Forecasting of Thailand and Myanmar Border Trade Value for Strategic Planning

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ABSTRACT

Forecasting the values of border trade are needed for strategic planning, especially in the competitive enhancement strategy. This paper applies the autoregressive integrated moving average (ARIMA) models to forecast the border trade value between Thailand and Myanmar on a monthly data basis. The data used are ranged from 2007 to 2016. The results bring about the forecasting model for the further border trade investment of both countries which is useful for making the decision on part of the entrepreneurs, investors, exporters, and importers. Furthermore, the relevant agencies can use these findings to determine the promoting directions of border trade in the future.

CCS Concepts

• Applied computing→ Economics.

Keywords

bordered trade value; forecasting; ARIMA; strategic planning

1. INTRODUCTION

The ASEAN Economics Community (AEC) agreement aims to create a single market and production base with minimal economics barriers by reducing all international trade tariffs between its members to 0% rate within the year 2015, eliminating all non-tariff barriers to trade (NTBs) as soon as possible, improving rules of origin laws, and using the compatible customs coordinates among its members. These actions bring more ease for goods of AEC's members to enter the regional market especially via the border trade. An increase in border trade activity together with the development of Myanmar and Laos's economics and domestic politics will lead to Thailand's opportunities in exporting goods and expanding production base by establishing border crossing points and transportation routes among these countries.

Considering Myanmar, it has a lot of industrial growth potential and has already stepped up to be a regional production base and exporting goods distribution center. Moreover, the current direction in the country's reform and newly private investment promotion policy make Myanmar a great trading and investment potential whereas its significant growth on its economics as its GDP per capita increased from 193.2 USD in 2000 to 1,275.0 USD in 2016 [1].

With the proper political geography, the situation makes the border trade to be the most important trade channel between Thailand and Myanmar. Nowadays, two countries have set up six permanent border crossing points, two temporary crossing points and ten checkpoints along the border. During the past decades, the growth rate of border trading between two countries has been significantly increasing; the average growth rate of border trading volume between the year 2010 and 2016 was around 13.96% [2].

In the areas of the Chiang Mai province, there are two Thai-Myanmar joint trading areas: the Kio Pha Wok border checkpoint and the Lak Tang border checkpoint. Statistics from Chiang Dao Customs, Chiang Mai Province also show an increasing rate in border trading activities. The economy size of Chiang Mai is one of the top of the country and sharing its border with Myanmar: these two countries still exchange goods and service through the small border checkpoints only. The Chiang Mai's local government authority is still working to promote its border checkpoints

to be permanent border crossing points and is currently dealing with some major issues such as the effects on the permanent open border. Also, the trend of border trading in the future is on creating a strategy plan to promote the Thai-Myanmar border trade in the area to be headed in the right direction.

This study focused on investigating the trend of trading value at the border checkpoints and how to use these results to create a strategy that would help promote and develop border trading between the two countries. Thus, the main objectives of the study are 1) to forecast the Thai-Myanmar border trading value with the ARIMA models using the Box-Jenkins methodology, and 2) to evaluate guidelines and strategies for border trading development at Chiang Mai's border checkpoints that would help develop the economy and society of the province.

2. LITERATURE REVIEW

The ARIMA model is one of models that is typically used to forecast time series data in the economic and social fields for more than three decades. This model is a generalization of an autoregressive moving average (ARMA) model which consists of two models, an autoregressive (AR) model and a moving average (MA) model where an initial differencing step (corresponding to the integrated (I) part of the model) has been applied to eliminate the unit roots of the time series. Therefore, the key point is on naming the combination of these models to an autoregressive integrated moving average (ARIMA) models [3]. The ARIMA modelling approach with the Box-Jenkins method is by far the most popular methodology because it can find the best fit statistical properties to the time-series modeling [4]. The ARIMA models are based on assumptions that the evolving variable of interest is regressed on its own present and past values include the white noise. In other words, this model use both present and past data to forecast the future data.

Literature reviews have shown that a lot of researchers used ARIMA model to forecast international trade data such as [5] used ARIMA model by Box-Jenkins and Holt-Winters method to forecast Thailand's rice export, [6] performed ARIMA model to predict shrimp and frozen food export earning of Bangladesh, and [7] compared the Taiwan export forecasting techniques between fuzzy time series model and ARIMA model. His findings shown that the prior model was more accurate forecasts of the export amount than the latter model because of the smaller predicted error and closer predicted trajectory to the realistic tendencies. Furthermore, [8] modeled the terms of trade in Ethiopia and predicted its value through ARIMA model, and [9] also employed this model to forecast the balance of trade of Pakistan. The best fit forecasting model will be based on the Akaike information criterion (AIC) and the Bayesian information criterion (BIC) [10], [11], [12], [13].

3. THE METHODOLOGY AND MODEL

This research used a quantitative research method to study and forecast border trade value. Also, qualitative research was utilized to evaluate the guidelines and strategies for border trading development.

In order to forecast border trade value to find the strategical planning to increase competitive efficiency, this study used the Department of Foreign Trade's data from 2007 to 2016 to forecast the border trade value trend and used an evaluation of strategy to develop the border trade to increase the competitive efficiency.

3.1 The Thai-Myanmar Border Trade Value Forecasting

The Thai-Myanmar border trade value forecasting used the secondary data from the Department of International Trade Promotion encompassing 120 monthly data of imports and exports from 2007 to 2016.

Modelling the ARIMA model to forecast Thai-Myanmar border trade value trend was applied with the Box-Jenkins [14] methodology which is identified as the best fit ARIMA model for the autocorrelation function (ACF) and partial autocorrelation function (PACF). Given a time series data where p is the order of autoregressive processes and q is the order of moving average, an ARMA (p, q) model is given by:

$$y_t = \phi_1 y_{t-1} + ... + \phi_p y_{t-p} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - ... - \theta_q \varepsilon_{t-q} \qquad (1)$$

or $\quad \phi(L) y_t = \theta(L) \varepsilon_t \qquad (2)$

When $\phi(L)$ and $\theta(L)$ is the degree of polynomial of AR and MA, respectively. Due to some data is a non-stationary data with d unit root, $\{y_t\}$ must be in the differential form to make the data stationary, when p is order of autoregressive processes, q is order of moving average and d is the degree of differencing an autoregressive integrated moving average model or ARIMA (p, d, q) model is given by:

$$\Delta^d y_t = \phi_1 y_{t-1} + ... + \phi_p y_{t-p} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - ... - \theta_q \varepsilon_{t-q} \qquad (3)$$

or $\quad \phi(L) \Delta^d y_t = \theta(L) \varepsilon_t \qquad (4)$

The Box-Jenkins method for forecasting uses a four-stage modelling approach which is model identification, parameter estimation, diagnostic checking and forecasting, respectively [16].

3.2 Evaluate the Guidelines and Strategies to Create the Border Trading Development

This part of the study starts by gathering data using in-depth interview, focus group meeting and observation, sampling from peoples living in both area of Chiang Mai's Thai-Myanmar border checkpoints which consist of local Thai-Myanmar trade entrepreneurs, Thai exporters, Thai government and private sector employees such as customs officers, sub-district administrative organization officers, municipal administration, provincial commercial officers, provincial industry officers, provincial chamber of

(Unit: Million THB)

| Month	ARIMA_ (TOT)	ARIMA_ (EX)	ARIMA_ (IM)	ARIMA_ (BAL)
Jan 2017	22,491.37	9,391.48	10,607.68	2,005.67
Feb 2017	22,662.84	9,682.29	10,647.30	2,061.80
Mar 2017	22,835.61	9,645.36	10,687.07	2,117.94
Apr 2017	23,009.70	9,075.29	10,726.99	2,174.07
May 2017	23,185.11	9,573.95	10,767.06	2,230.19
Jun 2017	23,361.87	9,112.44	10,807.28	2,286.32
Jul 2017	23,539.97	9,595.51	10,847.65	2,342.44
Aug 2017	23,719.42	9,788.00	10,888.17	2,398.57
Sep 2017	23,900.25	10,208.48	10,928.84	2,454.70
Oct 2017	24,082.45	10,771.05	10,969.66	2,510.84
Nov 2017	24,266.05	10,821.90	11,010.63	2,566.97
Dec 2017	24,451.04	11,642.63	11,051.76	2,623.10
Average	23,458.81	9,942.37	10,828.34	2,314.38
Jan 2018	24,637.44	11,107.14	11,093.04	2,679.24
Feb 2018	24,825.27	11,460.54	11,134.48	2,735.37
Mar 2018	25,014.52	11,337.98	11,176.07	2,791.50
Apr 2018	25,205.22	10,737.80	11,217.82	2,847.63
May 2018	25,397.37	11,330.92	11,259.72	2,903.76
Jun 2018	25,590.99	10,819.27	11,301.78	2,959.89
Jul 2018	25,786.09	11,451.91	11,343.99	3,016.02
Aug 2018	25,982.67	11,681.51	11,386.37	3,072.15
Sep 2018	26,180.75	12,214.68	11,428.90	3,128.28
Oct 2018	26,380.34	12,837.43	11,471.59	3,184.41
Nov 2018	26,581.45	12,913.37	11,514.44	3,240.54
Dec 2018	26,784.09	13,800.40	11,557.45	3,296.68
Average	25,697.18	11,807.75	11,323.80	2,987.96

Source: calculated.

The results of border trade value forecasting at the trading checkpoints in Table 2 show that the total trade value (TOT), Thai export to Myanmar (EX), Thai import from Myanmar (IM) and Thai-Myanmar border trade balance (BAL) have increasing trends when comparing their value in the past. The average value of them in 2018 are 25,697.18; 11,807.75; 11,323.80 and 2,987.96 million THB, respectively. Moreover, the Thai-Myanmar border trading value has a tendency from 2007 to 2018, which is shown in Fig. 1 representing that the total trade value (Fig. 1a), Thai export to Myanmar (Fig. 1b), Thai import from Myanmar (Fig. 1c) and Thai-Myanmar border trade balance (Fig. 1d) have tended to obviously increase.
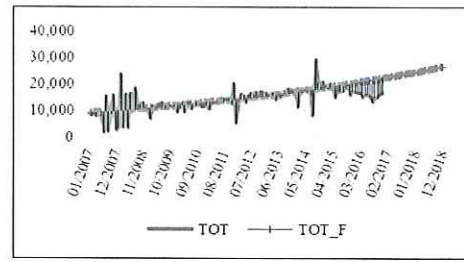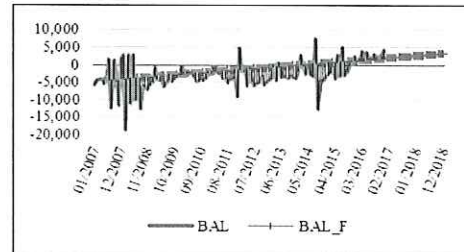

(a) Total trade value
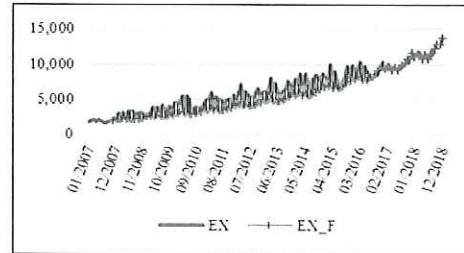
(b) Thai export to Myanmar
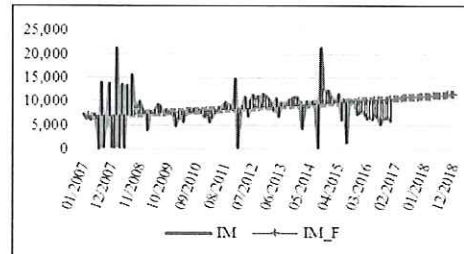
(c) Thai import from Myanmar

(d) Thai-Myanmar border trade balance

Figure 1. Forecasting of the Thai-Myanmar border trading value trend from 2007 to 2018

Considering the growth rate of crucial Thai goods exported to Myanmar in 2016 comparing with base year 2012, the results revealed that motorcycle and parts, machinery, sugar, non-alcohol drink and steels had the highest growth rates around 75.16%, 73.02%, 49.56%, 26.85% and 19.90%, respectively. While the Thai importing goods consisting of fishery goods, frozen squid, animal products, spices and agricultural products had the highest value growth rates of 382.90%, 343.72%, 156.62%, 129.46% and 92.97%, respectively [15]. One of the key factors that help supported the growth of border trading is the local border trade authorities of Myanmar which have changed their economic policy toward free trade along with the emerging of many

regional trading bloc agreements. The border trading not only benefits the people living in the border area but also for greater solidarity and closer cooperation between the two countries.

4.2 Border Trading Strategical Planning to Increase Competitive Efficiency Analysis Results

This part of the study developed a strategical planning to increase the competitive efficiency between Thailand and Myanmar from the forecasting of border trading at Chiang Mai border checkpoints. The results and the cooperatives are from the local government agency and local private sector along with other sectors involving border trading encompassing 100 samples. Using the SWOT analysis and appreciation influence control (AIC), the score system was added to determine the priority of the strategy, given 2.34 – 3.00 average score to the high priority strategy, 1.67 – 2.33 average score to the medium priority strategy and 1.00 – 1.66 average score to the low priority strategy. The results are expressed in Table 3.

TABLE III.   PRIORITY ANALYSIS RESULTS OF STRATEGICAL PLANNING TO INCREASE COMPETITIVE EFFICIENCY BETWEEN THAILAND AND MYANMAR

Border Trading Development Strategy Objectives	Average Score	Priority *
Increase public relation of Thai-Myanmar border trade in Chiang Mai	2.409	High
Open official border trading service center	2.400	High
Give more trading area to the local entrepreneurs	2.387	High
Building local entrepreneurs network to improve goods quality	2.361	High
Seeking an agreement between two governments to open the permanent border crossing points	2.278	Medium
Invest in Thai-Myanmar transportation infrastructure in Chiang Mai	2.110	Medium
Improve border trading law to accommodate the growing trade value	1.984	Medium
Open the logistic center to accommodate importers and exporters	1.545	Low
Utilizing Chiang Mai as a production hub for exports goods to Myanmar	1.287	Low
Improve border checkpoint as a commerce tourism area	1.246	Low

Note: *"High priority strategy" is the strategy that should be complete within 1-2 years, "Medium priority strategy" is the strategy that should be complete within 5 years and "Low priority strategy" is the strategy that should be complete within 10 years.

Table 3 show that the strategies should be completed within 1-2 years to increase the public relation of Thai-Myanmar border trade in Chiang Mai, open official border trading service center, give more trading area to the local entrepreneurs and building local entrepreneurs network to improve quality goods with the average score of 2.409, 2.400, 2.387 and 2.361 respectively, while seeking an agreement between the two governments to open the permanent border crossing points, invest in Thai-Myanmar transportation infrastructure in Chiang Mai and improve border trading law to accommodate the growing trade value strategies which has

a medium priority (the strategy that should be completed within 5 years) with average score 2.278, 2.110 and 1.984 respectively. The low priority strategies (should be completed within 10 years) are opening the logistic center to accommodate importers and exporters, utilizing Chiang Mai as a production hub for exports goods to Myanmar and improving border checkpoint as a commerce tourism area with the average score of 1.545, 1.287 and 1.246, respectively.

5. CONCLUSION

In order to promote the border checkpoints into the permanent border crossing points, the effects of open permanent border crossing points and border trading trend in the area must be carefully studied and use the results to create strategy plans that would help promote Thai-Myanmar border trade in the Chiang Mai area towards the right direction. This study forecasted on the Thai-Myanmar border trade value by using the ARIMA model from the Box-Jenkins approach and using a SWOT analysis along with the appreciation influence control (AIC) to evaluate the guidelines and strategies to develop border trading at Chiang Mai's border checkpoints.

The result show that between 2007 and 2018 the total border trade value, value of Thai export to Myanmar, value of Thai import from Myanmar and Thai-Myanmar border trade balance all have statistically significant increasing trend which implied to the trading and investment opportunities between the two countries. However the promotion of the border checkpoints into the permanent border crossing points must have full cooperation from the involvement sectors that include government agency and private sector to create the growth-driven development strategies that can divide the priority into three categories consisting of high priority strategy which is the strategy that should be completed within 1-2 years, a medium priority strategy which is the strategy that should be completed within 5 years and a low priority strategy which is the strategy that should be completed within 10 years. These strategies will help increase the competitive efficiency between Thailand and Myanmar in the future and help develop the economy and society of the community along the border.

6 ACKNOWLEDGMENT

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