

# An analysis of the relationship of inflation and unemployment to the gross domestic product (gdp) in zimbabwe

*Tendai Makoni*

*Department of Mathematics and Computer Science, Great Zimbabwe University, Zimbabwe.  
Great Zimbabwe University, P.O Box 1235, Masvingo, Zimbabwe.*

**ABSTRACT:** The time series yearly data for Gross Domestic Product (GDP), inflation and unemployment from 1980 to 2012 was used in the study. First difference of the logged data became stationary as suggested by the time series plots. Johansen Maximum Likelihood Cointegration test indicated a long-run relationship among the variables. Granger Causality tests suggested unidirectional causality between inflation and GDP, implying that GDP is Granger caused by inflation in Zimbabwe. Another unidirectional causality was noted between unemployment and inflation. The causality between unemployment and inflation imply that unemployment do affect GDP indirectly since unemployment influences inflation which in turn positively affect GDP.

**Keywords:** Inflation, unemployment, GDP, cointegration and Granger causality.

## 1. INTRODUCTION

Zimbabwe is one of the countries whose economic development is measured in terms of factors such as unemployment and inflation. Inflation and GDP are considered as important economic indicators in Zimbabwe. Unemployment rate is considered as one of the macroeconomic factors that are used to measure the state of the economy for a country like Zimbabwe. High inflation is coupled with increased price variability and at times can lead to the departures of investors. The reduction of country's international competitiveness may be a result of inflation as the country's exports will be expensive.

GDP figures are vital as they are a good indicator of the country's economic health. In 2008, Zimbabwe's GDP declined by more than 40% while inflation reached an estimate of 90-sextillion % in 2008 possibly due to political instability and unemployment. The experienced hyperinflation between 2007 and 2008 forced the introduction of multiple currencies in February 2009. Henderson (1999) suggested that economic growth must decrease inflation because the more goods are produced, the lower the prices of goods. Because of his argument, it is believed that there is a relationship between inflation and economic growth.

Unemployment rate in Zimbabwe measures the number of people actively looking for a job as a percentage of the labour force and is calculated by dividing the number of unemployed persons aged 15 years and above by the economically active population in that age range. In 1980, Unemployment rate averaged to 7.26% in 1980, 4.2% in 2004 and 10.7% in 2011 as reported by the Reserve Bank of Zimbabwe.

Okun's law tries to explain the relationship between GDP and unemployment when it states that there is a corresponding 2% increase in employment for every 1% increase in GDP. However, there is no consensus about this law. Generally, GDP and unemployment rates go hand in hand since a decrease in GDP is reflected by the decrease in the unemployment rate.

Dewan & Hussein (2001) found in a sample of 41 middle-income developing countries including Fiji, that inflation was negatively correlated to growth. Mubarik (2005) suggested that low and stable inflation promotes the country's economic growth and vice versa. Ahmed and Mortaza (2005) in their Bangladesh study found a statistically significant long-run negative relationship between inflation and economic growth. A long-run positive relationship between GDP growth rate and inflation was noted by Malik and Chowdhury (2001) for the four countries, Bangladesh, India, Pakistan and Sri Lanka. In Pakistan, Chaudhry and Farooq (2012) found a negative and significant inflation growth relationship to the country's economy.

Unemployment could lead to prostitution by young females and this will have a serious effect on the performance of the economy (Nwaobi, 2009). Unemployment has been found to reduce national wealth while increasing crime waves and social political violence (Lawanson, 2003). GDP, unemployment and inflation are assumed to be related because governments and central banks often make decisions based on these items. The major objective of this paper is to analyze empirically the relationship between inflation and unemployment to the GDP and try coming up with possible solution the negative effects.

## **2. DATA**

The study uses secondary yearly data for only three variables, namely, GDP, inflation and unemployment. Thirty-two observations were considered since the period under study covers from 1980 to 2012. The data was collected from ZIMSTAT's Quarterly Digest of Statistics (1980-2012) as well as from the Central Statistical Office (May 2005), Compendium of Statistics 1985-2002 CSO.

## **3. REVIEW OF METHODS USED.**

Granger causality test was proposed by Granger (1969) in order to determine if one time series is useful in forecasting another. In this case, a multivariate Granger-causality test was more appropriate since three variables were included in this study and it is assumed that more than one variable can influence the results. Umaru and Zubairu (2012) examined the effect of inflation on economic growth in Nigerian using Granger causality test and found that GDP Granger cause inflation and inflation does not Granger cause GDP.

Time series plots are used to check the stationarity of the variables. This is done since stationarity of variables is a pre-requisite of a Granger causality test. Log-normal transformation was also used as a way of making the data stationary. The first difference of the logged data suggests stationarity; hence Johansen maximum likelihood cointegration test (1988, 1991) was used. A cointegration is conducted to examine if there is long run relationship between variables and it

was done first before Granger causality test since the presence of cointegration between variables indicates the presence of unidirectional or bidirectional causality.

## 4. RESULTS

### 4.1 Time series plot

Time series plots for all the three variables, GDP, inflation and unemployment were plotted in order to examine stationarity of the variables. Figure 4.1 shows a time series plot of yearly GDP.

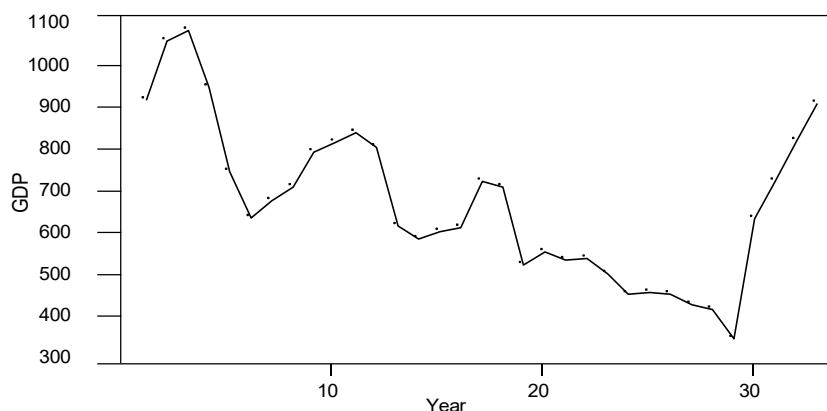


Figure 4.1: GDP time series plot

The GDP increased soon after independence in 1980 and later started a downfall. A noted contraction of the economy around the years 2002 and 2008 was possibly due to political instability in the country. After the formation of the Government of National Unity in February 2009, an increase in the GDP was noted possibly due to political stability. Since the GDP time series plot indicate non-stationarity, a log-normal transformation was made to the data. Logged data seemed non-stationary; hence a first difference of the logged data was done. First difference of logged data seems stationary as suggested by Figure 4.2 below.

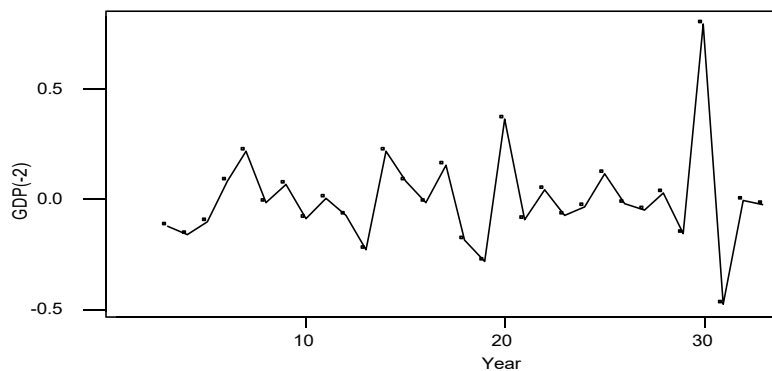


Figure 4.2: Stationary GDP time series plot

Inflation and unemployment was also transformed using the log-normal transformation since they were not stationary. The first difference of the transformed data became stationary.

#### 4.2 Cointegration test

Before carrying out Granger causality test, it is important to check whether the two variables are cointegrated. Therefore, after the data for all variables became stationary after the first difference, a Johansen maximum likelihood cointegration test was conducted under the two hypotheses stated below:

$H_0$ : No cointegration among the variables

versus

$H_1$ : Variables are cointegrated

Table 4.1 below shows the summary of the cointegration test using Johansen trace statistic and maximum eigenvalue statistic.

Unrestricted Cointegration Rank Test (Trace)					
Hypothesized . No. of CE(s) Prob.**	Eigenvalue	Trace Statistics	0.05	Critical	Value
None*	0.530180	37.35714	29.79707		0.0056
At most 1*	0.361475	13.93958	11.49471		0.0446
At most 2	0.001069	0.033147	3.841466		0.8555
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level					
* denotes rejection of the hypothesis at the 0.05 level					
**MacKinnon-Haug-Michelis (1999) p-values					
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)					
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05	Critical	Value

Prob.**				
None*	0.530180	23.41756	21.13162	0.0234
At most 1*	0.361475	13.90643	12.26460	0.0469
At most 2	0.001069	0.033147	3.841466	0.8555
Max-eigenvalue test indicates 2 cointegration eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Table 4.1: Cointegration results

Table 4.1 above shows that there are two cointegrating equations. The null hypothesis of no cointegration was rejected on both the first and second hypothesis denoted by „None\*\*“ with a p-value of 0.0056 and „At most 1\*\*“ with a p-value of 0.0446 respectively which are less than 0.05 on the unrestricted cointegration rank test (Trace). The same conclusion can be drawn from the unrestricted cointegration rank test (Maximum Eigenvalue) results. The hypothesis of no cointegration is being accepted on the last hypothesis denoted by „At most 2“ implying that there is no cointegration.

#### 4.3 Granger causality test

The presence of two cointegrating equations leads to the Granger causality test in order to see variables which influence others. Table 4.2 shows the summary of the Granger causality test after letting  $X$  = Inflation,  $Y$  = Unemployment and  $Z$  =GDP. Hypothesis under the Granger causality tests are:

$H_0$ : There is granger causality between variables.

versus

$H_1$ : There is no granger causality between variables.

Null Hypothesis:	Obs	F-Statistic	Probability	Direction of Causality
Y does not Granger Cause X	31	6.12735	0.0066	Null hypothesis cannot be rejected, $Y \rightarrow X$
X does not Granger Cause Y		0.51290	0.6047	
Z does not Granger Cause X	31	1.25962	0.3005	Null hypothesis cannot be rejected, $X \rightarrow Z$
X does not Granger Cause Z		3.12437	0.0461	
Z does not Granger Cause X	31	1.52227	0.2370	Null hypothesis cannot be rejected
Y does not Granger Cause Z		0.38447	0.6846	

Table 4.2 Granger causality test results.

Causality results in Table 4.2 above, reveals that  $Y$  (unemployment) granger causes  $X$  (inflation), the null hypothesis is being accepted at 61% with a probability value of 0.0066. this means unemployment positively affects inflation. Furthermore,  $X$  (inflation) does not granger causes  $Y$  (unemployment) since the null hypothesis is being rejected at 51% with a probability of 0.6. It is also noted that  $Z$  (GDP) does not granger causes  $X$  (inflation) because the null hypothesis is being rejected at 13% with 0.3 being the probability value.  $X$  (inflation) does granger cause  $Z$  (GDP)

with the null hypothesis being accepted at 31% while 0.5 being the probability value implying that inflation statistically influence GDP. Results further reveals that Z (GDP) does not granger causes X (inflation) as the null hypothesis is being rejected at 15% with a probability value of 0.2. Finally, Y (unemployment) does not granger causes Z (GDP) since the null hypothesis is being rejected at 38% with 0.7 being the probability value. Generally, there is unidirectional causality between Y (unemployment) and X (inflation) implies that an increase or decrease in the unemployment rate will have an impact on the yearly inflation rate. Another unidirectional causality was noticed between X (inflation) and Z (GDP) implying that any changes in inflation have a positive impact on the annual GDP of Zimbabwe.

## 5. CONCLUSIONS

Both inflation and unemployment do have an effect on the country's GDP. Granger Causality test shows that inflation Granger-causes GDP which means that inflation can forecast movements in GDP. Unemployment also influences the country's GDP in the sense that it affects inflation which has a direct relationship with GDP. This means any fluctuations in inflation rate and unemployment rate has an impact on the growth of the economy.

### 5.1 Recommendations

There is need for strategic policies to reduce high inflation and unemployment rates in Zimbabwe as they positively affect the country's GDP. Other factors such as political factors may have an impact on the country's GDP hence political stability is needed in a country to revive the economy. In Zimbabwe, there is economic growth due to indigenization program but inflation rate is high hence it is important for the government to focus more on the possible sources of the country's current inflation and solve it.

## REFERENCES

- [1] Ahmed, S., and Mortaza, G. (2005). Inflation and Economic Growth in Bangladesh: 1981-2005. Policy Analysis Unit (PAU) Working Paper 0604
- [2] Central Statistical Office (May 2005), Compendium of Statistics 1985-2002 CSO, Printflow Publishers, Harare, Zimbabwe
- [3] Chaudhry, S., Qamber, Y. and Farooq, F.(2012).Monetary Policy, Inflation and Economic Growth in Pakistan: Exploring the Co-integration and Causality Relationships, Pak. J. Commer. Soc. Sci. 6 (2), 332-347
- [4] Dewan, E and S. Hussein. (2001). "Determinants of Economic Growth", *Working Paper*, Reserve Bank of Fiji.
- [5] Friedman, Milton. (1977). „Noble Lecture: Inflation and Unemployment“. *Journal of Political Economy* 85, 451-472.
- [6] Granger C. J., Investigating Causal Relationships by Econometrics Models and Cross Spectral Methods, *Econometrica*, Vol. 37, 1969, pp. 425-435.
- [7] Henderson D. (1999): "Does Growth Causes Inflation?" Cato Institute Policy Report, Vol. 21 No. 6
- [8] Johansen, S, 1991, "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," *Econometrica*, Vol. 59, No. 6, pp. 1551–1580.

- [9] Johansen, S., 1988, "Statistical Analysis of Cointegration Vectors," *Journal of Economic Dynamics and Control*, Vol. 12, No. 2–3, pp. 231–254.
- [10] Lawanson, O. I. (2003). High Rate of Unemployment in Nigeria: The Consequences on Human Resource Management, 7th Global Conference on Business and Economics held at Rome, Italy on October, 13th –14th.
- [11] Mubarik, Y. A. (2005). Inflation and Growth: An Estimate of the Threshold Level of Inflation in Pakistan, *State Bank of Pakistan – Research Bulletin*, 1(1-2), 35-44.
- [12] Mallik, G. and Chowdhury, A. (2001). Inflation and Economic Growth: Evidence from South Asian Countries, *Asian Pacific Development Journal*, 8(1), 123-135.
- [13] Nwaobi, G. C. (2009). "Inflation, Unemployment and Nigeria Families: An Empirical Investigation", Publication of Quantitative Economic Research Bureau Nigeria, MPR paper No.14596.
- [14] Umaru, A and Zubairu, A. A. (2012). Effect of inflation on the Economic Growth and Development of the Nigerian Economy" An Empirical Evidence. *International Journal of Business and Social Science*, 3 (10): 183-191.
- [15] Zimbabwe National Statistic Agency (2012), *Compendium of Statistics*, Printflow Publishers, Harare, Zimbabwe.

\*\*\*\*\*