 (AR1)
			-1.536618 (MA2)	0.1272 (MA2)
1,1,3	0.015648	46.03789	-0.358807 (AR1)	0.7204 (AR1)
			0.988729 (MA3)	0.3249 (MA3)
1,1,4	0.010225	46.04345	-0.481736 (AR1)	0.6309 (AR1)
			-0.982440 (MA4)	0.3280 (MA4)
2,1,1	0.021735	46.03177	-1.373936 (AR2)	0.1722 (AR2)
			0.430759 (MA1)	0.6675 (MA1)
2,1,2	0.022663	46.03088	0.035771 (AR2)	0.9715 (AR2)
			-0.288039 (MA2)	0.7739 (MA2)
2,1,3	0.032098	46.02131	-1.304483 (AR2)	0.19480 (AR2)
			0.949329 (MA3)	0.3445 (MA3)
2,1,4	0.025330	46.06696	-1.308303 (AR4)	0.1935 (AR4)
			-0.810837 (MA4)	0.4192 (AR4)
3,1,1	0.022117	46.03157	1.459678 (AR3)	0.1472 (AR3)
			-0.339441 (MA1)	0.7349 (MA1)
3,1,2	0.039024	46.01437	1.384682 (AR3)	0.1689 (AR3)
			-1.367855 (MA2)	0.1741 (MA2)
3,1,3	0.057849	45.99645	5.679329 (AR3)	0.0000** (AR3)
			-3.981887 (MA3)	0.0001**(MA3)
3,1,4	0.025900	46.02784	1.438467 (AR3)	0.1531 (AR3)
			-0.771148 (MA4)	0.4433 (MA4)
4,1,1	0.0009906	46.04370	-0.838680 (AR4)	0.4035 (AR4)
			-0.641256 (MA1)	0.5227 (MA1)
4,1,2	0.025071	46.02846	-0.555633 (AR4)	0.5796 (AR4)
			-1.332919 (MA2)	0.1853 (MA2)
4,1,3	0.019456	46.03417	-0.743157 (AR4)	0.4590 (AR4)
			0.969470 (MA3)	0.3344 (MA3)
4,1,4	0.097660	45.99806	5.373160 (AR4)	0.0000**(AR4)
			-0.003461 (MA4)	0.9972 (MA4)

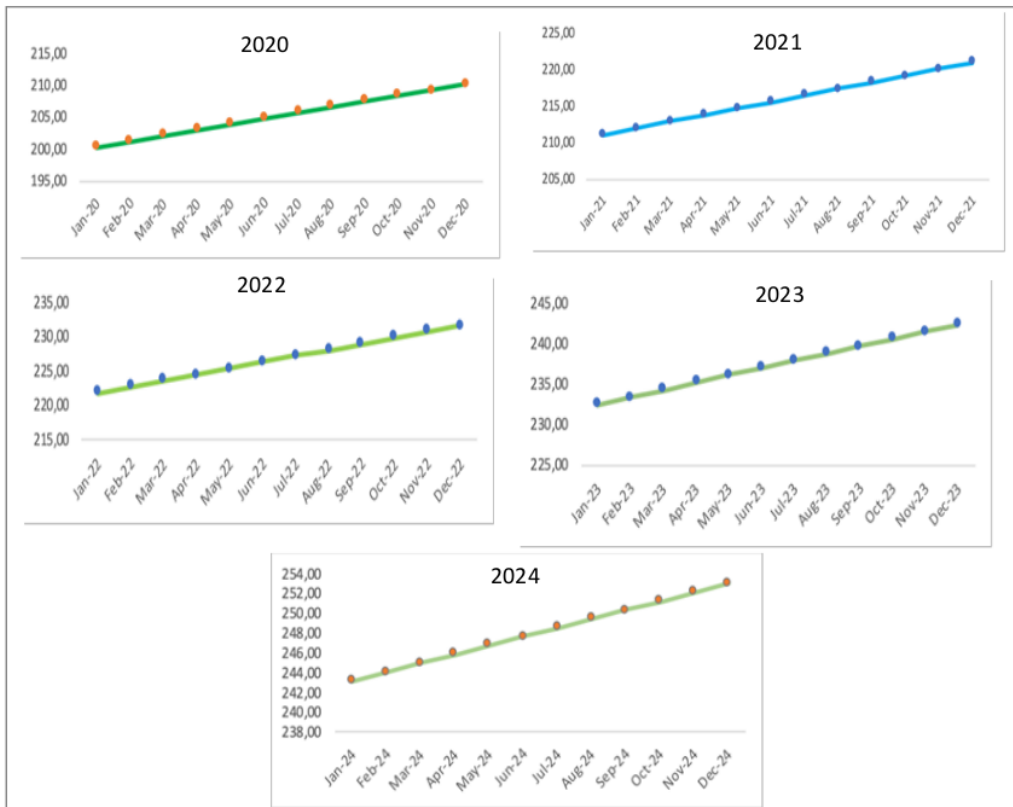Note : ** significant at α 5 %

Figure 1. Forecasting Government Debt in 2020-2024 (USD biliion)

In January 2020, government foreign debt is estimated at USD 200.31 billion, an increase of 0.22% compared to December 2019. Then, government debt keeps increasing in December 2020 at USD 210.14 billion or 4.9% in January 2020. The government debt is estimated to grow by 4.7% from January to December. In January 2021, government debt is amounts to USD 211.03 billion and it increases in December 2021 at USD 220.85.

The estimated results of government debt in 2022 are not much different from those in 2021. In January 2022, government debt will reach USD 221.75 billion and it keeps growing in January 2023 of USD 231.57 billion or 4.43% in 2022. In January 2023, government debt is predicted to reach USD

232.46 billion and it keeps growing until the end of 2023 at USD242.29 billion. Government debt grows by an average of 4.23% in 2023.

Based on forecasting results, the government foreign debt in December 2024 is predicted to be USD 253.01 billion and it will keep growing 4.23% from December 2023. Compared to the government debt at the beginning of the observation period in January 2010 which was amounted to USD 93.86 billion. Then, in 11 years Government foreign debt is forecasted to rise by 169.6%. The estimation of Indonesia's government foreign debt growth is large and will be very critical if it is not properly controlled and managed to stimulate the economy.

A good financial state is derived from public debt and deduction of interest expense which can cover the difference in tax revenue and expenses productively (Dinca & Dinca, 2015). Cholifihani (2008) states that Indonesia faces long-term debt problems because of the improvement of public foreign debt services which can slow economic growth. Also, Bank of Indonesia (2020) states that at the end of 2019, the Indonesian government debt is prioritized more for the health services sector, social and educational activities, and construction. This is in line with President Jokowi's vision which focuses on the development of infrastructure, human resources, and social welfare.

Increasing Indonesia's debt in the long run is predicted to plan to build a new capital city on the island of Borneo. The project requires a very large investment and cannot be fully funded by the state budget. the biggest investment costs in the construction of new capital cities are infrastructure development, such as toll roads, housing, government buildings, and mass transportation.

Another factor which is predicted to further increase Indonesia's debt in the coming years is the covid-19 pandemic. That pandemic can contribute to the short-run shocks in the Indonesian economy. Then, the Government of Indonesia issues fiscal stimulus policies such as social security, food security, health insurance, pre-employment policies, and tax incentives for the private sectors and also the individuals. Fiscal stimulus policies are not supported by adequate national budgetary capacity, so the most possible way is to issue global bonds with a long-run tenor.

CONCLUSION

Indonesia is vulnerable to be in the debt trap due to its large debt. This study aims to dynamically predict the value of government debt over the next five years. In this paper, secondary data from 2010-2019 from Indonesian foreign debt statistics published by Bank Indonesia are used and analyed by using ARIMA model. The results indicate that the ARIMA model (3,1,3) is rated from the lowest AIC value of the 16 models tested, then the AR and MA variables in the model are also significant at α 5%. Based on forecasting results, Indonesia's government debt will increase significantly amounted to 169.6% from the initial observation period in January 2010. In December 2020, Indonesia's debt is predicted to reach USD 253.01 billion. Having known this, the Government of Indonesia should be able to wisely manage its debt to avoid default condition.

The results of this study recommend several policies for the Indonesian government; Funds obtained from foreign debt are used for productive purposes, rather than consumption purposes. Types of productive activities that can encourage economic growth such as infrastructure development and improving the quality of human resources. The Indonesian government must control and supervise the use of foreign debt funds to avoid corruption he Indonesian government must control the use of foreign debt funds to avoid corruption by applying strict rules and involving the Corruption Eradication Commission (KPK)

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