Forecasting International Tourist Flows to a Small Island: The Case of Saipan

해외 관광수요 추정: 사이판 섬을 중심으로

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Abstract: Sustainable tourism, unlike conventional tourism, explicitly strives to maintain economic, environmental, and social sustainability in tourist destinations. Saipan, the capital and the largest island of the chain of Pacific islands known as the Commonwealth of the Northern Mariana Islands (CNMI), is a tropical destination that heavily relies on the tourist industry as a source of income. When analyzing the trends of tourist arrivals from the top three countries that account for the majority of tourist arrivals in Saipan – China, Japan, and Korea – the necessity to implement sustainable tourism in Saipan becomes clear. This article forecasts tourism demand, which is one of the main factors in determining sustainable tourism on a small island. Analyzing both long-term and cyclical trends in tourist arrivals assists budget-constrained policymakers and related organizations in implementing sustainable tourism. Therefore, forecasting accuracy is essential in tourism policy and planning.

The tourist arrival data obtained from Marianas Visitors Authority’s official Japanese website are made into a time series for Chinese, Japanese, and Korean visitor data from 2006 to 2016. Given the various time-series forecasting models, we employ simple but powerful forecasting techniques, such as ARIMA and ETS to control for the possible seasonality and trend in our tourism data. Using these forecast methods, the tourist arrival data is used to predict the future trends of tourist arrivals in Saipan for the next twelve months. The performance of our forecasting model in this study is evaluated based on the five

* This paper was supported by research funds for newly appointed professors of Jeonbuk National University in 2018.

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measures of accuracy, as measured by comparison with actual tourism flows: mean error, mean absolute scaled error, mean percentage error, mean absolute error, and mean absolute percentage error. A comparison of the two popular forecast techniques in this study shows that the ETS model statistically outperforms the ARIMA model in terms of various measures of accuracy. A practical implication of this finding is that the ETS approach should be used when forecasting tourism demand for small islands. We predict the visitor arrivals from China, Japan, and Korea to Saipan by using the better model.

The estimated 80% and 95% intervals for the number of tourist arrivals by the ETS model are presented in this study. The upper (lower) bound is the maximum (minimum) value of the estimated tourist arrivals. We find strong evidence that the tourist arrival trend for Korean visitors to Saipan will increase in the short run; although, the Chinese and Japanese tourist arrival trends seems to be stable, except for Japanese tourist arrivals in August. Nonetheless, with such an intense demand for Saipan’s natural resources, sustainable island tourism becomes necessary. Our estimated result is useful to practitioners in the sense that they are able to prepare for carrying capacities and the means of destination management on Saipan. Proper management for maintaining the island environmentally, economically, and socially requires the preservation of indigenous culture, local quality of life, natural resources, and economic stability while accommodating the demands of arriving tourists.

It is crucial to preserve the assets of Saipan in order to maintain and improve its economy. Thus, our time series modeling for forecasting the number of visitors becomes necessary to develop overall economic, environmental, and social sustainability in the island. An interesting addition to implementing sustainable tourism in Saipan is the idea of maintaining a “cap” on the number of incoming tourists visiting the island. Perhaps, with more research on Saipan’s environment, specifically an estimate of how much of the island’s resources tourists exhaust and how much the island can withstand the aforementioned, this “cap” could be practical to prevent perpetual damage to Saipan’s biodiversity, resources, culture, and economy. Along with this idea, knowing the minimum number of tourists needed to sustain Saipan’s necessities is valuable.

Key Words: Island Tourism, Saipan, Forecasting, ETS, ARIMA
I. Introduction

Tourism is an important industry that significantly contributes to the GDP, especially on a small island like Saipan, which is a minuscule island in the middle of the Pacific and also the largest island among the chain of islands categorized as the Northern Mariana Islands. Saipan is recognized as a resort destination, known for its tropical climate and nature. With the influx of tourists from all over the world, it is crucial to focus on preserving the assets of the island in order to maintain and improve the economy.

The supply side of the tourism industry has received more attention than the demand in the literature. In particular, a number of studies mainly emphasize the sustainability of tourism resources and tourist facilities, such as transportation, hotels, shopping facilities, and restaurants. These include Handfield et al. (2005), Font et al. (2008), Zhang et al. (2009), and Guo and He (2012). Even though some studies focus on the demand side, their attention centers on large sized tourist destinations (for example, Lin et al., 2011 and Tsaur and Kuo, 2011 for Taiwan; Song et al., 2010 and Wu et al., 2012 for Hong Kong; Yap and Allen, 2011 and George Assaf et al., 2011 for the Australia tourism demand). Unlike the previous studies, we turn our attention to tourism demand on small islands. The tourist destinations like Saipan solely rely on the tourism industry to sustain their entire economy. Thus, the tourism industry on small islands is highly vulnerable to seasonal fluctuations of international tourism flows.

The implementation of sustainable tourism becomes necessary to improve the island’s overall economic, environmental, and social sustainability. Sustainable tourism development requires balance between both the sustainable growth of the tourism industry and the resources or environment preservation. It cannot be achieved without a firm’s understanding and proper management of tourism demand. The purpose of this research is to introduce an efficient forecasting model that can forecast tourist arrivals on a small island. Using our suggested time series forecasting model, we predict Saipan’s tourism demand during the peak summer season. Our forecast estimates enable budget-constrained policymakers and related organizations to establish their appropriate strategies and operational plans for sustainable growth of the small island.

A time series model is popular to forecast tourism demand in the literature. In particular, several models are utilized to explore the trends and patterns of the historic time series. Previous studies such as Li et al. (2005) and Song and Li (2008) provide comparisons in tourism demand modelling and forecasting studies. Greenidge (2001) and Kulendran and Shan (2002) apply the basic structural time series to the univariate time-varying dataset including seasonal and trend components. The autoregressive integrated moving average (ARIMA) model is frequently employed for a non-stationary time series in the literature. As an extension of the univariate time series analysis, the multivariate generalized autoregressive con-
This figure displays the location of Sipan. The tropical destination of Saipan is the capital and the largest island of the chain of Pacific islands known as the Commonwealth of the Northern Mariana Islands (CNMI). The left panel shows the island’s geographical location in Southeast Asia and the right panel shows the island’s detailed map, indicating its several main cities. This map is made on the basis of the U.S. Military Academy’s Map Collection and Yahoo images.

Figure 1. Saipan local and regional map

A traditional heteroscedastic model is used to investigate the tourism demand volatility (Chan et al., 2005). Exponential smoothing is also a popular model, which allows more weight for recent observations than for earlier ones. Saayman and Botha (2017) forecast tourist arrivals in South Africa by using a non-linear and non-causal model, which is the smooth transition autoregressive model. Recently, artificial intelligence techniques, such as the artificial neural network, have been used in the literature. Kon and Turner (2005) apply the method to estimate the inbound tourism demand for Singapore. Cho (2001) and Goh and Law (2002) employ both ARIMA and Error–trend–seasonal (ETS) to estimate visitor arrivals from different countries to Hong Kong. Given the various time-series forecasting models, we employ simple but powerful forecasting techniques, such as ARIMA and ETS to control for the possible seasonality and trend in our tourism data.

Saipan, the capital and the largest island of the chain of Pacific islands known as the Commonwealth of the Northern Mariana Islands (CNMI), is a tropical destination that heavily relies on the tourist industry as a source of income. Geographically located south of Japan and east of the Philippines, Saipan economically depends on its beautiful, tropical landscapes – white, sandy beaches, vibrant coral reefs, and flowing coconut trees.

Conventional tourism does not particularly aim to improve conservation efforts or education, does not take the local community into account, and has the potential to gravely harm the fragile environment. Alternatively, sustainable tourism not only yields the same profits as conventional tourism, but the local commun-
This figure indicates that sustainable island tourism entails that an appropriate balance be established between three dimensions, such as economic, environmental, and social aspects. These common concerns and issues often arise in regards to small islands. Proper management for maintaining the island environmentally, economically, and socially requires the preservation of indigenous culture, local quality of life, natural resources, and economic stability.

Figure 2. The three dimensions of sustainable tourism

Sustainability often keeps more of the profits. Sustainable tourism is also designed to benefit the locals, respect the traditional culture, inform tourists and residents, and preserve the island’s natural resources. A specific issue in Saipan is the damage done by tourists and tour operators to the coral reefs. Interestingly, tourists who generally convey interest in sustainable tourism are from the U.S. and European countries while the majority of tourist arrivals in Saipan are from Asian countries, especially from China, Japan, and Korea.

The tourism industry is the main source of revenue and island tourism undeniably has its drawbacks. The most common concerns and issues that arise can be categorized into three fields, some unique to small islands: economic, social, and environmental. Sustainable island tourism entails that an appropriate balance be established between these three dimensions as shown in Figure 2.

Small islands typically have one or two principal economic industries due to a restricted domestic market. The reliance on tourism branches out from several issues that inevitably affect islands: limited resources and infrastructure, poor accessibility, and a heavy dependence on external powers—foreign trade and importing. Seasonality is another economic issue because it causes the unpredictability of employment and even dwindling local businesses.

An important issue that ceaselessly impacts tourism on small islands is the dispute over tourist demand versus environmental protection. Therefore, sustainable tourism should be considered when there is a lack of resources yet it is necessary to accommodate tourists from different countries. Competition for land, resources, and labor increase as the islands adapt to the tourists; however, this can often be at the expense of local social, cultural, and economic activities. The competition for infrastructure becomes an issue as well (Stylidis et al., 2007).

Socio-cultural impacts include adapting to
Table 1. Various ARIMA type models

This table presents various ARIMA type models with different autoregressive terms for the $p$ order, an integrated part for non-seasonal differences required to have stationarity for the $d$ order, and a moving average in the forecasting equation for the $q$ order. Note that this table is made on the basis of Professor Robert Nau’s website at Duke University, (https://www.fuqua.duke.edu/faculty/robert-nau).

<table>
<thead>
<tr>
<th>Model Description</th>
<th>First-order autoregressive model</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIMA(1,0,0)</td>
<td>Random walk</td>
</tr>
<tr>
<td>ARIMA(0,1,0)</td>
<td>Random walk</td>
</tr>
<tr>
<td>ARIMA(1,1,0)</td>
<td>Differenced first-order autoregressive model</td>
</tr>
<tr>
<td>ARIMA(0,1,1) with constant</td>
<td>Simple exponential smoothing</td>
</tr>
<tr>
<td>ARIMA(0,2,1) or (0,2,2) without constant</td>
<td>Linear exponential smoothing</td>
</tr>
<tr>
<td>ARIMA(1,1,2) with constant</td>
<td>Damped–trend linear exponential smoothing</td>
</tr>
</tbody>
</table>

The continual growth of the tourism industry. Often, tourism development may imply modernization and the loss of the local traditional culture. Sustainable tourism strongly encourages community collaboration for successful tourism development on islands as to avoid cultural friction or cause familial troubles among the locals. To achieve the sustainable tourism in Saipan, we forecast the future trends of tourist arrivals on the island by using time series modeling. By predicting the number of tourist arrivals, our study helps stakeholders to prepare for carrying capacities and the means of destination management that could cater to the numbers of tourists envisaged.\(^1\)

The remainder of this paper is organized as follows. In the next section, we introduce the time series forecasting methodologies such as ARIMA and ETS. We also discuss measures of forecasting accuracy, which can be used for a model selection in this study. Section III analyzes the time series trend for the top three countries that visit Saipan and provides our forecast estimates by utilizing a better model. Concluding remarks are presented in Section IV.

\(^1\) Stakeholders can include any person or group of people who hold an interest in or are affected by decisions made by management agencies. Stakeholders include members of the community, tourism industry workers - whether it be in hotels, restaurants, or tour guides -, transportation agencies, and local conservation groups just to name a few.
Table 2. Various ETS models

This table presents various ETS type models with different trend and seasonal components. We consider the twelve different approaches as shown in the table. AN, AA, and AM indicate the simplest Holt’s method, additive Holt–Winters’ method, and multiplicative Holt–Winters’ method, respectively. This table is made on the basis of Table 1 in Kralikova et al. (2012).

<table>
<thead>
<tr>
<th>Trend component</th>
<th>Seasonal component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N(none)</td>
</tr>
<tr>
<td>N(none)</td>
<td>NN</td>
</tr>
<tr>
<td>A(additive)</td>
<td>AN</td>
</tr>
<tr>
<td>M(multiplicative)</td>
<td>MN</td>
</tr>
<tr>
<td>D(damped)</td>
<td>DN</td>
</tr>
</tbody>
</table>

required to have stationarity for the \(d\) order, and a moving average in the forecasting equation for the \(q\) order. Finally, the general equation is defined as:

\[
X_t = \alpha_1 X_{t-1} + \cdots + \alpha_p X_{t-p} + \epsilon_t, \quad (1)
\]

where \(p\) is the order, \(\alpha_1, \alpha_2, \ldots, \alpha_p\) are the parameters or coefficients, \(\epsilon_t\) is an error term, usually a white noise with intensity \(\sigma^2\). The ARIMA type model can be classified based on different \(p, d, q\) combinations and Table 1 presents only the most typical specifications in the literature.

ETS or exponential smoothing can be used on time series data to produce smoothed data; in turn, the smoothed data can be used to make forecasts. While observations are weighted equally with simple moving averages, with ETS models, exponentially decreasing weights are assigned over time. Holt (2004) expands exponential smoothing, and the classification of exponential smoothing methods is described in Hyndman et al. (2002). We consider the twelve different approaches as shown in Table 2 and each approach includes both trend and seasonal components.

The general equations for the process of ETS are defined as:

\[
s_0 = x_0 \\
\alpha_t = \alpha x_t + (1 - \alpha)s_{t-1}, \quad (2)
\]

where \(\alpha\) is the smoothing factor, and \(0 < \alpha < 1\).

2.2 Measures of accuracy for forecasting

The performance of our forecasting model in this study is evaluated based on the five measures of accuracy, as measured by comparison with actual tourism flows: mean error (ME), mean absolute scaled error (MASE), mean percentage error (MPE), mean absolute error (MAE), and mean absolute percentage error (MAPE). The measures are critical factors in determining the best model between ARIMA and ETS models for forecasting visitor arrivals over the next twelve months. The smaller the error overall, the better the model is at depicting the given data.
ME is the mean deviation of a distribution of accidental errors and is given by

$$ME = \frac{1}{n} \sum_{i=1}^{n} (f_i - y_i).$$

(3)

MASE is defined as the mean absolute error of the model relative to the mean absolute error obtained from a naive random-walk model without drift a drift component. This statistic is given by

$$MASE = \frac{1}{n} \sum_{i=1}^{n} \left( \frac{|e_i|}{\frac{1}{n-1} \sum_{i=2}^{n} |Y_i - Y_{i-1}|} \right) = \frac{\sum_{i=1}^{n} |e_i|}{n - 1 \sum_{i=2}^{n} |Y_i - Y_{i-1}|}.$$  

(4)

MAE is less sensitive to the significantly large errors of time series forecasting and can be expressed as

$$MAE = \frac{1}{n} \sum_{i=1}^{n} |f_i - y_i| = \frac{1}{n} \sum_{i=1}^{n} |e_i|.$$  

(5)

MPE is often used to show whether the estimates are biased and is defined as follows:

$$MPE = \frac{100\%}{n} \sum_{i=1}^{n} \frac{a_i - f_i}{a_i}.$$  

(6)

Lastly, MAPE is the mean absolute deviation of a distribution of accidental errors and is given by

$$MAPE = \frac{1}{n} \sum_{i=1}^{n} \frac{|A_i - F_i|}{A_i}.$$  

(7)

### III. Time Series Trend Analysis for the Top Three Countries

There are several determinants affecting tourism demand, such as tourism expenditures, price and income levels, marketing costs, and cultural and demographic factors (Gonzalez and Moral, 1995). In addition, Witt and Witt (1995) mention that population, income and consumption levels, and their trend in an origin are more important. The distribution channel of the travel agents can be a critical factor for tourism demand (Hsu and Wang, 2008). However, many previous studies including Lagos 1999; Habibi et al. 2009; Nonthapot and Lean 2013 point out that most of the determinants suggested above are not easy to measure and to collect.

The number of tourist arrivals is widely considered as the most appropriate barometer of international tourism demand in the literature over a couple of decades (Song et al., 2003; Song and Witt, 2003; Dritsakis, 2004; Naudé and Saayman, 2005; Ouerfelli, 2008; Habibi et al., 2009). Thus, in our study, the monthly arrivals of international tourists to Saipan from January 2006 to August 2016 is used as a measure of the international tourism demand on that island. Specifically, this variable is measured by the top three countries that account for the majority of international tourist arrivals in Saipan–China, Japan, and Korea.
This figure shows the seasonal decomposition of time series by loess (STL) model of Chinese tourist arrivals in Saipan from January 2006 to August 2016. The components consists of seasonal, trend, and remainder components. In particular, the remainder component is the residuals of the fit. Note that there is an increasing trend for monthly Chinese tourist arrivals in Saipan.

Figure 3. Decomposition plot of monthly Chinese tourist arrivals in Saipan

This figure shows the seasonal decomposition of time series by loess (STL) model of Japanese tourist arrivals in Saipan from January 2006 to August 2016. The components consists of seasonal, trend, and remainder components. In particular, the remainder component is the residuals of the fit. Note that there is a decreasing trend for monthly Japanese tourist arrivals in Saipan.

Figure 4. Decomposition plot of monthly Japanese tourist arrivals in Saipan
This figure shows the seasonal decomposition of time series by loess (STL) model of Korean tourist arrivals in Saipan from January 2006 to August 2016. The components consists of seasonal, trend, and remainder components. In particular, the remainder component is the residuals of the fit. Note that there is an increasing trend for monthly Korean tourist arrivals in Saipan.

Figure 5. Decomposition plot of monthly Korean tourist arrivals in Saipan

The monthly data is obtained from the Japanese Marianas Visitors Authority website: the Marianas Visitors Authority office in Japan releases the figures of tourist arrivals throughout the CNMI on a monthly basis.

Figure 3 displays the decomposition of the Chinese tourist arrivals to Saipan over the sample period into three components by using the Seasonal-Trend by Loess (STL) filter procedure: seasonal, trend, and remainder components. In particular, the top panel is the original monthly time series and the second panel exhibits a seasonal component showing the variation near the seasonal frequency of one cycle per year. A trend component of long-term changes in level is presented in the third panel. The last panel in Figure 3 displays the remainder component, explaining the remaining variation after removing the seasonal and trend components. Figure 4 and Figure 5 show the decomposition plots of the monthly Japanese and Korean visitor arrivals, respectively.

From the competing models (ARIMA and ETS), we first select the best fitting model to our sample series. We conduct one year ahead forecasting for the three countries between September 2016 and August 2017. The time span of twelve months is chosen because it can be the most efficient and advantageous prediction set for Saipan; the predicted esti-
Table 3. Comparing ARIMA and ETS for 12 months forecasting

This table presents the estimates for five measures of accuracy: mean error (ME), mean absolute scaled error (MASE), mean absolute error (MAE), mean percentage error (MPE), and mean absolute percentage error (MAPE). The smaller the error overall, the better the model is at depicting the given data. The ETS model exhibits smaller errors for all three countries’ data.

<table>
<thead>
<tr>
<th>Country</th>
<th>Model</th>
<th>Test Set</th>
<th>ME</th>
<th>MASE</th>
<th>MAE</th>
<th>MPE</th>
<th>MAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>ARIMA (0,1,2)</td>
<td>1,555.29</td>
<td>3,587.77</td>
<td>2,522.68</td>
<td>6.32</td>
<td>12.88</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ETS (A,A,N)</td>
<td>239.44</td>
<td>3,253.15</td>
<td>2,496.25</td>
<td>-1.48</td>
<td>13.73</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>ARIMA (0,1,1)</td>
<td>-323.24</td>
<td>1,089.79</td>
<td>948.81</td>
<td>-9.53</td>
<td>18.56</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ETS (A,A,N)</td>
<td>-23.61</td>
<td>1,046.18</td>
<td>890.78</td>
<td>-3.71</td>
<td>16.51</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>ARIMA (0,1,0)</td>
<td>7,659.92</td>
<td>8,228.87</td>
<td>7,659.92</td>
<td>45.71</td>
<td>45.71</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ETS (M,N,N)</td>
<td>7,429.44</td>
<td>8,014.77</td>
<td>7,429.44</td>
<td>44.23</td>
<td>44.23</td>
<td></td>
</tr>
</tbody>
</table>

Estimates for the upcoming year can help the government, local businesses, and residents take an action to keep sustainable tourism in Saipan. The empirical results from different models are reported in Table 3. Please note that the model selection among various ETS or ARIMA model specifications for each country is based on Akaike Information Criterion (AIC) and Bayesian information criterion (BIC). The complete statistics for AIC and BIC in this study can be available upon request.

To evaluate the forecast accuracy of our competing models, we employ the pairwise comparisons discussed in the previous section. The measures of accuracy reveal that the ETS model exhibits significantly smaller errors than those from ARIMA models, except for MAPE in China. The results provide strong evidence that the ETS model clearly outperforms the ARIMA model in our study.

The top panel in Figure 6 displays a gradual increase in the number of Chinese tourists arriving to Saipan over the next 12 months. The shading around the line represents the prediction intervals of the arrivals. The speedy growth of Saipan’s convenient entertainment facilities may be a factor of the tourist increase. For example, the establishment of an international casino generates a surge of luxury Chinese tourists. Unlike the increasing trend of Chinese tourist arrivals, Japanese visitors to Saipan greatly decreased in the past 10 years. Unfortunately, this stable diminishing trend seems to continue based on the results of forecasting as shown in the second panel. This decrease may be the outcome of flight cuts and reductions, particularly among flights travelling between Japan and Saipan. For example, in October 2015, Delta Air Lines cut the flight between Narita, Japan and Saipan. Therefore, Saipan is only receiving one daily flight from Japan. Furthermore, the last panel in Figure 6 presents that the Korean tourist arrival trend persists to flourish from September 2016 to August 2017. As more Korean flight carriers add Saipan as a stop to their routes, access
between the two countries not only becomes easier but more affordable. With the expansion of airlines making stops into Saipan, Saipan’s tourist industry seems to be recuperating, especially in regards to their Korean market.

As shown in Table 3, ETS is a better forecasting model in terms of accuracy. The estimated 80% and 95% intervals for the number of tourist arrivals by the ETS model are presented in Table 4. The upper (lower) bound is the maximum (minimum) value of the estimated tourist arrivals. Our empirical results present that the tourist arrival trend to Saipan is quite stable during the peak summer season.
Table 4. Tourist arrivals forecast by country during the peak summer season in 2017

This table presents numerical forecasts for Saipan tourist arrivals by country during the peak summer season, May through August 2017. Based on the table, we can predict 80% and 95% confidence intervals for the number of tourist arrivals in Saipan for the next twelve months. Therefore, we will be able to prepare for carrying capacities and the means of destination management that will cater for the numbers of tourists being envisaged in Saipan.

<table>
<thead>
<tr>
<th>Country</th>
<th>Forecast</th>
<th>Estimates</th>
<th>80% CI</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
</tr>
<tr>
<td>China</td>
<td>May</td>
<td>18,299.50</td>
<td>9,271.69</td>
<td>27,327.31</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>17,912.64</td>
<td>8,634.80</td>
<td>27,190.47</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>19,428.08</td>
<td>9,522.19</td>
<td>29,333.96</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>19,140.85</td>
<td>8,920.96</td>
<td>29,360.74</td>
</tr>
<tr>
<td>Japan</td>
<td>May</td>
<td>4,092.40</td>
<td>2,861.37</td>
<td>5,323.42</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>4,078.77</td>
<td>2,799.81</td>
<td>5,357.74</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>4,602.55</td>
<td>3,102.67</td>
<td>6,102.43</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>6,330.23</td>
<td>4,205.14</td>
<td>8,495.32</td>
</tr>
<tr>
<td>Korea</td>
<td>May</td>
<td>18,902.39</td>
<td>12,610.98</td>
<td>25,193.80</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>19,141.31</td>
<td>12,568.75</td>
<td>25,713.86</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>20,496.53</td>
<td>13,543.00</td>
<td>27,450.06</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>20,587.54</td>
<td>13,349.45</td>
<td>27,825.63</td>
</tr>
</tbody>
</table>

However, previous studies find that there are variations in monthly tourism demand for large sized tourist destinations. (Tsaur and Kuo, 2011). Our forecasts also indicate a gradual but continuous increase of international inbound tourism demand, which is consistent with the finding in Australia (Yap and Allen, 2011). Our estimation results provide implications for practice. Practitioners are able to prepare for carrying capacities and the means of destination management that will cater for the numbers of tourists being envisaged in Saipan. In addition, it is crucial to preserve the assets of Saipan in order to maintain and improve its economy. Thus, our time series modeling for forecasting the number of visitors becomes necessary to develop overall economic, environmental, and social sustainability in the island.

IV. Conclusion

This article attempts to investigate the forecasting accuracy of popular forecasting models, such as ARIMA and ETS. International tourist arrivals from China, Japan, and Korea to Saipan are used for model calibration, and various model accuracy measures are adopted to select a better forecasting model for the small island. Most previous studies forecasting tourism pay more attention to tourism destinations of large islands and countries. Thus, their empirical models could not be directly applicable
for the small islands where tourism is clearly the most important industry for their economies. For the small island, accurate demand forecasts directly allow policymakers to make better informed decisions and to achieve sustainable tourism in the long run, both economically and environmentally.

The ARIMA and ETS approaches are compared for a time-series dataset between 2006 and 2016 and the model with the lowest mean error is chosen to capture trends in visitor arrivals, both long-term and cyclical. Then, we predict the number of international tourist arrivals from the three countries by using a better forecasting model. Our empirical results present that the tourist arrival trend for Korean visitors to Saipan will increase in the short run; although, the Chinese and Japanese tourist arrival trends seem to be stable, except for Japanese tourist arrivals in August. Nonetheless, with such an intense demand for Saipan’s natural resources, sustainable island tourism becomes necessary. Proper management for maintaining the island environmentally, economically, and socially requires the preservation of indigenous culture, local quality of life, natural resources, and economic stability while accommodating the demands of arriving tourists.

An interesting addition to implementing sustainable tourism in Saipan is the idea of maintaining a “cap” on the number of incoming tourists visiting the island. Perhaps, with more research on Saipan’s environment, specifically an estimate of how much of the island’s resources tourists exhaust and how much the island can withstand the aforementioned, this “cap” could be used to prevent perpetual damage to Saipan’s biodiversity, resources, culture, and economy. Along with this idea, knowing the minimum number of tourists needed to sustain Saipan’s necessities is valuable. Our suggested forecasting model can provide insights for policymakers and practitioners, who are implementing sustainable tourism and can use this information to further understand its necessity in regards to Saipan’s future tourist arrival trends. However, our study fails to control for several determinants affecting tourism demand. To expand our study, one can include critical factors for tourism demand in the forecasting, such as tourism expenditures and cultural and demographic factors. We leave this suggestion to future research.
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