Identification of the connection between tourism demand and economic growth in ASEAN-3

Satawat Wannapan*, Chukiat Chaiboonsri and Songsak Sriboonchitta

Faculty of Economics,
Chiang Mai University,
Chiang Mai, 50200, Thailand
Email: lionz1988@gmail.com
Email: chukiat1973@gmail.com
Email: songsakecon@gmail.com
*Corresponding author

Abstract: This paper is based on the Bayesian inference to explore two purposes. First, the specific objective is proposed to consider an empirical analysis employing the panel Bayesian vector autoregressive (PBVAR) model. Secondly, the empirical study is aimed to analyse the driven factor between tourism demands and service sectors by adapting Granger-causality Bayesian test. Technically, the simulated computation called Markov chain Monte Carlo (MCMC) approach is employed to investigate the research’s findings. Yearly time-series data of tourism growth (tourist arrivals) and economic growth (service sectors) in ASEAN-3 countries such as Singapore, Thailand, and Malaysia were observed during 1996–2015. The empirical results of this study will deeply clarify the linkage between tourism demands and economy in ASEAN-3 countries and give recommendations to more assure that a suitable tourism policy is appropriately activated.

Keywords: tourism demands; Bayesian inference; panel data; panel Bayesian vector autoregressive model; granger-causality Bayesian test.


Biographical notes: Satawat Wannapan is a PhD student at the Faculty of Economics, Chiang Mai University, Thailand.

Chukiat Chaiboonsri is an Assistant Professor at the Faculty of Economics, Chiang Mai University, Thailand.

Songsak Sriboonchitta is a Professor in Economics at Faculty of Economics, Chiang Mai University, Thailand.

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1 Introduction

Southeast Asia (ASEAN) is reconsidered as one of the famous continents that a vast number of tourists who are both foreign and intra-Asian tourists decide to travel. In particular, Malaysia, Singapore, and Thailand are the major tourism countries. Historically, in 2014, $16.69 billion was generated by tourism sectors in Malaysia’s economy. For Thailand, it was a double amount (approximate $38.4 billion) gained from tourism activities. Moreover, Singapore is one of the favourite countries in ASEAN, which welcomed 15.09 million international tourists in 2014. Following the commitment of ASEAN National Tourism Organizations (ASEAN NTOs), one important policy in the roadmap is the incentive for developing tourism infrastructures and improving tourism service quality (ASEAN National Tourism Organizations, 2008). However, problems are now defined as inefficient revenue producing and insufficient government efforts in tourism. Thus, the empirical study seeking to determine the link between tourism and economic growth should be immediately conducted to explore the way that supports political authorities to make decisions (Antonakakis et al., 2015). To assure that comprehensible tourism policies are appropriately launched, Bayesian statistics is employed to revitalise the analysis regarding the relationship between tourism and economic growth. Interestingly, academic researchers appreciate the usefulness of Bayesian methods to resolve complicated statistical computing. This move is seemingly due to the advent of inexpensive high-speed computing facilities and the improvement of accurate stochastic integration methods; especially Markov chain Monte Carlo (MCMC) approaches (Chen et al., 2013). Ultimately, in this paper, the authors developed Bayesian inference in the unit root testing, the panel vector autoregressive model (PVAR), and the Granger-causality test to clarify how tourism demand connects with the economy.

2 The objectives and scope of research

The main purpose of this study is divided into two sections. First, the specific objective considering an empirical analysis based on the panel Bayesian vector autoregressive model, or PBVAR-model is employed. In this section, the PBVAR model can explore the relationship between service sectors and tourism demands in Singapore, Thailand, and Malaysia, which the yearly data was collected during 1996 to 2015. Additionally, it is applied to predict the speed of economic recovery when shocks threaten tourism demands as well as the expansion rates of service sectors. Secondly, the empirical study analysing the driven-factor between tourism demands and service sectors is formulated. In this part, the authors extend the Granger-causality testing by adapting Bayes information criterion (BIC) to select the best model among null hypotheses and alternative hypotheses.

3 Literature review

Historically, many academic researches mostly mentioned on economic growth and especially tried to statistically investigate market behaviours in financial or tourism sectors around the world. For instances, Kraipornsak (2011), Marire and Sunde (2012),
Tsaurai and Odhiambo (2013), Alberti et al. (2014), Bozkurt et al. (2015), Hor (2015), Solag et al. (2015), Konarasinghe (2016), and Pomsuwan and Soontayatron (2017). Differently, Bayesian statistics was applied to extend the ability of the unit root testing, PVAR model, and the Granger-causality analysis. Considering unit-root testing, Tekatli (2010) developed and implemented a Bayesian generalised factor model that allows for non-orthogonally of the idiosyncratic factors and the flexibility of cross-sectional and time-series dimensions. Chen et al. (2013) explored Bayesian inference to test the unit root in the multi-regime threshold autoregressive. In the section of the PBVAR model, Chaitip and Chaiboonsri (2015) studied a modelling dependent structure for AEC measurement using belief function and the PBVAR model. Afterward, Chaiboonsri and Chaitip (2016) examined the relationship between the demand for ICT in ASEAN countries and social-economic mechanisms. In the case of Granger-causality testing in economic issues, there are interesting papers such as Droumaguet et al. (2015) derived the restrictions for Granger non-causality based on Bayesian approach to evaluate the hypotheses of financial time-series data in US Dlamini et al. (2015) explored the causal relationship between electricity consumption and economic growth. However, the Granger causality test based on Bayesian inference is rare in econometric researches.

4 The research framework and methodology

4.1 The conceptual framework of research

Singapore, Thailand, and Malaysia are the major key country in ASEAN economy. For understanding more widely, the panel Bayesian vector autoregressive (PBVAR) model and Granger causality theory (Granger, 1961) are extended to clarify the relationship between economic growth (services sectors) and tourism growth (tourism arrivals). Figure 1 displayed the conceptual framework of the PBVAR model (Part 1), and Figure 2 showed the tourism economic diagram regarding Granger-causality relationship (Part 2).

Figure 1 The relationship between tourism demands and tourism supplies in ASEAN-3

Part 1: the conceptual framework of PVAR model

![Diagram of the conceptual framework of PVAR model](image)
5 The empirical results

5.1 Data descriptive

The basic statistics employed in this paper were presented in Table 1. The time-series data displayed the numbers of tourist arrivals and the percentages of service sectors per GDP in three ASEAN countries during 1996 to 2015. Moreover, the yearly tourism demand growth data collected from Singapore, Thailand, and Malaysia is shown in Figure 3, and the yearly tourism service growth per GDP is displayed in Figure 4.

Table 1 Data descriptions of tourist arrivals and service sectors in Singapore, Thailand, and Malaysia

<table>
<thead>
<tr>
<th>Details</th>
<th>Tourists</th>
<th></th>
<th>Services</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. dev.</td>
<td>Max</td>
<td>Min</td>
</tr>
<tr>
<td>Singapore</td>
<td>5.317</td>
<td>16.79257</td>
<td>55.431</td>
<td>–19.675</td>
</tr>
<tr>
<td>Thailand</td>
<td>7.921</td>
<td>8.965266</td>
<td>20.586</td>
<td>–7.275</td>
</tr>
<tr>
<td>Malaysia</td>
<td>7.182</td>
<td>18.05149</td>
<td>48.464</td>
<td>–20.426</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Std. dev.</td>
<td>Max</td>
<td>Min</td>
</tr>
<tr>
<td>Singapore</td>
<td>69.8285</td>
<td>3.408601</td>
<td>75</td>
<td>65.1</td>
</tr>
<tr>
<td>Thailand</td>
<td>52.445</td>
<td>1.625609</td>
<td>55</td>
<td>49.4</td>
</tr>
<tr>
<td>Malaysia</td>
<td>46.482</td>
<td>3.079158</td>
<td>51.2</td>
<td>42.2</td>
</tr>
</tbody>
</table>

Figure 3 The descriptive data of tourism demand growth in ASEAN-3 (see online version for colours)
The results of estimation from PBVAR-model

From the objectives, this paper is to analyse the relationship between tourism demands (tourist arrival expansion rates) and tourism supplies (the growth rates of service sectors per GDP) in Singapore, Thailand, and Malaysia by PBVAR-Model. The Bayesian statistics approach is a very efficient method to estimate when the time-series data have a type of the vector autoregressive model or the panel vector auto-regressive model. This approach can also reduce uncertain parameters and improve forecasting accuracy (Sune, 2015; Chaiboonsri and Chaitip, 2016). The estimation results of impulse response function (IRF) (shown in Figure 5) indicated that whenever one standard deviation (one S.D. innovations) of three AEC countries was shocked then it impacts on both tourism demands and tourism supplies. According to Figure 5, panel pictures present that when the ASEAN-3 countries had economic shocks by one standard deviation in the demand side, it had a dramatically negative effect on the tourism demand for three years because it is sensitive to vibration on its changing. This result was supported by Pritchard (2003) and Falk (2013). After three years, the response of tourism demands would return
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to equilibrium. The negative impact from tourism demands also let the expansion rates of service sectors to decrease in two years. After that, service sectors could recover the equilibrium point in the next five years. In the fact of tourism supply, economic shocks by one standard deviation had a slightly negative impact on the expansion rates of tourism service sectors. When the shocks affected ASEAN-3 countries’ economy, the expansion rates dropped during two years and then slightly went down in the next five years. However, the variations in service sectors had a positive effect on tourism demands. This changing influenced an increment of tourist arrivals in the first year and then the trend is slightly dropped in the next five years. This result is backed by Huang et al. (2010).

5.3 The result of estimation form Granger-causality based on Bayesian statistics

One of the reasons for using the BIC rather than the Bayes factor itself in model selection was that the computations needed to evaluate the latter can be enormous, especially as it is necessary to specify prior distributions for the parameters in each of the (often numerous) competing families (Zucchini, 2000). In this paper, two models were formulated and the MCMC simulation was employed to estimate Bayesian information criterion (BIC) for selecting the best models. Model 1 was set to explain that tourism demands were influenced by service sectors (service sectors-driven tourism demand hypothesis – SDTH), and Model 2 was conducted to describe that service sectors were dominated by tourism demands (tourism-driven service sectors hypothesis – TDSH). Firstly, the result in Table 2 displayed the Granger causality of tourism in Singapore, Thailand, and Malaysia. This found that tourism demands (tourist arrivals) were the factor that determined economic growth (service sectors) in Singapore ($BIC_{model1} > BIC_{model2}$), and shown in Appendix A. Secondly, The Granger causality of tourism in Thailand was presented in Table 2. The result stated that service sectors were the indicator that influenced tourism demands ($BIC_{model2} > BIC_{model1}$), and contained in Appendix A. Lastly, the result in Table 2 displayed the Granger causality of tourism in Malaysia. This found that sectors were the indicator that affected tourism demands ($BIC_{model2} < BIC_{model1}$), and introduced in Appendix A.

6 Conclusion

In this study, the Bayesian inference was successfully described and implemented for revising the story of tourism relating to economic growth. The simulated Bayesian computation for the Dickey-Fuller unit root test (DF test) and the PBVAR called MCMC approach were employed respectively in expressing the dynamic coherence between tourism demands and economic growth in Singapore, Thailand, and Malaysia and forecasting the speed of economic adjustment. Moreover, the authors extended the ability of Granger-causality test by adapting BIC to represent details of the driven factor among tourism demands and economic growth. In the first part of result expressions, Bayes factors from the MCMC approach found that the expansion rates of tourist arrivals and service sectors per GDP in the ASEAN-3 countries were stationary and ready for analysing the PBVAR model. In the section of the PBVAR estimation, the impulse response result presented that tourism growth was more sensitive than economic growth...
when any shock affected to the economic system and the set of circumstances in the ASEAN-3 countries (see details in Figure 5). This result was supported by Pritchard (2003) and Falk (2013) who stated that visitors were highly price-sensitive. Thus, to assure that a comprehensible tourism policy is appropriately launched, this finding in this paper will recommend policy makers in ASEAN-3 countries to investing considerably in tourism infrastructures before emphasising tourism promotions. Explaining by each country, the Granger-causality Bayesian testing showed the two outcomes of the driven-factor among tourism demands and economic growth in ASEAN-3 countries. The first result was that tourism growth was the driven indicator stimulated the expansion rates of the economy in Singapore and Malaysia. This result supported by Antonakakis et al. (2015) was particularly significant for policy makers in these two countries, suggesting that the quality of tourism services should be invariably maintained as well as tourism promotions should be focused. The second outcome, on the other hand, economic growth was the driven factor activated the expansion rates of tourism in Thailand. This result supported by Jitsuchon (2006) and Vrooman (2007) was crucial for policy makers to focus and resolve highly on the stability of political atmospheres and the lack of good governances in Thailand before promoting tourism activities.

References


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Bibliography


### Appendix A

Table 2  Granger-causality based on Bayesian statistics for model selection in Singapore, Thailand, and Malaysia

<table>
<thead>
<tr>
<th>Country</th>
<th>Bayesian factor model</th>
<th>Hypothesis</th>
<th>Bayesian statistics (details)</th>
<th>Results</th>
<th>Bayesian information criterion (BIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>Model 1</td>
<td>Tourism demand is influenced by service sectors</td>
<td>MCMC regress iteration 2100  Number of simulated observations 100  Log-likelihood –84.19624</td>
<td>27.28698</td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td>Service sectors are influenced by tourism demand</td>
<td>MCMC regress iteration 700  Number of simulated observations 100  Log-likelihood –52.03498</td>
<td>26.32451</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>Model 1</td>
<td>Tourism demands are influenced by service sectors</td>
<td>MCMC regress iteration 5400  Number of simulated observations 100  Log-likelihood –71.26420</td>
<td>26.95347</td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td>Service sectors are influenced by tourism demands</td>
<td>MCMC regress iteration 11,000  Number of simulated observations 500  Log-likelihood –38.11512</td>
<td>32.13965</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaysia</td>
<td>Model 1</td>
<td>Tourism demands are influenced by service sectors</td>
<td>MCMC regress iteration 11,500  Number of simulated observations 500  Log-likelihood –85.78498</td>
<td>33.76212</td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td>Service sectors are influenced by tourism demands</td>
<td>MCMC regress iteration 5400  Number of simulated observations 200  Log-likelihood –49.86071</td>
<td>29.01174</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source*: From computations