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Letter from the Editor-in-Chief

Myanmar and Korea have many similarities and are complementary relationship. Therefore, we believe that research exchange will expand mutual understanding between Myanmar and Korea, and will be the cornerstone for mutual development.

KOMYRA and YUE have co-published The Myanmar Journal since August 2014. So far, many scholars have published numerous papers through the journal, and We are sure that this journal has helped many people understand Myanmar and Korea more clearly and closely.

The Myanmar Journal covers various issues in Myanmar and Korea. It covers various topics that can promote bilateral development and mutual understanding, not limited to specific topics such as economy, industry, society, education, welfare, culture, energy, engineering, healthcare, and agriculture.

We hope that this journal will continue to promote understanding of the current status and potential capabilities of Myanmar and South Korea and promote in-depth international exchange and cooperation.

We would like to express our deepest gratitude to the editorial board and YUE and KOMYRA for their valuable support in The Myanmar Journal publication.

February 28, 2022

Youngjun Choi *yj choi*

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This journal aims to promote the mutual cooperation and development of Myanmar and Korea through intensive researches in the entire filed of society, economy, culture, and industry.

It will cover all general academic and industrial issues, and share ideas, problems and solution for development of Myanmar.

Articles for publication will be on-line released twice a year at the end of February and August every year on the Myanmar Journal webpage (http://www.komyra.com/bbs/board.php?bo_table=articles).

The Impact of Covid-19 on Tourist Arrivals in Myanmar: An Intervention Time-Series Analysis

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ABSTRACT : Myanmar possesses great tourist potential and attractions in many respects, much of the industry remains to be developed. However, the number of tourist arrivals is small compared to her neighbors. Nowadays, with the view to preventing spread of Covid-19 pandemic, Myanmar's tourism sector is suffering a lot. In this study, estimated the impact of the interrupted incident on the monthly tourist arrivals to Myanmar from August 2018 to July 2021 is investigated. The spread of Covid-19 has affected the tourism industry obviously and caused 79% drop in international tourist arrivals in 2020 compared to 2019 in Myanmar. ARIMA (1, 0, 1) with the intervention was chosen from two different fitted models by using minimum values of RMSE, MAPE and MAD, as it provides the best model to represent tourist arrivals in Myanmar. The estimated coefficients of the model showed interrupted incident of Covid-19 was significantly affected the number of tourist arrivals. Finally, based on the best fitted model, it is found that the forecasts of monthly tourist arrivals to Myanmar in August to October 2021 were in the range between 23081and 48858 persons.

Key words *: Time Series, Intervention, ARIMA, Tourists arrival, Covid-19, Forecast*

I. Introduction

Tourism is one of the fastest growing sectors in the economy and the main sources of income for many countries in the world. It provides livelihoods for millions of people and allows billions more to appreciate their own and different cultures, as well as the natural world. For some countries, it can represent over 20 % of their GDP and, overall, it is the third largest export sector of the global economy.

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Tourism is one of the sectors most affected by the COVID-19 pandemic, impacting economies, livelihoods, public services and opportunities on all continents (UN, 2020). No country has escaped the decimation of its tourism sector, this crisis is not only a major shock for developed economies but also an emergency for developing countries.

As borders closed, hotels shut and air travel dropped dramatically, international tourist arrivals decreased by 56 % and $320 billion in exports from tourism were lost in the first five months of 2020 – more than three times the loss during the Global Economic Crisis of 2009 (UNWTO, 2020). Governments are struggling to make up for the lost revenues that are needed to fund public services, including social and environmental protection, and meet debt repayment schedules.

In line with the role of tourism in the world economy, tourism also plays an important role in the Myanmar economy and its major source of foreign exchange and revenue. World Economic Forum (2017) reported that Spain, France and Germany were the top three most tourist-friendly destinations in the world. Myanmar has been ranked 134th in the Travel & Tourism Competitiveness Index (TTCI) out of 141 countries in 2015 (WEF, 2015).

According to Ministry of Planning and Finance, during October 2018 and September 2019, the number of tourists visiting Myanmar reached 4,172,714, increased 21.16% compared to the number of tourists in the same period in 2017-2018 which reached 3,443,957 visits. However, the number of tourists in the same period of 2019-2020 which declined 2,090,163 visits. The rate of total international tourist arrivals dropped by 49.91% during October 2018 and September 2019 compared to in the same period in 2018-2019.

In Myanmar, the first Covid-19 case has been discovered on March 23, 2020. The government has temporarily suspended entry of foreign nationals through international airports since March 28, 2020, except entry with valid visa, special relief flights, Border Pass and Temporary Border Pass. With the view to preventing importation and spread of Covid-19 pandemic, Myanmar's tourism sector is suffering a lot as other tourism sectors around the world.

The travel restrictions are imposed to halt around the world in response to the global pandemic. UNWTO estimated the international tourist arrivals plunged by 74% in 2020 over the previous year due to widespread travel restrictions and massive drop in demand. The spread of Covid-19 has also affected the tourism industry obviously and caused 79% drop in international tourist arrivals in 2020 compared to 2019 in Myanmar (Ministry of Hotel and Tourism, 2020).

Time series are frequently affected by certain external events such as holidays, strikes, sales promotions and other policy changes (Wei, 2006). These extraordinary events are called interventions. Similarly, intervention influenced time series data on

tourist arrivals in Myanmar due to Covid-19 pandemic. Interventions in tourism are divided into two factors, namely internal and external factors. Promotion and various strategies that support the development of tourism are internal factors. On the other hand, external factors are out of control factors like outbreak of wars, natural disasters, pandemic, and so on.

To evaluate the effect of these external events, intervention analysis is used when the timing of intervention is known. The method is then generalized to study the impact of the events when the intervention is unknown and hence leads to the general time series outlier analysis (Wei, 2006). This type of analysis is the application of modeling procedures for incorporating the effects of exogenous forces or interventions in time series analysis. Box and Tiao (1975) pioneered intervention analysis to discuss the effects of the intervention to economic and environmental problems.

There are some researches that have been done using intervention analysis on interrupted time series on tourism data. Lee et al. (2010) conducted a multi-input intervention analysis to evaluate the impact of the economic crisis in Asia in 1997 and terrorist attacks such as Bali Bombing I and Bali Bombing II on the arrival of foreign tourists to Indonesia through the Soekarno-Hatta entrance. Saleh (2003) also analyzed the effect of violence in the West Bank and Gaza Strip on tourism in Israel using a time-series intervention model. Yogarajah (2018) introduced intervention time series analysis for fitting a most appropriate model to predict tourist arrivals in Sri Lanka.

The data used for the study is from the year 2018 to 2021 with intervention after March 2020 when the first Covid-19 case was found in Myanmar. In an intervention of this model, the input series is an indicator variable that contains values one after the March 2020 that occurrence of the first Covid-19 case affecting the response series of tourist arrival in Myanmar. This intervention model can be used both to model and forecast the response series. The objectives of this study are to introduce intervention time series analysis for estimating the impact of Covid-19 on the tourist arrival and fitting the most appropriate model to predict tourist arrivals in Myanmar by using intervention analysis.

II. Literature Review

1. Intervention Analysis on Autoregressive Integrated Moving Average (ARIMA) Model

The general form of the Box-Jenkins ARIMA(p,d,q) models, can be written as follows (Box and Jenkins, 1976; Box et al., 1994; Wei, 2006):

$$\phi_{\mathrm{p}}(B)(1-B)^{d}Y_t = \theta_0 + \theta_q(B)a_t \quad (1)$$

where,

Y_t is response variable at time t

θ_0 is deterministic parameter,

$\phi_{\mathrm{p}}(B) = 1 - \phi_1\mathrm{B} - \phi_2B^2 - \cdots - \phi_{\mathrm{p}}\mathrm{B}^{\mathrm{p}}$ is the AR component with order p,

$\theta q(B) = 1 - \theta_1\mathrm{B} - \theta_2B^2 - \cdots - \theta_q\mathrm{B}^{\mathrm{q}}$ is the MA component with order q,

$(1-B)^d$ is differencing with order d,

B is back shift operator and

a_t is residual white noise series with mean 0 and variance $\sigma_a^{2.}$

The intervention model is a statistical model that is used to estimate the effect of an intervention event both internal and external which is expected to affect the predicted variable. There are two common types of intervention, namely step and pulse functions. Detailed explanations of intervention analysis can be found in (Wei, 2006).

A model with multiple intervention inputs can be written as:

$$\mathrm{Y_t} = \theta_0 + \sum_{\mathrm{j}=1}^{\mathrm{k}} \frac{\omega_{\mathrm{s}}(\mathrm{B})}{\delta_{\mathrm{r}}(\mathrm{B})}\mathrm{B}^{\mathrm{b}}\mathrm{X_{jt}} + \frac{\theta_{\mathrm{q}}(\mathrm{B})}{\emptyset_{\mathrm{p}}(\mathrm{B})(1-\mathrm{B})^{\mathrm{d}}}\mathrm{a_t} \quad (2)$$

where,

Y_t is response variable at time t which shows the data is stationary,

$\mathrm{X_{jt}}$, j = 1, 2,..., k is binary indicator variable that shows the existence of an intervention at time t,

$\omega_{\mathrm{s}}(B) = \omega_0 - \omega_1B - \omega_2B^2 - \cdots - \omega_sB^s$,

$\delta_{\mathrm{r}}(B) = 1 - \delta_1B - \delta_2B^2 - \cdots - \delta_rB^r$ and

θ_0, $\phi_{\mathrm{p}}(B)$, (B), $(1-B)$, B and a_t are as defined in Equation (1).

Equation (2) shows the magnitude and period of intervention effect according to b, s, and r. The delay time is b, while s gives information about the time which is needed for an effect of the intervention to be stable, and r is the pattern of the intervention effect. A step function is an intervention type which occurs over a long term. And an intervention which occurs only at a certain time (T) is called a pulse

intervention.

2. Model Selection

The model selection is conducted by comparing the criteria such as RMSE (Root Mean Square Error), MAD (Mean Absolute Deviation), and MAPE (Mean Absolute Percentage Error). RMSE, MAD, and MAPE are defined as follows (Gooijer and Hyndman, 2006; Wei, 2006):

$$RMSE = \sqrt{\frac{1}{M}\sum_{i=1}^{M}(Y_t - \hat{Y}_t)^2} \quad (3)$$

$$MAD = \left(\frac{1}{M}\sum_{i=1}^{M}|Y_t - \hat{Y}_t|\right) \quad (4)$$

$$MAPE = \left(\frac{1}{M}\sum_{i=1}^{M}\frac{|Y_t - \hat{Y}_t|}{Y_t}\right) \times 100 \quad (5)$$

where M is the number of forecasts performed, Yt is the actual data, and Yt is the forecast or fitted value.

III. Methodology

The data employed in this research is secondary data, namely international visitor arrivals to Myanmar, August 2018 - July 2021. Data has been collected from the Selected Monthly Economic Indicators (SMEI) published by Central Statistical Organization (CSO) of Myanmar. In this research, intervention on ARIMA models has been applied. One special kind of Box-Jenkins ARIMA model with input series is called an intervention model or interrupted time series model. Intervention on the ARIMA model includes the following stages:

(i) Identify stationary.
(ii) Transform or differencing if the data is not stationary.
(iii) Dividing the dataset into k + 1 parts, where k is the number of intervention.
(iv) Modeling of the first intervention.
(v) Modeling of the mth intervention model, where m = 2, 3, . .. , k. (If more

than one intervention event occurred.)

Then calculate RMSE, MAD, MAPE and BIC on sample data. Furthermore, compare RMSE, MAD, and MAPE to obtain the best fitted model having the minimum RMSE, MAD, and MAPE. Last, forecast monthly tourist arrivals to Myanmar, during August to October 2021 based on the best fitted model.

IV. Results and Discussion

1. Modeling Tourist Arrival in Myanmar

An ARIMA model was applied on pre-intervention data of August 2018 to March 2020. The fist Covid-19 case was found on 23 March 2020, in Myanmar. The plot of data is given in Figure 1(a). It indicates that the data series is stationary in the both mean and variance. So, no transformation is needed to be stationary of the data series.

Figure 1(a). Plot of Monthly Tourist Arrivals to Myanmar (August 2018 to March 2020)

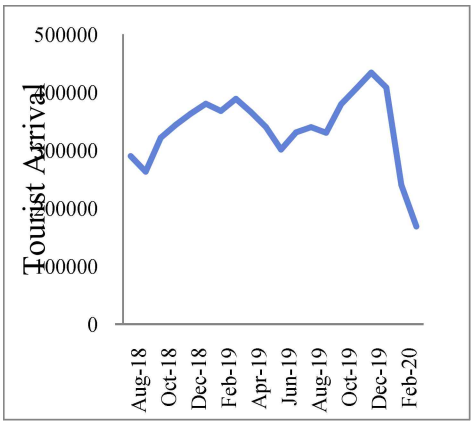
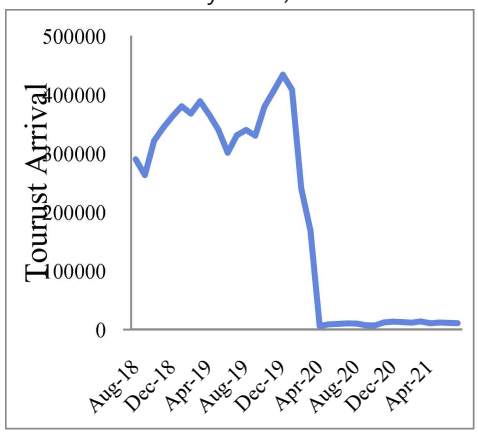


Figure 1(b). Plot of Monthly Tourist Arrivals to Myanmar (August 2018 to July 2021)



In Figure 1(b), it is obviously observed that in April 2020 there is a sudden down trend in tourist arrivals due to Covid-19 pandemic. This is the reason for this study is to use intervention time-series model on the international tourist arrivals to Myanmar.

By visual inspection of autocorrelation plot (ACF) and partial autocorrelation (PCAF) plots (Figure 2(a) and Figure 2(b)) of the tourist arrival data series shows the

ACF tails off and PACF cuts off after lag 1.

Figure 2(a). The plot of ACF

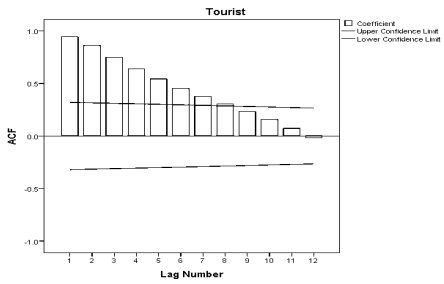
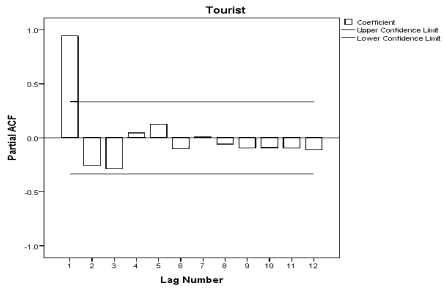


Figure 2(b). The Plot of PACF



Therefore, the series is likely to be generated by ARIMA(1,0,0) model. By assuming that the effect of occurrence of the first Covid-19 case in March 2020 has caused the intermediate change level in tourist arrivals to Myanmar, it is proposed the response function

$$X_{1t}=\begin{cases}0, & t<20\ (\text{March, 2020})\\ 1, & t\geq 20\ (\text{March, 2020})\end{cases}$$

Then, the intervention model becomes

$$Y_t=\theta_0+\omega_0 X_{1t}+\frac{1}{(1-\emptyset_1 B)}a_t \qquad (6)$$

The intervention function is the step function. The estimation results are found as follow.

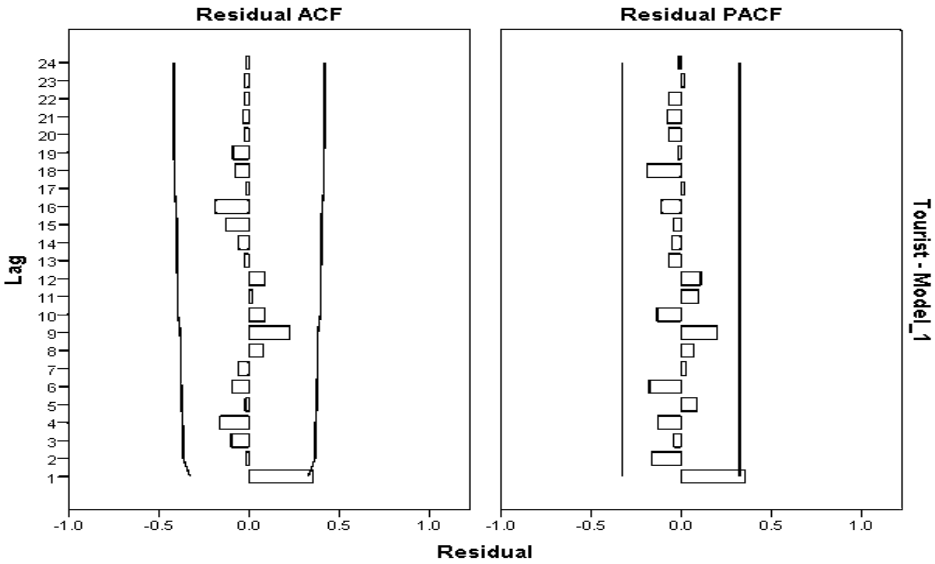
Table 1. Parameter Estimates for ARIMA(1,0,0) Model

Parameter	Estimate	Std. Error	t	Sig.
θ_0	263712.719	55338.903	4.765	0.000
ω_0	-183188.487	41511.505	-4.413	0.000
$\varnothing_1$	0.895	0.084	10.365	0.000

Once an appropriate model has been identified and its parameters estimated, it is, of course, necessary to determine whether this choice is adequate. The diagnostic checks including the residuals analysis are the most important stage of intervention model building process.

The estimates are all statistically significant. However, the ACF and PACF of the residuals show a single spike at lag 1 (Figure 3). So, residuals series is not a white noise and the fitted model is not adequate for the data series.

Figure 3: Plot of ACF and PACF for the Residuals for ARIMA(1,0,0) Model



Then, the following an ARIMA(1,0,1) is re-identified and the intervention model becomes

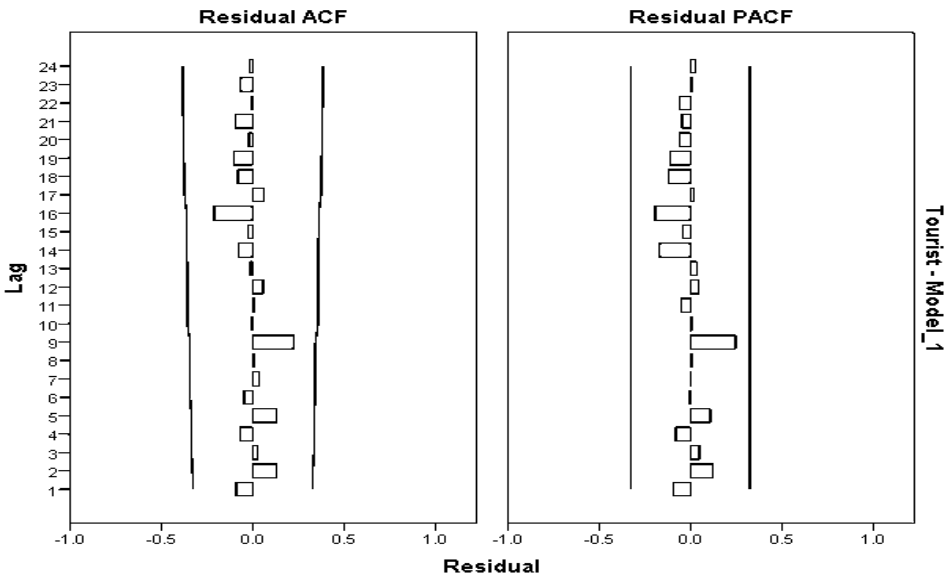
$$Y_t = \theta_0 + \omega_0 X_{1t} + \frac{(1-\theta_1 B)}{(1-\emptyset_1 B)} a_t \qquad (7)$$

Table 2. Parameter Estimates for ARIMA(1,0,1) Model

Parameter	Estimate	Std. Error	t	Sig.
θ_0	281582.978	35669.583	7.894	0.000
ω_0	-203802.578	28108.055	-7.251	0.000
$\varnothing_1$	0.727	0.144	5.059	0.000
θ_1	-0.761	0.150	-5.073	0.000

The all estimates are statistically significant. The ACF and PACF of the residuals series are small and lie within ± 2 standard error limits (Figure 4). These diagnostics indicate that the model has produced only uncorrelated white noise, which is characteristic of a properly specified model. Hence, the fitted model is adequate for the data series. Thus, the fitted intervention model in Equation (7) is satisfactory.

Figure 4. Plot of ACF and PACF for the Residuals for ARIMA(1,0,1) Model



The result implies that the effect of Covid-19 has produced a permanent level change and significantly reduced in monthly tourism arrival to Myanmar. The estimate of the intervention effect in terms of the tourist arrivals is 203803 lower than the pre-intervention level or equivalently, the effect of the Covid-19 decreased the number of tourist arrivals by 203803 units.

2. Selection of the Best Fitted Model

The RMSE, MAD and MAPE vales for the fitted models are calculated (Table 3).

Table 3. Model Validation

Model	RMSE	MAD	MAPE
ARIMA (1,0,0)	37755.954	22800.467	59.973
ARIMA (1,0,1)	33732.358	22415.322	50.644

Analysis of performance of the tourist arrivals from preceding 36 months gives ARIMA (1,0,1) model with intervention post Covid-19 period which helps in forecasting the future values of tourist arrivals. ARIMA (1,0,1) with the intervention was chosen from two different models by using minimum values of RMSE, MAD and MAPE (Table 3), as it provides the best fitted model.

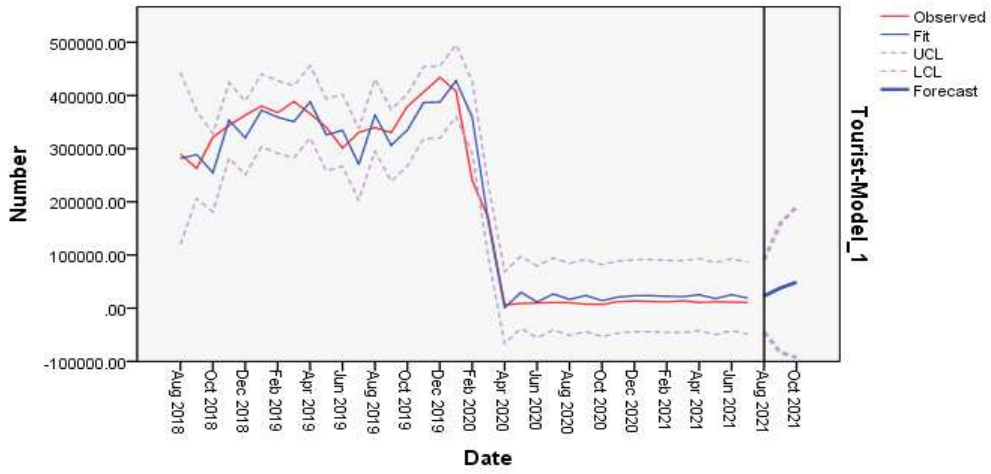
3. Forecasting

The forecasts for monthly tourist arrivals to Myanmar, during August to October 2021 based on the best fitted model are obtained (Table 4) and plotted in Figure 5.

Table 4. Forecast Values with Lower and Upper Limits

Months	Forecast	95% Lower confidence Limit	95% Upper confidence Limit
August, 2021	23080.59	-44591.23	90752.42
September, 2021	38005.47	-83312.75	159323.68
October, 2021	48858.08	-92841.86	190558.02

Figure 5. Plot of Forecasting for Tourism Arrival in Myanmar by Best Fitted Model with Intervention



V. Conclusion and Recommendations

Studying the impact due to unexpected disruptions such as the Covid-19 pandemic on tourism is important for forecasters, planners, investors and operators. This paper provides an analysis of the impact of intervention, on the number of tourist arrivals in Myanmar.

The decrease of tourist arrivals in Myanmar was due to the Covid-19 pandemic the government has temporarily suspended entry of foreign nationals through international airports since March 28, 2020, except entry with valid visa, special relief flights, Border Pass and Temporary Border Pass and the number of tourists in April,

May and June 2021 were only 6311, 8932, and 9763 respectively.

Although forecasting is vital to the planning of all activities, it is particularly crucial in the tourism industry due the perishable nature of the tourism product. Choosing the right model to forecast tourism data series requires not only sufficient knowledge about the nature and characteristic of the time series but also a good understanding of the theory behind the models.

This research performed an analysis of intervention on ARIMA model to forecast monthly tourist arrivals to Myanmar. Based on RMSE, MAD, and MAPE, the best fitted model is selected. Analysis of performance of the tourist arrivals from preceding 36 months gives us ARIMA (1,0,1) model with intervention post-Covid period as the best intervention model which helps us in predicting the future values of tourist arrivals to Myanmar. Accordingly, the forecast values for the number of tourist arrivals to Myanmar for August, September and October 2021 are 23081, 38005 and 48858 respectively. Hence, these numbers are very low compared to before Covid-19 periods.

Tourism, one of the most dynamic and most job intensive sectors, has been one of the hardest hit by the Covid-19 pandemic. Millions of livelihoods are at stake and need to be supported. As countries gradually should lift travel restrictions and tourism can slowly restarts in many parts of the world, health must continue to be a priority and coordinated heath protocols that protect workers, communities and travelers while supporting companies and workers must be firmly in place. International cooperation needs to be stepped up, especially around travel restrictions and border management, to ensure support to livelihoods and economies with responsibility and sense of solidarity.

Further extensions of study may be undertaken by considering the econometric approach such as co-integration, VAR, transfer function model and panel data analysis to investigate the properties of the arrival series as well as its long-run equilibrium relationships with other exogenous variables. In addition, forecasting should be updated regularly for the planning purposes when the new data are available.

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