Exports and imports in Zimbabwe: recent insights from artificial neural networks

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EXPORTS AND IMPORTS IN ZIMBABWE: RECENT INSIGHTS FROM ARTIFICIAL NEURAL NETWORKS

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ABSTRACT

This study, which is the first of its kind in the case of Zimbabwe; attempts to model and forecast Zimbabwe's exports and imports using annual time series data ranging over the period 1975 – 2017. In order to analyze Zimbabwe's export and import dynamics, the study employed the Neural Network approach, a deep-learning technique which has not been applied in this area in the case of Zimbabwe. The Hyperbolic Tangent function was selected and applied as the activation function of the neural networks applied in this study. The neural networks applied in this research were evaluated using the most common forecast evaluation statistics, i.e. the Error, MSE and MAE; and it was clearly shown that the neural networks yielded reliable forecasts of Zimbabwe's exports and imports over the period 2018 – 2027. The main results of the study indicate that imports will continue to outperform exports over the out-of-sample period. Amongst other policy recommendations, the study encourages Zimbabwean policy makers to intensify export growth promotion policies and strategies such as clearly identifying export drivers as well as export diversification if persistant current account deficits in Zimbabwe are to be dealt with effectively.

Contribution/Originality:

This study uses new estimation methodology, the Artificial Neural Networks approach, in order to analyze exports and imports in Zimbabwe. Besides being the first study in the case of Zimbabwe, this paper's primary contribution is finding that imports will continue to outperform exports over the out-of-sample period.

1. INTRODUCTION

Studies on the analysis of international trade (exports and imports) continue to be skewed towards the exports – economic growth nexus (Myrdal, 1957; Blumenthal, 1972; Bhagwati and Srinivasan, 1975; Balassa, 1978; Ragin and Delacroix, 1979; Feder, 1982; Balassa, 1985; Jaffee, 1985; Krueger, 1985; World Bank, 1987; Feenstra, 1990; Segerstrom *et al.*, 1990; Esfahani, 1991; Jaleel and Kwan, 1991; Luis *et al.*, 1991; WB, 1991; WB, 1993; Baldwin and Forslid, 1996; Harrison, 1996; Ben-David and Loewy, 1998; Sentsho, 2003; Stait, 2005; Saaed and Hussain, 2015; Ali *et al.*, 2018) while maintaining a low profile on the imports – economic growth nexus (Pindiriri *et al.*, 2014; Moyo and Mapfumo, 2015; Ali and Li, 2016). Even here in Zimbabwe, many researchers, for example, Mafusire (2001); Ogbokor (2005); Munoz (2006); Chigusiwa *et al.* (2011); Tsaurai and Odhiambo (2012); Moyo and Mapfumo (2015); Bonga *et al.* (2015); Puruweti (2016) and Bonga (2018) empirically verified the export-led growth hypothesis while only Pindiriri *et al.* (2014) and Moyo and Mapfumo (2015) basically showed that the import-led growth hypothesis still remains relevant to Zimbabwe in the sense that the imports of capital goods instead of consumption goods promote economic growth.

In Zimbabwe, it is almost unnecessary to reiterate that the export-led growth hypothesis grabs the lion's share, but this does not render Pindiriri *et al.* (2014) and Moyo and Mapfumo (2015) good-for-nothing. This study is quite different from previous studies; those who support the export-led growth hypothesis (i.e Mafusire (2001); Ogbokor (2005); Munoz (2006); Chigusiwa *et al.* (2011); Tsaurai and Odhiambo (2012); Saungweme (2013); Bonga *et al.* (2015); Puruweti (2016) and Bonga (2018)) and those who support the import-led growth hypothesis (i.e Pindiriri *et al.* (2014); Moyo and Mapfumo (2015)) in the sense that we distance ourselves away from the "old debate" of whether imports or exports promote growth but however, attempt to model and forecast exports and imports using

Artificial Neural Networks (ANNs). This technique has not been used for analysis of exports and imports in Zimbabwe so far. This study is the first of its kind in the case of Zimbabwe.

Zimbabwe, once touted as the Jewel of Africa at Independence in 1980, has over the years acquired a reputation as the sick man of the Southern Africa region, with disastrous economic policies, political instability and a peculiar inability to get itself out of often self-inflicted difficulties (Bayai and Nyangara, 2013). The Zimbabwean economy has struggled to take off since independence despite frequent trade policy reforms (Bonga *et al.*, 2015). Zimbabwe's once vibrant economy collapsed following a prolonged period of policy missteps and international isolation. The country had achieved lower-middle-income status with GDP per capita of US$1205 and life expectancy of 61.3 years in 1982, just two years after independence, but dropped to low-income status with GDP per capita of US$878.20 and life expectancy of 57 years in 2016. Poor macroeconomic management and a reduced supply of goods because of widespread price controls resulted in record hyperinflation, which peaked at 231000000% in 2008 before stabilizing after a multicurrency regime was adopted in 2009. Significant economic challenges remain: high fiscal deficit, rising inflation, cash shortages, high public debt, high informality, and an overvalued exchange rate, which undermines the economy's competitiveness (African Development Bank Group, 2018).

During the decade 2002 – 2012, overall exports continued to decline in both value and volume compared to the 1990s, Export earnings, for instance, declined by 49% from a peak of around US$2.6 billion in 1997 to around US$1.3 billion in 2006. The import bill escalated exponentially during the same period, increasing from US$2.2 billion in 1996 to around US$2.7 billion in 2006. A negative balance of trade has been experienced since 2002 (Government of Zimbabwe, 2012). Zimbabwe's exports fell from US$3.6 billion in 2011 to US$2.8 billion in 2016 – an annualized rate of 5.7%. Imports totaled US$5.2 billion in 2016, resulting in a trade deficit of US$2.4 billion. The current account deficit declined from 4.2% of GDP in 2016 to 4% in 2017 as export incentive schemes introduced in 2016 stimulated exports and is projected to decline to 3.8% of GDP in 2018 as the government envisages new limits and controls on imports (Statutory Instrument 64). Nevertheless, merchandise imports (mainly finished goods, fuel and electricity) continue to exceed exports, putting pressure on the supply of urgently needed foreign exchange: 85% of Zimbabwe's foreign exchange comes from five products (tobacco, gold, platinum, chrome and diamonds), making it critical to diversify exports (ADBG, 2018).

The figure below shows the trends of exports and imports in Zimbabwe, measured as a percentage of GDP, over the period 1975 to 2017:

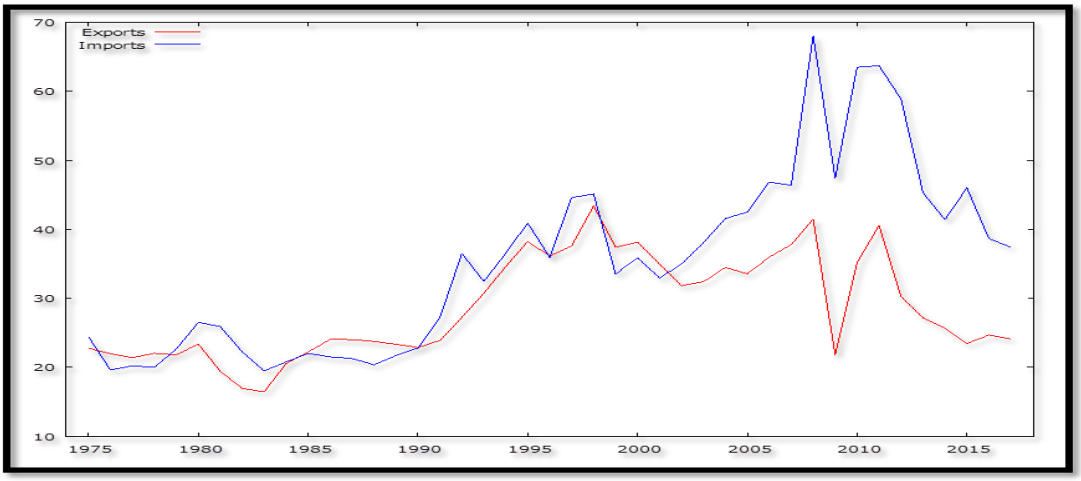


Figure-1. Exports and Imports in Zimbabwe over the period 1975 – 2017.
Source: Author's Own Computation

The graph above shows that Zimbabwe is basically a net importer, meaning that; over the period 1975 to 2017, Zimbabwe has been experiencing persistant trade deficits. The graph also shows that there is a wider gap between exports and imports over the period 2002 to 2017 as compared to the period 1975 to 2001. In 1975, exports were 22.76% of GDP while imports were 24.43% of GDP; indicating a trade deficit of 1.67% of GDP. As of 2017, the

trade deficit was approximately 13.28%. Forecasting exports and imports can help policy makers better understand nature of future trade deficits and prepare feasible policy prescriptions.

With the generous endowment of natural resources, existing stock of public infrastructure, and comparatively skilled labor force, Zimbabwe has an unprecedented opportunity to join existing supply chains in Africa via the African Continental Free Trade Area (ADBG, 2018). South Africa remains Zimbabwe's single largest trading partner accounting for at least 40% of total exports and 60% of total imports. Traditionally, the European Union (EU) used to be the major export destination for Zimbabwe accounting for two-thirds of total exports. With around 7% share of Zimbabwe's total exports, China is now the third most important market for Zimbabwe's exports after South Africa and the EU (GoZ, 2012). Zimbabwe continues to undergo political and economic transformation following the November 2017 resignation of President R. G. Mugabe and the February 2018 passing of long time main Opposition Leader, National Hero, Dr. M. R. Tsvangirai. The current government, led by His Excellency, President E. D. Mnangagwa, remains committed to economic and structural reforms, especially ensuring macroeconomic stability and improving the business environment. This study, whose objectives are outlined below, will go a long way in assisting the new dispensation in materializing the much awaited economic growth and development in Zimbabwe.

1.1. Objectives

i. To analyze Zimbabwean export and import trends over the period 1975 – 2017.
ii. To forecast Zimbabwean exports and imports over the period 2018 – 2027.
iii. To determine whether Zimbabwe has a trade deficit or surplus.

1.2. Relevance of the Study

Trade promotes the use of better (Aghion and Howitt, 1992; Serletis, 1992) and larger (Romer, 1987) variety of intermediate products and capital equipments. Imported varieties account for 15% of productivity growth in a typical country in the world, while the effects are larger in the developing countries (Broda *et al.*, 2006). Trade is critical for the much needed knowledge spillovers across countries (Grossman and Helpman, 1991; Coe and Helpman, 1995; Coe *et al.*, 1997; Keller, 2000; Keller, 2004). A nation's economic growth and development depends on international trade (Smith, 1776; Marshall, 1890). International trade is the engine of economic growth (Nurkse, 1961). In Zimbabwe, exports are very critical since they have a significant and positive effect on economic growth as shown by Mafusire (2001); Ogbokor (2005); Munoz (2006); Chigusiwa *et al.* (2011) Tsaurai and Odhiambo (2012); Bonga *et al.* (2015); Puruweti (2016) and (Bonga, 2018). On the other side of the same coin, Pindiriri *et al.* (2014) and Moyo and Mapfumo (2015) have shown that the import of capital goods and intermediate inputs has a significant and positive effect on economic growth in Zimbabwe. This proves beyond any reasonable doubt, that; indeed, for Zimbabwe, both exports and imports are essential. The implication is that without international trade, Zimbabwe cannot achieve any meaningful growth.

For a developing country like Zimbabwe, whose economy is struggling to take off, forecasts of exports and imports have critical policy relevance. For example, forecasts of exports and imports can help policy makers deduce a country's future trade deficits, which in turn allow policy makers to gauge the sustainability of a country's trade deficits. If there are forecasted, persistant trade deficits, which imply, persistant current account deficits; then what it means is that the existing monetary and fiscal policies of that country are questionable. The forecasts of exports and imports are also very important because they portray the forthcoming status of the economy, and such information is quite essential, especially to potential investors. An escalating current account deficit, as highlighted by Narayan and Narayan (2003) is a clue that future generations have to compensate for the deficit in the form of higher taxes. These higher taxes, according to Narayan *et al.* (2008) cause "brain drain" which in turn will negatively affect growth and development. Therefore, there is need to re-look at export and import dynamics in Zimbabwe, especially with a unique analytical dimension, such as the use of ANNs, in order to offer recent and scrupulous research driven policy prescriptions that will help Zimbabwe move out of her economic paralysis.

2. LITERATURE REVIEW

2.1. Related Previous Studies

Narayan *et al.* (2008) forecasted Fiji's exports and imports using ARIMA models with a data set ranging over the period 1975 to 2002 and found out that Fiji's imports will outperform exports over the period 2003 – 2020 and current account deficits will escalate to approximately F$934.4 million on average over the 2003 – 2020 period. Khan (2011) analyzed total imports of Bangladesh using SARIMA, Holt-Winters' and VAR models with a data set ranging over the period July 1998 to July 2009 and concluded that the VAR model outperforms other models in forecasting total imports of Bangladesh. Farooqi (2014) analyzed imports and exports of Pakistan using the ARIMA approach with a data set ranging over the period 1947 to 2013 and found out that the ARIMA (2, 2, 2) and ARIMA (1, 2, 2) models were suitable to forecast annual imports and exports of Pakistan respectively. Lu (2015) forecasted US total textiles and apparel export to the world using Regression and ARIMA models with a data set ranging over the period 1989 to 2014 and found out that both Regression and ARIMA models give nearly the same results but however suggested that further research ought to explore the ANNs technique since it has a better forecast ability. Baxter and Srisaeng (2018) used the ANN approach to predict Australia's export air cargo demand, employing a data set ranging over the period 1993 to 2016 and concluded that the ANN model is an efficient tool for predicting Australia's annual export air cargo demand. Alam (2019) forecasted exports and imports using ANNs and ARIMA techniques, employing a data set ranging over the period 1968 to 2017 and found out that the ANN and ARIMA (1, 1, 2) and ARIMA (0, 1, 1) models are suitable for predicting the total annual exports and imports of the Kingdom of Saudi Arabia.

From the review of relevant previous studies above, we can easily notice that most studies used either the seasonal ARIMA (i.e. Khan (2011)) or the generalized ARIMA approach (i.e. Narayan *et al.* (2008); Farooqi (2014); Lu (2015); Alam (2019)) in order to model and forecast exports and or imports. Khan (2011) had to use the Holt-Winters' method and the VAR models too. Lu (2015) also used Regression models as well. Thus, ARIMA models continue to be used to model and forecast exports and imports, firstly due to their widespread popularity and simplicity and secondly due to their ability to reliably produce good forecasts. However, ARIMA models, seasonal or generalized, usually fail to accurately predict series that have complex patterns (for example, zigzag patterns), characterised by several turning points. SARIMA models perform better when there are seasonality effects, hence the name, Seasonal ARIMA. Another striking issue to note is that only Baxter and Srisaeng (2018) and Alam (2019) employed ANNs to model and forecast exports and imports. Alam (2019) used ANNs along with ARIMA models while Baxter & Srisaeng only used the ANNs. It is almost unnecessary to reiterate that many researchers are beginning to realize the importance of ANNs in modeling and forecasting complex data in a wide range of fields, for example, engineering, geography, economics and so on. In Zimbabwe, no one has ever attempted to use ANNs to analyze international trade (exports and imports). This paper is the first of its kind and is envisaged to steer-up a scholarly debate in the area of international trade, especially with regards to modeling and forecasting exports and imports.

3. MATERIALS & METHODS

3.1. The Artificial Neural Network (ANN) Approach

ANN models have attracted considerable attention in many applications (Gomes *et al.*, 2011). ANNs are computational systems based on the principles of biological and neural systems (Ozkan and Erbek, 2003). They are useful tools for prediction, function approximation and classification (Hassoun, 2002). ANNs are capable of adequately modeling a variety of problems due to their ability to approximate a variety of nonlinear mappings, tackle massive parallel processing of information as well as their ability to learn from and adapt to their environment (Gomes *et al.*, 2011). These networks have the capacity to learn, memorize and create relationships among data (Ozkan and Erbek, 2003). The use of ANNs in a number of empirical works is generally motivated by results showing that simpler models of ANNs are able to approximate any measurable function to any decision (Cybenko, 1989; White, 1990; Gallant and White, 1992). The main advantage of the ANN approach is that it does not require any assumption of any functional relationship between its input variables and the corresponding output. It is capable of learning and building its own non-linear model from a relationship between input variables and output during the

training process (Paswan *et al.*, 2018). In ANNs, the activation functions most used in practice are the logistic sigmoid function and the hyperbolic tangent function (Gomes *et al.*, 2011). The choice of activation functions may strongly influence complexity and performance of neural networks and have been said to play an important role in the convergence of the learning algorithms (Duch and Jankowski, 1999; Duch and Jankowski, 2001; Singh and Chandra, 2003; Chandra and Singh, 2004). For the purposes of this paper, we adopt a Hyperbolic Tangent function; instead of other types of activation functions available in literature. The Hyperbolic Tangent activation function can be written as:

$$\tanh(x) = \frac{e^{2x} - 1}{e^{2x} + 1} \qquad (1)$$

Equation (1) is explained as follows: Argument ($\boldsymbol{x}$) is a real number, that is, any positive or negative number. In this regard, ($\boldsymbol{x}$) can represent either exports or imports. Equation (1) is reffered to as the Hyperbolic Tangent activation function and is an ancient, well-known, mathematical function defined as the ratio between the hyperbolic sine and the cosine functions or simply explained as the ratio of the half-difference and half-sum of two exponential functions in the points. The Hyperbolic Tangent function is a continuous function with a domain of $(-\infty,\infty)$ and a range of (-1, 1). The Hyperbolic Tangent function is perfect in this study for the purposes of forecasting whether or not exports (or imports) will rise ($\tanh(x)=1$) or fall ($\tanh(x)=-1$. ANNs, as highlighted by Gomes *et al.* (2011); have been widely used in studies of complex time series forecasting, such as weather, energy consumption, financial series, among others. In this study, we use ANNs to analyze exports and imports in Zimbabwe over the period 1975 – 2017.

3.2. Definition of Variables & Data Collection

Exports are domestically produced goods and services sold abroad and imports are defined as the purchase of foreign goods and services (Romero, 2012). Trade balance refers to the value of exported goods minus the value of imported goods (Statista, 2018). In this study, both exports and imports are measured as a percentage of GDP (Gross Domestic Product). The data on exports and imports in Zimbabwe, over the period 1975 to 2017; was gathered from the World Bank online data base.

4. FINDINGS OF THE STUDY

4.1. Descriptive Statistics

Table-1. Descriptive Statistics, Using The Observations 1975 – 2017.

Variable	Mean	Median	Minimum	Maximum
Exports	28.596	25.680	16.440	43.390
Imports	35.204	35.910	19.470	68.050
Variable	Std. Dev.	C.V.	Skewness	Ex. kurtosis
Exports	7.3442	0.25683	0.31386	-1.1834
Imports	13.106	0.37227	0.68946	-0.15263
Variable	5% Perc.	95% Perc.	IQ range	Missing obs.
Exports	17.430	41.288	12.430	0
Imports	19.678	63.676	22.390	0

Source: Author's Own Computation

Table 1 above shows the descriptive statistics of the export and import series. Both series have positive means, that is, 28.596% for exports and 35.204% for imports. Minimum exports are 16.44% of GDP and were experienced in 1983, while minimum imports are 19.47% of GDP and were realized in 1983: that year, a trade deficit of 3.03% was experienced. Maximum exports are 43.39% and were achieved in 1998 while maximum imports are 68.05% and were realized in 2008. This could be attributed to widespread macroeconomic discomfort which occurred in Zimbabwe during the decade 1998 to 2008, which resulted in the well-known hyperinflation. During that period, most economic agents would rather buy consumption goods in neighboring South Africa than in Zimbabwe because everything was simply costly and unaffordable to an ordinary citizen. As shown by the skewness statistics in the table above, both

imports and exports series are positive skewed. The negative statistics for kurtosis indicate that both series are not normally distributed.

4.2. ANN Model Summary for Zimbabwe Exports

Table-2. ANN model summary for Zimbabwe Exports.

Variable	Exports
Observations	31 (After Adjusting Endpoints)
Neural Network Architecture:	
Input Layer Neurons	12
Hidden Layer Neurons	12
Output Layer Neurons	1
Activation Function	Hyperbolic Tangent Function
Back Propagation Learning:	
Learning Rate	0.005
Momentum	0.05
Criteria:	
Error	0.022485
MSE	0.113335
MAE	0.200159

Source: Author's Own Computation

4.3. In-Sample Forecast for Zimbabwe Exports

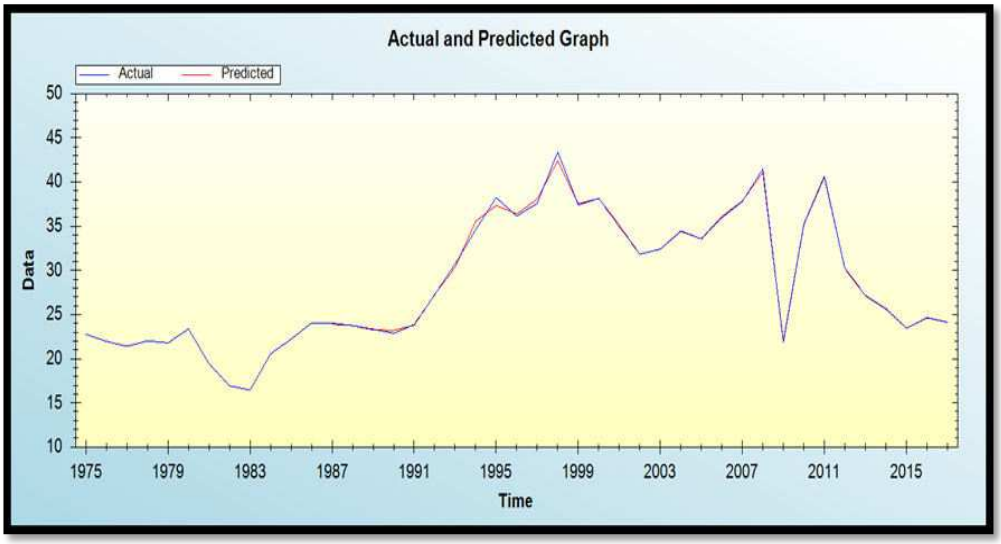


Figure-2. In-sample forecast for Zimbabwe Exports.

Source: Author's Own Computation

4.4. Out-of-Sample Forecast for Zimbabwe Exports

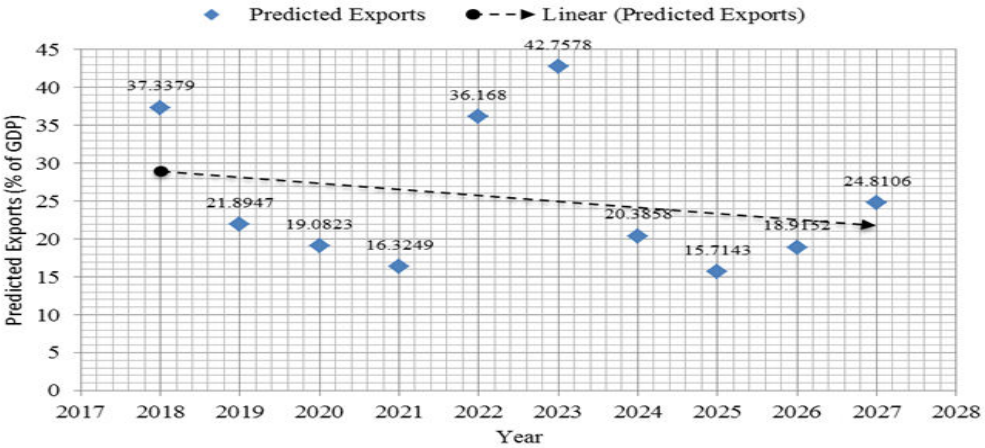


Figure-3. Out-of-sample forecast for Zimbabwe exports.

Source: Author's Own Computation

4.5. ANN Model Summary for Zimbabwe Imports

Table-3. ANN model summary for Zimbabwe imports.

Variable	Imports
Observation	31 (After Adjusting Endpoints)
Neural Network Architecture:	
Input Layer Neurons	12
Hidden Layer Neurons	12
Output Layer Neurons	1
Activation Function	Hyperbolic Tangent Function
Back Propagation Learning:	
Learning Rate	0.005
Momentum	0.05
Criteria:	
Error	0.01567
MSE	0.178854
MAE	0.277402

Source: Author's Own Computation

4.6. In-Sample Forecast for Zimbabwe Imports

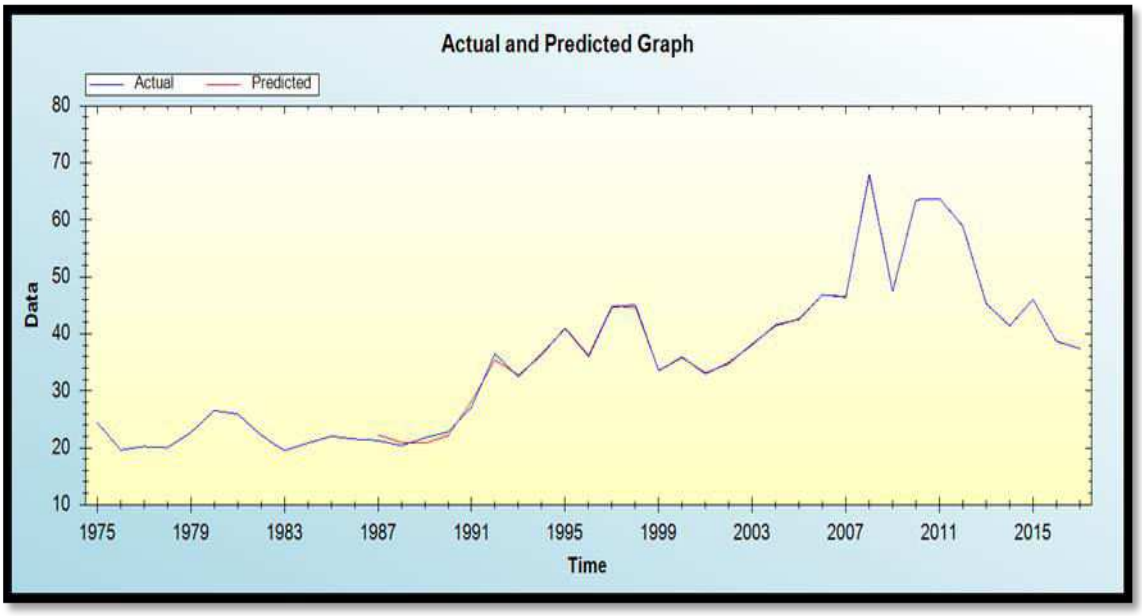


Figure-4. In-sample forecast for Zimbabwe Imports.

Source: Author's Own Computation

4.7. Out-of-Sample Forecast for Zimbabwe Imports

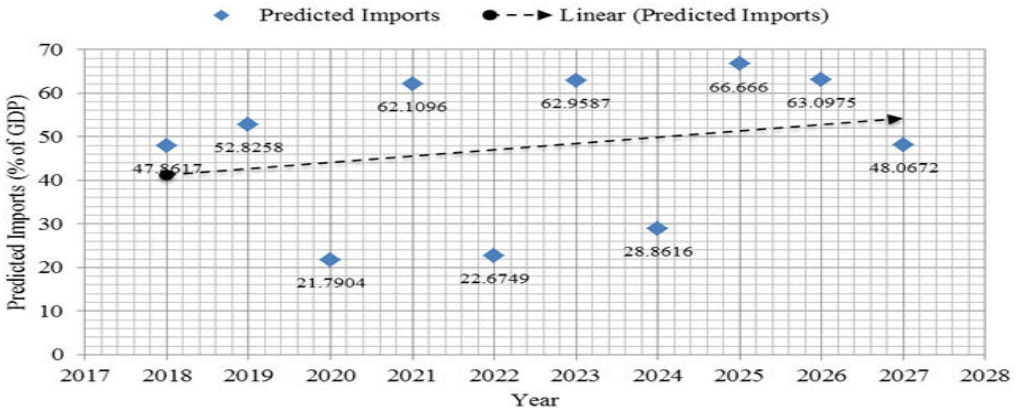
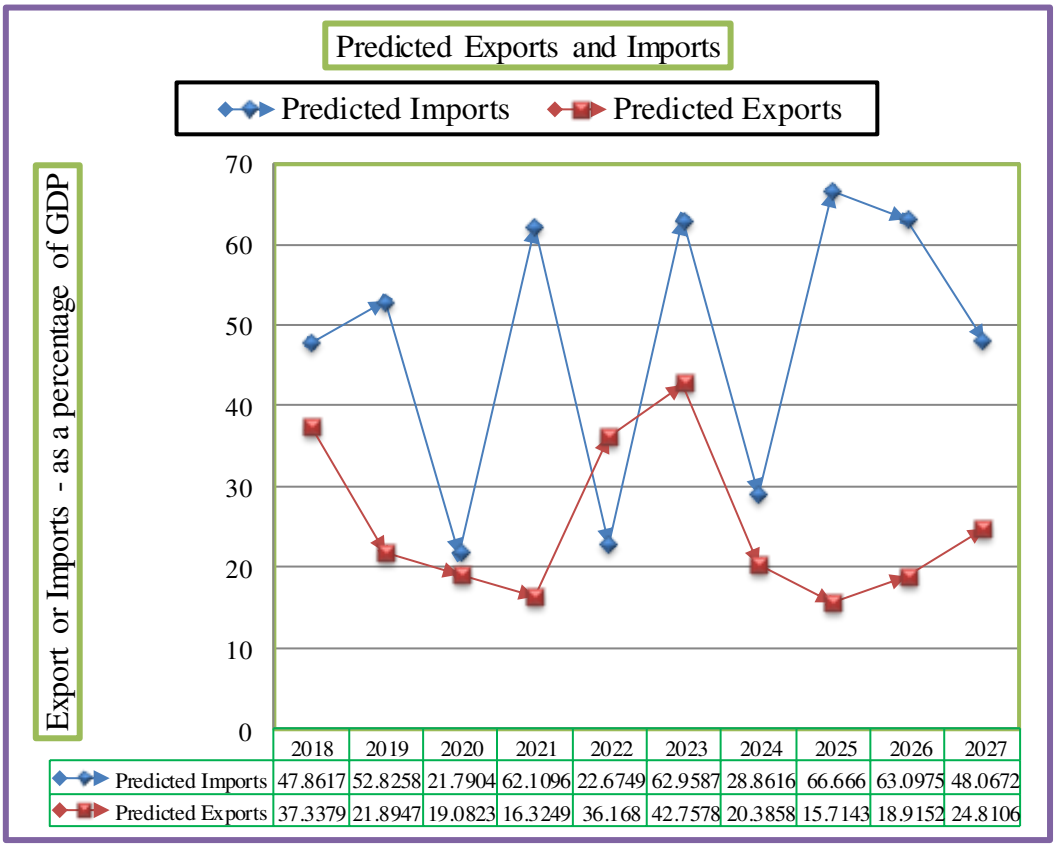


Figure-5. Out-of-sample forecasts for Zimbabwe Imports.

Source: Author's Own Computation

Table 2 shows the ANN model summary for Zimbabwe exports while Table 3 shows the ANN model summary for Zimbabwe imports. The models shown by Tables 2 and 3 can be, thus, written as ANN (12, 12, 1) models. Figure 2 and Figure 4 show in-sample forecasts for both exports and imports, respectively: the striking feature is that the neural networks fit the data very well as clearly shown. Figure 3 and Figure 5 show out-of-sample forecasts for both exports and imports, respectively. However, the out-of-sample forecasts provide different information: Figure 3 shows that exports in the next 10 years will be generally on a downwards trend while imports, as shown in Figure 5, basically; will be on an upwards trajectory over the next decade (2018 – 2027).

4.8. Predicted Exports and Imports on a Single Graph



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Predicted Imports	47.8617	52.8258	21.7904	62.1096	22.6749	62.9587	28.8616	66.666	63.0975	48.0672
Predicted Exports	37.3379	21.8947	19.0823	16.3249	36.168	42.7578	20.3858	15.7143	18.9152	24.8106

Figure-6. Predictions on a single graph.

Source: Author's Own Computation

If exports grow at a faster rate as compared to imports, it will lead to increased economic growth, improvement in balance of payments, increased foreign exchange reserves, resulting into increased purchasing power of the country (Sajjad and Mahmood, 2014). Exports can increase intra-industry trade, help the country to integrate in the world economy and hence reduce the impact of external shocks on the domestic economy (Stait, 2005). Figure 6 indicates that over the next 10 years (2018 – 2027), will continue to face persistant trade deficits, with only a very small trade surplus, of approximately 13.4931%, projected to take place in 2022. This can only happen if Zimbabwe continues to intensify her export promotion strategies. The projected trade deficits indicate that in the next 10 years, Zimbabwe; will continue to face problems of the worsening of the balance of payments as well as shortages of foreign exchange reserves.

4.9. Residual Analysis and Forecast Evaluation for the ANNs

4.9.1. Residual Analysis for the Export ANN

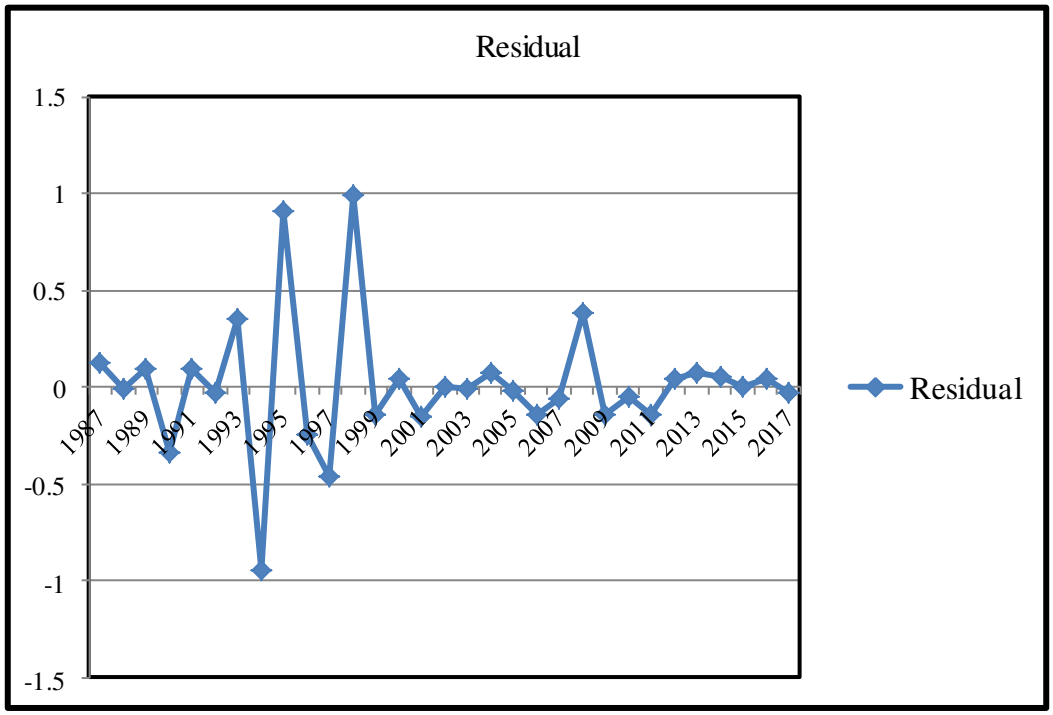


Figure-7. Residual plot for Export ANN.

Source: Author's Own Computation

4.10. Residual Analysis for the Import ANN

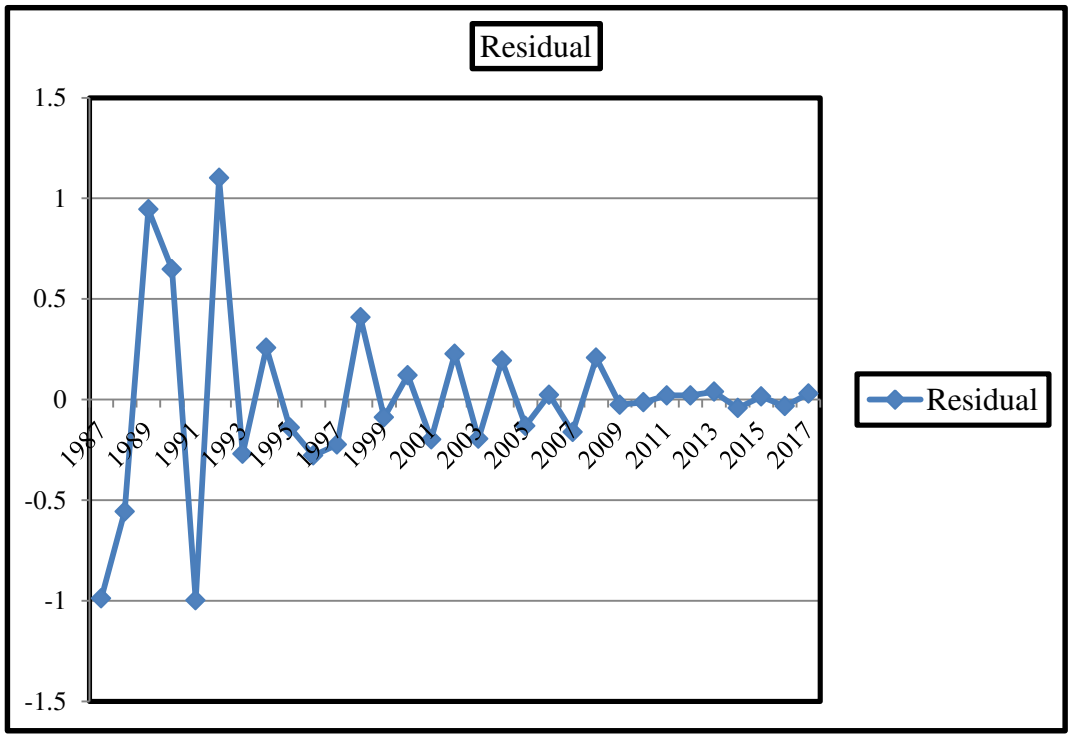


Figure-8. Residual plot for Import ANN.

Source: Author's Own Computation

Figure 7 and 8 show the residual plots of the ANNs for both exports and imports, respectively. It is quite clear from the residual plots that both exports and imports series are not stationary. However, ANNs also have the capability of modeling and forecasting non-stationary series, with acceptable forecast accuracy as shown below in Table 4.

4.11. Forecast Evaluation Statistics for Both Export and Import ANNs

Table-4. Forecast Evaluation.

Evaluation Statistic	Statistic – Exports	Statistic – Imports
Error	0.022485	0.01567
MSE	0.113335	0.178854
MAE	0.200159	0.277402

Source: Author's Own Computation

The Error is a measure of deviation of forecasted values from actual ones. A desirable Error must be closer to zero. The Error for export and import ANNs are 0.022485 and 0.01567 respectively, indicating that our forecasts are quite good. The MSEs for both export and import ANNs are 0.11335 and 0.178854 respectively and are generally small and acceptable. Nyoni (2018) highlighted that the MAE measures the average absolute deviation of forecasted values of original ones and for a forecast to be good, the MAE must be as small as possible. In this paper, the MAEs for both export and import ANNs are 0.200159 and 0.277402 respectively and are relatively small and acceptable.

5. DISCUSSION OF THE FINDINGS

Exports play a critical role in any economy. In fact, the export-led growth hypothesis is superior to the import-led growth hypothesis. That is the reason why Zimbabwe, just like any country; prioritizes export performance so much. Exports greatly influence the level of economic growth, employment and the balance of payments. Exports can open up the domestic economy to foreign markets, thus leading to increasing returns, economies of scale, as well as increased capacity utilization, thereby inducing competitive pressures, spurring innovation and facilitating technological advancement and knowledge spillovers into the domestic economy and in turn resulting in gains in domestic production and management practices. In distressed countries like Zimbabwe, where foreign currency is always inadequate, exports play an important role in generating the much needed foreign exchange; which can be used to finance the importation of capital goods and intermediate inputs that are essential to domestic production. Therefore, it is imperative to highlight the fact that exports are a "darling" of literally all policy makers around the world, because they have positive spillover effects on the rest of the economy. The current wave of growth in Rwanda, Kenya and Botswana; provides a good and clear example of the importance of export performance to economic growth. In Asia, East Asian countries, during the period 1970s to 1980s, grew phenomenally due to significant export performance. Thus, exports are indeed an engine of economic growth, especially in developing countries such as Zimbabwe. In Zimbabwe, export growth is crucial because of its positive effect on the economy. Because Zimbabwe has lower exports as shown by the trend 1975 – 2017, see Figure 1 and the out-of-sample forecast 2018 – 2027, see Figures 3 and 6, what it means is that Zimbabwe will continue to suffer from lack of adequate foreign exchange which in turn implies that Zimbabwe, for the next decade (2018 – 2027), is likely to continue to possess a small purchasing capacity in the international market. The results of this study are not surprising given the poor export performance in Zimbabwe and the greater composition of consumption goods in Zimbabwe's imports.

5.1. Policy Implications

i. Foreign exchange shortages hinder the economy's capacity to import essential inputs for industrial production (GoZ, 2012). There is, therefore; urgent need to address foreign exchange shortages in Zimbabwe, especially through promoting tourism since it is a vital source of foreign exchange earnings.
ii. Policy makers in Zimbabwe should intensify export growth promotion policies and strategies such as clearly identifying export drivers as well as export diversification.
iii. The government of Zimbabwe should address the issue of private investment, in order to boost exports.
iv. There is also need to reduce domestic consumption and spending on imports through tight fiscal policy (i.e higher taxes).
v. The government of Zimbabwe can also devalue the exchange rate in order to make exports competitive but the success of this policy will depend on the elasticity of exports and imports (i.e whether the Marshall-Lerner condition holds or not).

6. CONCLUSION

The economy of Zimbabwe is riddled with poverty, inequality, informality, chronic and recurrent phases of economic stagnation, poor institutional climate, cash crisis, rampant corruption, political volatility, low savings and

investment, high interest rates, high costs of production, lack of competitiveness, low aggregate demand, poor infrastructure as well as high rates of unemployment (Nyoni and Bonga, 2017). These are some of the critical issues that continue fight against export performance in Zimbabwe. The study employed ANNs to model and forecast exports and imports in Zimbabwe over the period 1975 to 2017. Forecast evaluation statistics show that the selected neural architecture is adequate and has a good forecast capability. Out-of-sample forecasts, ranging over the period 2018 – 2017; show that imports will basically outperform exports, implying that; over the out-of-sample period, Zimbabwe will continue to face persistant current account deficits.

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