DOWN TREND FORECASTING METHOD WITH ARFIMA: INTERNATIONAL TOURIST ARRIVALS TO THAILAND

PRASERT CHAITIP, CHUKIAT CHAIBOONSRI *

ABSTRACT: *Forecasting is an essential analytical tool in tourism policy and planning. This paper focuses on forecasting methods based on ARFIMA(p,d,q) or fractionally integrated moving average(ARFIMA). The secondary data were used to produce forecasts of international tourist arrivals to Thailand for during period of 2009. From these period the results confirm that the best forecasting method based on ARFIMA(p,d,q) method is ARFIMA(0,0.443,1). Furthermore these methods predict that international tourism arrivals to Thailand for during period of 2009 will be both down trend and constant trend. If these results can be generalized for future year, then it suggests that the both Thailand government sector and also the private tourism industry sector of this country need to both develop tourism market of Thailand more and develop tourism product in Thailand more too.*

KEY WORDS: *Thailand; Down Trend Forecasting Method; ARFIMA method; International tourists*

1. INTRODUCTION

Thailand's tourism industry likely will suffer throughout 2009 with significant loss of revenue and loss of jobs. Since somewhere in the middle of 2008 a severe worldwide recession has dampened the desire to travel. Thailand furthermore has suffered from political instability, a closure of Suvarnabhumi Airport (26 November 2008, by the Yellow Shirts protesters). A Red Shirt mob invaded the East Asia Summit in Pattaya on 11 April 2009, leading to a cancellation of the summit, with world leaders scurried away to safety. This was followed by violent riots the next day (during Songkhran) and the declaration of a state of emergency by Prime Minister Abhisit Vejjajiva. The protesters withdrew and the state of emergency was lifted on 24 April. On top of all that, flu cases emerged in March and April of 2009 in Mexico, with the official first announcement of the new H1N1 flu on 23 April. On 12 May, it was made

* *Assoc.Prof., Ph.D., Chiang Mai University, Thailand*
Ph.D. Student, Bangalore University, India, chukiat1973@yahoo.com

public by Health Minister Witthaya Kaewparadai that two Thais who returned from Mexico had been infected with swine and subsequently recovered.

Whether a real pandemic lies ahead, is still unclear. However, at least it seems, this new flu strain is less lethal, than initially suspected. Based on information above have inspired to looking for the down trend forecasting method for forecasting the international tourists arrival to Thailand in downturn period. The one down trend forecasting method was used in this paper is the fractionally integrated moving average (ARFIMA (p,d,q)).

In a lot of articles to study about time series methods to forecast international tourism (in terms of tourist arrivals) for a particular country (Richa, 2005). An incomplete list of recent studies includes those by Martin and Witt (1987), Chan (1993), Witt *et al*(1994), turner et al (1995, 1997), Kulendran and King (1997), Chu (1998), Kim (1999) and Lim and McAleer (2000a, 2000b), N. Rangaswamy, Prasert and Chukiat (2006). Authors differ on the best method for tourism forecasting. For example, whereas Martin and Witt (1989) used simple autoregressive (AR) models, Lim and McAleer found that the Autoregressive Integrated Moving Average (ARIMA) forecast tourism arrivals more accurately, and N. Rangaswamy, Prasert and Chukiat found that the best methods to forecast international tourists arrivals to Thailand was both VAR model and SAIMA(p,d,q)(P,D,Q) model.

Fong-Lin Chu (2008) used ARFIMA(p,d,q) model to forecasting international tourists arrival in Singapore. it is impossible to reach a unanimous decision for any particular model, since forecasts are affected by a variety of factors, particularly the country/countries under consideration, the type of data and time span covered by the study. Form articles above found that the ARFIMA model have not previous been used to forecast the international tourists arrival to destination countries based on concept of down trend period. Consequently this paper would like to forecast the international tourists' arrival to Thailand in during period of down trend based on ARFIMA model forecasting method.

2. RESEARCH AIM AND OBJECTIVE

This research aims to predict the number of international tourist arrivals to Thailand in the period of 2009 and also to seek the best forecasting model for forecasting international tourist arrivals to Thailand in this period.

3. SCOPE OF THIS RESEARCH

The scope of this research is the period 1998-2009 and mostly the data was secondary data. The countries were used for forecasting international tourist arrivals to Thailand be all the countries have impact to the international tourism industry of Thailand (Source of Data: Immigration Bureau, Police Department). And the variables were used in this research is the numbers of international tourist arrivals to Thailand from 1998-2008 to forecast during period of 2009.

4. THE RESEARCH FRAMEWORK OF TOURISM FORECASTING AND FORECASTING METHODOLOGY

Tourism forecasting methods can be divided into qualitative and quantitative methods and causal quantitative techniques. Regardless of the type of forecasting method used, the usefulness of any tourism demand forecasting model is really determined by the accuracy of the tourism forecasts that it can generate, as measured by comparison with actual tourism flows (Mahmoud, 1984). Frechtling (1996, 2001) highlighted five patterns in a tourism time series: (a) seasonality, (b) stationarity, (c) linear trend, (d) non-linear trend and (e) stepped series. The time series non-causal approach or forecasting a single variable approach is limited by the lack of explanatory variables and it also was best used for short-term to medium-term forecasting. Additionally, in this approach, it is assumed that the factors related to seasonality, trend and cycle are slow to change and can be extrapolated in the short term (Kon and Turner, 2005 and N. Rangaswamy, Prasert and Chukiat, 2006, 2009). And also the method to forecast international tourist arrival to destination country namely ARFIMA(p,d,q) model has been used in previous time by many researcher such as Fong-Lin Chu (2008), Chukiat (2009) and Presert (2009).

In this paper, focus on forecasting a single variable approach as well as this variable as international tourists arrival to Thailand during period 1998-2009. And also ARFIMA(p,d,q) model was used to forecast international tourist arrival to Thailand during period of 2009. However, this model never been used to forecast the international tourist arrival to Thailand in previously.

4.1 The general model of ARFIMA

ARFIMA models was proposed by Granger and Joyeux(1980) after that Hosking(1981) also proposed this method to fit long-memory data. An autoregressive fractionally integrated moving-average (ARFIMA) process is ARFIMA(p,d,q) model as well as it can be written give by: (see equation (1)).

$$Ø(\beta)\Delta^d y_t = \delta + \theta(\beta)\,\varepsilon_t \qquad (1)$$

with

$$Ø(\beta) = 1 - Ø_1\beta - Ø_2\beta^2 - \ldots\ldots - Ø_p\beta^p$$

and

$$\theta(\beta) = 1 - \theta_1(\beta) - \theta_2(\beta)^2 - \ldots\ldots - \theta_q(\beta)^q$$

where:
δ = constant term
$\theta(\beta)$ = moving-average operator at order q
ε_t = error term of equation 14E
$Ø(\beta)$ = The autoregressive operator at order p
$\Delta^d y_t$ = differencing operator at order d of time series data y_t

- For *d within (0,0.5)*, the ARFIMA process is said to exhibit long memory or long range positive dependence
- For *d within (-0.5, 0)*, the process exhibits intermediate memory or long range negative dependence
- For *d within [0.5, 1)* the process is mean reverting and there is no long run impact to future values of the process
- The process is short memory for d=0 corresponding to a standard ARMA process

5. FORECASTING ACCURACY IS BASED ON THE AIC (AKAIKE, 1973) IN WITHIN-SAMPLE FORECASTS: (ONE YEAR) OF EACH ARFIMA MODEL FOR FORECASTING INTERNATIONAL TOURIST ARRIVALS TO THAILAND DURING PERIOD OF 2009

Table 1 shows forecasting performance accuracy of the models based on ARFIMA method for forecasting international tourist arrivals to Thailand for 2009. The value of AIC of each ARFIMA model was used for selection the best of ARFIMA models for forecasting international tourist arrivals to Thailand for this period.

Table 1. Accuracy comparison in sample for different forecasting models based on ARFIMA method for 2009

Number	Models of forecasting	AIC
1	ARFIMA(1,d,1) model, d = 0.437	26.11
2	ARFIMA(1,d,0) model, d = 0.415	26.16
3	ARFIMA(0,d,1) model, d = 0.443	26.10
4	ARFIMA(2,d,2) model, d = 0.439	26.14
5	ARFIMA(1,d,2) model, d = 0.437	26.13

Form: computed

Form table 1, the best model to forecast international tourist arrivals to Thailand during the specified period is ARFIMA(0,0.443,1). The value of Akaike Criteria(AIC) = 26.10 as well as this model is best model among of these model because the value of AIC is less than other models (Torre, Didier and Lemoine, 2007). Consequently ARFIMA(0,d,1) model was used for selection the best model for forecasting international tourist arrivals to Thailand for this period (see more detail at appendix A).

6. THE CONCLUSIONS OF RESEARCH AND POLICY RECOMMENDATIONS

This paper provides forecasting analysis of international tourist arrivals to Thailand for during period of 2009 based on the ARFIMA (p,d,q) method. The best ARFIMA models is the ARFIMA(0,0.443,1). Because of this model has a value of

Akaike Criteria(AIC) = 26.10 also this value is very low than other ARFIMA models (see more detail at Torre, Didier and Lemoine, 2007). And the ARFIMA (0,0.443,1) model predicts that in 2009 the number of international tourists arrival to Thailand will be 13,253,457 million (see more information at appendix A, table 2 and figure 1). Moreover, the value of Mean Absolute Error (MAE) is 78,936.04 million in during period of January – May, 2009. And also the value of Mean Absolute Percentage Error (MAPE (%)) is 7.40 % in the same of during period (see more information at appendix A, table 2 and figure 1).

Therefore the conclusion of this research is that for the next one year (2009), the number of international tourists to Thailand will be constant. This result was similar with the information from Tourism Council of Thailand (TCT) told that in 2009 the number of international tourist will be constant or decrease because of negative impact factors effecting to international tourism industry of Thailand such as World economy slow down, World's price of flue go up and fever's 2009.

If these results can be generalized for future years, then it suggests that both the Thailand government sector and the private tourism industry sector need to both develop tourism market of Thailand more and develop tourism product in Thailand more too. In term of the tourism market development need to launch an active marketing campaign, promoting Thailand's exclusive culture and natural beauty through every channel especially the internet, and high quality accommodation, restaurants, and services. And also in term of tourism product development need to keep on improving both the quality and management of tourist products in Thailand.

Such as to develop tourist destinations in Thailand, provide educational tourism to people in the industry of Thailand and decrease the negative image of tourist destinations in Thailand. Moreover, keeping tourist destinations clean, keeping tourist destinations beautiful, keeping tourist destinations safe and to protect the environment of tourist destinations. And also the private tourism sector and the Thai government tourism sector should maintain good management of tourist destinations in Thailand. Such as maintaining the amenities of the tourism products, keeping good accessibility to the tourism products, keep a good image of tourism products, keeping the right price of tourism products and keeping the competitiveness of tourism products (Prasert and Chukiat, 2009).

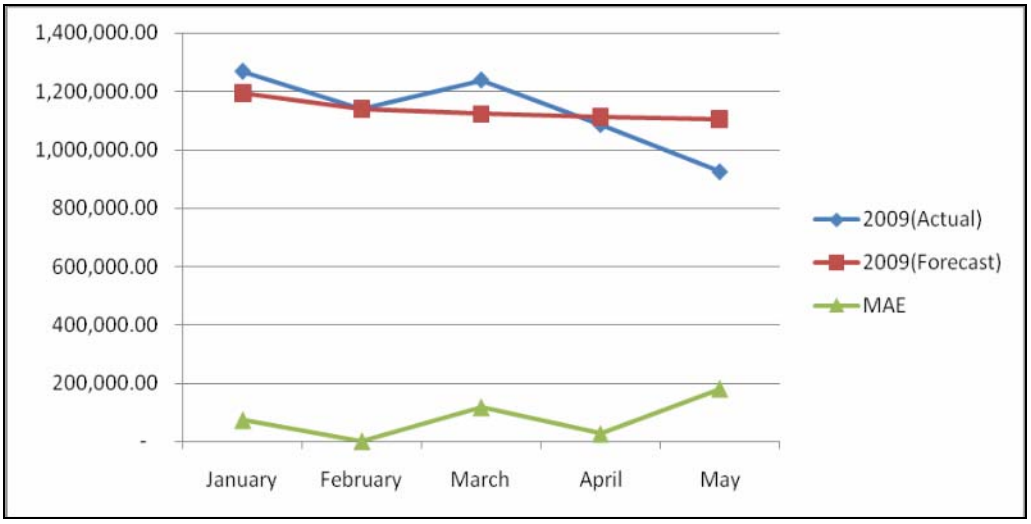
Appendix A

Extension experimental results of forecasting international tourist arrivals to Thailand for during period of 2009 based on ARFIMA(p,d,q) forecasting method

Table 2. Forecast the number of international tourist arrivals to Thailand during period of 2009 based on ARFIMA(0,0.443,1). (MAE: Mean Absolute Error, MAPE(%): Mean Absolute Percentage Error)

Month/Year	2009 (Actual)	2009 (Forecast)	MAE	MAPE(%)
January	1,267,029.00	1,194,369.92	72,659.08	5.73
February	1,138,092.00	1,138,525.71	433.71	0.04
March	1,237,507.00	1,121,634.33	115,872.67	9.36
April	1,085,351.00	1,111,340.21	25,989.21	2.39
May	923,918.00	1,103,643.52	179,725.52	19.45
June	-	1,097,327.70	-	-
July	-	1,091,880.40	-	-
August	-	1,087,041.50	-	-
September	-	1,082,661.06	-	-
October	-	1,078,644.24	-	-
November	-	1,074,926.60	-	-
December	-	1,071,461.86	-	-
Total	**5,651,897.00**	**13,253,457.05**	**78,936.04**	**7.40**

From: compute



From: compute

Figure 1. Graphical presentation of forecasting international tourist arrivals to Thailand for during period of 2009 based on ARFIMA (p,d,q)

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