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by Danang Dwi Gusti

Submission date: 23-Apr-2023 04:36PM (UTC+0900)
Submission ID: 2072564076
File name: busebastianaready_24_apr_1.6.docx (80.85K)
Word count: 3338
Character count: 20900

Author, A., & Author, B. (2020). Title. *Journal of International Studies, 13*(1), 9-25. doi:10.14254/2071-8330.2020/13-1/1

Journal of International Studies

Scientific Papers

Indonesia-Malaysia-Thailand Growth Triangle Vector Analysis

Sebastiana Viphindrartin.
Economic Departments, University of Jember, Indonesia.
sebastiana@unej.ac.id
ORCID 0000-0002-6571-1554

Suryaning Bawono.
STIE Jaya Negara Tamansiswa Malang,Indonesia.
ninobalmy@gmail.com
ORCID 0000-0001-6617-276x

Abstract. This study simulates the economic cooperation of Indonesia, Thailand, Malaysia. We investigated the accumulated direction of influence growth of economic in the three countries so that it can be seen the forecasting of the accumulated direction of influence of the three countries. This research took time from the beginning of the cooperation between the three countries, namely in 1993 until before the COVID-19 pandemic occurred. We intentionally committed 2020 due to economic turmoil which is quite difficult to predict, so in this study, we only take the 1993-2019 time period. This study uses real GDP in conducting simulations with secondary data based on the World Bank. Economic cooperation between Indonesia, Malaysia, and Thailand in this study is simulated by vectoring the economic growth of the three countries using the autoregression vector (VAR). By doing vectoring, it is possible to forecast the direction of impact accumulation as well as identify its relevance and direction of influence. From the results of the simulation process, it can be concluded that the three countries have the opportunity to strengthen each other economically.

Keywords: Indonesia, Malaysia, Thailand, Vector Analysis

JEL Classification: C10,E04,E44

1. INTRODUCTION

The Indonesia-Malaysia-Thailand Growth Triangle (IMT - GT) is a collaborative project between Indonesia, Malaysia, and Thailand which was initiated in 1993 by the leaders of the

two countries. The three countries agreed to encourage the development of tripartite economic cooperation to accelerate economic reforms in underdeveloped countries. The main objective of the IMT-GT project is to provide the private sector of the three countries in the economic zone. To become a trade and investment leader in contributing to economic growth and encouraging regional economic development by taking advantage of the economic advantages of proximity and similarity in geography, environment, religion, culture, traditions, and languages. The governments of the three countries have agreed to promote the role private sector in building economic growth, support the public sector to provide the environment and infrastructure that will facilitate economic development and encourage IMT -GT is part of the economic development of each country sustainable development plan (Santos & Soares,2020 ; Azam et al,2015).

The decision to join the IMT-GT project was primarily aimed at international economic development in the southern border provinces which initially covered 5 provinces namely Songkhla, Satun, Pattani, Yala, and Narathiwat to increase trade and investment. increase local employment and can enable workers to work in Malaysia well. The local populace's standard of living and income will both improve as a result (Duffield et al,2019). The government will encourage the private sector to become the mainstay. in the implementation of these development projects and financing To complete the required projects in accordance with the IMT-GT project development plan, the private sector will play a role in supporting and guiding changes to rules, regulations or plans. Providing flexibility and in accordance with the needs of private sector development of economic and easing the burden on the government by participating in and supporting the implementation of certain types of projects. such as projects related to Infrastructure utilities, etc. without the burden of the government in terms of collaborative projects from 3 private sector countries.

However, the IMT-GT project still requires direct and indirect support from the government. and other relevant agencies This is due to the idea of developing the IMT-GT project as a new project that does not have clear guidelines and development patterns and cannot be used as a guideline in developing projects in other areas. This can be applied to suit the IMT-GT project, even ASEAN organizations have characteristics that only facilitate certain types of IMT-GT activities. And most importantly, the IMT-GT project does not have a data storage unit for IMT-GT project development and project performance monitoring (Harun & Ja'afar,2021).

The IMT-GT project emphasizes cooperation in various fields including trade and investment Agriculture and agro-industry traveling infrastructure and transportation network development of human resources and Halal production and services. Its principal objective is the development of the southern provinces while highlighting the need of private sector involvement in that process. After the establishment of the Indonesia-Malaysia-Thailand Trilateral Economic Zone Development Program, it has developed both geographically and cooperative projects. The member territory currently consists of 14 provinces in the southern region of Thailand, 8 states in the Malay Peninsula (Perlis, Kedah, Penang Island, Perak, Selangor, Kelantan, Malacca, Nukery), and 10 provinces on the island in Indonesia. Sumatra (Aceh, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Bangka-Belitang, Riau, Lampung) (Centre for IMT-GT Subregional Cooperation,2018).

The Indonesia-Malaysia-Thailand Trilateral Economic Zone Development Program is primarily aimed at promoting international economic, trade, and investment relations. By increasing the production potential and capacity of the three countries, while reducing production costs and reducing competition. To stimulate the production of goods and services

within the group through the exchange of production technologies. This will increase competitiveness in the world market for export products from member countries for regional economic progress in general on the basis of mutual support. Contribute significantly to Indonesia's development policies in the areas of industry, agriculture, fisheries, and tourism, Malaysia's Industrial Development Policy and the policy of spreading prosperity to the Thai region (LDD,2021).

This study simulates economic collaboration from Indonesia, Thailand, Malaysia. We look into the economic growth's accumulated direction of impact in the three nations so that forecasting of the accumulated direction of influence of the three nations can be noticed. This research takes a period of time from the beginning of the cooperation between the three countries, namely in 1993 until before the COVID-19 pandemic occurred. We deliberately omitted 2020 because of the economic shock which is quite difficult to predict, so in this study, we only take the 1993-2019 time period.

2. LITERATURE REVIEW

Development of the Indonesia-Malaysia-Thailand, Trilateral Economic Zone (Indonesia-Malaysia-Thailand Growth Triangle: IMT-GT) or the "Development Economic Triangle" was established in 1993 by former President Suharto, former Prime Minister Dr. Mahathir, and former Prime Minister Chuan Leekpai. 1994 “The Economic Triangle of Singapore, Malaysia, Indonesia: IMS-GT” was established to establish cooperation in the fields of trade, agriculture, tourism, communications, and light industry. with Singapore to support finance and technology (Li et al,2021). The cooperation carried out by Indonesia, Malaysia and Thailand will be aimed at profitable international cooperation so that the productivity of the three countries, especially in the business world, will increase.

International economy refers to trade in commodities and services between one country and another which consists of important activities such as international trade, international payments, international economic cooperation. International trade refers to the exchange of commodities and services between nations. Countries that trade in each other's goods are called trading partners, each nation's purchases are referred to as imports, while its sales are referred to as exports (Rahman,2021). Countries that sell products abroad are called Exporting Countries or Exporters. Each country has the status of an importer and exporter at the same time because different countries produce different products. A trade surplus is a trade balance in which the value of exported goods is greater than the value of imported goods. Theoretically, international trade aims to improve the welfare of the population by increasing production efficiency so that the population can obtain better-quality goods at lower prices (Viphindrartin & Bawono,2021).

The policies of countries in Asia related to the international economy have an impact on the economy in the Asian region. International economic policy is a policy that determines the economy of each country. The international economy can unite countries in the world to cooperate with each other and build the world economy. Including the economy in Asia (Kannadhasan & Das, 2019).

Cooperation agreements are owned by Indonesia and also Malaysia with the two world palm oil producing countries. The agency will support prices and manage the supply of palm oil on world markets. Indonesia and also Malaysia are currently the 1st and 2nd largest exporters of palm oil in the world, respectively. Indonesia and Malaysia have a world market share of 85%. Indonesia, which exports more palm oil than any other country, has put safety precautions in place. The gasoline business is not the only one that uses palm oil. however, it is also utilized

as a significant component in a range of goods, including the creation of chocolate and cosmetics. Palm oil is an important industry in Indonesia and Malaysia (Varkkey et al,2018). Indonesia, Malaysia, and Thailand both have palm oil Agriculture industries (Mukherjee & Sovacool,2014). The agriculture industry is one of the industries that is the object of cooperation between Indonesia, Malaysia and Thailand.

The condition of the oil palm farming industry in Indonesia has similarities, namely that both are managed by the majority of small farmers. So that the cooperation between Indonesia and Thailand in supporting the palm oil industry can be pursued in both countries to improve the agricultural industry, especially palm oil (Innocenti & Oosterveer, 2020).

Regarding industrial activities, the impact of carbon emissions is a serious concern, where natural conservation in Indonesia and Thailand and the economy in both countries need to be considered, and policies in the management of natural sustainability and economic growth can determine the quality of the environment and the economy both in Indonesia and Thailand (Salman et al,2019).

The halal industry is one of the industries that are the object of cooperation between Indonesia and Malaysia. Indonesia and Malaysia are two countries with a majority Muslim population. Both countries have business aspects and Islamic business potential and can be partners in the development of halal business in both countries (Qoyum et al, 2021). Indonesia with an archipelagic country and Malaysia can foster the tourism industry and collaborate in the tourism business and various fields in Business to strengthen the economy in both countries (Yang et al,2020).

Market information will have a beneficial effect on the quality of economic relations (Maloku et al,2021). Global collaboration and country integration are impacted by international cooperation. In Asia, international economics brings together economic cooperation. Indonesia and Thailand as countries in Asia have strong international cooperation in various fields, including cooperation between the two countries, namely economic cooperation and collaboration in the energy sector (Kumar, 2016). Cooperation between Indonesia, Malaysia and Thailand can develop in the field of energy cooperation in power plants. One of them is the cooperation of the hydroelectric power industry (Tang et.al, 2019). The renewable energy sector in Indonesia and Thailand has the potential to continue to be developed. So that the cooperation between the energy sector of Indonesia and Thailand has the potential for mutual benefit (Kusumadewi & Limmeechokchai, 2017). Malaysia and Indonesia as neighboring countries are geographically close together. From the geographical proximity of the population movement from Indonesia to Malaysia and vice versa occurs and increases the social capital of the population which drives the economy in both countries (Hasanah,2015).

3. METHODOLOGY

This study simulates the economic cooperation of Indonesia, Thailand, Malaysia. We investigated the accumulated direction of influence of growth of economic in the three countries so that it can be seen the forecasting of the accumulated direction of influence of the three countries. This research took time from the beginning of the cooperation between the three countries, namely in 1993 until before the COVID-19 pandemic occurred. We intentionally committed 2020 due to economic turmoil which is quite difficult to predict, so in this study, we only take the 1993-2019 time period.

This study uses real GDP in conducting simulations with secondary data sourced from the world bank. Aggregate economic growth can be analyzed using dynamic methods (Zhukova &

Sobolieva-Tereshchenko, 2021). Economic cooperation between Indonesia, Malaysia, and Thailand in this study is simulated by vectoring the economic growth of the three countries using the autoregression vector (VAR). By using vectoring, it is possible to see the direction of influence and significance as well as predict how the direction of effect will accumulate.

The VAR/VECM model is applied as follows:
GDP_IND = C(1,1)*GDP_IND (-1) + C(1,2)*GDP_IND (-2) + C(1,3)*GDP_MY (-1) + C(1,4)*GDP_MY(-2) + C(1,5)*GDP_THAI (-1) + C(1,6)*GDP_THAI (-2) + C(1,7)
GDP_MY = C(2,1)*GDP_INDONESIA(-1) + C(2,2)*GDP_IND (-2) + C(2,3)*GDP_MY (-1) + C(2,4)*GDP_MY (-2) + C(2.5)*GDP_THAI (-1) + C(2,6)*GDP_THAI (-2) + C(2.7)
GDP_THAI = C(3,1)*GDP_IND(-1) + C(3,2)*GDP_IND(-2) + C.(3,3)*GDP_MY(-1) + C(3,4)*GDP_MY(-2) + C.(3,5)*GDP_THAI (-1) + C(3,6)*GDP_THAI (-2) + C(3,7)
Where C is a constant and GDP is Gross Domestic Product Real.

4. EMPIRICAL RESULTS AND DISCUSSION

In the VAR test, all variables must be stationary at the level to be estimated using the VAR model. If not, the VECM model is used for estimation with the restriction that all created variables must be cointegrated. In this study the stationary test used ADF test with the results in table 1:

Table 1. ADF Test Results

ADF		Stat.	Prob.ability.
Fisher Chi-sq.		5.85E+01	0.00E+00
Choi Z-stat		-6.67E+00	0.00E+00
	Prob.	Lag	Obs
D(GDP_IND,2)	0.00E+00	0.00E+00	2.40E+01
D(GDP_MY,2)	1.00E-04	1.00E+00	2.30E+01
D(GDP_THAI,2)	1.00E-04	0.00E+00	2.40E+01

** Prob. via Fisher's test was calculated and measured by the asymptotic Chi-square distribution. In addition, the assumption of asymptotic normality is used in other tests

Measuring the stationarity of the variables is done by compared prob.value with the alpha value. In this study, the alpha value was determined at 5%, and the stationary category was seen based on a comparison of the probability value which was smaller than the 5% alpha value. All variables appear stationary according. to the findings of the data stationarity test performed using the ADF test. Where it is seen from the probability value of the variable has a value below 5% alpha or 0.05.

To simulate the direction of the influence between variables, a VAR model estimation is carried out where all data on the variables have met the requirements for Vector Autoregression estimation. With the estimation results in table 2 :

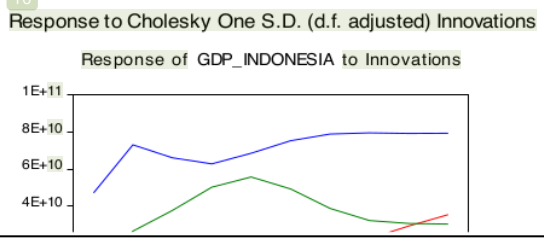
Table 2. Autoregression Vector Estimation Results

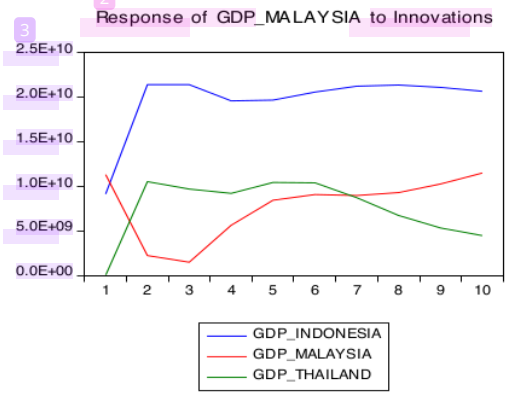
	GDP_INDONESIA	GDP_MALAYSIA	GDP_THAILAND
GDP_INDONESIA(-1)	1.30E+00	2.06E-01	1.50E-01
	-2.91E-01	-8.93E-02	-1.27E-01
	[4.48517]	[2.31106]	[1.18647]
GDP_MALAYSIA(-1)	3.49E+00	1.01E+00	9.69E-01
	-8.78E-01	-2.70E-01	-3.83E-01
	[3.97343]	[3.76292]	[2.53047]
GDP_THAILAND(-1)	2.07E+00	8.11E-01	1.70E+00
	-8.19E-01	-2.51E-01	-3.57E-01
	[2.52469]	[3.22773]	[4.75207]
C	-7.26E+10	2.73E+10	1.80E+10
	-6.00E+10	-1.80E+10	-2.60E+10
	[-1.21702]	[1.48724]	[0.69009]
R-squared.	9.87E-01	9.86E-01	9.83E-01
Adj. R-squared	9.82E-01	9.81E-01	9.77E-01
Sum sq. resids	4.02E+22	3.79E+21	7.64E+21
S.E. equation	4.73E+10	1.45E+10	2.06E+10
F-statistic	2.21E+02	2.04E+02	1.72E+02
Log likelihood	-6.46E+02	-6.16E+02	-6.25E+02
S.D. dependent	3.54E+11	1.04E+11	1.36E+11

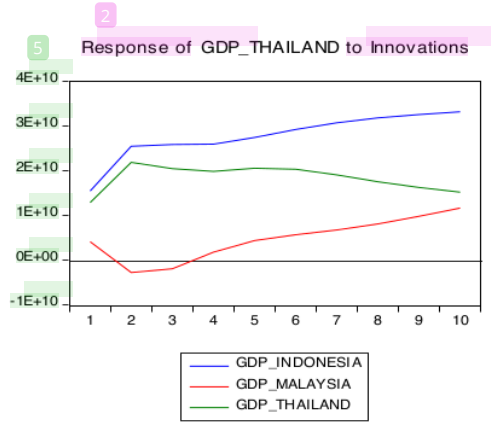
From the test results, all variables influence each other significantly. The significant relationship between variables was measured by comparing t-statistic and t-table (where the t-table > t-statistic). Indonesia's GDP against Malaysia's GDP has a t-table 2.31106 and a t-statistic value of 0.206, which means that Indonesia's GDP has a significant influence on Malaysia's GDP. Likewise, Malaysia's GDP against Indonesia has a t-table value of 3.97343 where t-table is greater than the t-statistic value of 3.49. Similarly, Thailand's GDP is against Indonesia and Malaysia and vice versa. This shows that the GDP of the three countries influences each other significantly.

IRF refers to how an endogenous variable in a dynamic VAR system reacts to shocks that occur in other variables. IRF also helps to ascertain the impact of shocks between variables in both the present and the future. In this study, the IRF is used to see the direction of influence between variables.

Figure 1. IRF Growth Of Economic



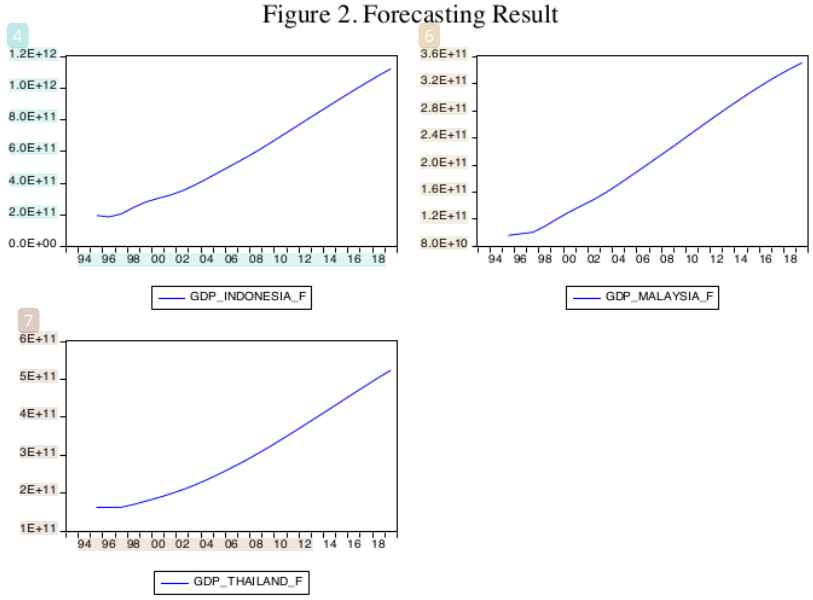

Response of GDP_MALAYSIA to Innovations
2.5E+10
2.0E+10
1.5E+10
1.0E+10
5.0E+09
0.0E+00
1 2 3 4 5 6 7 8 9 10
GDP_INDONESIA
GDP_MALAYSIA
GDP_THAILAND


Response of GDP_THAILAND to Innovations
4E+10
3E+10
2E+10
1E+10
0E+00
-1E+10
1 2 3 4 5 6 7 8 9 10
GDP_INDONESIA
GDP_MALAYSIA
GDP_THAILAND

This research in presenting the impulse response divides the time period into 10 time periods. The response to changes in economic growth can be seen responding to each other in the first period and a shock occurs when the three variables, namely the GDP of the three countries, influence each other to form adjustments until the second period and begin to form a balance after the second period. The formation of balance and adaptation to influence when the three variables influence each other which is assumed by the three countries to work together in the economic field can be seen in the three countries which are shown in the direction of movement of influence on the response and impulse in the first and second periods forming a shock on each graph which begins to form a balance in the period after the second period.

To see the estimation of the accumulated direction of influence, forecasting of the accumulated direction of influence is carried out where all directions of influence are accumulated and a forecasting graph is made in figure 2.

Figure 2. Forecasting Result



After forecasting has been carried out by accumulating the direction of the influence of growth of economic in the three countries using autoregression vectors, The graph demonstrates the direction of effect of each economic growth in Indonesia, Thailand, and Malaysia on each other to influence each other to promote economic growth in the three nations. According to the estimation results, the three nations' economic cooperation may be able to boost one another's economies.

5. CONCLUSION

Economic cooperation between Indonesia, Malaysia, and Thailand in this study is simulated by vectoring the economic growth of the three countries using the autoregression vector (VAR). By doing vectoring, the direction of influence and significance as well as forecasting the accumulation of the direction of influence. From the results of the simulation

process, it can be concluded that the three countries have the opportunity to strengthen each other economically.

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