Modeling Analysis of Economic Growth in Asia with a Dynamic Panel Approach Generalized Method of Moment (GMM)

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ABSTRACT

Purpose: High growth is expected to overcome various economic problems. Therefore, various efforts have been made by the government in synergy with other related institutions as a form of optimization of economic growth. That is why economic growth is an important indicator for the development of a country. This study aims to analyze economic growth and the factors that influence economic growth in Asia during the 2000-2019 period using dynamic panels.

Design/methodology/approach: The independent variables in this study are the human development index (HDI), changes in exports (PEXPORT) and government spending (EXPENGOV) using the GMM system method as a model for modeling economic growth. The GMM model system is the best model with Sargan testing. The data used in this study are in the scope of Asia with the number of observational studies that are 11 (eleven) with a total panel data turned on by the state observation system 209.

Findings: The results show that the human development index (HDI) has a negative and significant effect on economic growth in Asia 2000-2019 period. Meanwhile, the export change variable (PEXPORT) and government expenditure (EXPENGOV) had a positive and significant effect on economic growth in Asia for the 2000-2019 period.

Research limitations/implications: Furthermore, economic growth also strengthened the previous year’s economic growth at a significance level of 1%. This shows that economic growth is economic growth, economy, economy, and state government spending.

Originality/value: This paper is an original

Paper type: Research paper

Keyword: Economic Growth, Exports, Human Development Index (HDI), Government Spending, System GMM.

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I. INTRODUCTION

The high economic growth of a country is in line with the high economic activity of a good and in a certain period. Increasing economic growth and economic stability are expected to minimize a country's economic problems with various fiscal and monetary policies. Therefore, various government activities and their interactions both directly and indirectly will affect economic growth. That is the reason why, economic growth is one of the important things in developing the quality of a country.

According to Bekele & Mersha research (2019) shows that export performance shows that that real gross domestic product (GDP), Ethiopian population, Ethiopian real GDP, trade openness, institutional quality and distance are the determining factors for transportation costs to be cheaper which then advances coffee export performance (Bekele & Mersha, 2019). Furthermore, according to research Baldwin (2005) states that exports are one of the economic sectors that play an important role by expanding the market between several countries, which can then encourage industry and other sectors. Therefore, it is necessary to increase competitiveness to the quality of exports of individual countries.
As one of the economic sectors that plays an important role, where exports with market expansion between several countries, where can hold an expansion between one country and another, this will encourage the improvement of other industries in an economy (Baldwin, 2005). Thus exports have an important role as an economic driving force from the sale of goods from within to outside the country (Tambunan, 2001:2).

A country’s ability to increase its economic growth in line with the improvement of development facilities and the effects of globalization and integration between countries which then facilitates import export activities and other relations. The economic integration that is currently taking place is the ASEAN group with the ASEAN area together (Lloyd-Smith, 2004).

In addition, export challenges can occur by internal and internal factors of each trading partner country. According to research shows that GDP per capita can have an effect on decreasing trade exports (Isdiana & Aminata, 2019). The differences that occur where the types of goods traded in developed and developing countries are certainly different in terms of high-quality goods are very diverse, for example trade between fellow developing countries and between developing countries and developed countries is more characterized by trade between industries (Purba, 2017). In addition, there are differences in the exchange rate of countries with weak currencies are at a disadvantage and vice versa (Purba, 2017).

High development financing a country often conducts debt as a source of funds in addition to profits from exports. This problem often occurs in countries in Asia, for example, which implement deficit budgeting systems with multilateral through export, commercial, leasing and Government Securities (SBN) credit facilities as one of the government’s efforts to meet collateral financing as carried out by Japan, China and Indonesia (Dewi, 2020). On the other hand, argues that there is a negative impact of government loans on economic growth. This will affect encouraging economic instability in the short term (Checherita-Westphal & Rother, 2010). The economic problem in the short term is inflation (Andryas, 2015). This problem will encourage the increase in the financial sector to encourage the real growth of the economies of these countries (Alimi, 2015).

According to Novianti et al. (2013) stated that so far the goods exported by Indonesia are goods that have low added value because generally the goods exported are raw or semi-finished goods. Meanwhile, the higher per capita income from the importing country, which in this case (Indonesia’s export destination country), they specialize more in goods that have high added value (Novianti et al., 2013).

Based on research Azizah & Beik (2014) in the analysis of Indonesia’s exports to OIC member countries, where the real GDP of the importing country negatively affects Indonesia’s exports to the destination country.

The quality of well-connected transportation infrastructure will have implications for the very fast turnover of merchandise. This is a manifestation of government spending on infrastructure development so that it will have an impact on increasing trade volume and economic growth. The following are some studies on the influence of port infrastructure in international trade activities: Bottasso et al. (2018) analyze the impact of port infrastructure on international trade related to exports and imports.

To see economic growth modeling, a study was made entitled “Analysis of Economic Growth Modeling in Asia with a Dynamic Panel Approach to the Generalized Method of Moment (GMM) Dynamic Panel Approach”. This study aims to see and analyze the significance of the variables of human development index (HDI), changes in exports (PEXPORT) and government expenditure (EXPENGOV) and the lag of economic growth to the economic growth of Asian Countries in 11 countries using a dynamic panel system.

The Asian countries that are sampled by the countries are: China, Fiji, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, the Philippines, Thailand, and Vietnam. Meanwhile, countries that have high economic growth rates are China and Myanmar, which are not always in line with the level of the human development index (Figure 1). The relationship between HDI and economic growth of each country from one another is different from one another and has a debatable relationship. Research according to shows that economic growth affects the human development index, which means that the quality of human resources will affect economic growth and vice versa (Ezkirianto & Alexandi, 2013). On the contrary, according to the Granger Causality method model where economic growth and human development index have no relationship with each other (Susanti & Zamora, 2019). This difference in relations occurs due to policy differences between one country and another.
Economic growth in Asian countries tends to experience fluctuating developments as well as the human development index (HDI) during the period 2000-2019. Economic growth is one of the indicators of the success of a country's economy. Indicators that can be used to measure economic growth are Gross Domestic Product (GDP) or gross national product (GNP) for national and international scales. Differences in economic growth rates can also be influenced by the level of economic openness in the current era of globalization getting wider in every country in the World from the trade and financial sectors.

The existence of human ability to improve their quality of life can be seen from the human development index (HDI) (Pangesti & Susanto, 2018). The hope is that with a high building index, it will create a sustainable economic growth to become one of the main goals in the economic development process (Anwar, 2018). This is in line with research (Asnidar, 2018) where simultaneously the Human Development Index has a significant effect on economic growth. The quality of human resources will affect the technological capabilities it has so that the output of goods and expectations produced by each country will be different, for example in export goods in 11 countries in Asia in Figure 2 below:
There is an increase in human development index (HDI) partly negative and significant to poverty, where in the short term an increase in the human development index will reduce the level of poverty in the long term (Shina, 2019). This is in line with research according to Kharisma & Saleh (2013) showing that between income using a dynamic panel model between Education and Health related to Economic growth. The ability of resources is also in line with the output results produced by a country's community in the field of innovation and quality of its products. This, in line with research related to trade openness is one of the framework conditions that will improve, improve and strengthen innovation in developing countries (Nordin & Nordin, 2016).
Based on Figure 3, it shows that the movement of economic growth and government spending fluctuates every year and differs from state to state. This condition shows that development priorities are different in each of their respective countries. The tendency therapy is increasing in line with the wagner hypothesis or Keynes hypothesis which states that government spending can help economic growth in the exclusion of low-income countries. According to research where there is a causality relationship between government spending and economic growth (Dudzevičiūtė et al., 2018; Putra, 2017; Wu et al., 2010). Furthermore, differences in data, test methods, and other variables added in the research model caused the causal relationship between government spending and economic growth to be diverse (Anitasari & Soleh, 2015; Solikin, 2018). Furthermore, according to Anitasari & Soleh (2015) it is stated that government spending in the short term does not have a significant effect on economic growth.

Based on this background, the method that will be used in this study is the regression of dynamic panel data with the Arellano-Bond Generalized Method of Moment (GMM) approach. Where, this study uses dynamic panel data regression by involving 11 countries in Asia with the advantage that this method can determine the effects in the short and long term (Bloom, 2012).

II. RESEARCH METHODS

Analysis of research on the economic growth of a country in Asia using a combination of cross section data and time series data (Bloom, 2012). The results of the study using generalized method of moments (GMM) panel data can also show the process of convergence of calculated per capita income growth as seen from the beta value (Anggara, 2019).

A. Data Types and Sources

Using data from more than 11 countries in Asia during the period 2000-2019 with 198 observations. The Asian countries included in this study consisted of: China, Fiji, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, the Philippines, Thailand, and Vietnam. The data source used in this study is based on the world bank. Furthermore, the method that this study uses the estimator of the general method of moment (GMM) developed for the dynamic model of panel data introduced by (Arellano & Bond, 1991; Arellano & Bover, 1995; Holtz-Eakin et al., 1988). The standard approach is to estimate the above model in the first difference, using the previous slowness of the explanatory variable as an instrument Caselli et al. (1996); Dollar & Kraay (2003) Consider the following regression equation:

\[ y_{it} - y_{it-1} = \beta_1 (y_{it-1} - y_{it-2}) + \gamma_t + (\mu_{it} + \mu_{i,t}) \]

(1)

In particular, the estimation model becomes:

\[ Y_{it} - Y_{it-1} = (\alpha - 1)Y_{it-1} + \beta_0 X_{it} + \mu_i + \epsilon_{it} \]

(2)

Is the logarithm of economic growth, \( Y_{it} - Y_{it-1} \) represents the rate of economic growth, \( Y_{it-1} \) is a natural logarithm The level of economic growth, \( X_{it} \) denotes the vector of the explanatory variable \( \mu_i \), shows unobserved state-specific effects \( \epsilon_{it} \) is the error of the tram, i is the country, and t is the time or period of the year.

This section provides the results of empirical estimates of OLS and GMM regression on the relationship between financial development and economic growth. Four estimation techniques are used to review various econometric approaches that study the linkages between financial development and economic growth as previously described. These methods are Pooled OLS, OLS-Fixed effect, common methods of moment in difference (GMM-Difference, Arellano & Bond, 1991) and in systems (GMM-System, Blundell & Bond, 1995). Hausman test, which allows the selection of certain fixed or random effects (Alimi, 2015).

Dynamic panel data model to describe the relationship between economic variables which in reality are dynamic, namely variables are not only influenced by variables at the same time but also influenced by variables at the previous time. Therefore, dynamic panel data models are more suitable for use in economic analysis. Parameter estimation on dynamic panel models using the Generalized Method of Moments (GMM) developed by Arellano and Bond. The Arellano and Bond method was later developed by Blundell and Bond called the GMM-System Estimator by combining the moment of condition and the instrument matrix between the first difference model and the level model to produce a more efficient parameter estimator (Lubis, 2013). The models used in this study were spatial autoregressive model (SAM) and spatial error model (SEM) (Anderson & Hsiao,
The model was estimated using the smallest squared panel, fixed effect, random effect, as well as the first difference of GMM (GMM-DIFF) and GMM system (GMM-SYS).

Originally this model was proposed in 1991 by Manuel Arellano and Stephen Bond (Anderson & Hsiao, 1981; Bond et al., 2001; Caselli et al., 1996; Knowles & Owen, 1995; Li & Huang, 2009). Dynamic pane models are also very important in modeling (Anderson & Hsiao, 1981).

The continued development of models with the principle of advanced estimation which is a panel data model with dynamic conditions, namely (Bond et al., 2001; Caselli et al., 1996; Knowles & Owen, 1995; Li & Huang, 2009). Research in Indonesia applicatively uses a dynamic model of economic growth as a reference model to analyze convergence in Indonesia, namely Firdaus & Yusop (2009) at the provincial level and the period 1983-2003 using the General Method of Moments (GMM) method. Furthermore, according to Kharisma & Saleh, (2013), analyzing income dispersion and testing absolute convergence and conditional conver- gence in 26 provinces in Indonesia during the period 1984-2008 with a dynamic panel model that provides an empirical analysis of the composition of human capital, namely education and health, to economic growth in Indonesia. According to the research of Granger & Hyung (1999) consider problems related to dynamic panels that have a strong correlation with individual specific factors.

This study aims to empirically test the determinants of economic growth in Asian countries using 11 selected countries with a data range from 2000 to 2019. Previous studies have emphasized determinants of economic growth such as the human development index (HDI), changes in exports (PEXPORT) and government spending (EXPENGOV). A systematic empirical study based on the Generalized Method of Moments (GMM) that has been taken to estimate all the determinants of innovation discussed by researchers in capturing long-term and short-term relationships. In addition, the empirical model is expressed as follows:

$$Y_{it} - Y_{it-1} = (a - 1)Y_{it-1} + \beta_1 IPM_{it} + \beta_2 PEXPORT_{it} + \beta_3 EXPENGOV_{it} + \mu_i + \epsilon_{it}$$

where i is country index, t is time index, is the logarithm of expenditure on R&D as a percentage of GDP as a proxy of innovation where data were extracted from Penn World table.

In line with equation (3), it can be written with:

$$Y_{it} = aY_{it-1} + \beta_1 IPM_{it} + \beta_2 PEXPORT_{it} + \beta_3 EXPENGOV_{it} + \mu_i + \epsilon_{it}$$

Furthermore, by using additional conditional moments where the langged difference variable is orthogonal to the degree of interference. To obtain this additional moment condition, they assume that the panel-level effect is not related to the first difference of the dependency variable. The conditions of additional moments for the second part of the system are set as follows:

$$E[(Y_{it_s} - Y_{it-1})(\lambda_i - \epsilon_{it})] = 0 \text{ untuk } s = 1$$

$$E[(IPM_{it-t} - IPM_{it-t-1})(\lambda_i - \epsilon_{it})] = 0 \text{ untuk } s = 1$$

$$E[(PEXPORT_{it-t} - PEXPORT_{it-t-1})(\epsilon_{it})] = 0 \text{ untuk } s = 1$$

$$E[(EXPENGOV_{it-t} - EXPENGOV_{it-t-1})(\epsilon_{it})] = 0 \text{ untuk } s = 1$$

The GMM system has a theoretical advantage over the differences in GMM. Blundell & Bond (1995) showed that the GMM of the system has better finite sample properties in the case of short panels with presistent series (autoregressive terms of about 0.8 and 0.9).

This research model is also the same as the one used (Dekiawan, 2014), where the model is estimated using the smallest squared panel, fixed effect, random effect, as well as the first difference between GMM (GMM-DIFF) and GMM system (GMM-SYS). The amount of government spending is equal to the growth rate (Dekiawan, 2014), which is recorded in the trade balance (DTBAL) (Firdaus, 2018).

### III. RESULTS AND DISCUSSION

Based on the test results to provide an overview and conditions of the relationship of each variable. Based on the results of the correlation analysis in Table 1, it is shown that the presence of positive and negative and significant values is shown in the variables of the results of this study.

This research was conducted in the Asian region with a focus of 11 (eleven) countries such as China, Fiji, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, the Philippines, Thailand, and Vietnam. Based on the results of the analysis in Table 1, it shows the significance of independent variables as a whole with a degree of probability at 10%, 5%, and 1%. At the probability value below the significanation rate of 1%.5% or 10%, it is said that the model is invalid or the null hypothesis (Ho) is rejected so that this study uses the SYS-GMM method where there is no serial autocorrelation of errors and has a valid instrument. The GMM model system is an analysis because the conditions are in accordance with the feasibility of the model.

The analysis of economic growth is influenced by economic growth 1 year earlier, economic growth 2 years earlier, government spending, the ratio of investment to GDP, and financial development, while this study
found that there is a negative relationship between financial development and economic growth, so it is indicated that financial development has a negative effect on economic growth in developing countries (Cahyanti & Arianti, 2017).

Table 1. Dynamic Panel Estimation Results with Dependent Variables of Economic Growth

<table>
<thead>
<tr>
<th>Estimated Coef.</th>
<th>Standard Error</th>
<th>Z</th>
<th>P-Value</th>
<th>Shprt-run Multiplier</th>
<th>Log-run Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1215886</td>
<td>0.0655504</td>
<td>1.85</td>
<td>0.064*</td>
<td>-0.006888</td>
<td>0.2500651</td>
</tr>
<tr>
<td>-14.18916</td>
<td>3.687685</td>
<td>-2.76</td>
<td>0.006***</td>
<td>-17.40262</td>
<td>-2.947164</td>
</tr>
<tr>
<td>0.0532487</td>
<td>0.0094684</td>
<td>5.62</td>
<td>0.000***</td>
<td>0.0346909</td>
<td>0.0718065</td>
</tr>
<tr>
<td>-0.1720833</td>
<td>0.0685869</td>
<td>-2.51</td>
<td>0.012**</td>
<td>-0.306511</td>
<td>-0.037655</td>
</tr>
<tr>
<td>Constanta</td>
<td>15.18109</td>
<td>5.05</td>
<td>0.000***</td>
<td>9.284544</td>
<td>21.07764</td>
</tr>
<tr>
<td>Sargan Test</td>
<td>0.0256</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>chi2(160)</td>
<td>176.6902</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The research equations are:

\[ PE_{it} = 15.18109 + 0.1215886 PE_{it-1} - 14.18916 IPM_{it} + 0.0532487 PE_{EXPORT}_{it} + 0.1720833 EXPEN_{GOV}_{it} + \epsilon_{it} \]

Based on the results of the analysis, a sargan test was carried out to see the overidentifying restriction or validity problem in the instrument used, with Ho there was no problem with the validity of the instrument (valid instrument) which exceeded the parameters which means that the instrument was not correlated with errors in the FD-GMM equation. After the analysis, the chi-square probability value was obtained, with the probability value below the significance level of 1%, 5%, or 10%, it was said that the model was invalid or the null hypothesis (Ho) was rejected so that this study used the SYS-GMM method where there was no serial autocorrelation of errors and had a valid instrument. The GMM model system is an analysis because the conditions are in accordance with the feasibility of the model.

Furthermore, significant variables affecting economic growth in Asia with 11 countries where the efficiency lag of economic growth has a significant positive effect on economic growth in Asia, namely China, Fiji, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, the Philippines, Thailand, and Vietnam. Thus it can be concluded that economic growth in the t year was dominated by economic growth in the previous year. This is in line with research Cahyanti & Arianti (2017) which states that the economy is influenced by economic growth 1 year earlier, economic growth 2 years earlier.

On the other hand, based on the output results, it was obtained that the value of the human development index (HDI) coefficient has a negative and significant influence at the level of 1 percent (1%). This is in line with research Kharisma & Saleh (2013); Shina (2019) which states that when the economic growth rate is high, the ability to manage resources and decisions in buying goods will be prioritized compared to the increase in resources so that HDI tends to be neglected so that the human development index decreases.

If there is an increase in the human development index by 1% then in the short term it will cause a decrease in economic growth of -17.40262, while the effect for the long term is -2.947164. Thus, it can be concluded that the effect of increasing the human development index on the decline in economic growth in the long term is smaller than in the short term.

Furthermore, based on the results of the output it is obtained that the value of the coefficient of change in government spending $PE_{EXPORT}$ has a positive and significant influence at the level of 1 percent (1%) on economic growth. This is in line with the research of Baldwin (2005); Bekele & Mersha (2019) which states that
when the economic growth rate is high, it is also characterized by an increase in the number of exports that increase, then a country that has high economic growth in line with the sophisticated infrastructure that helps in the movement of exports so that it is more efficient and profitable.

If there is an increase in export changes of 1% then in the short term it will cause an increase in economic growth of 0.306511, while the effect for the long term is 0.0718065. Thus, it can be concluded that the effect of increasing export changes on the decline in economic growth in the long term is greater than in the short term.

Then, based on the output results it is obtained that the value of the coefficient of change \( P_{\text{export}} \) has a negative and significant influence at the level of 1 percent (5%). This is in line with research (Anitasari & Soleh, 2015; Solikin, 2018) which states that when government spending will affect economic growth with a note that government spending is allocated for improving infrastructure development which leads to an increase in investment so that there will be a multiplier effect development that then increases economic growth in various sectors. Therefore, the impact of economic growth will be felt in the long term not in the short term (Anitasari & Soleh, 2015; Solikin, 2018).

If there is an increase in government spending by 1% then in the short term it will cause a decrease in economic growth of 0.0346909 in financing development and reducing the allocation of other sectors, so that the effect for the long term is -0.037655. Thus, it can be concluded that the effect of increasing government spending will cause a decrease in economic growth in the short term greater than in the long term resulting from other payments in financing the amount of expenditure or loans made.

IV. CONCLUSIONS AND SUGGESTIONS

A. Conclusion

Based on the results of estimates where the valid model used in this study is the SYS-GMM method, because the probability of sargan test is below the level of significance, so the SYS GMM model is the best model.

The increase in economic growth based on the indicators that have been tested has been obtained that previous economic growth or those canalized with the lag of economic growth and changes in exports have a very positive and significant influence on the increase in economic growth and vice versa. Therefore, there is a need for trade openness in the development of innovation and power in 11 Asian countries such as China, Fiji, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, the Philippines, Thailand, and Vietnam.

Furthermore, variables such as the human development index (HDI) and government spending that have a negative and significant relationship to economic growth need to be further assessed based on countries that have high and moderate incomes. This is because policy differences will affect the allocation of funds in growth-enhancing strategies in 11 Asian countries such as China, Fiji, Indonesia, Japan, Korea, Malaysia, Myanmar, Pakistan, the Philippines, Thailand, and Vietnam. In addition, related to short-term relationships is greater than in the long term so that in the long term the negative impact will be even smaller.

B. Suggestion

The results of this test show that the importance of the government’s role in maintaining trade stability and growth will affect inflation movements in the following year. In addition, the improvement of the Human Development Index (HDI) must continue to be carried out with various policy instruments in improving the quality of productive human resources. Therefore, synergy between the government, monetary authorities and the public is needed for economic stability by controlling inflation through decisions on the purchasing power of goods for production needs.

The government should design policies related to international trade to improve trade integration with financial development that has a structured system.

Suggestions for subsequent research can focus on identifying investments both domestically and abroad by economic sector that can drive economic growth specifically linking economic growth, investment, poverty and unemployment.

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