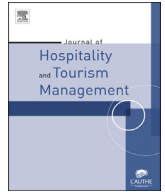




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## The swine flu and its impacts on tourism in Brunei

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## ABSTRACT

This paper demonstrates how to disentangle the impacts of the swine flu on tourism in Brunei, which overlaps with the continued effects of the 2008 global financial crisis that occurred earlier using the autoregressive integrated moving average and intervention time series analysis methods. Estimating the impacts of the swine flu for the first 12 months' post-swine flu period, we have predicted the number of tourists by fitting two autoregressive integrated moving average models: one for the swine flu and another for the global financial crisis which occurred and affected the number of tourist arrivals; and one intervention time series analysis model. It is shown that the number of tourists have been reduced significantly due to both the swine flu and the global financial crisis, which is reconfirmed by testing the coefficients of the fitted intervention time series analysis model. It is found that a small country like Brunei lost nearly 30,000 (15%) tourists and B\$15 million dollars due to the swine flu during the first twelve months' post-swine flu period.

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## 1. Introduction

This study shows how to disentangle the effects of swine flu (SF) from the effects of earlier global financial crisis (GFC) on tourism and economy in Brunei. This may be a useful contribution to both policy makers, practitioners and to the tourism literature. Brunei is a small country with a population of 400,000 people. It is situated on the north-west side of the Island of Borneo and it has oil and gas reserves. The country is quite safe and tolerant for all types of ethnic people and it attracts many foreign tourists every year from various countries. For example, 226,000 tourists visited Brunei in 2008 (Brunei Tourism Development Department, 2010).

Brunei lost a significant number of tourists due to the 2008 GFC and this declining trend intensified until mid-2009, which can be seen by comparing tourist arrival numbers: 198,338 and 139,684 respectively during the 10 months pre- and post-GFC periods (Brunei Tourism Development Department, 2010). Then a small window of world economic recovery was observed. But then the

world faced another crisis by the news of outbreak of A (H1N1) virus which is popularly known as swine flu (SF). Swine Flu occurs when people are in contact through talking or sitting or walking near the infected person/s and in contact with infected secretions produced through sneezing, coughing, spitting or transfer after touching infected areas. This is a serious infectious disease which people have every reason to fear (Denoon & Hitti, 2010; and Ministry of Health: Brunei Darussalam, 2010). The presence of the A (H1N1) virus affected Brunei sharply and its effect on tourism was serious across the world including Brunei.

Mexico recorded the first known SF case on March 17, 2009. Like the rest of the world, Brunei was not immune from the fear of SF. Mahdini (2010) described how Brunei's government took every possible preventative measure to avoid SF and to boost the confidence of the people. Brunei's government was prepared to face the outbreak as early as May 2, 2009 but Brunei's residents were already panicking by the end of May 2009.

These measures failed to protect some of the people of Brunei from SF. A student was identified with positive A (H1N1) virus on June 20, 2009. A 12 year old girl became the first fatality on July 2, 2009. The recorded infected numbers were increasing at a rapid pace and by the reopening time of schools the total number of SF infected cases reached 142 which is a very high rate in a country of less than 400,000 people (Ministry of Health: Brunei Darussalam,

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2010; France Presse Agence, 2009; Melvin, 2009; and; Mahdini, 2010). Stephen and Suni (2009) indicated that Brunei was hit very hard due to SF virus and they showed that there was a growth of 547% in H1N1 cases over the last 10 days of July 2009, which was the highest in the world, followed by Bolivia (326%). They further provided statistics and showed that 5.3 people were infected per 10,000 people in Brunei, the second highest in the world, just after Chile's 5.5 people infected per 10,000 people. All this information kept foreign tourists away from the country. Swine flu significantly reduced the number of tourists visiting Brunei, which was already suffering from the earlier GFC (World Tourism Organization, 2010).

The main purpose of this study is to evaluate the impacts of SF on tourism and the economy in Brunei, using two auto regressive integrated moving average (ARIMA) models: one for the SF and another for the GFC which occurred prior to SF, but which continued its effects on tourism during the post-SF period; and one intervention time series analysis (ITSA) method. This is because the ITSA is an important and useful method for analyzing the effects of crisis events on time series (TS) data. It is quasi-experimental in nature and the validity of the model depends on the timing of the intervention and the response of the process to it (see Gilmour, Degenhardt, Hall, & Day, 2006).

The ITSA model considers the effects of SF and the GFC, using two separate transfer functions in one ITSA model. It can also test the effects of the two crisis events separately to show whether the number of tourists has been reduced significantly due to SF and the GFC. The estimated number of lost tourists will then be used to calculate the total amount of money lost due to SF during the first 12 months' post-SF period.

The study is organized as follows. A brief review of the literature is provided in Section 2. Data used in the present study are given in Section 3. Section 4 is concerned with evaluation methods. Empirical illustrations are provided in Section 5, while some important discussions are made in Section 6. Concluding remarks are made in the final Section.

## 2. A brief review of literature

Tourism has become an important global industry since 1970 and it is growing rapidly. The World Tourism Organization (2008) mentioned that in 2007 there were nearly 900 million international tourists and it was growing at over 6% per year. Tourism has wide spread implications and this has been the subject of considerable public and academic interest. There is a huge amount of literature on tourism among which Turner (2015), Zhang, Lin, and Newman (2016), Nawijn, Mitas, Lin, and Kerstetter (2013), UNWTO (2016) can be mentioned. More importantly, an extensive review of literature can be seen in Witt and Witt (1995), Song and Li (2008), Lee, Lowry, and Delconte (2015), Merinero-Rodriguez and Pulido-Fernandez (2016), Goh and Law (2011), Chen and Petrick (2013), Piuchan and Sunkul (2016), and Getz and Page (2016).

There are two main approaches to evaluate the effects of crisis events. These are: (i) the pre-post method, and (ii) the forecasting approach. The pre-post method attempts to evaluate the effects of a crisis by comparing the number of the tourists in the same period of the pre- and post-crisis event (Chen & Chen, 2005). However, it fails to incorporate the pre-trend of the data, which might affect the actual change of the crisis and hence it cannot accurately measure the effects of the crisis event.

In contrast, forecasting methods can predict the tourist numbers for the post-event period as if the crisis event had not occurred. This predicted tourist number is then subtracted from the actual number for a certain post-event period and this is usually interpreted as the effect of the crisis. Most forecasting methods have the advantage of controlling long-term trends. Quantitative forecasting

methods are mainly divided into two groups. First, time series (TS) methods (basic, intermediate, and advanced) which have many advantages. It is based on the assumption that the present and past behavior of the data will continue in the future, and observations at different points in time are statistically dependent. The ARIMA model is the most popular TS forecasting model. One can fit an ARIMA model to almost any TS data with the desired precision. However, there are some disadvantages for the ARIMA model such as (i) there is no way to know where to start the ARIMA model; (ii) it cannot be used for non-stationary data; (iii) it requires a large number of data points; and (iv) it is a univariate TS forecasting method and cannot be used for a multivariate TS data analysis. The ITSA model is a further development of the ARIMA model and it can measure and test the effects of intervention/s. It uses both the pre- and post-intervention data, whereas the ARIMA model uses only the pre-intervention data. It provides better forecasts than the ARIMA model for interrupted TS data. The vector auto-regression (VAR) model is one of the most successful, flexible, and easy to use models for the analysis of multivariate TS data and can provide better forecasts than the ARIMA model. It can be considered as one type of econometric model and it possesses all the advantages of the regression method. Also, the size of the model is not a concern. However, this can be estimated by various ways and hence it can give a wide variety of different forecasts.

On the other hand, causal methods (Regression method and Structural method) are concerned with methodologies for identifying relationships between dependent and independent variables and attempt to incorporate the interdependence of various variables in the real world. However, the difficulty of applying the causal methods is identifying the appropriate independent variables that affect the forecast variable. Structural models are more transparent as they can check if the predicted behavior by the model for each component corresponds to what is expected from the data. The structural forecasting method is relatively straightforward, and missing observations are easier to treat. It can also manipulate multivariate series by direct extension of the univariate structural formulation which is not possible with the ARIMA model. Many researchers forecast with structural models for economic analysis and use the term "econometric model forecasts" and these are routinely used for econometric policy analysis. The main advantages of econometric models are: (i) this method possesses all the advantages of the regression method, (ii) the size of the model is not a problem; and (iii) to estimate and solve the model using software packages is easy. However, the accurate forecasting of these two causal models depends on the quality of independent variables that affect the forecast variable (see Chen, Bloomfield, & Cabbage, 2008 for comparing forecasting models in tourism).

In the past, researchers used various methods as mentioned above to evaluate the impacts of uncertain events such as diseases, earthquake, etc., on tourism, using the ARIMA, ITSA, Structural Time Series, VAR and many other methods. For example, the Severe Acute Respiratory Syndrome (SARS) is a serious disease which affected tourism in most Asian countries. Many authors have analyzed the impacts of various disease outbreaks on travel and tourism for various countries using econometric methods (Chen, Jang, & Kim, 2007; Chien & Law, 2003; Kou, Chen, Tseng, Ju, & Huang, 2008; McAleer, Huang, Kuo, Chen, & Chang, 2010; McKercher & Chon, 2004; WTTC, 2003; Wilder-Smith, 2006; Tung & Chao, 2011; Oukil, Channouf, & Al-Zaidi, 2016; Cuhadar, 2014). By contrast, Cankurt and Subasi (2016), Song, Li, Witt, and Athanasopoulos (2011), Turner (2015) and many others used structural TS analysis to model and forecast tourist demand. On the other hand, many authors such as Aboagye-Sarfo, Cross, and Mueller (2016), Zheng, Farrish, and Kitterlin (2016), Wu and Hayashi (2013, 2014), Chung, Ip, and Chan (2009) and many

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