African Journal of Hospitality, Tourism and Leisure, Volume 8 (4) - (2019) ISSN: 2223-814X

A middle-income economy by 2030: A Zimbabwe tourism destination perspective based on a GDP forecast using the Box-Jenkins ARIMA approach

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Abstract

The study used annual time series data on GDP per capita in Zimbabwe from 1960 to 2017, in order to model and forecast GDP per capita using the Box – Jenkins ARIMA technique. The tests indicated that Zimbabwe GDP per capita data is I (1). The results of the study revealed that the GDP per capita in Zimbabwe is likely to improve in the next decade. Qualitative research was also conducted in order to establish the main factors that might support the anticipated growth from a tourism perspective through in-depth interviews. A further quantitative research was done to try to understand the most dominant factors which were injecting a positive GDP from a tourism sector point of view. The results showed that tourism enterprising, political stability, tourism innovation, Foreign Direct Investment and favourable pricing were all critical issues. The study therefore recommended therefore recommended the need for a currency reform, a friendly business environment and a stringent political dialogue in the country as factors which would help drive the country towards a middle income economy status by 2030.

Keywords: Tourism destination, gross domestic product, Zimbabwe, ARIMA, economic growth

Introduction

The Gross Domestic Product (GDP) is one of the primary indicators used to measure the healthiness of a country's economy (Onuoha *et al*, 2015). GDP is everything produced by all people and all the companies within an economy (Kimberly, 2008). GDP is also used to determine the standard of living of individuals in an economy (Onuoha, *et al*, 2015) and is also a well-known measure of economic growth. Economic growth can be defined as a sustained increase in per capita national output or net national product over a long period of time (Nyoni & Bonga, 2018a). Sustainable economic growth mainly depends on a nation's ability to invest and make efficient and productive use of the resources at its disposal (Nyoni & Bonga, 2017f). Policy makers and analysts are continually assessing the state of the economy (Barhoumi *et al*, 2011) and in Zimbabwe, just like in any other country, the need for a more consistent and accurate GDP forecast for the conduct of forward-looking monetary policy is inescapable. No study has sought model and forecast GDP per capita in Zimbabwe. This study, which is the first of its kind, seeks to model and forecast Zimbabwe GDP per capita over the period 1960 – 2017.

Literature review

Modelling Economic Growth

Gupta (2007) forecasted the South Africa economy with VARs and VECMs using monthly data over the period 1970 to 2000 and found out that the Bayesian Vector Error Correction Model (BVECM) has the most accurate out of sample forecasts. Bipasha and Bani (2012) forecasted GDP growth rates of India based on ARIMA models using annual data from 1959 to 2011 and found out that the ARIMA (1, 2, 2) model was the best model to forecast GDP growth in India. Dritsaki (2015) forecasted real GDP in Greece basing on the Box-Jenkins ARIMA approach during the period 1980 – 2013 and found out that the ARIMA (1, 1, 1) model was the optimal model. In Kenya, Wabomba *et al* (2016) modeled and forecasted GDP using ARIMA models with an annual data set ranging from 1960 to 2012 and established that the ARIMA (2, 2, 2) model was the best for modeling the Kenyan GDP.

Tourism and Economic Growth

Inchausti-Sintes (2015) informed that an improvement in tourism growth can help accelerate economic growth rate. This was supported by Richardson (2010) who propounded that tourism is an effective tool that can be used to for economic progression and alleviate poverty. Dritsakis, (2004) made a proved a hypothesis that international tourism can be a viable strategic factor for economic growth. From another perspective Cristea (2012) announced that tourism not only have a direct impact on the GDP of a country but also indirectly affect growth of other industries. Figure 1 below shows a summary of some researches and country cases that tested the relationship between tourism and economic growth.

Sample	*Authors*	*Method*	*Period*	*Countries*	*Causality Relationship*
One Country	Dritsakis (2004)	Error Correction Model	1960-2000	Greece	Tourism ⇔ Growth
	Oh (2005)	Granger Causality Test	1975-2001	Korea	Growth ⇨ Tourism
	Özdemir and Öksüzler (2006)	Granger Causality Test	1963-2003	Turkey	Tourism ⇨ Growth
	Yavuz (2006)	Granger Causality Test	1992-2004	Turkey	None
	Vanegas et al. (2007)	Granger Causality Test	1980-2005	Nikaragua	Tourism ⇨ Growth
	Kızılgöl and Erbaykal (2008)	Toda- Yamamato Causality Test	1992-2006	Turkey	Growth ⇨ Tourism
	Akan and Işık (2009)	Granger Causality Test Johansen Cointegration Test	1970-2007	Turkey	Tourism ⇨ Growth
	Brida et al. (2010)	Granger Causality Test	1980-2006	İtaly	Tourism ⇨ Growth
	Kapiki (2011)	Field Research	2010	Greece	-
	Polat and Günay (2012)	Error Correction Model	1969-2009	Turkey	Tourism ⇨ Growth
	Çoban and Özcan (2013)	Johansen Cointegration Method	1963-2010	Turkey	
More Than One Country	Gökovalı and Bahar (2006)	Panel Data Analysis	1987-2002	Mediterreanean Countries	Tourism ⇨ Growth
	Holzner (2011)	Panel Data Analysis	1970-2007	134 countries	Tourism ⇨ Growth
	Chou (2013)	Panel Data Analysis	1988-2011	10 Transition Countries	Causality in 7 countries

Figure 1. Previous researches on tourism and economic growth **Source:** Bayramoğlu & Arı (2015)

The presentation in Figure 1 above according to Bayramoğlu & Arı (2015) shows various methods that have been used to test relationship between economic growth and tourism for specific countries and more than one country. It clearly shows that none of these countries have used the Box – Jenkins ARIMA technique to model technique which is a thrust of this study.

Statement of problem

The Zimbabwean tourism destination has been experiencing reduced tourist inflows and revenues from late 1990s (Zimbabwe Tourism Authority, 2011). According to Valek and Wu (2013) the number of tourists' arrivals determines economic growth through tourism. Various reasons have been pointed to as the cause of this demise but mainly socio-economic and political upheavals are to blame (Ndlovu & Heath, 2013). To date fewer studies have forecasted GDP growth in Zimbabwe especially in relation to tourism consumption. As supported by Inchausti-Sintes (2015) that tourism can help in improving economic growth rate. However, Mikic (1988) assessed the effect of tourism on the balance of payment but not specifically on the GDP per capita whilst Mazumder, et.al, (2011) used input-output technique to test tourism multiplier but not considering historical data of more than a decade. Balaguer and Cantavell (2002) then looked at the impact of tourism in the economic development using VAR method but based on quarterly data between 1995 and 1997 and discovered that economic development in Spain was also driven by tourism. The thrust of this study was to project the GDP per capita for Zimbabwe guided by the objective of being a middle class economy by the year 2030 using the Box-Jenkins AMIRA Model. The reason was not only to project the economy growth but also to establish tourism factors that would accelerate the anticipated growth rate. This would help in advising policy makers and the government on the correct tourism injectors to concentrate on so as to be middle class economy by year 2030.

Research objectives

- To project the Zimbabwean GDP per capita by the year 2030.
- To identify factors that lead to Zimbabwe tourism growth by the year 2030.
- To recommend factors that support a GDP growth per capita for Zimbabwe to be a middle class economy by year 2030.

Methodology

ARIMA Models

Autoregressive Integrated Moving Average (ARIMA) models were popularized by George Box and Gwilym Jenkins in the early 1970s. It's an iterative process that involves four steps; identification, estimation, diagnostic checking and forecasting of time series (Wabomba *et al*, 2016). ARIMA models are a class of linear models that is capable of representing stationary as well as non – stationary (Box & Jenkins, 1976). ARIMA methodology of forecasting is different from most methods because it does not assume any particular pattern in the historical data of the series to be forecast (Wabomba *et al*, 2016). The ARIMA (k, d, w) model is a general non – seasonal model where k is the number of autoregressive (AR) terms, d is the number of differences and w is the number of moving average (MA) terms and can be represented as:

$$\Delta^d Y_t = c + \alpha_1 \Delta^d Y_{t-1} + \cdots + \alpha_k \Delta^d Y_{t-k} + \theta_1 \mu_{t-1} + \cdots + \theta_w \mu_{t-w} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [1]$$

Where Y is the GDP per capita series, c is the constant and everything else remains as already defined above. The ARIMA (0, 1, 0) is simply a random walk model because there is no AR and MA components involved and only one difference exists.

The Box – Jenkins Methodology

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, 2018i).

Also a QUAL to QUAN sequential mixed method was applied in order to further understand the factors that would support a middle class economy of the country by 2030. This was through a further analysis of the outcomes from Box – Jenkins ARIMA model. A qualitative research helped in coming up with factors from a tourism perspective that can inject into a GDP growth. A quantitative research therefore went on to establish the most dominant factors to speed up tourism development and GDP per capita.

In-depth interviews

In-depth interviews were used to get opinions and views of participants in support of a qualitative research design. They were done with n=5 participants chosen using a purposive judgmental sampling method. The key determinants for their selection were professional position in the tourism industry and economic development, years of work experience and educational level. The profiles of the participants are as shown in Table 1 below.

Table 1. Profile of participants for in-depth interviews

INDUSTRY	n	POSITION	DURATION	DATE
Tourism	1	Senior Destination Marketing Officer	1 hour 12 minutes	13/02/19
Ministry of Tourism and Hospitality	1	Senior Principal Officer	1 hour 26 minutes	12/01/19
Ministry of Higher and Tertiary Education	1	University Lecturer in Tourism Management	48 minutes	4/02/19
Economic Consultancy	1	Senior Economic Development Consultant	1 hour 7 minutes	11/2/19
Ministry of Finance and Economic Development	1	Economist	1 hour 32 minutes	15/03/19

Surveys

A survey was carried out after attaining of ethical consent, to compliment the quantitative research. The respondents for the survey were selected using a stratified random sampling technique in three main clusters of the tourism industry, that is, in the accommodation sector,

travel sector and resorts. In each cluster a further convenience sampling was done in order to distribute the survey questionnaires to any member who was available at that moment. The number of respondents were as follows: accommodation (35); travel (21); and resorts (16) resulting in a total of n=72.

Data Collection

This piece of work is based on 58 observations (i.e, 1960 – 2017) of annual Zimbabwean GDP per capita (Y). All the data was adapted from the World Bank whose recognition in Zimbabwe (just like in any part of the world) as a source of macroeconomic data is well above board. For a qualitative research in relation to tourism factors, the study used in-depth interviews to collect data and for a quantitative research the study used a survey questionnaire.

Data Analysis

Diagnostic Tests & Model Evaluation

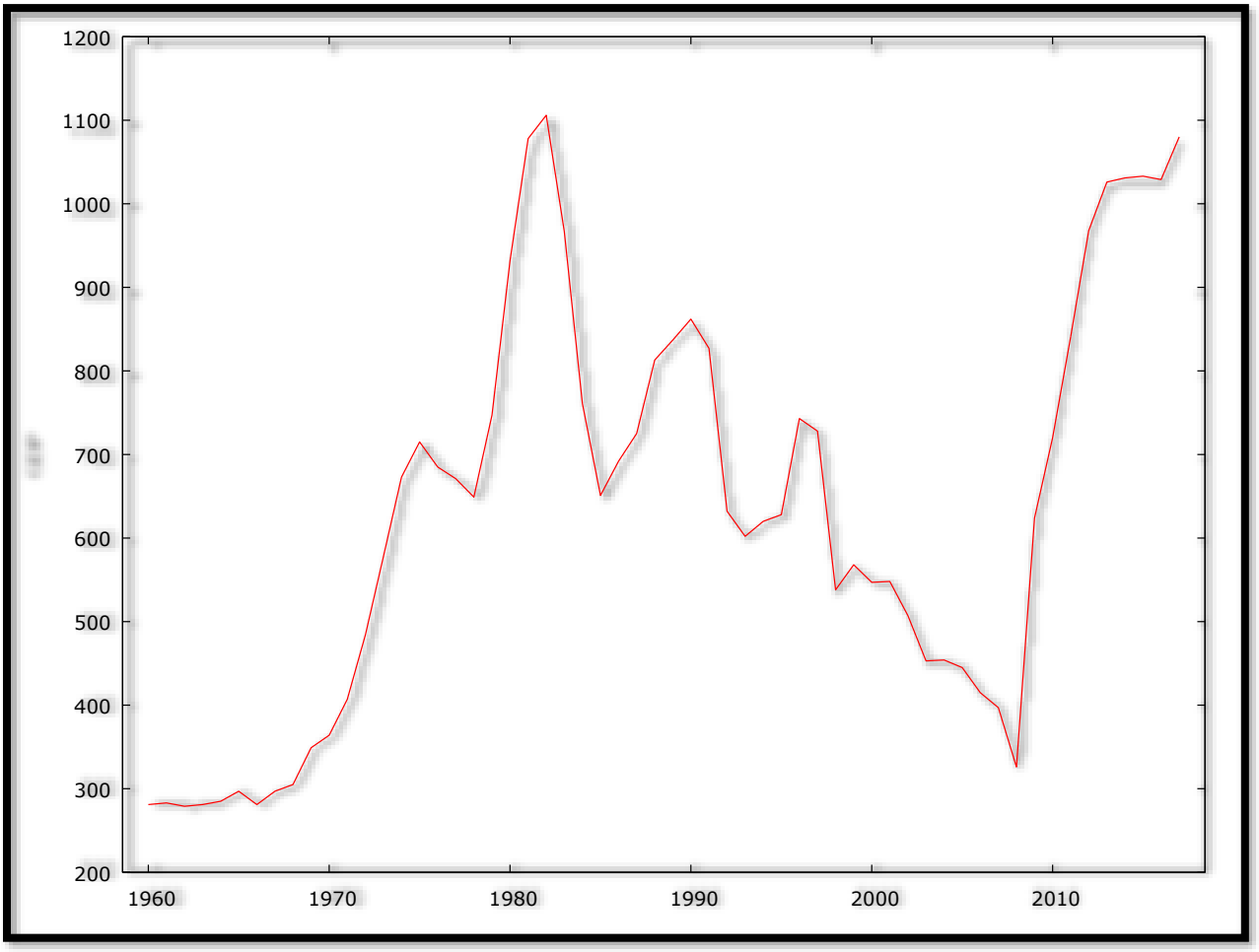

Figure 2. Stationarity Tests: Graphical Analysis **Source:** Research Test (2019)

Figure 2 above indicates that the GDP per capita variable is not stationary as shown by its general upwards trend over the period under study and this simply means that its mean is changing over time and hence its variance is not constant over time.

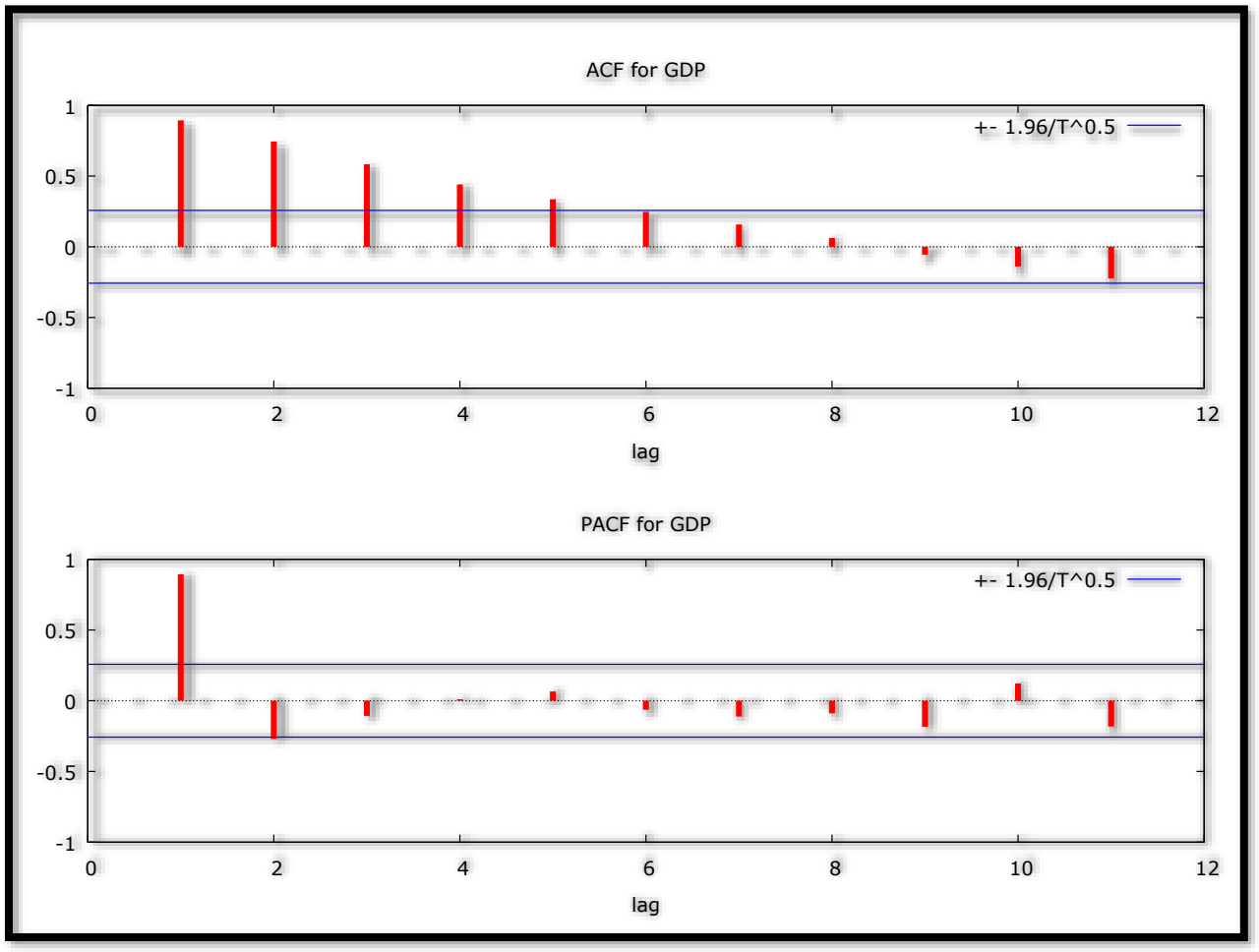

Figure 3. The Correlogram in Levels **Source:** Research Test (2019)

The ADF Test

Table 2. Levels-intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
Y	-1.918917	0.3215	-3.552666	@1%	Not stationary
			-2.914517	@5%	Not stationary
			-2.595033	@10%	Not stationary

Table 3: Levels-trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
Y	-2.267318	0.4442	-4.130526	@1%	Not stationary
			-3.492149	@5%	Not stationary
			-3.174802	@10%	Not stationary

Table 4: without intercept and trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
Y	0.104211	0.7117	-2.606911	@1%	Not stationary
			-1.946764	@5%	Not stationary
			-1.613062	@10%	Not stationary

Figure 3 and tables 2 – 4 confirm the non-stationarity of the GDP per capita in levels.

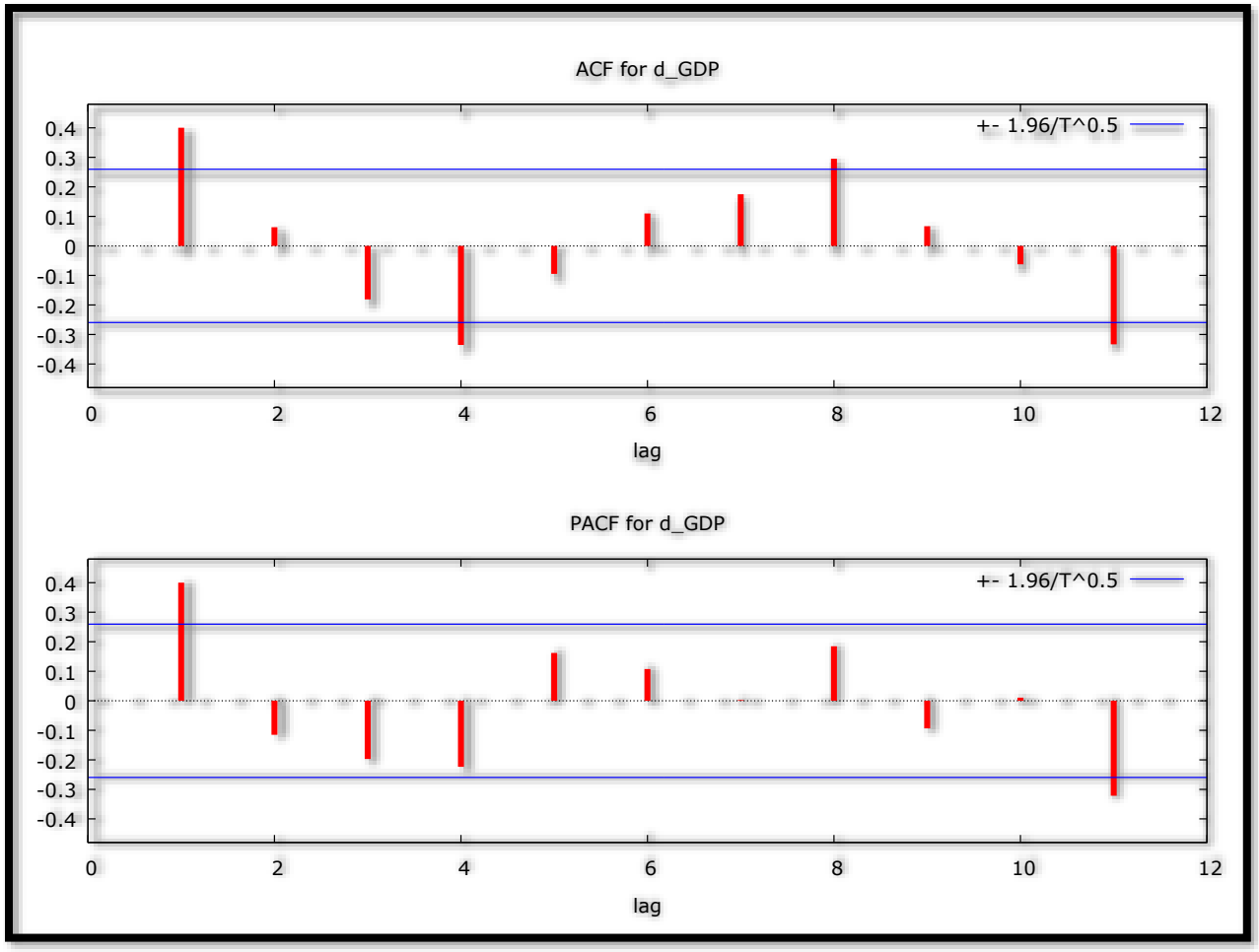

Figure 4. The Correlogram (at 1st Differences) **Source:** Research Test (2019)

Table 5. 1st Difference-intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
Y	-4.793715	0.0002	-3.552666	@1%	Stationary
			-2.914517	@5%	Stationary
			-2.595033	@10%	Stationary

Table 6: 1st Difference-trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
Y	-4.753460	0.0017	-4.130526	@1%	Stationary
			-3.492149	@5%	Stationary
			-3.174802	@10%	Stationary

Table 7. 1st Difference-without intercept and trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
Y	-4.737351	0.0000	-2.606911	@1%	Stationary
			-1.946764	@5%	Stationary
			-1.613062	@10%	Stationary

Figure 4 and tables 5– 7 indicate that the GDP per capita variable is stationary after taking first differences. Therefore, Y is I (1).

Table 8: Evaluation of ARIMA models (without a constant)

Model	AIC	U	ME	MAE	RMSE	MAPE
ARIMA (1, 1, 1)	664.4294	1.008	9.0059	51.16	77.871	8.0828
ARIMA (1, 1, 0)	**662.7752**	1.0043	8.6356	50.799	78.115	8.0106
ARIMA (2, 1, 0)	664.1785	1.0096	9.4042	51.3	77.692	8.1222
ARIMA (3, 1, 0)	664.3882	0.9988	10.851	51.056	76.422	8.1308
ARIMA (4, 1, 0)	664.2427	0.98925	12.708	51.508	74.91	8.1542
ARIMA (5, 1, 0)	664.2836	0.98319	10.719	50.127	73.524	7.9131
ARIMA (0, 1, 1)	663.2998	1.0072	10.296	52.238	78.483	8.2344
ARIMA (0, 1, 2)	664.2743	1.0016	9.1828	50.422	77.767	7.9723
ARIMA (0, 1, 6)	663.6016	0.89069	9.7036	51.47	71.181	8.1993
ARIMA (0, 1, 7)	665.4184	0.87906	10.096	51.299	71.025	8.1901
ARIMA (0, 1, 8)	666.1006	**0.86588**	8.7303	50.912	69.956	7.9808
ARIMA (2, 1, 2)	665.008	0.95976	10.101	51.648	75.302	8.1096
ARIMA (3, 1, 3)	664.9905	0.96651	9.3105	48.224	72.567	7.7264
ARIMA (2, 1, 3)	663.6395	0.95834	11.124	50.08	73.03	7.9997
ARIMA (3, 1, 2)	663.3679	0.95273	10.382	49.774	72.816	7.9367
ARIMA (3, 1, 1)	665.7702	0.99516	11.727	51.496	75.988	8.1845
ARIMA (0, 1, 9)	667.3693	0.87146	8.0925	50.494	69.52	8.1359

A model with a lower AIC value is better than the one with a higher AIC value (Nyoni, 2018n). In this study, while we make take into consideration the AIC statistic; we focus more on Theil's U statistic because we want a parsimonious model with good forecast accuracy. Amongst the tried and tested models, the ARIMA (0, 1, 8) model is finally chosen.

Residual & Stability Tests

ADF Tests of the Residuals of the ARIMA (0, 1, 8) Model

Table 9. Levels-intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
ε_t	-7.285015	0.0000	-3.552666	@1%	Stationary
			-2.914517	@5%	Stationary
			-2.595033	@10%	Stationary

Table 10: Levels-trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
ε_t	-7.221975	0.0000	-4.130526	@1%	Stationary
			-3.492149	@5%	Stationary
			-3.174802	@10%	Stationary

Table 11. Without intercept and trend & intercept

Variable	ADF Statistic	Probability	Critical Values		Conclusion
ε_t	-7.261132	0.0000	-2.606911	@1%	Stationary
			-1.946764	@5%	Stationary
			-1.613062	@10%	Stationary

Tables 9 – 11 indicate that the residuals of the ARIMA (0, 1, 8) model are stationary.

Stability Test of the ARIMA (0, 1, 8) Model

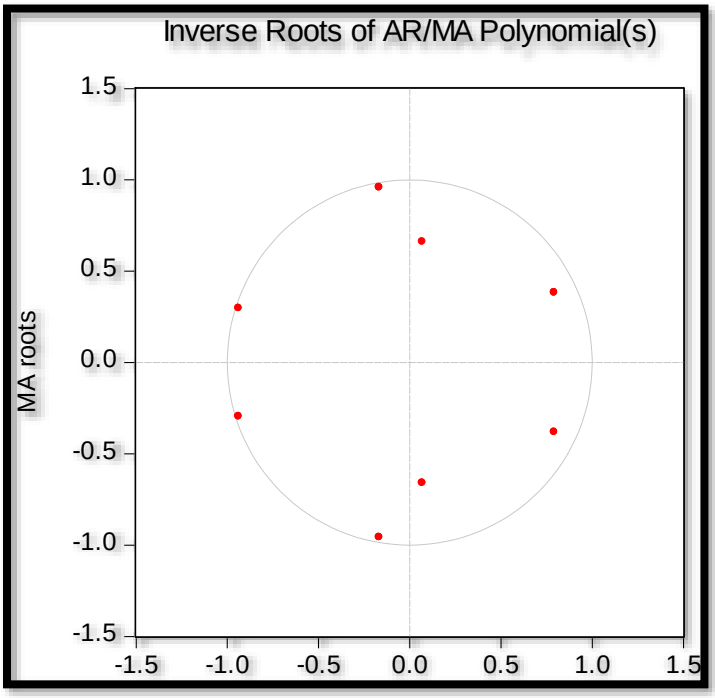

Figure 5. Stability Test of the ARIMA (0, 1, 8) Model

Figure 5 above indicates that the ARIMA (0, 1, 8) model is stable as the corresponding inverse roots of the characteristic polynomial lie in the unit circle.

Findings and discussions

Table 12. Descriptive Statistics

Description	Statistic
Mean	632.16
Median	630
Minimum	279
Maximum	1106
Standard deviation	247.81
Skewness	0.22164
Excess kurtosis	-0.95005

As shown in Table 12 above, the mean is positive, i.e 632. The minimum GDP per capita in Zimbabwe so far is 279 and was realized in 1962. The skewness is 0.22164 and the most striking

characteristic is that it is positive, indicating that the Y series is positively skewed and non-symmetric. Nyoni & Bonga (2017h) have noted that the rule of thumb for kurtosis is that it should be around 3 for normally distributed variables and yet in this paper, kurtosis has been found to be -0.95005; indicating that the Y series is not normally distributed.

Table 13. Results Presentation[1]

ARIMA (0, 1, 8) Model:

$$\Delta Y_{t-1} = 0.46\mu_{t-1} + 0.17\mu_{t-2} + 0.02\mu_{t-3} - 0.38\mu_{t-4} + 0.04\mu_{t-5} + 0.35\mu_{t-6} + 0.02\mu_{t-7} + 0.18\mu_{t-8} \ldots\ldots\ldots [2]$$

P: (0.00) (0.23) (0.90) (0.00) (0.78) (0.03) (0.92) (0.24)

S. E: (0.13) (0.15) (0.14) (0.15) (0.15) (0.15) (0.18) (0.16)

Variable	Coefficient	Standard Error	z	p-value
MA (1)	0.455926	0.132321	3.446	0.006***
MA (2)	0.173460	0.145075	1.196	0.2318
MA (3)	0.0182734	0.144303	0.1266	0.8992
MA (4)	-0.384356	0.148229	-2.593	0.0095***
MA (5)	0.0423727	0.149028	0.2843	0.7762
MA (6)	0.349380	0.151150	2.311	0.028**
MA (7)	0.0168894	0.167460	0.1009	0.9197
MA (8)	0.184011	0.156584	1.175	0.2399

Interpretation of Results

Both MA (1) and MA (4) components (i.e the MA (1) and MA (4) coefficients) are statistically significant at 1% level of significance and this implies that previous disturbances (i.e shocks) to the Zimbabwean economy are important in explaining GDP per capita dynamics. It is important to note that the MA (1) coefficient is positive while the MA (4) coefficient is negative. The MA (6) coefficient is positive and statistically significant at 5% level of significance. The economy of Zimbabwe continues to experience various shocks that impact significantly on GDP per capita. Currently, the country is experiencing a fuel price shock that is likely to trigger a lot of suffering to ordinary Zimbabweans and hence a further deterioration of the overall living standards of Zimbabweans.

[1] *The *, ** and *** means significant at 10%, 5% and 1% levels of significance; respectively.*

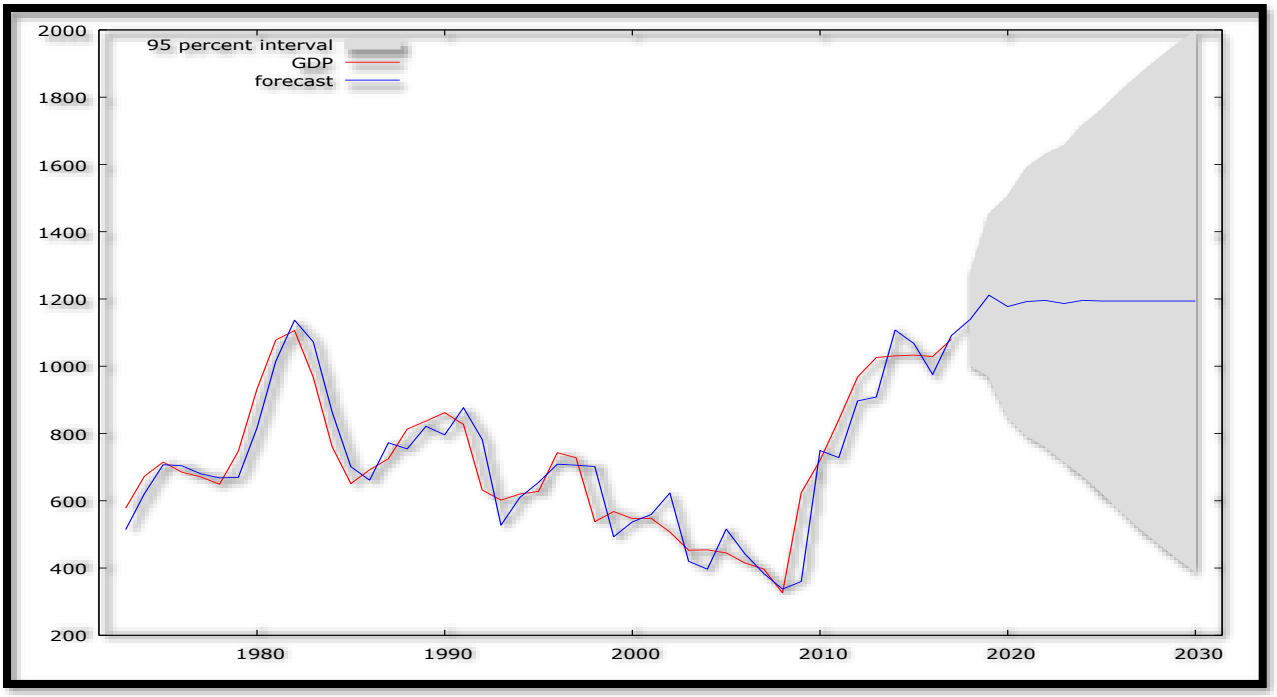

Figure 6. **Forecast Graph** **Source:** Research Test (2019)

Figure 7. Predicted GDP per capita (2018 – 2030) **Source:** Research Test (2019)

Figures 6 and 7, with a forecast range of 13 years; indicate that Zimbabwe GDP per capita is set to improve over the next decade, especially if the new political dispensation implements the urgently needed currency reforms amongst other crucial economic revival strategies needed to

get the country out of the current crisis. By the end of the year 2020, Zimbabwe GDP per capita is expected to be somewhere around 1211.42 USD, which confirms that the economy will grow. It is important to note that the middle-income status may not be reached by 2030 as long as nothing is done to address the current economic decay.

Results of the in-depth interviews

The participants for interviews suggested the following as the main drivers for injecting GDP growth per capita through tourism.

- Foreign direct investment;
- Political stability;
- Good international relations;
- Favorable climate;
- Reduced corruption;
- Good corporate governance;
- Tourism enterprising;
- Tourism innovation;
- Favourable pricing; and
- Eradicating corruption.

Results from the survey

The above results from in-depth interviews were further investigated through a research survey to find the most dominant variables that can be concentrated by policy makers and tourism providers to speed up industry and GDP growth rate. The results from the surveys are as shown in Figure 7 below.

**** based on a 1 to 5 Likert Scale were 1 is Strongly Agree and 5 Strongly Agree

Figure 8. Responses on injectors for GDP growth through tourism **Source:** Research Finding (2019)

The presentation in Figure 8 above shows the results in terms of mean values ranging from 1 to 5 with 1 being a strong agreement and 5 strongly disagree. The study therefore considered the variables will the lowest mean that is below 2 to be the most dominant factors for tourism and GDP growth. The most dominant factors were therefore discovered to be: tourism enterprising (1.11); political stability (1.05); tourism innovation (1.01); Foreign Direct Investment (1.21); and favourable pricing (1.73). A ranking of these factors shows that the most agreed to be drivers for tourism and GDP growth per capita is tourism innovation followed by political stability, tourism enterprising, Foreign Direct Investment and good international relations. These results were supported by Čačić, (2013) who informed that tourism is fragmented to an extent of been assessed from a political, social and financial perspective. This means that there is a great need to consider these factors for improved tourism and GDP growth in Zimbabwe.

Conclusion

This study was premised on assessing if the Zimbabwean economy will be a middle class economy by 2030 as anticipated by the government and other economic bodies. The study used annual time series data on GDP per capita in Zimbabwe from 1960 to 2017, to model and forecast GDP per capita using the Box – Jenkins ARIMA model. The diagnostic tests indicated that Zimbabwe GDP per capita data is I (1). The results of the study revealed that the GDP per capita in Zimbabwe is likely to improve in the next decade. A further investigation on the factors that will lead to improved GDP growth from a tourism perspective informed that the main dominant drivers are tourism enterprising, political stability, tourism innovation, Foreign Direct Investment and favourable pricing.

Recommendations

This study mainly recommends policy reforms by the government, businesses, communities and households. This through reinforcing an economic transition from a threefold approach as follows:

- There is a need to:
- urgently implement currency reforms in Zimbabwe and have an own currency.
- create a friendly business environment in Zimbabwe. Investors, whether foreign or domestic, all they need is a conducive investment climate.
- A necessity exists for political dialogue in order to instill political stability in the country. While economics arguably leads politics, Zimbabwe cannot go anywhere with pending issues in the political arena.

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