

Modelling and Forecasting Tourist Arrivals in Sri Lanka

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Abstract

The Sri Lankan tourism industry contributes significantly to economic development through diversified mechanisms of revenue generation and for creation of employment opportunities. The tourism industry is volatile and easily affected by man-made or natural catastrophes: terrorism, financial crisis, and tsunamis. The racial dispute among Sri Lankan government forces and Liberation Tigers of Tamil Elam, which started in the 1980s spanned over thirty years and adversely affected the development of the tourism sector. However, with the conclusion of the ethnic strife in 2009, tourism started to boom. The objective is to estimate and forecast tourist arrivals for the tourism industry from August 2021 to August 2025. This study used monthly tourist arrivals from January 2000 to July 2021 to predict values for August 2021 to August 2025 and evaluates against the actual, based on the number of visitor arrivals. Box-Jenkins Autoregressive Integrated Moving Average (ARIMA) was used to model the visitor arrivals to Sri Lanka by evaluating the study period and have applied the Standard ARIMA model to achieve the research purpose. Monthly tourist arrival data obtained from the Sri Lankan Tourism Development Authority and diagnostic test statistics, including autocorrelation and partial correlation, were used to examine the parameters of ARIMA. The results revealed civil war has impacted on tourist arrivals and was further noted that terrorism affected tourist arrivals negatively. In addition, the findings showed that the forecasted tourist arrivals were substantially less than the actual, which indicated that the Sri Lankan tourism industry rebounded shortly after the three-decade long civil war. Hence, this analysis highlights the potential of the Sri Lankan tourism industry to recover rapidly from shock events. Moreover, it is advantageous for policymakers, academia, society, and the government of Sri Lanka to set up the national tourism framework and also align the crisis management process effectively.

Keywords: Autoregressive Integrated Moving Average, Civil war, Tourism industry performance, Tourist Arrivals

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Introduction

Tourism is considered one of the world's largest and fastest-growing industries. The tourism industry is a broad category that encompasses a wide range of goods and services. Furthermore, tourism includes tourist transportation, housing, guesthouses, entertainment, renowned destinations, religious sites, and trips (Embuldeniya and Rajapaksha, 2015). Tourism is an economic and social occurrence that has shown steady expansion and diversity throughout the years. The tourism industry has now become a substantial sector, even a critical stream of revenue for many areas and countries. In the Manila Declaration on World Tourism in 1980, tourism was recognised as 'an activity crucial to the lives of nations because of its direct impact on the social, cultural, educational, and economic sectors of national societies and their international connections. Tourism brings financial flows into the economy when travelers spend on goods and services they desire. According to the World Tourism Organization, the tourism-related business contributes 10% of global Gross Domestic Product (GDP), and only one out of every ten jobs is connected to it. Its strategic position in the Indian Ocean on vital air and sea routes linking Europe and the Far East, Sri Lanka has been famed as a worldwide centre (Fernando et al., 2016). According to O' Hare and Barrett (1994), roads to the Far East, as well as the Indian Ocean, Middle Eastern, African, and Australasian destinations, are 'controlled' by the island, as in colonial times." Due to its strategic location and uniqueness, Sri Lanka has been a tourist destination for centuries. The island's southern half dominates the rough hills, while a huge plain dominates the northern half. It has beautiful palm-fringed beaches on its southwestern, southern, and south-eastern coastlines (Lai, 2002). As an attractive location for visitors, Sri Lanka can strongly compete with other attractive locations, thanks in part to its strategic topographical location (Fernando, 2017).

Sri Lanka is one of the most famous guest locations in the world, with a diverse range of golden beaches, strange and unique wildlife, stunning topography, and a wealth of cultural heritage, as confirmed by the Sri Lanka Tourist Board, which claims that tourists are drawn to the country by eight main tourist attractions. Pristine, historical, thrills, wild, blissful, picturesque, essence, and festive are some of the reasons that tourist attractions lead to. Pristine refers to the beaches that may be found around the coastal border of the island. Sri Lanka is an island surrounded by sea that is suitable for a beach vacation and is also known for its historical significance, with more than 3,000 years of documented history. The hill capital Kandy, the religious city of Anuradhapura, the Dutch Fort of Galle, the antiquated place of

Polonnaruwa, the rock stronghold of Sigiriya, the golden rock temple of Dambulla, the picturesque Horton plains, and the rain forest of Sinharaja are among the country's eight world heritage sites. Aside from these well-known landmarks, the island has a plethora of historical sites. According to the Sri Lankan Tourism sector, "With a diverse range of climates and topography crammed into a compact island, Sri Lanka provides a variety of activities from the tops of mountains to the deepest depths of the oceans," the island offers "a range of adventures from the top of the mountains to the depths of the oceans." The biodiversity of the island is a shelter to a vast kind of animals, birds, fish, butterflies, and snakes is one of the reasons Sri Lanka is popular as a guest location. The elephant, leopard, sloth bear, blue whale, and sperm whale are the big five of Sri Lankan fauna. Tourists mostly prefer to visit Yala, Udawalawa, Kumana, and Bundala National Parks, among others. Traditional Ayurveda clinics and spas, yoga instruction, and a significant number of meditation institutes are also popular tourist attractions. Tourists are attracted to Sri Lanka for its scenic splendor, which includes waterfalls such as Bambara Kanda, Dunhida, Devon, and Ramboda and botanical gardens such as the Royal Botanical Garden and Haggala Garden. Traditional festivities like Perahera, the Sinhala and Tamil New Year, and the Kataragama festival draw visitors worldwide. Sri Lanka's recurrent records on gems play an important part in attracting international tourists to the country. When people travel to specific locations to obtain lodging, transportation, food, and recreational services, they stimulate the economy of the receiving region and create a market. It is a reason to attract more tourists to those locations. Tourists are eager to visit those locations to have an enjoyable stay because of the facilities, security, and satisfaction.

Tourism is a cyclical industry that is extremely sensitive to adverse influences such as political, economic, legal, environmental, historical, and cultural factors. Man-made disasters such as terrorism, civil conflicts (Richter and Waugh Jr, 1986), and natural disasters such as tsunamis, floods, and earthquakes have caused damage to the Sri Lankan tourism industry (Becken, 2013). For the past two decades, the Sri Lankan tourism industry has been severely impacted by the civil war, tsunami, and recently due to the Easter Sunday attack and Coronavirus Disease 2019 (COVID-19). Race-related conflicts that began in the early 1980s have significantly influenced the Sri Lankan economy and tourism sector growth during the last 30 years. The civil conflict among the Sri Lankan government and the Liberation Tigers of Tamil Elam (LTTE) began with shocking inhumanity, and tourist visits to Sri Lanka rapidly decreased. The tsunami that hit Sri Lanka on December 26, 2004, created significant and immediate devastation in the country's tourism sector.

During the civil war, the tsunami negatively impacted the sector, causing even severe issues with foreign tourist visitation as well as the Easter attack on April 21, 2019, that resulted in a 3 million drop in tourist visitations. While the Sri Lankan tourism sector recovers from the Easter Sunday assault in 2019, within a year later, COVID-19 has significantly impacted visitor arrivals in Sri Lanka due to flight cancellations, and travellers have cancelled their trip plans to Sri Lanka. Forecasting is critical in many types of organisations because predictions of future events are required for decision-making. Any information about future tourism flow volumes and patterns is useful for hotel managers, tour guides, and other sectors involved in tourism or transportation to plan their investments and marketing strategies. Government institutes also require a reliable predictions of visitor arrivals for tourism to set and provide for the necessary tourism-related physical and organisational structures and facilities, consisting planning of accommodation and transportation growth, among other things. Over the last few years, the tourist arrivals variable has remained the most widely held measure. The present study will unveil additional information because of the research, which will fill any gaps left by past researchers on the issue. As a result, this study will benefit the academic community, students or lecturers, as well as other interested readers, by providing a helpful and important source of information on tourism's contribution to the development of Sri Lankan tourism image. This research will assist organisations that support the tourism sector in Sri Lanka in identifying and assessing their influence on the development of the tourism image and improving their plans to promote and improve the tourism image.

Problem Statement

The country's tourism industry significantly increased tourist arrivals after the end of the civil war, reaching millions of visitors. Several job opportunities and income streams have come to the forefront of the industry's backward and forward connections. However, it is critical to identify the problematic aspects and rectify these proactively, as a sensible policy step to avoid future issues. With the vision of generating revenue and boosting people's livelihoods, the tourism-led growth hypothesis is at the core of Sri Lanka's development strategy. Consequently, very limited studies have been conducted to predict tourist arrivals from August 2021 to August 2025 in Sri Lanka, specially in the COVID-19 pandemic. As a result, forecasting tourist arrivals in future can encourage development in foreseen future.

Objective

Concerning the research problem mentioned above, the main goal of this research is to forecast tourist arrivals in the Sri Lankan tourism industry. The objective is to estimate and forecast tourist arrivals for the tourism industry from August 2021 to August 2025.

Theoretical Considerations and Empirical Evidence

According to Ohlan (2017), tourism and economic expansion have a strong relationship in the short term and long term. Hence, tourism plays an important part in a country's development. Tourism has a significant part in job creation in the country, for which the government must promote and create a suitable climate. Tourism helps to enhance the country's socio-economic situation. Kreag (2001) stated that tourism growth increases community interest, which in turn increases tourism value in the country. A successful tourism industry generates economic activities in the country, which raises the country's income level and brings prosperity to the country by creating jobs. According to Adrian (2017), tourism has a close association with other branches of the economy since tourism increases commodity demand through the immigrant population, which pushes the country's industrial development and solves job issues. As a result, tourism industries not only help to build other sectors, but they also help to promote their products over the world and generate demand for them. Not only proliferated sectors in the country, but culture homogenisation occurs over the world as well. One culture has spread to other civilisations, causing groups to suffer losses. As a result, tourism improves socioeconomic conditions while also drives social changes in communities, which can be either beneficial or harmful.

Global Tourism Industry

The tourism business is one of the world's most dynamic and competitive sectors (Uğur and Akbıyık, 2020). In 2016, the tourism industry contributed 10.2% of global GDP, creating United States Dollars (USD) 7.6 trillion in revenue and 292 million jobs. In 2016, tourism-related employment accounted for 10% of all global employment (Tourism, 2017). International tourism has been continuously expanding for more than six decades, thanks to technological developments that lead to more efficient and less costly tourist visitation. As reported by the latest United Nations World Tourism Organization (UNWTO) estimates, international tourist visitation topped 1.4 billion in 2018, within the overall tourism export income over USD 1.7 trillion, or immensely USD 5 billion per day on average. The global tourism market has continued to rise and diversify, according to Glaesser et al. (2017), building it one of the world's fastest-growing economic industries. From 25

million in 1950 to 1,186 million in 2015, foreign visitor arrivals have constantly risen. According to UNWTO predictions, this growth trend will continue with the number of foreign visitor arrivals forecasted to extend 1.8 billion by 2030. The amount of foreign tourist visitation to landing places, which measures the number of foreign tourists arriving at their destination and staying at least one night every day, represents the worldwide tourism trend. Over the previous year (2017), the worldwide tourist business grew by 6%, reaching USD 1.4 billion in revenue and USD 1.5 trillion in direct spending. As a result, global tourism is one of the world's most significant economic industries. This is especially true for Southeast Asia, which saw a remarkable 9% growth rate in 2017 and has continued to rise in the first nine months of 2018 (Tiwari et al., 2018). Tourism can be viewed as a strategy to take advantage of the country's natural and cultural resources to boost tourism capital, foreign exchange, and government tax revenue (Du et al., 2016).

Sri Lankan Tourism Industry

Sri Lanka is one of the most famous tourist places for foreign tourists and was recorded as the finest locations to travel in 2013 by Lonely Planet. Sri Lanka was also named as the foremost location to travel by Lonely Planet, Rough Guides, The Guardian, and The New York Times in 2016. After remittances, textiles, and garments, the travel and tourism sector is Sri Lanka's third-largest revenue earner. During the civil war started in the 1980s, following international mediation sponsored by Norway, a right-of-centre pro-western administration led by the United National Party was elected in 2002. A new peace process with the LTTE was begun, culminating in signing a Cease Fire Agreement (CFA) in 2002. Between 2002 and 2006, the country was relatively peaceful, with the government undertaking six rounds of peace talks with separatists from Eelam. Due to the relative confidence about the likelihood of long-term peace and the comparatively calm atmosphere, tourist visitation to Sri Lanka surged during this period. The final battle between the LTTE and government security forces began in 2006, disrupting the tourism industry from 2006 to 2009. Tourist arrivals were on the decline during the time, as expected. In May 2009, government forces vanquished the LTTE, bringing the war to a close (Semasinghe, 2016). Tourist arrivals in Sri Lanka expanded rapidly in 2004, reaching 566,202. By 2019, Sri Lanka was enjoying unparalleled tourism growth, with year-on-year increases of more than 22% (Munasinghe et al., 2019).

On the other hand, the tsunami significantly impacted the Sri Lankan tourism industry; nevertheless, this catastrophe was only partially visible in terms of visitor arrivals. In early 2005, the tsunami's aftermath severely affected the Sri Lankan tourism sector. The tourism sector in Sri Lanka has seen a decrease,

according to the Sri Lanka Tourism Development Authority (SLTDA) monthly statistics reports, with yearly arrivals falling by 3% from 566,202 in 2004 to 549,308 the following year. Monthly visitor arrivals increased in 2005 and 2006 for the first eight months, but only slightly during the peak season, which in both years spanned from September through December. Tourist receipts declined by 13% from USD million 416.8 in 2004 to USD million 362.3 in 2005 which was greater than the loss in tourist arrivals. According to the literature, during the post-tsunami period, Sri Lanka had a severe decrease in foreign visitor arrivals, and the tsunami had a considerable impact on tourism revenue. It has been proven that tsunami had a remarkable negative effect on tourist arrivals in Sri Lanka (Rosselló et al., 2020). After 2009, the Sri Lankan tourism sector built a spectacular comeback and became one of the country's rapid-growing businesses (Tisdell and Bandara, 2004). Tourism has been acknowledged as having a significant role to play in Sri Lanka's post-war development. The Sri Lankan authority established a five-year "Tourism Development Strategy" (2011-2016) to encourage tourism and entice huge numbers of foreign visitors, with goals including increasing tourism arrivals, increasing direct and indirect employment opportunities, enhancing foreign exchange revenues, and encouraging Sri Lanka as the world's most pledging island for tourism. The government's initiatives demonstrate its desire to encourage tourism around the island. The SLTDA launched a marketing strategy with the tagline "Sri Lanka-The Wonder of Asia." As a result, tourism in Sri Lanka set a new high in 2016, with over 2 million visitors. This is seen to be critical to compete with other Asian countries that draw more foreign visitors (Fernando et al., 2016).

For the first time in 2016, tourism in Sri Lanka exceeded 2 million tourist arrivals, a phenomenal expansion of 14% above the 1.8 million tourist arrivals in 2015. Global tourists spent an ordinary of 10.2% guest nights in 2016, producing USD 3.5 million in income. Asian travellers remained the most important initiator of tourism in Sri Lanka, recording for 45.1% of the total, accompanied by Western Europe (31.4%). In 2016, the occupancy rate of ranked accommodation was 74.76%, while total guest nights indicated in foreign hotels surged to 10.6 million guest nights, an increase of 18.4% over 2015 (Munasinghe et al., 2019). Sri Lanka is known for its tropical seaside resorts, water sports, deep-sea fishing, photography done beneath the surface of the water, shipwreck diving, coral reef diving, and whale watching. More tourists are drawn to historical heritage sites and woodland animal reserves. With the end of the dispute in May 2009, Sri Lanka, in general, and tourism, entered a new chapter (Fernando, 2016). Due to nearly three decades of civil conflict, Sri Lankan tourism has struggled, but it has made a significant return from 2009 to 2016 (Tisdell and Bandara, 2003).

After the civil war ended in 2009, the Sri Lankan tourism industry has seen tremendous development and expansion. Since the 1980s, ethnic strife has had a negative impact on the Sri Lankan tourism sector, with visitor arrivals fluctuating. Tourist arrivals decreased progressively from 407,230 in 1982 to 302,000 in 1996, then steadily climbed until it reached 566,200 in 2004. Since 2005, the tsunami and the return of ethnic strife have resulted in a notable drop in visitor arrivals and job possibilities. Since 2010, the European Union, Canada, and the United States have eased their travel warnings on Sri Lanka. The number of international tourists that visited Sri Lanka enhanced dramatically from 654,476 in 2010 to 2,050,832 in 2016. Domestic tourism is also showed signs of improvement (Kumar, 2018).

Sri Lankan tourism industry achieved a record high of over 2 million visitors in 2016, up 14% from the previous year. The upward trend in Sri Lankan tourism is expected to continue in 2017. Sri Lankan tourism sector is one of the country's most significant foreign exchange earners. In 2015, tourism brought in 2,980.6 million USD in foreign exchange profits, which grew to 3,518.5 million USD in 2016. In 2015, the tourism sector created 319,436 direct and indirect jobs, which rose to 335,659 in 2016. Tourists come to Sri Lanka from all corners of the world. According to the SLTDA, Sri Lanka attracted the most tourists from Western Europe (643,333) in 2016. South Asia was the second most popular tourism destination while Australia ranked last, with 83,851 visitor arrivals. India (17.39%), China (13.24%), the United Kingdom (9.17%), and Germany (6.5%) are among the nations that send visitors to Sri Lanka. Because of its location close to India, Sri Lanka entices more Indian travellers. Sri Lanka has made several promotional initiatives to entice more North America, Asia, and Western Europe visitors. Beaches across Sri Lanka, antiquated historical places, the middle highlands, and wildlife reserves are just a few of Sri Lanka's significant tourism attractions (Kumar, 2018).

Following the civil war, Sri Lanka's most recent terror incident was the Easter Sunday attack that occurred on April 21, 2019. However, the Easter attacks were named after the suicide bombings that occurred in churches and hotels in Sri Lanka, which was Easter Sunday. The Easter attacks in Sri Lanka claimed lives of more than 320 people, including 40 foreign visitors. Tourists were increasingly becoming scared of visiting Sri Lanka because of terrorist attacks on hotels (Sathiamoorthy et al., 2020). The majority of countries worldwide have warned their citizens to avoid travel to Sri Lanka. This demonstrates that the tragic Islamist Easter Sunday attack in 2019 had a devastating effect on the Sri Lankan tourism sector and had an adverse influence on the country's key economic pillar (Silva, 2019). Furthermore, the

government estimated that the tourism industry share of GDP declined by 30% from 2019 to 2020. According to prior studies, the deadly attack resulted in a loss of 3 million visitor arrivals and a decrease in tourism earnings of USD 1.5 billion, as estimated by the Sri Lankan hotel association in 2019. The tourism industry of Sri Lanka was recovering after the Easter Sunday attack in 2019, when COVID-19 outbreak in early 2020 marked the temporary closure of the tourism industry with no signs of recovery so far (Gnanapala and Arachchi, 2020). It created an uncertain and unpredictable situation throughout the entire world, including our country. The pandemic had a significant impact on people's livelihoods worldwide, including in Sri Lanka. The ongoing COVID-19 crisis has negatively impacted the tourism sector in Sri Lanka due to travel restrictions imposed by international, regional, and local governments (Sivesan, 2020). Tourist arrivals and foreign exchange had been adversely affected because of the pandemic. International visitor arrivals to Sri Lanka fell sharply by 70.8 % year on year to 71,370 tourist arrivals in March 2020, based on figures released by the SLTDA reports (SLTDA, 2020). March 2020 was the third succeeding month in which visitor arrivals in Sri Lanka had been decreased. Tourist arrivals decreased by 6.5% and 17.7% respectively in January and February 2020. To curb the spread of the COVID-19 pandemic, the Sri Lankan tourism industry tightened tourist visitation from mid-March 2020 and banned all international tourist visitation from all nations on March 19, 2020.

For tourism planning and policymaking, reliable forecasting of foreign visitor arrivals is essential. Forecasted outcomes are routinely employed to make key strategic choices and assessments. It is also necessary for destination management infrastructure development and tourism investment (Silva et al., 2019). Strategies and proposals are essential in determining the shortage of resources accessible to assist development efforts and the most effective utilisation of these limited resources (Jenkins, 2015). This is critical when growing nations employ tourism-led evolution methods, including development, job creation, increased foreign exchange revenues, and poverty depletion. Some governments employ tourism approaches and plans to resurrect the tourism industry by placing goals, especially for foreign visitor arrivals, and adopting regulations to meet those goals. Frequently, targets are made without any exact forecasting or any predicting of foreign visitor arrivals. As a result, many people failed to reach their goals because these were unrealistic. The number of visitor arrivals is a common, frequently used method of quantifying tourism demand when a certain number of tourist visitation is considered (Guerreiro, 2019). Data on arrivals are normally accessible in the country, whereas departures are usually accessible in the origination country. Tourist arrival data has the benefit of being independent

of vacation extent when contrasted to overnight visits (Broekel and Alfken, 2015). Tourism planning and policy choices are aided by forecasting visitor arrivals to a certain destination.

The tourism industry has large development potential with substantial multiplying effects, since it earns foreign currency, generates tax income, and creates jobs. As a result, accurate tourism demand forecasts are essential for strategic, tactical, and operational planning. To anticipate tourism demand, several different econometric models have been utilised. Forecasting approaches such as time series, econometric, artificial intelligence-based, and judgmental models have all been used. The subject of tourism demand predicting has piqued the interest of academics. As a result, Wong et al. (2007) and Song et al. (2008) suggest that combined predictions be used to increase model accuracy. On the other hand, long-term forecasting benefits from combining projections. Tourist arrivals remain the most significant indication, even though the fundamental indicator reflecting tourism demand has been steadily adjusted. Many authors segregate this variable into sub-variables like vacation visitor arrivals, trade visitor arrivals, visitor arrivals for visiting friends and relatives, tourist arrivals by air, tourist expenditure in the location, and visitors' expenses on specific tourism product categories (Petrevska, 2012, Kulendran and Wong, 2005).

In the 1970s, Box and Jenkins were the first to create the term "time series analysis." This sort of analysis looks at the previous values of a variable to project its future value, such as tourism demand. Three univariate time series models widely employed in the literature to describe diverse occurrences are the autoregressive process (AR), the moving average process (MA), and the Autoregressive Moving Average (ARMA) model, which combines the two processes. Calantone et al. (1987) emphasised the need to integrate several prediction techniques to generate a comprehensible forecast. Autoregressive Integrated Moving Average (ARIMA) models can describe both stationary and non-stationary time series and make accurate forecasts based on the previous description of a single variable. This method varies from prior forecasting methods in that it does not presuppose any pattern in the time series to be forecasted.

The study employed the univariate Box Jenkins ARIMA technique to find an appropriate ARIMA model to simulate the time series of visitor arrivals and anticipate tourist arrivals. Identification, estimation, diagnostic checking, and forecasting are the four steps in the Box-Jenkins univariate ARIMA model analysis, which is widely used for forecasting and modelling (Anderson, 1977). EViews covers several model selection criteria to help you discover an

acceptable ARIMA (p, d, q) model (Jayasinghe et al., 2021). estimated the number of COVID-19 pandemic cases in Germany, France, Italy, Iran, and Turkey between 12.03.2020 and 09.07.2020 using the ARIMA model. According to Chu (1998b), quantitative strategies for estimating the number of tourist arrivals have received more attention than qualitative ones. Quantitative techniques, which are further split into causal models and time series models, employ mathematics to analyse historical data sequences in a systematic way (Chu, 1998b, Choong-Ki et al., 1996). Casual models based on the accuracy of the projection from data of two years or fewer are less relevant and compatible than time-series models (Choy, 1984). Univariate time series are used to build a model that understands previous time-series behaviour and allows for accurate future predictions (Law, 2000, Gonzalez and Moral, 1996). To forecast visitor arrivals flows, it is also advised to use monthly or quarterly data rather than the more often used yearly data (Coshall, 2000). Kurawarwala et al. (1998) utilised historical data to determine seasonal variation in demand and evaluated the models using an ARIMA model to look at forecast performance. Laeeq Razzak Janjua et al. (2021), assessed tourist demand and assessing tourism demand using the Box-Jenkins time series method and the ARIMA model. In Thailand, the study used enough historical international visitor arrivals data from January 1991 to March 2020 and projected through December 2022.

A time series model explains a variable in terms of its unique history as well as a random disturbance term. Exploration of the historical movements and motif (such as seasonality) of the time series included, as well as prediction of the future of this series based on the trends and patterns identified in the model, receives special attention (Song et al., 2008). The Holt Winters Methods and integrated autoregressive moving-average models (ARIMA) have dominated time-series models for tourism demand predicting during the last four decades (Chu, 1998a). Simple ARIMA or seasonal ARIMA (SARIMA) models can be used based on the repetition of the time series, with the other obtaining importance in recent years even though seasonal variation is such a prominent characteristic of the tourism sector and policy constructors are intensely interested in periodic fluctuations, established a multivariate SARIMA model with an interference mechanism to contribute for the prospective spill-over influence of "parallel" demand series on a specific market (Goh and Law, 2002). Their research discovered that the multivariate SARIMA model outperformed the simple SARIMA and other univariate time series models with regard to forecasting. In addition to time series, artificial intelligence (AI) methods have appeared in the literature on tourism predicting (Brida et al., 2011). We can include determinant variables in ANN (Artificial Neural Networks) models. A study to predict Japanese

visitor arrivals in Hong Kong presented a novel approach that employs a supervised feedforward neural network model (Chu, 1998a). Because these are based on expert opinion and judgment, qualitative methods are not used as the primary method for forecasting. As a result, qualitative methods must coexist with quantitative methods. Most researchers start with a qualitative method and then add a weighted qualitative variable to the equation.

Qualitative approaches improve accuracy and the narrowing of the gap between actual and predicted results. Some academics have attempted to increase forecasting accuracy by combining forecasts given by multiple models. Forecast combination, according to general forecasting literature, can increase predicting accuracy. The application integrative approach is described in a study that introduced an integrative approach which integrates statistical approaches with brilliant judgements in a Quasi-Delphi procedure to collect key industry input for the forecasting procedures. This method was used to predict the worldwide and domestic tourism markets in South Australia (Goh and Law, 2002). A forecast may not always be 100% accurate; actual values may differ from forecasts.

Methodology

This paper aims to forecast and estimate visitor arrivals between August 2021 and August 2025. The research used the sample as monthly tourist arrivals in Sri Lanka from January 2000 to July 2021, representing the overall tourism business in the country. The study is based on a quantitative approach. Box-Jenkins ARIMA model is used to accomplish the study objective, as it is a popular modelling method for predicting future visitor arrivals of any time series variable based on historical values. The statistics set for the research objective consists of 259 observations for the period from January 2000 to July 2021 including a forecast from August 2021 to August 2025. The current study has utilised secondary data obtained from annual reports released by Sri Lanka Tourism Development Authority over a 21-year period, to gauge and forecast tourist arrivals for the period from 2021 to 2025. EViews statistical software is used to analyse monthly tourist arrivals data to forecast tourist arrivals from using appropriate. ARIMA model and involves a four-stage process: identification, estimation, diagnostic checking, and forecasting.

The identification process involves evaluating the variable's properties and mainly checking whether the variable is stationary or non-stationary. If the data set is stationary, mean and variance do not fluctuate over time without any trend. Furthermore, most economic variables are non-stationary, or it has a particular trend. Therefore, non-stationary data should be converted into

stationary data with breaking the trend. Using the graph, correlogram, and diagnostic tests of Augmented Dickey and Fuller (ADF), Phillips and Perron (PP), and Kwiatkowski, Phillips, Schmidt, and Shin were used to check the stationarity of the data set.

The ARMA model is appropriate if the time series is stationary, but if the data is non-stationary, the data should be differenced and the ARIMA model employed. The ARIMA model is made up of three parts: p, d, and q. The correlogram had to be reviewed in the second step of the identification procedure to determine p for the Autoregressive (AR) component and q for the Moving average (MA) component of the ARIMA.

Autocorrelation Function (ACF)

$$\text{ACF}(k) = p_k = \frac{\text{cov}(y_t, y_{t-k})}{\text{var}(y_t)} \quad (1)$$

The Autocorrelation Function ACF (k) interprets the gross correlation between y_t and y_{t-k} . For an AR model, the ACF (k) = $P_k = \rho^k$

The Partial Autocorrelation Function (PACF) is the correlation between y_t and y_{t-k} minus the part explained by the intervening lags

$$p_k = \text{Corr}[y_t - E^*(y_t|y_{t-1}, \dots, y_{t-k+1}), y_{t-k}] \quad (2)$$

Where $E^*(y_t|y_{t-1}, \dots, y_{t-k+1})$ the minimum mean-squared error predictor of y_t by $y_{t-1}, \dots, y_{t-k+1}$

The study estimated AR and MA components and check different coefficients in the Estimation stage. The goal is to recognise the suitable model that has significant coefficients. A better model should be selected after identifying the significant components of ARMA. When comparing the models discovered during the estimating stage of the study, the following criteria must be met to choose an acceptable model to continue the forecasting process. After identifying the significant components of ARMA, then need to compare which model is better to forecast the time series data. AR and MA components' probability should be less than 0.05 and should be the lowest value from the selected models. The highest adjusted R-squared value is better and Akaike Info Criteria (AIC), Hannan-Quinn Criter and Schwarz Criteria should be the smallest value from the selected models.

Checking the residual of the model is like the white noise process at this step. The next step is to satisfy the conditions of a stable univariate process when choosing a prospective model to anticipate previous data. Then there are three requirements to check for time series data diagnostics. The first need is to ensure that the model's residuals are white noise. The estimated ARMA process should then be checked for (covariance) stationary. As a result, AR roots should be contained within the unit circle. As a result, AR roots should be contained within the unit circle. Finally, researchers should ensure that the ARMA process calculated is invertible. All MA roots, however, should be contained within the unit circle. After finishing the model diagnostics and ensuring that the model is adequate for data analysis, the final stage is to anticipate past data to predict future value.

Null hypothesis = residuals are white noise

$$\text{The Ljung-Box statistic: } Q' = T(T + 2) \sum_{k=1}^p \frac{p^2k}{T-k} \quad (3)$$

Where P_k is the autocorrelation at observation k .

After conducting the model diagnostics and ensuring that the model is adequate for data analysis, the final stage is to forecast historical data to predict future value.

Results and Discussion

Descriptive Analysis

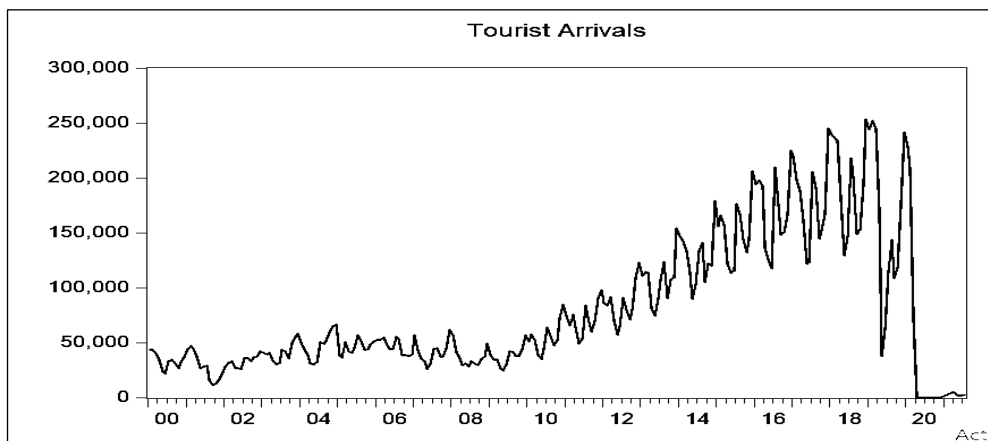
Table 1: Descriptive Analysis for Monthly Tourist Arrivals

Description	Statistics
Mean	80094.47
Median	52352.00
Maximum	253169.00
Minimum	0.0000
Std. Dev	63341.35
Skewness	1.046735
Kurtosis	3.111710
Jarque- Bera	47.43042
Probability	0.0000

Descriptive statistics for many visitor arrivals were obtained monthly; it includes a summary and measures of central tendency, the time series normality, and the desparation of the selected data set. The study is based on data from five consecutive years of months. According to Table 1, total monthly tourist arrivals range from minimum arrivals of 0.000 to maximum tourist visits 253,169. The average monthly international tourist arrivals are with a standard deviation of 63341.35. The skewness of the data set is exceptionally positively skewed because the value is higher than 1. The skewness is 1.046735. The P value of 0.0000 indicates that the monthly tourist arrivals data are not significantly deviate from normality, according to the Jerque-Bera test.

Figure 1 depicts how monthly tourist arrival figures have fluctuated over time. The study has predicted the tourism industry performance based on the dataset of monthly visitor arrivals in Sri Lanka. Figure 1 depicts the trend in visitor arrivals in Sri Lanka from January 2000 to July 2021. It is clear that visitor arrivals will be significantly lower in 2020. Sri Lanka has never experienced decrease of this level in visitor arrivals from its previous trend. The next step is to choose a model and forecast monthly tourist data.

Figure 1: Monthly Tourist Arrivals 2000-2021



Source: Authors' compilation.

Model Selection Identification

By differentiating the selected data set (Table 2) shows that the data set is nonstationary. The condition is that the ADF test statistic has a probability less than 0.05. Figure 1 shows a time series plot with an uneven trend, indicating that the data is non-stationary.

The ADF unit root test solutions shown in table (Table 2), in addition, illustrated that visitor arrivals are stationary in the first difference.

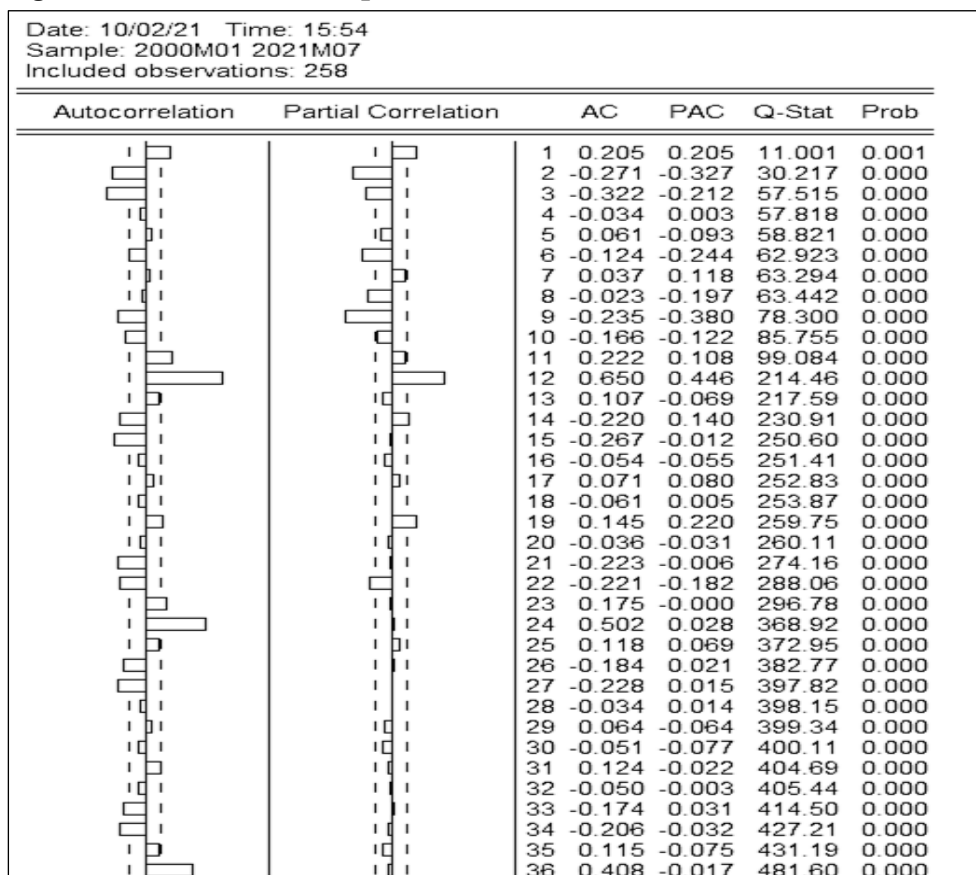
Table 2: Test of Stationary

		ADF Test			
Variable		Test Stat	Critical Value (5%)	P-Value	Conclusion
Tourist Arrival	Level	-0.95864	-3.428198	0.9464	Non-stationary
	First difference	-4.30129	-3.428198	0.0037	Stationary

The ADF test revealed that tourist arrivals from January 2000 to July 2021 were not stationary, with a P-value of 0.9464 and a unit root. The ADF test indicated that it became stationary after the difference was taken, the P-value was 0.0037, and the unit root was not found. Figure 2 depicts the AR and MA components of the first difference data set after checking for stationary.

The AR component is derived from Partial correlation, while the MA component is derived from Autocorrelation. This study suggests several models, and the best model is chosen for the analysis described in the estimation section.

Figure 2: AR and MA Component



Source: Authors' compilation.

Estimation

In this step, the tentative models, as mentioned above, were statistically evaluated to predict the future trend of visitor arrivals in Sri Lanka. According to Table. 3, the appropriate model should exist under some of the conditions. The first requirement is that the probability values for AR, MA, and Sigmasq be less than 0.05, indicating that the data is significant.

Table 3: Estimated Models

Model	(1,1,1)	(1,1,2)	(2,1,1)	(2,1,2)	(2,1,12)	(3,1,1)	(3,1,12)	(6,1,6)	(9,1,1)	(12,1,1)	(12,1,12)	(12,1,3)
C	0.93	0.89	0.91	0.86	0.96	0.92	0.98	0.96	0.92	0.97	0.90	0.91
AR	0.30	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sigmasq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adj. R Squa	0.06	0.11	0.10	0.10	0.36	0.13	0.36	0.20	0.09	0.43	0.43	0.46

Modelling and Forecasting Tourist Arrivals in Sri Lanka

Model	(1,1,1)	(1,1,2)	(2,1,1)	(2,1,2)	(2,1,12)	(3,1,1)	(3,1,12)	(6,1,6)	(9,1,1)	(12,1,1)	(12,1,12)	(12,1,3)
AIC	22.97	22.92	22.93	22.93	22.59	22.90	22.60	22.82	22.93	22.49	22.48	22.44
Schwarz Criteria	23.02	22.97	22.98	22.99	22.65	22.95	22.65	22.87	22.99	22.54	22.54	22.49
Hannan- Quinn Criteria	22.99	22.94	22.95	22.95	22.62	22.92	22.62	22.84	22.96	22.51	22.51	22.46

Source: Authors' compilation.

After considering the AR and MA components, the second condition must be met by selecting the model with the lowest AIC (22.4445), Schwarz criterion (22.4996), and Hannan-Quinn criterion (22.4667). According to the lowest value of AIC, Schwarz criterion, and Hannan-Quinn criteria Figure 3 is shown in the (12,1,3) model. Although the highest adjusted R squared value is 0.4602, Then the appropriate model is ARIMA (12,1,3), which is the best model for predicting the forecast values. Alternatively, the study chose the appropriate ARIMA (12,1,3) model, which includes the AR (12), d (1), and MA (3) processes. As shown in Fig 3. the equation ARIMA (12,1,3) is deliberately preferred over other models. Thus, to forecast visitor arrivals in Sri Lanka from August 2021 to August 2025.

The study was conducted in conjunction with the preventive measure of testing correlogram Q-statistics to determine the accurateness of the ARIMA (12,1,3) equation. Fig 4. depicted the residuals correlogram for the ARIMA (12,1,3) model, which was built flat, and the results propose that visitor arrivals in Sri Lanka should be predicted using ARIMA (12,1,3). As the results show, ACF and PACF are drawn against 36 lags, with the correlogram indicating that each lag lies within a 95% confidence interval and is statistically insignificant.

Figure 3: Correlogram Residual Squared Test

Date: 10/03/21 Time: 12:42 Sample: 2000M01 2021M07 Included observations: 258 Q-statistic probabilities adjusted for 2 ARMA terms						
Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.071	0.071	1.3074	
		2	-0.216	-0.222	13.503	
		3	0.040	0.079	13.924	0.000
		4	-0.011	-0.075	13.958	0.001
		5	-0.021	0.015	14.074	0.003
		6	-0.106	-0.137	17.089	0.002
		7	-0.109	-0.088	20.264	0.001
		8	0.054	0.019	21.047	0.002
		9	-0.036	-0.085	21.397	0.003
		10	0.059	0.100	22.351	0.004
		11	0.150	0.096	28.465	0.001
		12	-0.042	-0.036	28.941	0.001
		13	-0.073	-0.047	30.394	0.001
		14	0.012	-0.010	30.434	0.002
		15	-0.073	-0.095	31.922	0.002
		16	-0.044	-0.022	32.453	0.003
		17	0.047	0.064	33.070	0.005
		18	-0.002	-0.010	33.071	0.007
		19	0.132	0.151	37.938	0.003
		20	0.025	-0.019	38.117	0.004
		21	-0.090	-0.066	40.407	0.003
		22	-0.103	-0.169	43.449	0.002
		23	0.056	0.096	44.350	0.002
		24	0.042	0.001	44.861	0.003
		25	-0.018	0.061	44.952	0.004
		26	-0.034	0.026	45.287	0.005
		27	-0.063	-0.111	46.427	0.006
		28	0.019	-0.031	46.533	0.008
		29	0.015	-0.066	46.598	0.011
		30	-0.056	-0.059	47.529	0.012
		31	0.052	0.069	48.328	0.014
		32	-0.042	0.003	48.852	0.016
		33	-0.023	0.032	49.006	0.021
		34	-0.037	-0.137	49.427	0.025
		35	-0.051	-0.054	50.200	0.028
		36	0.086	0.001	52.451	0.023

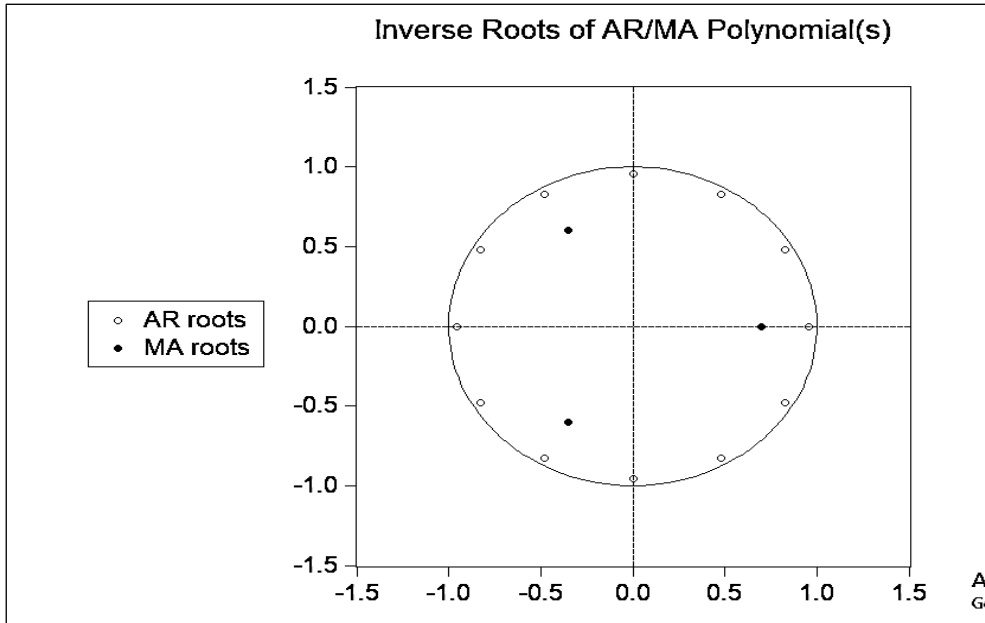
Source: Authors' compilation.

Diagnostic Checking

Following the estimation phase, the selected model is subjected to diagnostic testing. For the forecast period of tourist arrivals from 2021 to 2025, two conditions must be met. Those who are determining whether the estimated ARIMA is stationary and invertible. As a result, the AR and MA components should be located within the unit circle.

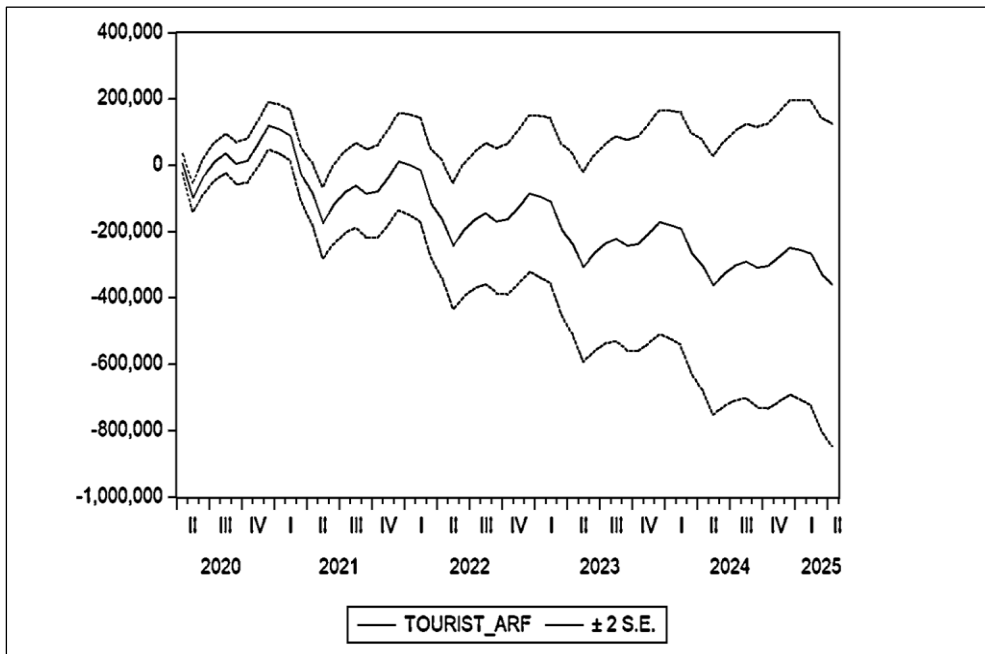
Figure 5 shows that the AR and MA components are inside the unit circle, indicating that the chosen model is suitable for forecasting monthly tourist arrivals. The residual is subjected to a white noise test after the ARIMA (12, 1, 3) model has been adjusted. Figure 4 shows the autocorrelation and partial autocorrelation function graphs for the residual series. Because the residual is white noise, the model is correct.

Figure 4: Inverse Root AR/MA Polynomial



Source: Authors' compilation.

Figure 5: Forecasting Tourist Arrivals

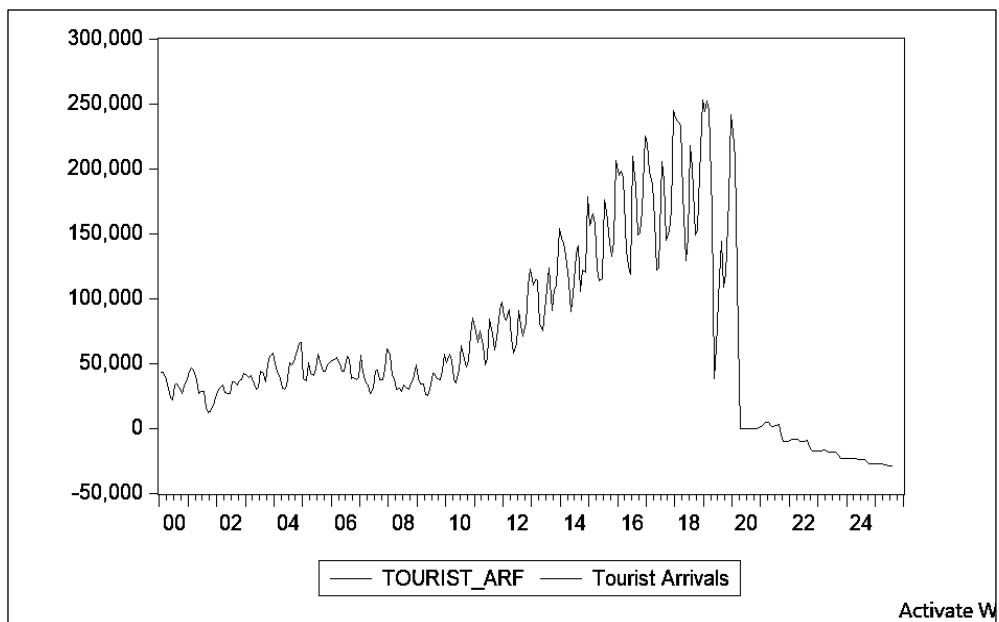


Source: Authors' compilation.

Figure 6 depicts the forecasted data graph in the final step of the ARIMA process. The blue line in the graph depicts the predicted visitor arrivals.

The last step is to forecast visitor arrivals in Sri Lanka. The ARIMA (12, 1, 3) model accurately predicts visitor arrivals between August 2021 and August 2025. The more extensive time series analysis obtained from January 2000 to July 2021 enables forecasting based on historical visitor arrival data. Furthermore, the study used the ARIMA model with dissimilar lag orders of the AR and MA components to predict future visitor arrival patterns with a rational difference.

Figure 6: Actual Tourist Arrivals and Forecasted Tourist Arrivals



Source: Authors' compilation.

Figure 7 depicts the predicted pattern. The predicted visitor arrivals will undoubtedly be affected from August 2021 to August 2025. The decline in visitor arrivals is moderately negative, indicating that international visitors will not visit Sri Lanka in the coming years. The cause of this situation is travel restrictions imposed worldwide because of the COVID-19 pandemic. Nonetheless, because of the global lockdown, the tourism industry in Sri Lanka will see a notable decrease in tourist visitation.

Conclusion

The COVID-19 outbreak has a significant impact on the world economic and industrial environment, especially in Sri Lanka's tourism sector. It is ideal to recognise how much of an effect it could have on tourist arrivals, as well as how many people would have lost tourism-related job positions or be distracted as a matter of fact of such a real impact. This research was carried out to predict one of Sri Lanka's most significant contributory segments of the tourism industry. We used monthly tourist arrival data from January 2000 to July 2021 to forecast monthly visitor arrivals for the next five-year period from August 2021 to August 2025. According to the study, there was a dramatic drop in foreign visitors in March 2021 because of a COVID-19 pandemic. A similar situation has been experienced by other countries. However, as a result of the global lockdown, Sri Lanka's tourism sectors have seen a significant drop in overseas arrivals. In addition, the study used time series ARIMA (12,1,3) predicting based on the Box Jenkins four-step methods to forecast tourist arrivals for the next five years beginning in August 2021. However, several ARIMA models were calculated before deciding on the best one. According to the evidence, the demand for tourist arrivals in Sri Lanka may decrease.

Based on our forecast, visitor arrivals in Sri Lanka will gradually decline over the next five years. Due to the ill effects of the pandemic, Sri Lanka needs more tourists to stimulate its economy. As a result, Sri Lanka must endeavour to expand its tourism industry. If Sri Lanka anticipates a significant inundation of tourists in the future, the sector should be adaptable to accommodate this influx in. In this regard, encouraging both domestic and foreign investment appears to be a viable strategy. Engaging well-instructed people in the tourism sector is critical because it affects service excellence and the potential to achieve the expectations of visitors' arrivals. Failure to do so may have negative effects on future arrivals, undermining the ruthless surroundings that entice visitors. Furthermore, the basic physical and organisational structures and facilities such as airports, road systems, and domestic flights must be enhanced in the future to accommodate the expanded number of foreigners. Sri Lanka has considerable tourism potential since the country offers an extensive variety of tourism commodities that attract visitors from a variety of market segments. Furthermore, the government must capture the necessary actions to determine a sustainable amount of visitor arrivals, as over-tourism can cause a variety of problems, including adverse effects on world heritage sites, locals, and the destination's environmental sustainability. The findings of this study provide a variety of possibilities for future research. The COVID-19 pandemic is still ongoing, and future researchers can expand the scope of the study concerning the tourism

sector, as such, can increase the size of the sample. The researchers can conduct new research by extending the current study's duration. The current study's findings indicate that the tourism industry will suffer a decline. Finding out the reasons behind the tourism industry can be used as a new research project to investigate potential threats impacting the industry.

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