Modeling and forecasting international tourism demand in Zimbabwe: a bright future for Zimbabwe's tourism industry

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MODELING AND FORECASTING INTERNATIONAL TOURISM DEMAND IN ZIMBABWE: A BRIGHT FUTURE FOR ZIMBABWE'S TOURISM INDUSTRY

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Abstract

This paper, which is the first of its kind in the case of Zimbabwe, uses annual time series on international tourism demand in Zimbabwe from 1980 to 2019, to model and forecast the demand for international tourism using the Box – Jenkins ARIMA approach. This research has been guided by the following objectives: to analyze international tourism trends in Zimbabwe over the study period, to develop and estimate a reliable international tourism forecasting model for Zimbabwe based on the Box-Jenkins ARIMA technique and to project international tourism demand in Zimbabwe over the next decade (2020 – 2030). Based on the Akaike Information Criterion (AIC), the study presents the ARIMA (2, 1, 0) model as the optimal model. The ARIMA (2, 1, 0) model proves beyond any reasonable doubt that over the period 2020 to 2030, international tourism demand in Zimbabwe will increase and that indeed, the future of Zimbabwe's tourism industry is bright. Amongst other policy recommendations, the study advocates for the continued implementation and enforcement of COVID-19 preventive and control measures as well as unwavering support for tourism sector development through policies such as the National Tourism Recovery and Growth Strategy.

Key Words: Forecasting, International Tourism, Zimbabwe

JEL Codes: L83, Z32, Z38

INTRODUCTION

Tourism is an important economic sector of every economy (Makoni *et al.*, 2021; Adil *et al.*, 2021), especially, international tourism; which remains a resilient pillar of sustainable economic growth and development in the world (Khan *et al.*, 2020; Balsalobre-Lorente *et al.*, 2020; Aliyev & Ahmadova, 2020; Eroz *et al.*, 2020; Reddy *et al.*, 2020; Lew, 2020; Cerveny *et al.*, 2020; Kumail *et al.*, 2020; Alam *et al.*, 2020; Xie *et al.*, 2020; Lyu *et al.*, 2020; Jia, 2020; Meyer, 2020; Tang, 2020; Shi & Sun, 2020; Haryanto, 2020; Jeyacheya & Hampton, 2020; Tsung-Pao & Hung-Che, 2020; Bandoi *et al.*, 2020; Eyuboglu & Eyuboglu, 2020; Jenkins, 2020; United Nations World Tourism Organization (UNWTO), 2020; Organization for Economic Cooperation and Development (OECD), 2020) and apparently offers the potential for growth rates far in excess of what can be achieved by domestic tourism and obviously deserves priority attention (English & Ahebwa, 2018). Globally, international tourism, being one of the fastest-growing industries (Songling *et al.*, 2019; Wakimin *et al.*, 2019; Lee *et al.*, 2020) has hogged the centre stage both as a foreign exchange earner and export industry. The sector contributes approximately 10.4% and 10% of global Gross Domestic Product (GDP) and employment, respectively (World Tourism Organisation (WTO), 2018) and represents a total of approximately 7% in the overall global exports (Van der Schyff *et al.*, 2019). In Africa, international tourism contributes approximately 2.8% of the continent's GDP, which is equivalent to an estimated US$36 billion international tourism receipts (Nene & Taivan, 2017).

Between 2005 and 2015 the tourism sector in Zimbabwe, generally contributed between 6% and 9% in terms of export earnings (ZTA, 2018). The sector contributed approximately 5.2% in terms of employment creation in 2018 (ibid). According to the RBZ (2016) report, the tourism industry in Zimbabwe surpasses agriculture and manufacturing industries in terms of the country's fastest turn around industries, contributing approximately 10% of GDP and is earmarked by the government to drive the economy (Zhou *et al*., 2014). The Government of Zimbabwe has set a target to attract 5 million tourists and create a $5 billion tourism economy by 2020 (Government of Zimbabwe, 2014). This shows that tourism has the capacity to give a very strong boost and support to economic growth (Eroz *et al*., 2020).

Zimbabwe is banking on tourism growth (Zhou *et al*., 2014), specifically, international tourism (Nyaruwata, 2017; Chitiyo *et al.*, 2019) to resuscitate the economy. In spite of a record low of nearly 200 thousand tourists in 1980, international tourist arrivals averaged approximately 1.7 million tourists over the period 1980 to 2018; with an all time high of almost 2.6 million tourists in 2018 (ZTA, 2018), suggesting that, in Zimbabwe; international tourism does not only have extra-ordinary economic potential but is also hovering on an upwards trajectory. Zimbabwe's tourism market is largely oriented towards the international market (ZTA, 2007; Abel *et al.*, 2013) with other African countries (ZTA, 2015; Africa Business Insight, 2017), United States of America (USA) and the United Kingdom (UK) being the major source markets (ZTA, 2015). Approximately 86% of Zimbabwe's tourists come from other African countries (Africa Business Insight, 2017). Tourists coming from South Africa now make the vast majority (ZTA, 2007; ZTA, 2013; Mapingure *et al.*, 2018), accounting for nearly 800 thousand visits in 2015; due to increased visits by those visiting relatives and friends as well as for leisure (African Travel & Tourism Association (ATTA), 2015). Although domestic tourism is also growing in the country; as indicated by the national average hotel occupancies which rose by 5% in 2018 to 53% from 48% recorded in 2017 (ZTA, 2018), the country is not yet ready to rely on domestic tourism because most of its citizens are low-income earners that cannot economically support tourism in Zimbabwe (Mkono, 2012; Mutana & Zinyemba, 2013; Chibaya, 2013; Chitiyo *et al.*, 2019). In 2018 alone, domestic tourism raked-in US$335 million while international tourism brought in US$1.051 billion (ZTA, 2018); signifying that international tourism has enormous potential to revive the country's distressed economy (Woyo & Woyo, 2018). International tourism is therefore an important contributor of foreign exchange in Zimbabwe (World Economic Forum (WEF), 2019).

Relevance & Timeliness of the Study

Zimbabwe's economy is well known for being one of the strongest economies in Africa during the 1980s (Bayai & Nyangara, 2013). However, today, the country has one of the lowest GDP per capita in the world (Trading Economics, 2021) and is characterized by a sluggish growth of approximately 4% per annum (Zimbabwe National Statistics Agency (ZimStats), 2019), which is quite below the sustainable growth rate of more than 5% per annum (The Global Economy, 2021). The country is also deeply entrenched in foreign exchange shortages (ZTA, 2018), projected to persist (World Bank, 2019). On this trajectory, Zimbabwe's ambitious goal of reaching upper-middle-income status by 2030 might be compromised (Welborn *et al.*, 2019).

International tourism, however, if given the attention it deserves can drive the economy on an upward trajectory and meaningfully contribute to the country's much awaited realization of upper-middle-income status by 2030. The sector contributed approximately 7.2%, 5.2%, and 4.7% to GDP, employment and export earnings in 2018, respectively (ZTA, 2018). According to RBZ (2016) the tourism industry surpasses agriculture and manufacturing industries in terms of the country's fastest turn around industries. The tourism sector is also earmarked by the government to drive the economy (Zhou *et al.*, 2014; Nyaruwata, 2017) and the government has set a target to attract 5 million tourists and create a $5 billion tourism economy by 2020 (Government of Zimbabwe, 2014). Therefore, the country's economy can be resuscitated through international tourism development (Chitiyo *et al*., 2019).

The lack of an evidence-driven tourism policy can be an impediment to the attainment of the needed growth in the country and has contributed to misuse and neglect of abundant tourism resource endowments (especially, the flora and fauna) in the country (WEF, 2019). In Zimbabwe, very few studies, for example; Makoni & Chikobvu (2018a & b), Makoni *et al.* (2018), Makoni & Chikobvu (2021), and Makoni *et al.* (2021) forecasted tourism, despite its overall role in foreign exchange generation. Of these studies, only two, that is; Makoni & Chikobvu (2021) and Makoni *et al*. (2021) focused on international tourist arrivals based on disaggregated data and this, apparently, leads to an information hiatus with regards to aggregated international tourism modeling and forecasting. This study is poised to unveil evidence-driven policy pathways in order to take Zimbabwe to a better level in terms of international tourism development and consequently, economic growth.

Research Objectives

The general objective of this study is to examine international tourism drivers in Zimbabwe. Hence, the following specific objectives will be pursued:

i. To analyze international tourism trends in Zimbabwe over the study period.

ii. To develop and estimate a reliable international tourism forecasting model for Zimbabwe based on the Box-Jenkins ARIMA technique.

iii. To project international tourism demand in Zimbabwe over the next decade (2020 – 2030).

Contribution of the Paper

There is a dearth of knowledge in Zimbabwe, particularly, on modeling and forecasting international tourism demand despite the fact that tourism remains one of the largest (English & Ahebwa, 2018; Habibi *et al*., 2018; World Travel & Tourism Council (WTTC), 2019) and fastest-growing industries in the world (African Development Bank (AfDB), 2018; Dogru & Bulut, 2018; Songling *et al*., 2019; Wakimin *et al*., 2019; Nicolaides, 2020; Lee *et al*., 2020) and is a well known major force in international trade (Selimi *et al*. 2017), representing a total of 7% in the overall global exports (Van der Schyff *et al*., 2019).

Apparently, the Government of Zimbabwe has begun to seriously acknowledge the role of tourism in economic growth and development and is now eager to rigorously promote tourism internationally (Zhou *et al*., 2014; Nyaruwata, 2017; Chitiyo *et al*., 2019), particularly through initiatives such as regional tourism promotion, destination branding and image transformation, digital marketing campaign, diaspora tourism promotion, wide scale rollout of the Service Excellence Programme, Tourism Health, Safety and Hygiene Protocols as well as international tourism promotion (Ministry of Environment, Climate, Tourism and Hospitality Industry, 2020). Availability of comprehensive and convincing empirical evidence in this domain is likely to go a long way in helping policy makers to formulate policies that would have significant impact on the sector and thus contribute to economic growth. Accurate international tourism demand forecasts are critical for the government, policy makers and investors as they help in proper tourism management (Makoni *et al*., 2021).

Therefore, the findings of this research will provide essential information for strategic planning and policy formulation by the Government of Zimbabwe and the tourism business community at large. This paper is apparently in line with Zimbabwe's National Tourism Policy (2012 – date) whose main thrust is to place Zimbabwe in the top five destinations in the SADC region by 2035. The paper is also consistent with the National Tourism Master Plan (2017 – 2035) which works as a guide in product development and diversification, infrastructural and manpower development, community participation and preservation of nature, culture, and heritage.

This research has also comes at a time when the Government of Zimbabwe is also implementing the National Tourism Strategy (2018 – 2030) whose main objective is to increase the tourism sector's contribution to GDP to USD$8.1 billion by 2030 and has recently launched the National Tourism Recovery and Growth Strategy whose primary goal is to achieve a USD$5 billion tourism economy by 2025. The National Tourism Recovery and Growth Strategy recognizes the devastating effect that the COVID-19 pandemic has had, nationally and globally, on the fortunes of tourism and consequently seeks to, among other things, provide access to entrepreneurs within the sector, capital to affected tourism businesses, including small businesses within the tourism value chain, in a bid to save and secure jobs and to re-establish lost contact with the local, regional and international tourism source markets.

Therefore, this study is essential because it is a direct response to national initiatives such as the National Tourism Policy, National Tourism Master Plan, National Tourism Strategy and the National Tourism Recovery and Growth Strategy and is envisioned to enhance the success of these initiatives. Indeed, the paper will foster evidence-based decision making with respect to international tourism demand modeling and forecasting in Zimbabwe, in order to strategically reposition the country for increased benefits from international tourism.

LITERATURE REVIEW

The basic concept underlying research on tourism demand modeling and forecasting is based on the classical economic theory that the main drivers of demand are price factors and income. Since this assertion is a product of consumer utility maximization theory, it follows that the influence of consumer theory is very essential in the discussion of which drivers could possibly influence inbound tourism demand. By implication, consumer theory suggests that foreign tourism demand would be influenced by income level of the tourist, prices of tourism products and services in a destination, tourism substitute prices in related destinations, and other variables which could also influence a tourist's decision to visit a foreign destination (Lim, 1997; Smeral, 2003; Vencovska, 2011). These variables are mostly collected at the macro level and so may not provide much information as to how the social characteristics of the tourist influence his or her decision to undertake touristic activities. Therefore, other studies have shown that tourist socio-demographic characteristics such as gender family size, age, educational level among others, play a crucial role in their decision to travel and enjoy tourism in a foreign destination (Menezes *et al.*, 2008; Ngagu, 2014; Okon, 2014). These studies usually use micro data at the individual or household level, collected through surveys at destination entry and exit points. Given the main thrust of this paper, that is, a focus on international tourism demand modeling and forecasting based on the ARIMA technique; Table 1 shows a fair sample of studies undertaken more recently, specifically within the past 10 years:

Table 1: Previous Studies Reviewed

Author(s)/Year	**Country**	**Period**	**Methodology**	**Main Findings**
Gurudeo *et al.* (2012)	Australia	1950 – 2009	ARIMA; VAR	The best fit model is the ARIMA (2, 2, 2) model
Petrevska (2012)	Macedonia	1956 – 2010	ARIMA	A 25% increase in international tourist arrivals was expected
Borhan & Arsad (2014)	Malaysia	January 1999 – December 2012	SARIMA	The number of tourist arrivals contain a strong seasonal component and will generally continue to rise
Yilmaz (2015)	Turkey	January 2002 – December 2013	SARIMA; BSM	The SARIMA model performs better than the BSM model
Song & Fei (2016)	China	Janaury 2006 – December 2015	ADLM-ECM	Tourism demand will increase
Priyangika *et al* (2016)	Sri Lanka	January 2000 – December 2014	ARIMA; GARCH; ARCH; SARIMA	The ARCH (1) model with optimal lags (2, 7 and 12) was identified as the best model
Kumar & Sharma (2016)	Singapore	January 2003 – December 2013	SARIMA	The best fit model is the SARIMA $(1, 0, 1)(1, 1, 0)_{12}$ model
Purwanto *et al.* (2016)	Indonesia	January 1991 – December 2013	BPNN; KNN; MLR	The best fit model is the BPNN model
Yu *et al.* (2017)	Japan	January 2009 – December 2015	SARIMA; SAD	The SAD model performs better
Theara & Chukiat (2017)	Cambodia	January 2000 – July 2017	ARIMA; GARCH; ARIMA-GARCH	The best fit model is the ARIMA (3, 1, 4)-GARCH (1, 1)
Chandra & Kumari (2018)	India	January 2003 – December 2016	VECM; SARIMA; Grey Model; Naïve I & II models	The VECM model performs better than all the other models
Zahedjahromi (2018)	USA	January 1998 – December	SARIMA	The SARIMA $(0, 1, 2)(0, 1, 1)_{12}$ is the best fit

		2011		model; Tourist arrivals will increase
Makoni & Chikobvu (2018a)	Zimbabwe	January 2006 – December 2017	SARIMA	The best fit model is the SARIMA (2, 1, 0)(2, 0, $0)_{12}$ model; Tourist arrivals to Victoria Falls are likely to increase
Makoni *et al.* (2018)	Zimbabwe	January 2010 – December 2016	SARIMA	The best fit model was found to be the SARIMA (1, 0, 1)(1, 1, $0)_{12}$ model; An increase in tourists was found to very likely
Msofe & Mbago (2019)	Tanzania	January 1995 – December 2017	SARIMA	The SARIMA (1, 1, 1)(1, 1, $2)_{12}$ model was found to be the best fit model
Tharu (2019)	Nepal	1993 – 2018	ARIMA	The best fit model is the ARIMA (1, 1, 1) model
Makoni & Chikobvu (2021)	Zimbabwe	January 2000 – June 2017	ARMA-GARCH; ARMA	Unexpected tourism shocks will significantly impact the Zimbabwe international tourist arrivals for longer durations; A slow increase international tourist arrivals (outside of the COVID-19 period); The ARMA (1, 1) model is the best fit model
Makoni *et al.* (2021)	Zimbabwe	January 2002 – December 2018	QRA	International Tourist arrivals expected to increase

Source: Author's Analysis From Reviewed Literature (2021)

From Table 1 above, it is clear that, in the case of Zimbabwe, a few studies regarding international tourism have been done by Makoni and colleagues. However, the researchers have not yet aggregated (or macroeconomic level) international tourism data for Zimbabwe. Hence, this is indeed the first study of its kind in the case of Zimbabwe. It is imperative to note that, of the 18 previous studies reviewed, the majority (that is, 15 papers, namely: Gurudeo *et al.* (2012), Petrevska (2012), Borhan & Arsad (2014), Yilmaz (2015), Priyangika *et al.* (2016), Kumar & Sharma (2016), Yu *et al.* (2017), Theara & Chukiat (2017), Chandra & Kumari (2018), Zahedjahromi (2018), Makoni & Chikobvu (2018a), Makoni *et al.* (2018), Msofe & Mbago (2019), Tharu (2019), Makoni & Chikobvu (2021) as well as Makoni *et al.* (2021)) used the ARIMA approach, either exclusively or alongside other forecasting models in analyzing international tourism. This is explicit proof to show that the ARIMA approach is indeed widely used when it comes to analyzing international tourism demand, hence its use in this study. Other modes that have been used to model and forecast international tourism demand, as shown in Table 1 above, include the VAR (Gurudeo *et al.*, 2012), BSM (Yilmaz, 2015), ADLM-ECM (Song & Fei, 2016), ARCH and GARCH (Priyangika *et al.*, 2016; Theara & Chukiat, 2017; Makoni & Chikobvu, 2021), BPNN, KNN and MLR (Purwanto *et al.*, 2016), SAD (Yu *et al.*, 2017), VECM, Grey, Naïve I & II (Chandra & Kumari, 2018) as well as QRA (Makoni *et al.*, 2021).

METHODOLOGY

The Autoregressive (AR) Model

A process M_t (annual international tourist arrivals at time t) is an autoregressive process of order p, that is, AR (p) if it is a weighted sum of the past p values plus a random shock (Z_t) such that:

$$M_t = \emptyset_1 M_{t-1} + \emptyset_2 M_{t-2} + \emptyset_3 M_{t-3} + \cdots + \emptyset_p M_{t-p} + Z_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [1]$$

Using the backward shift operator, B, such that $BM_t = M_{t-1}$, the AR (p) model can be expressed as in equation [2] below:

$$Z_t = \emptyset(B)M_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [2]$$

where $\emptyset(B) = 1 - \emptyset_1 B - \emptyset_2 B^2 - \emptyset_3 B^3 - \cdots - \emptyset_p B^p$

The 1st order AR (p) process, AR (1) may be expressed as shown below:

$$M_t = \emptyset M_{t-1} + Z_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [3]$$

Given $\emptyset = 1$, then equation [3] becomes a random walk model. However, when modeling and forecasting international tourism, random walk processes are rarely applicable. When $|\emptyset| > 1$, then the series is reffered to as explosive, and thus non-stationary. Generally, most time series are explosive. In the case where $|\emptyset| < 1$, the series is said to be stationary and therefore its ACF (autocorrelation function) decreases exponentially.

The Moving Average (MA) Model

A process is reffered to as a moving average process of order q, MA (q) if it is a weighted sum of the last random shocks, that is:

$$M_t = Z_t + \theta_1 Z_{t-1} + \theta_2 Z_{t-2} + \cdots + \theta_q Z_{t-q} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [4]$$

Using the backward shift operator, B, equation [4] can be expressed as follows:

$$M_t = \theta(B)Z_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [5]$$

where $\theta(B) = 1 + \theta_1 B + \theta_2 B^2 + \cdots + \theta_q B^q$

Equation [4] can also be expressed as follows:

$$M_t - \sum_{j \leq 1} \pi_j M_{t-j} = Z_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [6]$$

for some constant π_j such that:

$$\sum_{j \leq 1} |\pi_j| < \infty$$

This implies that it is possible to invert the function taking the Z_t sequence to the M_t sequence and recover Z_t from present and past values of M_t by a convergent sum.

The Autoregressive Moving Average (ARMA) Model

While the above models are good, a more parsimonious model is the ARMA model. The AR, MA and ARMA models are applied on stationary time series only. The ARMA model is just a mixture of AR (p) and MA (q) terms, hence the name ARMA (p, q). This can be expressed as follows:

$$\emptyset(B)M_t = \theta(B)Z_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. [7]$$

Thus:

$$M_t\left(1 - \emptyset_1 B - \emptyset_2 B^2 - \cdots - \emptyset_p B^p\right) = Z_t\left(1 + \theta_1 B + \theta_2 B^2 + \cdots + \theta_q B^q\right) \ldots\ldots\ldots\ldots\ldots.\ldots [8]$$

where $\emptyset(B)$ and $\theta(B)$ are polynomials in B of finite order p, q respectively.

The Autoregressive Integrated Moving Average (ARIMA) Model

The AR, MA and ARMA processes are usually not applied empirically because in most cases many time series data are not stationary; hence the need for differencing until stationarity is achieved.

$$\left.\begin{array}{c} The\ first\ difference\ is\ given\ by: \\ M_t - M_{t-1} = M_t - BM_t \\ The\ second\ difference\ is\ given\ by: \\ M_t(1-B) - M_{t-1}(1-B) = M_t(1-B) - BM_t(1-B) = M_t(1-B)(1-B) = M_t(1-B)^2 \\ The\ third\ difference\ is\ given\ by: \\ M_t(1-B)^2 - M_{t-1}(1-B)^2 = M_t(1-B)^2 - BM_t(1-B)^2 = M_t(1-B)^2(1-B) = M_t(1-B)^3 \\ The\ d^{th}\ difference\ is\ given\ by: \\ M_t(1-B)^d \end{array}\right\} \ldots [9]$$

Given the basic algebraic manipulations above, it can be inferred that when the actual data series is differenced "d" times before fitting an ARMA (p, q) process, then the model for the actual undifferenced series is called an ARIMA (p, d, q) model. Thus equation [7] is now generalized as follows:

$$\emptyset(B)(1-B)^d M_t = \theta(B)Z_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots\ldots\ldots\ldots\ldots. [10]$$

Therefore, in the case of modeling and forecasting international tourism, equation [10] can be written as follows:

$$\emptyset(B)(1-B)^d M_t = \theta(B)Z_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. [11]$$

The Box – Jenkins Approach

The first step towards model selection is to difference the series in order to achieve stationarity. Once this process is over, the researcher will then examine the correlogram in order to decide on the appropriate orders of the AR and MA components. It is important to highlight the fact that this procedure (of choosing the AR and MA components) is biased towards the use of personal judgement because there are no clear – cut rules on how to decide on the appropriate AR and MA components. Therefore, experience plays a pivotal role in this regard. The next step is the estimation of the tentative model, after which diagnostic testing shall follow. Diagnostic checking is usually done by generating the set of residuals and testing whether they satisfy the characteristics of a white noise process. If not, there would be need for model re – specification and repetition of the same process; this time from the second stage. The process may go on and on until an appropriate model is identified (Nyoni, 2018). The Box – Jenkins technique was proposed by Box & Jenkins (1970) and is widely used in many forecasting contexts, including Tourism Economics. In this paper, hinged on this technique; the researcher will use automatic ARIMA modeling for estimating equation [10].

Data Issues

International tourism, for the purposes of this paper; is defined as tourism that crosses national borders (WTO, 2018; ZTA, 2018) and apparently occurs when people cross their national borders, traveling to and staying in foreign places for not more than one consecutive year for leisure, business and other purposes (*ibid*). The two most common variables used as proxies for international tourism activity are the total number of international tourist arrivals (Samimi *et al*., 2011; Lean *et al*., 2014; Chor & Ozturk, 2017; Nene & Taivan, 2017; Wu & Wu, 2019) and international tourism receipts or earnings (Sharma, 2018; Roudi *et al*. 2019; Mitra, 2019). In this paper, the researcher used secondary data on annual international tourist arrivals as a measure of international tourism. All the data was gathered from the ZTA head office in Harare and covers the period 1980 to 2019.

Evaluation of ARIMA Models

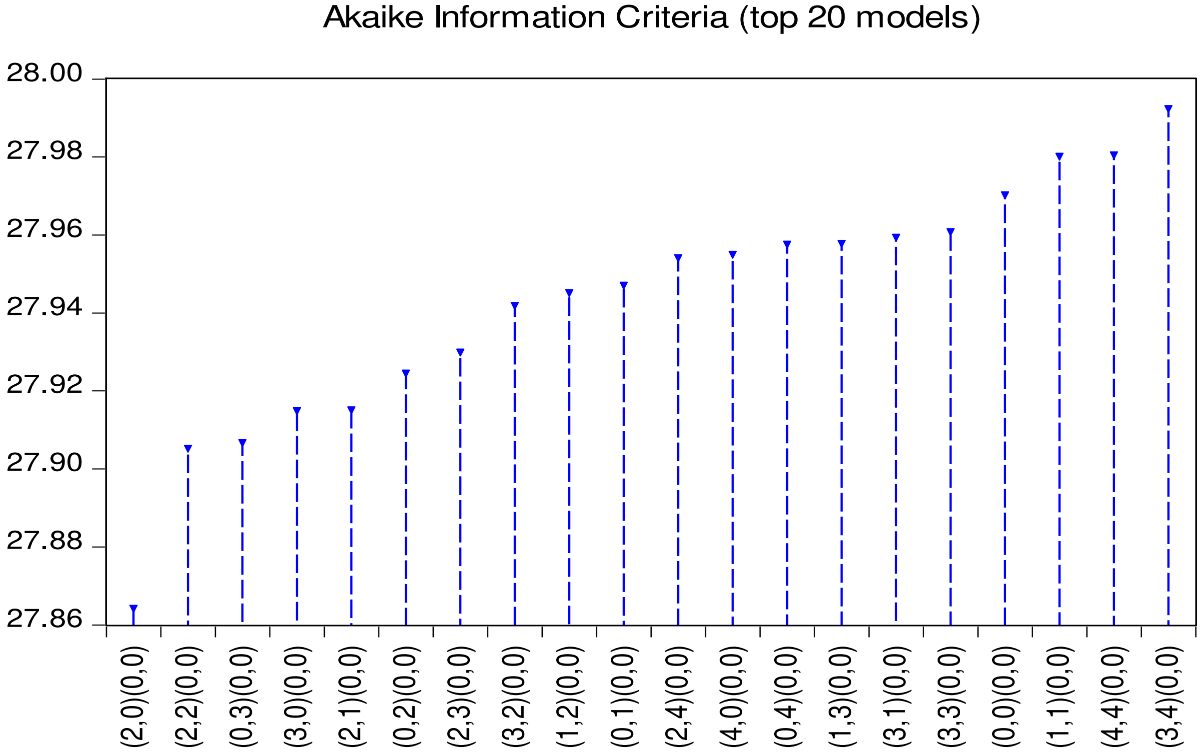
Criteria Table

Table 2: Criteria Table

Model	LogL	AIC*	BIC	HQ
(2,0)(0,0)	-539.353366	27.864275	28.034897	27.925493
(2,2)(0,0)	-538.153619	27.905314	28.161246	27.997140
(0,3)(0,0)	-539.181349	27.906736	28.120013	27.983258
(3,0)(0,0)	-539.341585	27.914953	28.128230	27.991475
(2,1)(0,0)	-539.345364	27.915147	28.128424	27.991669
(0,2)(0,0)	-540.530342	27.924633	28.095255	27.985851
(2,3)(0,0)	-537.635485	27.930025	28.228613	28.037156
(3,2)(0,0)	-537.867946	27.941946	28.240534	28.049077
(1,2)(0,0)	-539.931707	27.945216	28.158493	28.021738
(0,1)(0,0)	-541.968817	27.947119	28.075085	27.993032
(2,4)(0,0)	-537.106855	27.954198	28.295441	28.076633
(4,0)(0,0)	-539.123521	27.955052	28.210985	28.046879
(0,4)(0,0)	-539.174146	27.957649	28.213581	28.049475
(1,3)(0,0)	-539.178155	27.957854	28.213787	28.049681
(3,1)(0,0)	-539.208587	27.959415	28.215347	28.051241
(3,3)(0,0)	-537.237638	27.960905	28.302148	28.083340
(0,0)(0,0)	-543.420882	27.970302	28.055613	28.000910
(1,1)(0,0)	-541.613801	27.980195	28.150817	28.041413
(4,4)(0,0)	-535.621492	27.980589	28.407144	28.133633
(3,4)(0,0)	-536.852136	27.992417	28.376316	28.130157
(1,0)(0,0)	-542.897204	27.994728	28.122695	28.040642
(4,1)(0,0)	-538.946660	27.997265	28.295853	28.104395
(1,4)(0,0)	-538.974531	27.998694	28.297282	28.105825
(4,3)(0,0)	-537.153239	28.007858	28.391757	28.145598
(4,2)(0,0)	-539.111944	28.057023	28.398266	28.179458

Criteria Graph

Figure 1: Criteria Graph



Forecast Comparison Graph

Figure 2: Forecast Comparison Graph

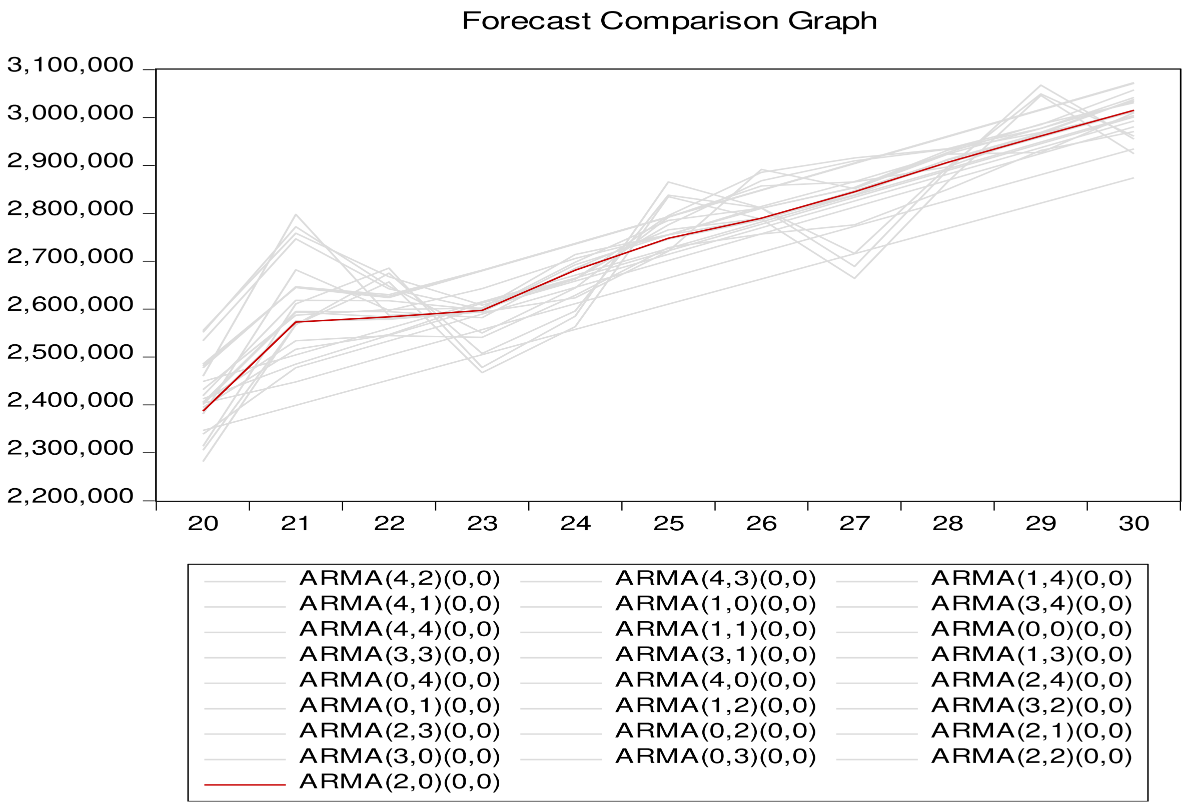


Table 2 and Figure 1 indicate that the optimal model is the ARIMA (2, 1, 0) model. Figure 2 is a combined forecast comparison graph showing the out-of-sample forecasts of the top 25 models evaluated based on the AIC criterion. The red line shows the forecast line graph of the optimal model, the ARIMA (2, 1, 0) model.

RESULTS

Summary of the Selected ARIMA (2, 1, 0) Model

Table 3: Summary of the Optimal Model

Automatic ARIMA Forecasting
Selected dependent variable: D(TA)
Sample: 1980 2019
Included observations: 39
Forecast length: 11
Number of estimated ARMA models: 25
Number of non-converged estimations: 0
Selected ARMA model: (2,0)(0,0)
AIC value: 27.8642751966

Main Results of the Selected ARIMA (2, 1, 0) Model

Table 4: Main Results of the Optimal Model

Dependent Variable: D(TA)				
Method: ARMA Maximum Likelihood (BFGS)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	55874.02	24308.75	2.298514	0.0276
AR(1)	-0.229009	0.176463	-1.297774	0.2029
AR(2)	-0.405550	0.139464	-2.907927	0.0063
SIGMASQ	5.96E+10	1.38E+10	4.313527	0.0001
R-squared	0.196273	Mean dependent var		52726.46
Adjusted R-squared	0.127382	S.D. dependent var		275934.3
S.E. of regression	257761.3	Akaike info criterion		27.86428
Sum squared resid	2.33E+12	Schwarz criterion		28.03490
Log likelihood	-539.3534	Hannan-Quinn criter.		27.92549
F-statistic	2.849037	Durbin-Watson stat		1.966523
Prob(F-statistic)	0.051395			
Inverted AR Roots	-.11+.63i	-.11-.63i		

ARIMA (2, 1, 0) Model Forecast

Tabulated Out of Sample Forecasts

Table 5: Tabulated Out of Sample Forecasts

Year	Forecasted International Tourist Arrivals
2020	2387126
2021	2573116

2022	2584085
2023	2597474
2024	2681289
2025	2747994
2026	2790056
2027	2844701
2028	2906458
2029	2961483
2030	3015166

Graphical Presentation of the Out of Sample Forecasts

Figure 3: Graphical Presentation of the Out of Sample Forecasts

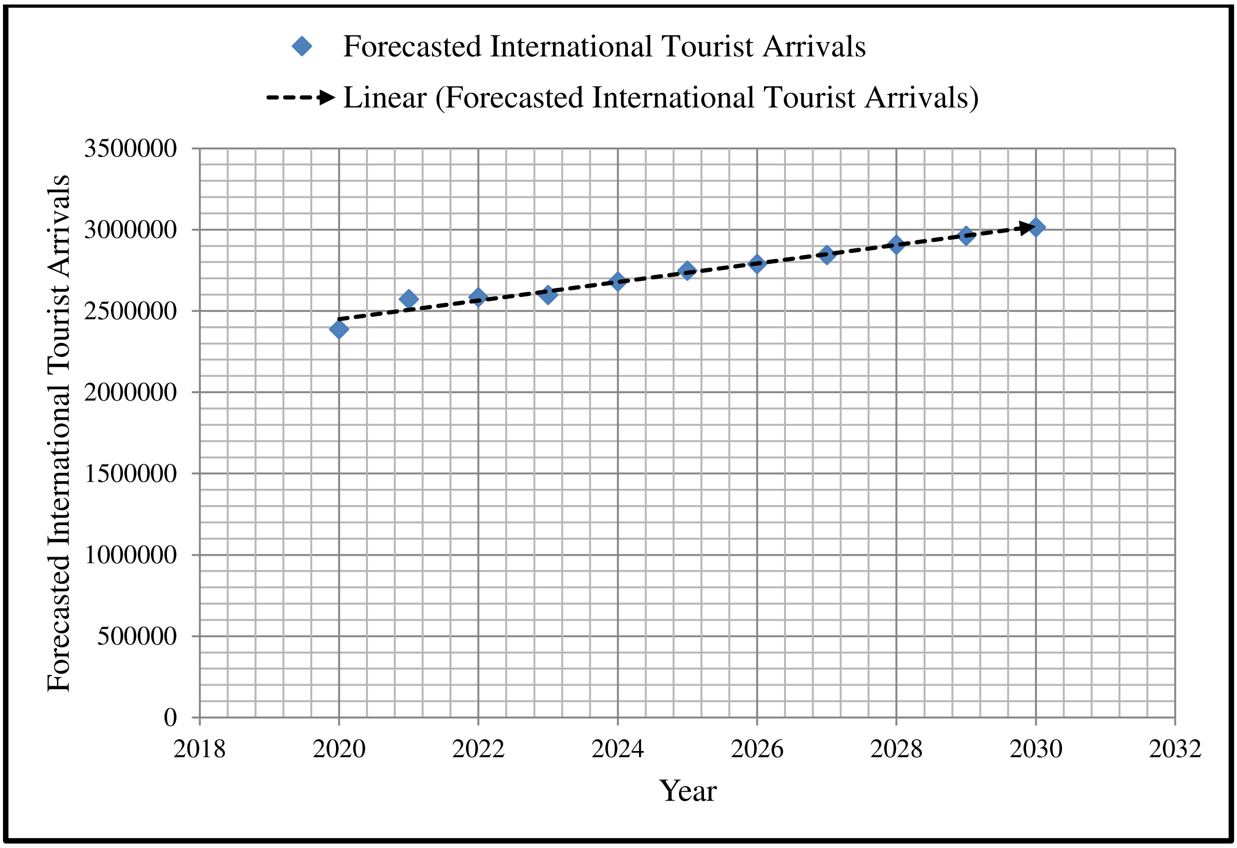


Table 4 shows the main results of the optimal model, the ARIMA (2, 1, 0) model. The AR (1) component is statistically insignificant while the AR (2) component is statistically significant at 1% level of significance. The insignificance of the AR (1) component implies that (immediate) previous period international tourist arrivals are not important in explaining long-run demand for international tourism. However, the significance of the AR (2) component indicates that previous period (that is, two years back) international tourist arrivals are vital in explaining long-run demand for international tourism in Zimbabwe. This means that after every 2 years, foreign tourist arrivals tend to increase systematically in the country. This can be attributed to exceptional visitor experiences, good hospitality services as well as tourism brand loyalty. Table 4 also indicates that the SIGMASQ component (which captures volatility) is statistically significant at 1% level of significance. This implies that international tourist arrivals in Zimbabwe tend to be highly volatile, probably due to volatile foreign exchange rate developments, high inflation, disease outbreaks such as Cholera and

Malaria, pandemics such as the current COVID-19 pandemic as well as natural disasters such as cyclone Idai. This is consistent with Makoni & Chikobvu (2021) who found out that unexpected tourism shocks (international tourism volatility) will significantly impact the Zimbabwe international tourist arrivals for longer durations and that there was a high likelihood of slow increase in international tourist arrivals (outside of the COVID-19 period). In line with previous studies such as Makoni *et al*. (2018), Makoni & Chikobvu (2018a) and Makoni *et al*. (2021), Table 5 and Figure 3 clearly indicate that there is likely to be an increase in international tourism demand over the period 2020 to 2030, ceteris paribus.

POLICY IMPLICATION & CONCLUSION

Modeling and forecasting international tourism demand in Zimbabwe remains critical for policy and planning purposes. Based on annual international tourist arrivals data, the study employed the ARIMA approach to generate forecasts for the period 2020 to 2030, holding other things constant. The study only considers the pre-COVID-19 data and we understand that this mean that the forecasts do not reflect the effects of the COVID-19 pandemic on the tourism sector in the country. Had it been not for the COVID-19 pandemic, the country could have anticipated to host those big numbers of foreign tourists. Most importantly, the results of the study point to a bright future for Zimbabwe's tourism industry, especially when the war against the COVID-19 pandemic is finally won. In the post-COVID-19 period, tourism planners and policy makers, through the implementation of existing tourism policies; should put in place infrastructure such as accommodation and ablution facilities in order to properly host the predicted increase in the number of tourist arrivals in the country. Just like what is happening in other countries across the globe, Zimbabwe should continue closely monitoring the COVID-19 situation, making sure that all the control and preventive measures against the pandemic are enforced and adhered to, religiously.

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