Forecasting the Number of Migrant Workers in Thailand: Empirical Study and Discussion

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Abstract

Thailand has a large number of migrant workers which concentration in economic areas and high demand employment. The purpose of this study aims to predict the number of migrant workers who are permitted to work in Bangkok, Metropolitan, Central, North, Northeast, and South in Thailand. Time series data were theoretically used to predict using autoregressive integrated moving average (ARIMA) or Box-Jenkins forecasting method. The results showed that the ARIMA(p,d,q) was appropriate to predict the number of migrant workers. Based on the lowest value of the AIC and RMSE statistics were classified by migrant workers in Bangkok, Metropolitan, Central, North, Northeast and South with ARIMA(3,1,3), ARIMA(1,1,1), ARIMA(3,1,3), ARIMA(3,0,3), ARIMA(3,1,3) and ARIMA(3,1,3), respectively. Regarding the forecasting efficiency technique, the comparison between the actual value and the estimated value was in the range of 82.78 - 95.87% which result from the correlation coefficient. The forecasting number of migrant workers in 2018 showed that the

number of migrant workers in Bangkok, North and Northeast was likely to decrease. Meanwhile, the number of migrant workers had a tendency of increasing in Metropolitan, Central, and South. However, the overall forecasting number of migrant workers in Thailand was likely to decrease by 5.68%.

Keywords: Forecasting, Box-Jenkins, Migrant Workers, Thailand, Economic Development

1. Introduction

International migration is increasing in the globalized world tends and is more likely in the future. Thailand is the top 20 of the migration destination countries and is a major destination for migrant workers in ASEAN countries. Nowadays, there are many countries in the world have turned to focus seriously on international migration management to provide benefits overall economy of both countries of origin and destination of the migrants.

Thailand has been supported and pushed for the production factors, product movements, services, investment, capital, and skilled workers between each other freely. Thailand is one of the founders of the ASEAN with the objective of developing countries, members of the economic, political and cultural groups. The economic approach is similar to the European Union (EU) that reducing barriers for trade production movement factors can be generally free and resulting in the production to be efficient and beneficial to all member countries. The economic structure of most ASEAN member countries is similar, except Singapore and Brunei. There is production in agriculture and service sectors that focus on labor more than industrial sectors that focus on using machines for production. Therefore, the migrant workers are a very important factor for this region. The movement of the number of migrant workers has a significant impact on the economy of each country in terms of an employment rate, production cost and the demand for consumer products.

During 2015-2017, the statistics of the number of employed which classified by industry, the proportion of employed persons in the agricultural sector has decreased by 33.93% in 2015 and decreased to 33.21% and 33.35% for the year 2016 and 2017, respectively (National Statistical Office, 2015 -2017). When considering the change in the proportion of employed people in the industrial sector of 2017 and the past year found that the growth rate dropped to 1.83%. Several important reasons that have reduced the number of people employed in the industrial sector, such as the attitude of the new generation of workers towards the agricultural occupation has led to a move towards more agricultural workers, the cost of production of economic crops that are likely to decrease, including labor costs, causing some workers to earn extra income by doing other jobs and insurance system for an agricultural policy of the government to reduce restrictions. There is serious development, promotion, and support. The previous year, the proportion of those employed outside the agricultural sector or the proportion of those employed in the industrial sector. Employment is likely to increase.

Since the industry with technology dependence rapidly grows year by year; there is a high demand for labor skills. Both in the amount of basic labor and semi-skilled workers are necessary for the business sector which may cause high employment in the near future. Currently, Thailand has hired many migrant workers to replace Thai workers in the manufacturing and service sectors. Because Thai workers have a better education level and can choose more jobs. Therefore, the manufacturing and service sectors employing migrant workers to replace many Thai workers, causing migration from neighboring countries come to work in Thailand. Because migrant workers will work that most Thai people are unpreferable to do as a dangerous, difficult and dirty work at a low wage rate making it desirable for entrepreneurs in Thailand. The government's announcement of the minimum wage policy of 300 Baht, resulting in higher wages in Thailand. This is another motivation

for migrant workers to move to work in Thailand. Thailand's economic and tourism growth continuingly, causing Thailand to have a large number of labor-intensive products and services. Most of the occupations that migrant workers are labor and servants.

The numbers of migrant workers, who are allowed to work in Thailand, are classified by region. The statistics in 2017 of the Department of Employment shown a large number of migrant workers come to work. Those migrant workers are not spread across to work equally in every area of Thailand. However, they are more concentrated in good economic conditions areas, high economic value and have a lot of employment. Due to the different types of production structure and employment patterns which vary by region. It is inappropriate to take the number of migrant workers in the whole country together because the number of migrant workers in the whole country is an overview of all workers. However, this number does not reflect in each area with the number of migrant workers increased or decreased significantly. This causes government or private agencies to use the information in policy planning and a project related to migrant workers is not effective. Because unable to respond comprehensively and thoroughly which is a waste of resources used for investment from policy planning and projects.

The concept of Box-Jenkins is a forecasting technique which have been applied in many fields such as Bijak et al. (2019) forecasted international migration of the United Kingdom using various approaches such as extrapolation, Bayesian and econometric models. The assessment of the forecasting accuracy used mean percentage error (MPE), mean absolute error (MAE) and root mean square error (RMSE). Moreover, Dobre and Alexandru (2008), Adenomon (2017) and, Dritsakia and Klazoglou (2018) conducted a research on forecasting unemployment rate in the case of the U.S., Romania and Nigeria, respectively. These studies also employed ARIMA concepts with concerned the statistical accuracies using MSE, MAE and RMSE. Therefore, the objective of this study is to forecast the number of

migrant workers in Thailand based on Box-Jenkins procedure or better known as ARIMA model because it is a popular method used to analyze secondary data especially the time series data. The next section will show a research methodology consisting of data, variables and forecasting method. Then, the empirical results, discussion and concluding remarks will be presented respectively.

2. 1 Forecasting Methodology

Data used in this study are the monthly time series of the number of migrant workers permitted to work in Thailand, starting from January 2007 to December 2017, a total of 132 months. The data have been classified by the main region of Thailand, namely Bangkok, Metropolitan, Central, Northeast, North, and South. The data were collected from the Office of Foreign Labor Administration, Department of Employment, Ministry of Labor, Thailand.

The forecast ARIMA(p,d,q) of Box and Jenkins (1970), which is a statistical technique that uses the behavior of historical observations to describe or predict the future trend of data consisting of four steps (Gujarati and Porter, 2009); (1) Identification model from the stationary testing by the ADF unit root method to determine the order of integration or I(d). Then, considering the correlogram diagram to determine autoregressive or AR(p) and moving average or MA(q), respectively. (2) Parameter estimation using the ordinary least squares (OLS) method, all parameters must be statistically significant at the level of 0.05. (3) Diagnostic checking to prevent problems from autocorrelation with the forecasting model considered by the Ljung-Box Q statistics. (4) Forecasting forward for a period of 12 months from January - December 2018. There will be a performance model forecast based on the correlation coefficient between the actual value and the estimated value (Chang et al., 2009; Lim et al., 2009).

The equation to test the stationarity of data and the predictive equation model with ARIMA(p,d,q) shown as the equation (1) and (2), respectively.

$$\Delta Y_t = \alpha_0 + \delta T + \beta_1 Y_{t-1} + \sum_{i=1}^{p} \beta_2 \Delta Y_{t-i} + \varepsilon_t \qquad (1)$$

By requiring "Y" to be the time series "Δ" is the differencing order, "T" is the time trend, "p" is the optimal lag length of the AR(p) model, selected from the Schwarz information criterion (SIC), "t" is the time period starting from 1, 2, 3, ..., p and "α, β and δ" are parameter coefficients, respectively.

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \beta_1 \Delta Y_{t-i} + \sum_{i=1}^{q} \beta_2 \varepsilon_{t-i} + \varepsilon_t \qquad (2)$$

By requiring "Y" to be the time series, "Δ" is the differencing order, "p" is lag order of AR(p) process and "q" is lag order of MA(p) process.

2.3 Empirical Results

The first step of the time series analysis is necessary to check whether the stationarity of time series data to avoid the findings of mean, variances and covariance which are instable in each period as time changes. Its results may cause problems with spurious results (Granger and Newbold, 1974). This study uses the ADF unit root method of Dickey and Fuller (1979, 1981). The analysis results are shown in Table 1 below.

Table 1 The results of ADF unit root

Variable	Level, I(d) = 0		First difference, I(d) = 1	
	t-statistics	P	t-statistics	P
Bangkok	-2.399	0	-11.514*	0
Perimeter	-1.138	0	-11.615*	0
Central	-2.460	0	-12.441*	0
North	-3.878*	0		
Northeast	-2.831	0	-10.650*	0
South	-2.399	0	-11.514*	0

Note: The asterisk (*) indicates significance level of 0.05.

Table 1 shows the stationary results of the data using the ADF unit root of the number of migrant workers in Bangkok, Metropolitan, Central, North, Northeast and South in Thailand by the null hypothesis (H_0) to test whether the data is non-stationary or not. The results from Table 1 show that at the level stage, Bangkok, Perimeter, Central, Northeast, and South have t-statistical values obtained from the analysis rather than the critical values at the 0.05 level significantly. Then, the first difference is added to the test for the stationarity of the data. The variables of Bangkok, Metropolitan, Central, Northeast and South have t-statistical values less than the critical values at significantly different 0.05 level, meaning that Bangkok, Metropolitan, Central, Northeast, and South have a stationarity at the first difference or I(1), except for the North which has a statistically significant less than the critical value at the 0.05 level or stationary at I(0) order.

Table 2 The selected models of ARIMA(p,d,q)

Variable	Bangkok	Perimeter	Central	North	Northeast	South
	ARIMA(3,1,3)	ARIMA(1,1,1)	ARIMA(3,1,3)	ARMA(3,0,3)	ARIMA(3,1,3)	ARIMA(3,1,3)
Constant	< -0.001	0.016	0.006*	0.001	0.001	< -0.001
	(0.004)	(0.015)	(0.002)	(0.001)	(0.002)	(0.004)
AR(1)	0.433*	0.312*	0.162*	-1.050*	-0.889*	0.433*
	(0.074)	(0.132)	(0.056)	(0.067)	(0.215)	(0.074)
AR(2)	-0.369*		-0.308*	0.455*	0.575*	-0.369*
	(0.077)		(0.048)	(0.103)	(0.094)	(0.077)
AR(3)	0.712*		0.696*	0.592*	0.686*	0.712*
	(0.069)		(0.052)	(0.066)	(0.152)	(0.069)
MA(1)	-0.452*	-0.329*	-0.332*	0.941*	0.713*	-0.452*
	(0.028)	(0.156)	(0.025)	(0.013)	(0.233)	(0.028)
MA(2)	0.449*		0.340*	-0.929*	-0.861*	0.449*
	(0.030)		(0.024)	(0.014)	(0.071)	(0.030)
MA(3)	-0.965*		-0.979*	-0.979*	-0.800*	-0.965*
	(0.023)		(0.013)	(0.012)	(0.202)	(0.023)
AIC	-0.878	-0.623	-1.006	-0.840	-1.140	-0.878
Q statistics	0.362	0.063	< -0.001	0.172	1.273	0.362
RMSE	$3.517 X 10^4$	$4.592 x 10^4$	$3.061 x 10^4$	$1.978 x 10^4$	$3.250 x 10^4$	$3.517 x 10^4$

Note: The asterisk (*) indicates significance level of 0.05.
The numbers in parentheses ( ) are standard errors (S.E.) of the regression coefficients.

Table 2 shows the parameter estimation of the migrant workers in Thailand by considering the most suitable model. The most appropriate forecasting method is based on the lowest values of the Akaike information criterion (AIC) and root mean square error (RMSE) statistics. However, the forecasting model must not have an autocorrelation. The most suitable ARIMA(p,d,q) for the variables of Bangkok, Metropolitan, Central, North, Northeast is ARIMA(3,1,3). The ARIMA(p,d,q) of Perimeter is ARIMA(1,1,1) and North is ARIMA(3,0,3). The performance of the forecasting models is based on the correlation coefficient compared with the actual value and the estimated value. It was found that the models of Bangkok, Metropolitan, Central, North, Northeast, and South have the relationship between the actual value compared to the estimated value of 92.99%, 95.87%, 93.71%, 82.78%, 87.75%, and 92.73%, respectively. However, the forecast results of the number of migrant workers in Thailand have been presented in the discussion to show the situation of the foreign labor trends in Thailand.

3. Discussion

The forecast number of migrant workers in Thailand is shown in Table 3. The number of migrant workers who has permission work in Thailand classified by region, Bangkok Metropolitan, Central, Northern, Northeastern and South during January - December 2018 (12 months). The details are as follows.

Bangkok is still a popular city for migrant workers because there are many important business centers. Some foreign investors come to work in Thailand for a short-term and long-term period. Japanese foreigners are the greatest number of people coming to work in Thailand. Most of them come to work as a department manager or an engineer. Most of which are skilled labor that is legally registered and has a circulation of migrants in Bangkok occur regularly and there are unskilled workers and semi-skilled types scattered in every area

of Bangkok. Despite being legally registered and not registered as required by law especially in the service sector and general contractor, the number of foreign workers in Bangkok is likely to decrease. The forecasting number of migrant workers in Bangkok in 2018 compared to the previous year showed that the number of migrant workers dropped to 19.56%.

The metropolitan area is a large migrant worker's market. Most of them are located in industrial estates which wants to hire migrant workers at all levels and tends to increase. As for the foreign labor market, there is a similar shortage. Labor is characterized by high turnover. They often flow into businesses that offer better compensation, which has bad working conditions, causing many entrepreneurs to face risk. It is necessary to use illegal labor. Business interruption is due to labor shortages and the relatively high turnover rate of labor. Most entrepreneurs commented that nowadays migrant worker can choose jobs that offer higher remuneration. This situation of the migrant worker market is characterized by the pulling of labor both from agriculture and manufacturing sectors, causing the number of migrant workers in the metropolitan area tends to increase. The results of the forecast of the number of migrant workers in 2018 in the metropolitan area compared to the previous year showed that the growth rate increased by 22.51%.

Table 3 Forecasting monthly data of the number of migrant workers in 2018

Month	The number of migrant workers classified by region						
	Bangkok	Perimeter	Central	North	Northeast	South	Thailand
January	340,388	750,493	386,199	184,115	38,151	388,078	2,087,424
February	346,697	763,228	387,390	177,398	36,611	400,909	2,112,233
March	318,434	776,259	384,901	174,251	35,369	408,933	2,098,147
April	304,491	789,538	388,067	173,316	34,364	416,919	2,106,695
May	312,235	803,053	391,384	169,422	33,549	426,122	2,135,765
June	302,052	816,801	390,373	171,572	32,886	432,650	2,146,334
July	285,721	830,785	392,605	167,338	32,347	437,759	2,146,555
August	287,452	845,009	396,829	170,771	31,910	444,148	2,176,119
September	287,320	859,477	397,315	166,816	31,556	449,830	2,192,314
October	275,487	874,192	398,873	170,329	31,272	453,900	2,204,053
November	271,716	889,160	403,187	167,167	31,045	458,484	2,220,759
December	274,237	904,383	404,982	170,045	30,865	463,416	2,247,928

The central region, the migrant worker policy found that the migrant workers who came to work in the central region were divided into two groups. The first group was three nationalities, Myanmar, Laos, and Cambodia, both legal and illegal. During the past year, the number of migrant workers who have come to work has increased because the government's relief for employers to bring illegal migrant workers to report to request for registration. The second group, other migrant workers (Most of them are Japanese) and non-migrant workers of the three nationalities are also increasing, while there is still a small amount. The migrant workers in this group can be divided into two sub-groups, which working in general industry and work in parts of industries that are promoted for an investment causing the number of

migrant workers increased. The forecasting results on the number of foreign labor in 2018 in the central region compared to the previous year showed that this number increased by 5.94%.

The northern region has two groups of migrant workers, the group that comes to work according to the law. Most of them are Japanese people working in an industrial estate in the North, especially Lamphun and Chiang Mai Provinces. Burmese workers are mostly a group of migrant workers who fled into the city. The differences in wages and standard of living between Thailand and neighboring countries, especially Myanmar is an important attraction for Burmese workers to flow into Thailand. Especially in the northern region, most of them are unskilled workers who are satisfied with the wages they earn. There are two crowded areas for the Burmese migrant, including Mae Sot district, Tak Province and nearby districts located in Umphang district, Phop Phra district, Mae Ramat district and Tha Song Yang district, Tak Province. These areas have the exporting industries, especially the garment production industry from Bangkok and Metropolitan. Another manufactory has been widely established in Mae Sai district and Mae Chan district, Chiang Rai Province, Mueang district, Mae Hong Son Province, Chiang Mai Province and Nan Province. Especially in Mae Sai district, Chiang Rai Province, some Burmese migrants come to work as a round trip in one day as the Thai and Burmese authorities allow people on both sides to cross and to buy goods at the time specified by each country. Some of the workers in this area are semi-skilled workers such as gem making, etc. Hiring migrant workers allows private businesses to hire cheap labor that is beneficial for export, increasing labor force and alleviating the shortage of unskilled workers. However, the movement of the majority of the population into Bangkok, Metropolitan and some of them go to work overseas, such as Taiwan, Japan, and the Middle East. This causes the number of labor is decreased in the northern region of Thailand. The

forecasting results of the number of migrant workers for the year 2018 in the northern region compared to the previous year showed that the growth rate decreased by 9.04%.

In the Northeast, the migrant workers that flow incoming from neighboring countries like Myanmar, Laos, Cambodia and beyond, like China and Vietnam. Those workers did not just come to Bangkok and metropolitan area only. They are spread in different regions and working in the service, industrial, household and agricultural sectors. The contract includes both daily and monthly contract with the influx of people according to the way of life. The attraction for migrant workers is the source of capital in Thailand, high wages and many factories. A large number of them were quite illegal. The economic conditions being the driving force and the wages in Thailand that are more expensive are attracting traffic. Thai government has attempted to systematically manage labor, initially allowing migrants to register legally and manage labor to be more systematic. At the same time, foreign workers have been moved to major cities in Bangkok, metropolitan, central and southern regions which have economic growth and the employment power of migrant workers is higher than the northeast region. Therefore, the number of migrant workers in this area is likely to drop. The forecast by the number of migrants in 2018 in the Northeast, compared to the previous year, showed the number of migrants decreased by 22.98%.

The southern region is a large fishing industry and a lot of business continuity. New legislation in the form of the government intended to speed up the issue of illegal foreign workers including reducing the situation of human trafficking in Thailand which is being monitored. However, as the law became effective immediately. It causes severe conditions in the economy. The law, regulations, and penalties has been strictly applied in this area. The government has postponed the enforcement of the decree for another 180 days to allow time to prepare. Causing the condition of the economy that relies on migrant workers to ease and the demand for migrant workers in the fishing sector are high. Because most Thai workers

reject jobs in the fishery sector is the main reason that the number of migrant workers in the southern region increased. The forecast by the number of migrants in 2018 of the South, compared to the previous year, showed increased to 23.78%.

4. Concluding Remarks

The forecast for the number of migrant workers in Thailand based on Box-Jenkins method can be a guideline and benefit for government or private agencies to use information in policy planning and projects related to migrant workers more effectively. The number of migrant workers in each region of Thailand has both a different rate of increase and decrease and shown that the entry of migrant workers working in Thailand has not spread work across all areas of the country equally. However, the migrant workers move to the area where is better economic condition and a lot of employment rate such as the metropolitan, the central and the southern region where there is the expansion of migrant workers in the area that is higher.

In many decades, the policy on migrant workers in Thailand has tried and enforced strict policies and lenient forms for managing foreign workers. Until now, Thailand has adopted short-term measures to remedy the shortage of labor and the influx of illegal migrants entering the city. By using the resolution of the cabinet extend the period for foreign workers to have temporary residence rights and the registration to work annually. It has been proven that these measures do not resolve the problem of foreign workers effectively. Due to the fact that the number of foreign workers officially registered with the responsible department decreasing every year, causing the government to open a new registration for foreign workers to allow unregistered migrant workers to register correctly or migrants who have already registered. However, the illegal workers returned to register once again. Currently, Thai entrepreneurs in manufacturing face a significant labor shortage. The

majority of the workforce in addition to being concentrated in the agricultural and service sectors. There is also the option to do freelance careers. In addition to working in the system which would aggravate the labor shortage problem and emphasizing the importance of incentives for attracting more labor to work, more than monetary compensation. Apart from that, the labor shortages are also caused by the inconsistency between supply and demand for skills and experience of many businesses in Thailand. The manufacturing sector has to face a shortage of semi-skilled labor especially the workers who have completed vocational education is also not sufficient to meet demand. Meanwhile, workers who have completed a bachelor's degree or a higher degree have moreover requirements. In the past, Thailand needed to rely on migrant workers to fill the labor demand in the manufacturing sector. However, the migrant workers are not a sustainable solution in the long term. Because the motivation to move back to work in the home country of migrant workers has increased during the rhythm of the move towards the AEC.

Thailand has entered to "Aging Society" situation since 2005, which is one to ten of the Thai population, is a population aged 60 years or over (Anantakul, 2017). Recently, the government and other agencies associated with the private sector and civil society is aware of such situations and the tendency of the situation as has been expected that Thailand will be "Completely Aged Society" in 2021 and "Super-Aged Society" by 2035. Therefore, the government has implemented policies and measures to help the elderly in a variety of measures including income security, housing, health, and occupational measures. It is absolutely necessary at various sectors in society must work together to accelerate their role in driving action to deal with the aging society are facing as well as to prepare to support the challenges of the upcoming situation. Moreover, it needs more measures to support the workforce to increase the flexibility of the system, increase skills and enhance new skills throughout the age. The design of the work provides incentives and flexibility to the labor age

that may need to look after other members of the family. It is an important policy choice and can help increase participation in the labor market appropriately and more directly. It is the force driving the economy forward in the next future as well.

The aging society trends increasing from the structure of the population that changed with the proportion of older people. Meanwhile, there has the same labor age or decreasing which will have a direct impact on the increasing production industry and the labor force that is needed by the manufacturing industry diminishes. However, the decrease in the labor force may be resolved by using technology to replace human labor or replacing migrant workers resulting in more labor migration. The opening of the ASEAN community that will probably drag to a free labor migration situation. Thailand is both the origin and destination countries where the skilled workers in ASEAN from low-paying countries will move to work for higher compensation. Thai workers in some career may move abroad, then find better work. Meanwhile, lower-level workers from underdeveloped countries, whether they are labor, housewives, construction workers, it will flow into the country. The entire studied results on the situation of migrant workers in Thailand can be a useful and guideline towards the Thai government and other agencies in preparing to deal with consequences, such as having a large number of migrant workers that lead to the risk of contagious diseases, drugs, crime, and human trafficking. Furthermore, the import of migrant workers that greater than the export of labor working abroad could cause labor shortages in certain areas. Finally, opportunities for lower-level Thai workers will have less chance of getting work, especially in regions with large numbers of migrant workers.

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