

# แบบจำลองเบย์เชียนสำหรับการท่องเที่ยวในประเทศไทยใต้ความไม่แน่นอนทางการเมืองและการก่อการร้าย

## Bayesian Model for Tourism in Thailand under Political and Terrorism Uncertainty

คุณกริช วงศ์แข

Komkrit Wongkhae

คณบดีคณะการบัญชีและการจัดการ มหาวิทยาลัยมหาสารคาม

Faculty of Accountancy and Management, Mahasarakham University

E-mail: komkrit\_w@hotmail.com

### บทคัดย่อ

ความไม่แน่นอนทางการเมืองและการก่อการร้ายส่งผลกระทบเป็นอย่างมากต่อการท่องเที่ยวและเศรษฐกิจของประเทศไทย เนื่องจากเหตุการทั้งสองเหตุการณ์ส่งผลกระทบต่อการเลือกจุดหมายปลายทางของนักท่องเที่ยว การศึกษานี้ได้ทบทวนความสัมพันธ์ระหว่างจำนวนนักท่องเที่ยวที่เข้ามาท่องเที่ยวในประเทศไทย ดัชนีผลผลิต ดัชนีราคาผู้บริโภค และดัชนีความเชื่อมั่นผู้บริโภครายเดือน โดยใช้เหตุการณ์การเกิดความวุ่นวายทางการเมือง และความไม่สงบในสามจังหวัดชายแดนภาคใต้เป็นตัวแปรภายนอก เพื่อทดสอบความเชื่อมโยงดังกล่าว การศึกษานี้ได้ใช้แบบจำลองโครงสร้างเวลาเตอร์ออร์โตรีเกรสสีพของเบย์ในการประมาณค่าและใช้เมตริกซ์ข้อจำกัดร่วมในการหาความสัมพันธ์ของตัวแปร ผลการศึกษาพบว่าเหตุการณ์ชุมนุมทางการเมืองส่งผลในทิศทางตรงข้ามกับจำนวนนักท่องเที่ยวแต่ส่งผลในทิศทางเดียวกับระดับราคานิค้ายในประเทศ ในขณะที่ความไม่สงบในภาคใต้ส่งผลเสียต่อดัชนีความเชื่อมั่นผู้บริโภค ข้อเสนอแนะเชิงนโยบายที่ได้จากการศึกษาในครั้งนี้คือการรักษาเสถียรภาพภายในประเทศสำคัญต่อระดับความเชื่อมั่นทั้งต่อผู้บริโภคในประเทศและต่อนักท่องเที่ยวที่จากต่างประเทศ

**คำสำคัญ:** แบบจำลองโครงสร้างเวลาเตอร์ออร์โตรีเกรสสีพของเบย์ ความเชื่อมั่นผู้บริโภค ความไม่แน่นอนทางการเมืองและการก่อการร้าย การท่องเที่ยว

### Abstract

Political and terrorism uncertainty did vastly effect on tourism as well as economic sector. Since these two unpleasant events affected the decision of destination selection of tourist. This study verified inter-relationship among tourism arrival, monthly index of production, consumer price index and local consumer confidence by using political and deep Southern terrorism unrests as exogenous variables. In order to capture these linkages, the study adopted Bayesian Structural Vector Autoregressive (BSVAR) Model for estimation. The contemporaneous restriction matrix was used to determine the relationship among variables. The study revealed that there exist negative shock of political demonstrations on tourist arrival and positive direction on national price level. The Southern terrorism events on the other hand, the effect was not found to the international tourism but the negative effect was sizably detected on local's consumer confidence. The policy recommendation was that the national stability is necessary to implement for enhancing both local confidence and tourist arrivals.

**Keyword:** Bayesian Vector Autoregressive, Consumer Confidence, Political and Terrorism Uncertainty, Tourism

**Paper type:** Research

### 1. Introduction

Tourism is playing its role as the crucial engine of economic growth (Antonakakis et al, 2015) and considered as less natural resources consumption and social cost mean

of growth (Berzina et al., 2015). Thus numbers of researches have devoted their studies to tourism and economic development, Holzner (2011) and Schubert et al (2011).



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Political instabilities cause many negative effects on economy, for example the stability link to financial development backward of Roe and Siegel (2011), negative effect on economic growth of Klomp and De Haan (2009) even the double effects on both financial development and growth of Campos et al. (2012). For tourism effect, the uncertainties of political turmoil led tourists to an unpleasant condition. Considering the big cost of travel that the voyagers spend on tickets, accommodations and trip programs but come up with closure of road or even airport, tourists definitely will diverse their plans to more peaceful destinations.

Thailand is one of the leader tourism destination of the region. The beautiful beaches, rich in cultures as well as the fantastic culinary enhance visitors around the globe to visit. Tourism income has contributed economic growth to the kingdom for decades. Thailand's tourism provides the beneficial contributions to its GDP, employment and revenues during 2006-2012 by the real growth rate of 7.5, 7.3 and 15.5 % respectively (World Travel and Tourism Council, WTTC). Nobody is perfect is the perfect definition for Thailand, since the land of smile always faces the obstacles to tourism from both naturally and manly. For natural disasters, Thailand have experienced the severe impacts of 2006 tsunami in Indian ocean that caused the tourism income lose for 49.8 billion Baht (Asian Disaster Preparedness Center, ADPC 2007). Besides the natural disaster, political unrest does affect more seriously on tourist confidence to travel in the peaceful Buddhism country. During the national election of 2007 and 2011, there have been numbers of political conflicts within the countries as well as the terrorisms in deeply Southern of the country. The impacts of two unpleasant events affect index of confidence for Thai people. How that would be happen for the far away coming tourists?

## 2. Literature Reviews

To forecast time series variables, Vector Autoregressive (VAR) is believed to be the beneficial model to explain the dynamic behavior of data. The assumption of VAR model is based on the single equation modeling approach that all variables assumed to be endogenous and affect linearly to each other. The usage of VAR model widely found in financial time series, Mollah and Hartman (2010), Brissimis and Magginas (2006) and the adaptation to

tourisms demand model in the study of Song and Witt (2006), Dritsakis (2004), De Mello and Nell (2005). In the study of Song and Witt (2006) claimed that VAR models are superior to the single equation modeling approach. However, by the study of Song and Li (2008), the out performances of VAR model compare to Time Varying Panel model (TVP) and Error Correction Model (ECM) was cited, since VAR model is too restrictive to represent the main characteristics of data. Additional, Farka and Da Silva (2011) criticized that VAR model with long lag and many of variables provide the imprecise parameter estimation and the error term which represents the impact from outside the model is dependent from the error from other variable, Park et al (2011).

The later revolution of VAR model, Structural VAR or SVAR was used to corporate shock to time series data. This model could be beneficial for the cessionary shocks occurs and exogenously changes. Addition SVAR model is able to address the endogeneity issue, Farka and Da Silva (2011). For the traditional VAR however, Sims and Zha (1998) offered that the prior information about the structure of the model will lead to the improvement of the model. Some problems usual occur if we estimated VAR with inadequate number of observations. The results were considered imprecise and complicate to interpret. The results of VAR could be improved if we have prior information of structural model and the possibility parameters, Sims and Zha (1998) and Waggoner and Zha (1999). The following theme of researches pave the way to Bayesian VAR modeling, Wong et al (2006) had developed the Bayesian VAR to tourism research to find whether or not the Bayesian restriction (prior) to the unrestricted VAR could make the efficiency model, and found the improvement of forecasting accuracy over the traditional VAR model. Brandt & Freeman (2006) also constructed the political uncertainty using Bayesian and pointed out that the prior can enhance the ability of forecasting. The other stunning of Bayesian VAR modeling are Carriero et al (2015) who offer the efficiently summarizes the information contained in large datasets, whereas a simple multivariate linear model would encounter the curse of dimensionality problem. Additional remarkable studies are Nakajima et al (2011) and Bloor and Matheson (2011).

From several of related studies above, some researches devoted their priority to investigate the efficiency of BSVAR estimation but lack of studies focused on the



association between number of international tourist and the country that empiric full of political conflicts and effective terrorism as well as using tourism as the main source of economic growth like Thailand. This study will fulfill this gap and lead to the new area of tourism study.

### 3. Objectives and Research Questions

To capture the impacts of shock on tourism demand of international arrivals, this study employed the Bayesian Structural Vector Autoregressive (BSVAR) model which is the corporation between Bayesian Vector autoregressive that used to forecast the tourist inflows and the structural break that is beneficial for dynamically study of an unexpected shock events and whether or not there is existence and how to identify the natures of shocks.

### 4. Research Methodology

As the objectives of the model were to verify the impacts of local consumer confidence and political instability as well as the severity of deep Southern unrest to tourism arrivals in Thailand. The model has been segmented into the instability and usual time of shock events. This study utilized the Sim and Zha (1998) model to specify the prior simultaneous equation. The following section will offer the Sims-Zha prior with its specifications. The Bayesian approach of innovation accounting will be demonstrated, and construct the Bayesian-shape bands for impulse-response with the emphasizing of superior of the prior density to other methods. To offer the model of estimation the study will start with the basic concept with Bayesian estimation.

Let  $(mx1)$  vector of parameters  $\mathbf{A}$ , be vector needed to be estimated from the observations  $\mathbf{y}_t$ . Hamilton (1994) suggests that the traditional statistic method presents that there exist the actual value of  $\mathbf{A}_i$  which referred as unknown but certain number. The process constructs an estimator  $\hat{\mathbf{Y}}_i$  from the sample. Hence  $\hat{\mathbf{Y}}_i$ 's property is random. The mean and probability range of  $\hat{\mathbf{Y}}_i$  are traditionally compare with the true value of  $\mathbf{Y}_i$ . Bayesian statistic on the other hand,  $\mathbf{Y}_i$  itself instead is random variable. Then Bayesian analysis is to explore the uncertainty of  $\mathbf{Y}_i$  by utilizing the distribution of its probability. Following the Bay's law

$$p(\mathbf{A}|\mathbf{y}) = \frac{p(\mathbf{y}|\mathbf{A})p(\mathbf{A})}{p(\mathbf{y})} \quad (1)$$

$p(\mathbf{A}|\mathbf{y})$  refers to posterior density or the probability function for the data given parameter of the model. While,  $p(\mathbf{y}|\mathbf{A})$  is the likelihood function and  $p(\mathbf{A})$  represents the non-data information, prior that changeable according to the nature of data and objective of research. Sims and Zha (1998) and Waggoner and Zha (2003) offered the estimation method of posterior for the Bayesian structural VAR which study on the specification of dynamic simultaneous equation model and it is constructed on the structural parameters. The model of SVAR has the basic form as:

$$\mathbf{y}_t' \mathbf{A}_0 = \sum_{l=1}^p \mathbf{Y}_{t-l}' \mathbf{A}_l + \mathbf{z}_t' \mathbf{D} + \epsilon_t' \quad (2)$$

Where  $\mathbf{A}_i$  represents  $m \times m$  matrices of contemporaneous and lag effects of endogenous variables.  $\mathbf{D}$  is  $h \times m$  parameter matrix of the exogenous variables included in the model with constant term.  $\mathbf{y}_t$  is  $m \times 1$  matrix of endogenous variable.  $\mathbf{z}_t'$  is  $h \times 1$  matrix of exogenous variable with intercept. And  $\epsilon_t'$  is  $m \times 1$  matrix of structural shocks. We consider the structural shocks are normal with mean and variance as the equations:

$$E[\epsilon_t | \mathbf{y}_1, \dots, \mathbf{y}_{t-1}, \mathbf{z}_1, \dots, \mathbf{z}_{t-1}] = 0 \quad (3)$$

$$E[\epsilon_t \epsilon_t' | \mathbf{y}_1, \dots, \mathbf{y}_{t-1}, \mathbf{z}_1, \dots, \mathbf{z}_{t-1}] = 1 \quad (4)$$

To obtain the reduce form representation of SVAR, the  $\mathbf{A}_0^{-1}$  will be post multiplied to equation (2), Therefore:

$$\mathbf{y}_t' \mathbf{A}_0 \mathbf{A}_0^{-1} = \sum_{l=1}^p \mathbf{Y}_{t-l}' \mathbf{A}_l \mathbf{A}_0^{-1} + \mathbf{z}_t' \mathbf{D} \mathbf{A}_0^{-1} + \epsilon_t' \mathbf{A}_0^{-1} \quad (5)$$

$$\mathbf{y}_t^{-1} = \sum_{l=1}^p \mathbf{y}_{t-l}' \mathbf{B}_l + \mathbf{z}_t' \mathbf{F} + \epsilon_t' \mathbf{A}_0^{-1} \quad (6)$$

To present the compact form of prior, the model may be written in the equation as:

$$\mathbf{y}_t' \mathbf{A}_0 = \mathbf{x}_t' \mathbf{F} + \epsilon_t' \quad (7)$$

Where  $\mathbf{x}_t' = [\mathbf{y}_{t-1}' \dots \mathbf{y}_{t-p}', \mathbf{z}_t']$  and  $\mathbf{F}' = [\mathbf{A}_1' \dots \mathbf{A}_p' \mathbf{D}']$  are matrices of variables and coefficient respectively. Then we are able to imply the general form of prior as:  $\mathbf{a}_i \sim N(\mathbf{0}, \bar{\mathbf{S}}_i)$  and  $\mathbf{f}_i | \mathbf{a}_i \sim N(\bar{\mathbf{P}}_i \mathbf{a}_i, \bar{\mathbf{H}}_i)$ . If  $\bar{\mathbf{S}}_i$  is  $m \times m$  prior covariance of the contemporaneous parameters.  $\bar{\mathbf{H}}_i$  is the  $k \times k$  prior covariance of parameter in  $\mathbf{f}_i | \mathbf{a}_i$ . The prior mean of  $\mathbf{a}_i$  are zero in the structural model, and random walk component is in  $\bar{\mathbf{P}}_i \mathbf{a}_i$ . To validate the relationship from estimation, Waggoner and Zha (2003) was used to construct the unrestricted VAR model and mapped into the restricted prior parameter space according to Sims and Zha (1998). The reason for adopting this criteria because of it could represent uncertainty about the location and skewness of the impulse-response function over the other prior (Brandt &

Freeman, 2006). In the estimation set of hyper parameter is used to measure standard deviation of the model coefficient; the summarized of those hyper parameters are presented in table 1.

**Table 1:** Hyper parameters of Sims-Zha reference prior

Parameter	Range	Interpretation
$\lambda_0$	[0,1]	Overall scale of the error covariance matrix
$\lambda_1$	> 0	Standard deviation around $A_1$ or persistence
$\lambda_2$	= 1	Weight of own lag and other lag
$\lambda_3$	> 0	Lag decay
$\lambda_4$	$\geq 0$	Scale of standard deviation of intercept
$\lambda_5$	$\geq 0$	Scale of standard deviation of exogenous variable coefficient
$\mu_5$	$\geq 0$	Sum of autoregressive coefficient component
$\mu_6$	$\geq 0$	Correlation of coefficient/Initial condition component

**Source:** Brandt and Freeman (2006)

To estimate the impact of political unrest to international tourist arrivals of Thailand, the study has set two events that believed to be the potential factor exogenously determines number of travelers, the political unrest events and the terrorism in deep Southern of Thailand. Many studies empirically verify the impacts of terrorism; Bhattacharai et al (2005) to Nepal, Araña and León (2008) to Mediterranean's the Canary Islands as well as Rittichainuwat and Chakraborty (2009) have explored the impacts of terrorist on Thailand tourism.

The model of equation (2) for  $m$  is number of endogenous variable, equal 2 for this model and  $p$  is number of lags. To compare the prior or the structure of specification in B-SVAR model, Brandt and Freeman (2006) suggested the log marginal data density or log marginal likelihood for the BSVAR model as following:

$$\log(m(Y)) = \log \Pr(Y|A_0, A_+) + \log \Pr(A_0, A_+) - \log \Pr(A_0, A_+|Y) \quad (8)$$

Where  $\log \Pr(Y|A_0, A_+)$  is the log likelihood of BSVAR model.

To explicitly explain the relationship between tourist arrival (ARR) which measured by number of tourist who arrived the kingdom by air and the consumer confidence (CON) in Thailand which represented the confidence of consumers for their current and future income and utilized in indices form. This study also includes the variables that are able to reflex the consequence of the interested variables, the price variation of CPI and the economic development which indicates by monthly production index (PDI). The latter variable could be proxied for GDP since the inadequate of monthly data (Leeper et al, 1996). All endogenous variables data started from January 2000 to December 2012 exploited in natural logarithm form and be obtained from ECOWIN database of Reuter. The time dummy of exogenous variables, political unrests (POL) which relate the conflicts between the political polarization of People's Alliance for Democracy (PAD) and United Front for Democracy against Dictatorship (UDD) and Southern terrorism events (SOU) that referred to the violence between authorities and terrorists were assigned to be 1 in the coincident month of occurrence in the same period of endogenous variables.

## 5. Findings

To ensure the stationary of data, the natural logarithm form of 4 endogenous variable was taken and all of them were integrated order 0 or I(0) of no unit root. To verify the results of the model, this study exploits 3 schemes of hyper parameter prior. Table 2 illustrates Contemporaneous restriction matrix. To select the model, we interpret the results from the contemporaneous structure and prior then compare the log marginal data density as the criteria.

**Table 2:** Contemporaneous ( $A_0$ ) restriction matrix

	LNARR	LNPDI	LNCN	LNCPI
LNARR	1	0	1	0
LNPDI	1	1	0	0
LNCN	0	1	1	0
LNCPI	0	0	1	1

**Table 3:** the sensitivity of hyper parameters of Sims-Zha reference prior

Parameter	1	2	3
$\lambda_0$	0.60	0.80	0.60
$\lambda_1$	0.10	0.10	0.10
$\lambda_2$	1.00	1.00	1.00
$\lambda_3$	2.00	1.00	1.00
$\lambda_4$	0.25	0.10	0.10
$\lambda_5$	0.00	0.25	0.07
$\mu_5$	0.00	0.00	5.00
$\mu_6$	0.00	5.00	5.00
$\log(m(Y))$	14.52	14.13	14.30
S.E. of $\log(m(Y))$	0.28	0.05	0.02
$\log(\Pr(A_0, A_+   Y))$	-12.2	-12.4	-12.2

From table 3, the maximum value of log marginal data density is the model of scheme 2. After alternatively select the prior belief, we continue the study by presenting the impulse response of four equation systems. The presentation shows the shock in each variable to equations system. The responses are estimated with 68% confidence region band for 12 month time horizon.

In figure 1, each plot illustrates the impact of a sign one standard deviation change in the variable in the column to the equations in the row. Starting the analytical results with the change in number of arrivals, the shock in arrival itself, strongly affect the arrival for the maximum of around 0.17% for the first three months and then decline to

average of about 0.05% for the next three months before heading up to 0.10 % in the rest of the time of study. Shock in arrival also strongly affect to Thailand economy proxied by natural logarithm of production index (LNPDI). Increasing in arrival seems to be inefficiency to increase the national product in at least first three months. However the production index has increased to 0.04% in the fourth month before starting to decline and approach to the steady deviation around zero after 8 months. Surprisingly, the result is almost similar for the response of local's confidence to the shock in tourist arrival. The last impact of tourism arrivals is given to the general price index of Thailand. The appearance of negative response of consumer price index equation associate with the shock in tourist arrival in the first 4 months. The explosion of price index pumps up to the maximum of 0.008% during the fourth to eighth months.

Shocks in production index on the other hand, all equations do response negatively to positive change in country deviation of production amount. The declining starts to lower than zero deviation in the first, second, fourth and fifth month for the equation of arrival, production index, and consumer confidence and consumer price index respectively. The maximum fall of response is averagely 0.02%. The highlight of the study is shed on the result of response of the variable to the shock of local consumer confidence. The local consumer confidence shock raise up the number of tourist arrival in positive direction after 2 months and reach maximum at the average of 0.05% in the sixth month. The similar pattern does happen to national production index but the increasing is six months delay. Shock in consumer confidence itself affects positive direction after 2 months. Finally, shock in consumer price index affects in positive direction change in all equations up to the average of 0.05% for tourism arrivals, 0.02% for production index and consumer confidence equations.

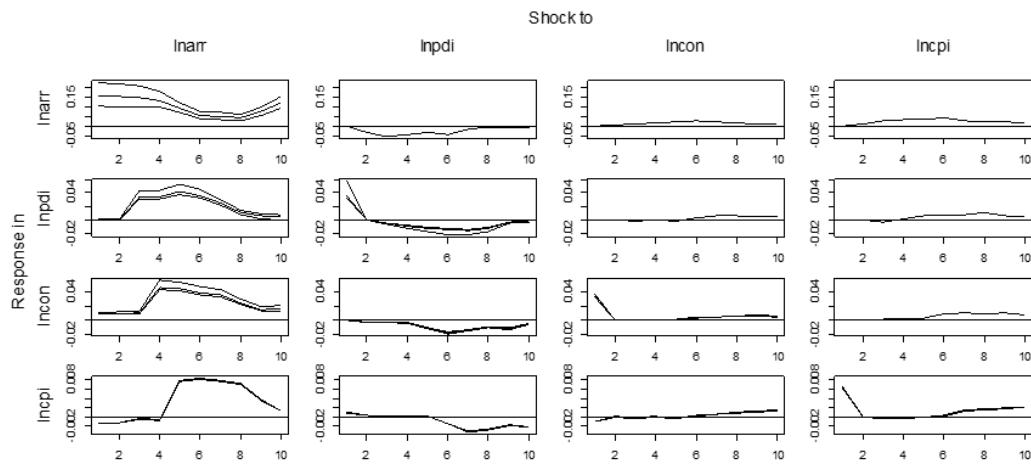


Figure 1: Impulse responses of all variables in the study

The posterior regression coefficients in Bayesian SVAR analysis is the subject of interest. The Bayesian is the deriving method from the minimizing of expected posterior loss. To adopt the application of Bayesian, the Bayesian estimation of the posterior mean of VAR regression and error covariance matrix are used as the Bayesian estimation. The results are reported in table 4. Another point of interest in this study, table 4 also reported the posterior coefficients of exogenous variables to the VAR equations of tourism arrival, production index, consumer confidence and Thailand price index. In this study, the effects from political unrest and the Deep South violence are explored. The appearance of conflicts reveals the interesting results.

Table 4: Exogenous variable posterior coefficients

Equation	Exogenous Variables	
	POL	SOU
Equation(LNARR)	-0.1158	0.0588
Equation(LNPDI)	-0.0076	0.0092
Equation(LNCON)	-0.0137	-0.0173
Equation(LNCPI)	0.0052	-0.0009

As the study of Bhattacharai et al (2005) the impact of uncertainty in political conflict led to the negative shock to tourism arrival of Thailand for 0.1158%. The sizably measurement is higher in negative direction to the presence of production index (0.0076%) consumer confidence

(0.0137%) and positive direction to consumer price index (0.0052%). For the deep Southern problem, impact of important events was not coincided with economic phenomenon.

## 6. Discussions and Recommendations

To verify the impact of relevant variables of tourism and economic sector, this study employed tourism arrival as the representative of tourism sector. The economic variables are defined by the monthly of production and consumer price index. The local consumer confidence was used in order to examine the coincide relationship between the local and international tourist. To capture this beneficial linkage, the study adopted the Bayesian Structure Vector Autoregressive (BSVAR) Model of Sims and Zha (1998) by using the hyper parameter which suggested by Erikson, MacKuen and Stimson or EMS (2002) and emphasized by the study of Brandt and Freeman (2006). The contemporaneous ( $A_0$ ) restriction matrix is used to determine the relationship among variables. To capture the impact of political uncertainty and terrorism of the Southern provinces, the time dummy of uprising events as well as time dummy of Southern tourism events was incorporated as exogenous shocks. The results reported the same direction of consumer confidence and number of tourist arrival. This result confirmed the study of Putra& Hitchcock (2006) which revealed the effects Bali bombs and the tourism arrival.

The highlight of the study reveals the negative shock of political demonstrations and tourist arrival and

positive direction to the national prince level. These finding also confirmed by the previous study of Barugahara (2015). The Southern tourism events in the other hand, the negative effect is not found to the international tourism but sizeable in the negative effect to local's consumer confidence. This affect similar to the study of Adebayo & Abe (2014) who informed that the internal terrorism did influence the local confidence in Nigeria. The policy recommendation is that the national's harmonious plan is necessary to implemented for enhancing both local confidence and tourist arrivals. Additional, the results implied the negative direction between political instability and economic growth therefore during turmoil period; alternative policy such as monetary and fiscal measures should be implemented. Finally, even though the deeply Southern part of Thailand is one of nation's obstacles to economic growth, policy implication should be differently handled.

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