Effect of Inflation on the Growth and Development of the Nigerian Economy (An Empirical Analysis)

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Abstract

This paper investigates the impact of inflation on economic growth and development in Nigeria between 1970-2010 through the application of Augmented Dickey-Fuller technique in testing the unit root property of the series and Granger causality test of causation between GDP and inflation. The results of unit root suggest that all the variables in the model are stationary and the results of Causality suggest that GDP causes inflation and not inflation causing GDP. The results also revealed that inflation possessed a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity. A good performance of an economy in terms of per capita growth may therefore be attributed to the rate of inflation in the country. A major policy implication of this result is that concerted effort should be made by policy makers to increase the level of output in Nigeria by improving productivity/supply in order to reduce the prices of goods and services (inflation) so as to boost the growth of the economy. Inflation can only be reduced to the barest minimum by increasing output level (GDP).

Key words: Inflation, economic growth and development (GDP).

1. Introduction

Maintenance of price stability continues to be overriding objective of monetary policy for most countries in the world today. The emphasis given to price stability in conduct of monetary policy is with a view to promoting sustainable growth and development as well as strengthening the purchasing power of the domestic currency amongst others. The Central Bank of Nigeria (CBN) employs the monetary targeting framework in the conduct of its monetary policy. This is based on the assumption of a stable and predictable relationship between money supply and inflation. Consequeuntly, the need to understand the relationship between inflation and economic growth of the Nigerian economy become imperative and the dynamics of inflation became central to the success of monetary policy to ensure the achievement of price stability. The effect of inflation (price instability) in the growth and development of the Nigerian economy cannot be over-emphasized.

2. Conceptual Framework

The concept of inflation has been define as a persistence rise in the general price level of broad spectrum of goods and services in a country over a long period of time. Inflation has been intrinsically linked to money, as captured by the often heard maxim ‘‘inflation is too much money chasing too few goods’’. Hamilton (2001) inflation has been widely described as an economic situation when the increase in money supply is ‘‘faster’’ than the new production of goods and services in the same economy. Piana (2001) economists usually try to distinguish inflation from an economic phenomenon of a onetime increase in prices or when there are price increases in a narrow group of economic goods or services.

Ojo (2000) and Melberg (1992) the term inflation describes a general and persistent increase in the prices of goods and services in an economy. Inflation rate is measured as the percentage change in the price index (consumer price index, wholesale price index, producer price index etc). Essien (2002) opine that the consumer price index (CPI), for instance, measures the price of a representative basket of goods and services purchased by the average consumer and calculated on the basis of periodic survey of consumer prices. Owing to the different weights the basket, changes in the price of some goods and services have impact on measured inflation with varying degrees. There are several disadvantages of the CPI as a measure of price level. First, it does not reflect goods and services bought by firms and/or government, such as machinery. Secondly, it does not reflect the change in the quality of goods which might have occurred overtime. Thirdly, changes in the price of substitutable goods are not captured. Lastly, CPI basket usually does not change often. Despite these limitations, the CPI is still the most widely used measurement of the general price level. This is because it is used for indexation purposes for many wage and salary earners (including government employees).

Another measure of inflation or price movements is the GDP Deflator. This is available on an annual basis. However, it is rarely used as a measure of inflation. This is because the CPI represents the cost of living and is, therefore, more appropriate for measuring the welfare of the people. Furthermore, because CPI is available on a more frequent basis, it is useful for monetary policy purposes.

In recent times, there have been three dominant schools of thought on the causes of inflation; the neo-classical/monetarists, neo-Keynesian, and structuralists. The neo-classical/monetarists opine that inflation is driven mainly by growth in quantum of money supply. However, practical experiences of the Federal Reserve in the United States (US) have shown that this may not be entirely correct. Hamilton (2001) and Colander (1995) the US money supply growth rates increase faster than prices itself. This has been traced to the increased demand for the US dollar as a global trade currency. The neo-Keynesian attributes inflation to diminishing returns of production. This occurs when there is an increase in the velocity of money and excess of current consumption over investment. The structuralists attribute the cause of inflation to structural factors underlying characteristics of an economy (Adams, 2000). For instance, in the developing countries, particularly those with a strong underground economy, prevalent hoarding or hedging, individuals expect future prices to increase above current prices and, hence, demand for goods and services are not only transactionary, but also precautionary. This creates artificial shortages of goods and reinforces inflationary pressures.

The literature is replete with those factors that could affect the level of inflation. These factors can be grouped into institutional, fiscal, monetary and balance of payments. Several studies such as Melberg (1992); Cukierman, Webb and Neyapti (1992); Grilli, et al (1991); Alesina and Summers (1993); Posen (1993); Pollard (1993); and Debelle and Fisher (1995) have shown that the level of independence (legal, administrative, and instrument) of the monetary authority is an important institutional factor determines inflation, especially, in industrialized countries, while rate of turnover of central bank governors in developing countries was seen as an important factor influencing inflation. However, caution should be exercised in the interpretation of these findings, given the difficulty in measuring the actual level of independence of a central bank.

The fiscal factors relate to the financing of budget deficits, largely through money creation process. Under this view, inflation is said to be caused by large fiscal imbalances, arising from inefficient revenue collection procedures and limited development of the financial markets, which tends to increase the reliance on seiniorage as a source of deficit financing (Agenor and Hoffmaister, 1997 and Essien, 2005). The monetary factors and demand side determinants include increases in the level of money supply in excess of domestic demand, monetization of oil receipts, interest rates, real income and exchange rate (Moser, 1995). Alesina and Summers (1993) prudent monetary management was also found to aid the reduction in the level and variability in inflation. The balance of payments or supply side factors, relate to the effects of exchange rate movements on the price level. Melberg (1992); Odusola and Akinlo (2001) and Essien (2005) opined that exchange rate devaluation or depreciation includes higher import prices, external shocks and accentuates inflationary expectations.

There are three major types of inflation according to neo-Keynesians. The first is the demand-pull inflation, which occurs when aggregate demand is in excess of available supply (capacity). This phenomenon is also known as the Phillips curve inflation. The output gap can result from an increase in government purchases, increase in foreign price level, or increase in money supply.

The second is known as cost-push inflation, ‘‘commodity inflation’’ or ‘‘supply shocks’’ inflation and occurs in the event of a sudden decrease in aggregate supply, owing to an increase in the price/cost of the commodity/production where there are no suitable alternatives (Thomas, 2006). This type of inflation is becoming more common today than before, as evident in the rising price of housing, energy and food. It is often reflected in price/wage spirals in firms, whereby workers try to keep up their wages with the change in the price level and employers pass on the burden of higher costs to consumers through increase in prices. The third type, referred to, as structural inflation, is built-in inflation, usually induced by changes in monetary policy.

Within these broad typologies of inflation, there are other types of inflation with varying determinants, effects, and remedies, which are classified based on the intensity, severity and persistence of the price increase. Thus, we have: hyperinflation (an extreme acceleration of yearly price increases of three-digits percentage point),. Extremely high inflation (ranging between 50% and 100%); chronic inflation (15-30%) and lasting for at least 5 consecutive years); high inflation (with rates between 30% and 50% a year); moderate inflation (when the general price level ranges from 5% to 25-30%); and low inflation (when the change in the consumer price index ranges from 1-2 % to 5%).for any inflation below zero, a country is regarded as experiencing deflation (Vegh,1992 and Piana, 2001). It is pertinent to note that there exists no biding restriction on the ranges of these classifications of inflation. The classicafitions is usually determined by the inflation histories of the countries.

There are basically six identified costs of inflation in the literature. These include: shoe leather costs, menu costs, unintended changes in tax liabilities, arbitrary redistribution of wealth, uncertainty, and increased variability of relative prices. The shoe leather costs occur when economic agents have an incentive to minimize their cash holdings and prefer to hold cash in interest bearing accounts due to the loss in the value of currency. Menu costs of inflation itemizes all the inconvenience that individuals and firms face as price lists are updated frequently and price labels are changed. This diverts the attention of economic agents from other more productive ventures. Unintended changes in tax liabilities, say a reduction may be treated as real gains when incomes are unadjusted. This arises because, with a progressive taxation, rising nominal incomes are taxed more. Wealth is redistributed between debtors and creditors, which may otherwise be unacceptable, with unexpected or incorrectly anticipated inflation. Uncertainty becomes a costs, when in periods of volatile inflation, investors/firms may be reluctant to invest in new equipment; individuals will be unwilling to spend as they are unsure of what government would do next. Through increased variability in relative prices, rising inflation would reduce the competitiveness of a country in the international market for goods and services. The negative effect of this on the balance of payments cannot be overemphasized.

3. Theoritical Framework

The Phillips Curve

Two major goals of interest to economic policy makers are low inflation and low unemployment, but quite often, these goals conflict. The adoption of monetary and/or fiscal policy moves the economy along the short-run aggregate supply curve to a point of higher price level. As higher output is recorded, this is followed by lower unemployment, as firms need more workers when they produce more and vice-versa. This trade-off between inflation and unemployment is described as the Phillips curve. This was an empirical discovery by Phillips (1958), which showed an inverse relationship between wage and unemployment rates, using United Kingdom data plotted over the period 1862-1957. The discovery is strengthened by the fact that movement in the money wages could be explained by the level and changes of unemployment. An argument in favour of the Phillips curve is the extension that establishes a relationship between prices and unemployment. This rests on the assumption that wages and prices move in the same direction. The strength of the Phillips curve is that it captures an economically important and statistically reliable empirical relationship between inflation and unemployment.

The Monetarists

The monetarists, following from the Quantity Theory of Money (QTM), have propounded that the quantity of money is the main determinant of the price level, or the value of money, such that any change in the quantity of money produces an exactly direct and proportionate change in the price level. The QTM is traceable to Irving Fisher’s famous equation of exchange: MV=PQ, where M stands for the stock of money; V for velocity of circulation of money; Q is the volume of transactions which take place within the given period; while P stands for the general price level in the economy.

Transforming the equation by substituting Y (total amount of goods and services exchanged for money) for Q, the equation of exchange becomes: MV=PY. The introduction of Y provides the linkage between the monetary and the real side of the economy. In this framework, however, P,V, and Y are endogenously determined within the system. The variable M is the policy variable, which is exogenously determined by the monetary authorities. The monetarists emphasize that any change in the quantity of money affects only the price level or the monetary side of the economy, with the real sector of the economy totally insulated. This indicates that changes in the supply of money do not affect the real output of goods and services, but their values or the prices at which they are exchanged only. An essential feature of the monetarists model is its focus on the long-run supply-side properties of the economy as opposed to short-run dynamics (Dornbush, et al, 1996).

The Keynesian

The Keynesian opposed the monetarists view of direct and proportional relationship between the quantity of money and prices. According to this school, the relationship between changes in the quantity of money and prices is non-proportional and indirect, through the rate of interest. The strength of the Keynesian theory is its integration of monetary theory on the one hand and the theory of output and employment through the rate of interest on the other hand. Thus, when the quantity of money increase, the rate of interest falls, leading to an increase in the volume of investment and aggregate demand, thereby raising output and employment. In other words, the Keynesians see a link between the real and the monetary sectors of the economy an economic phenomenon that describes equilibrium in the goods and money market (IS-LM). Equally important about the Keynesian theory is that they examined the relationship between the quantity of money and prices both under unemployment and full employment situations. According, so long as there is unemployment, output and employment will change in the same proportion as the quantity of money, but there will be no change in prices. At full employment, however, changes in the quantity of money will induce a proportional change in price. Olofin (2001) thus, this approach has the virtue of emphasizing that the objectives of full employment and price stability may be inherently irreconcilable.

The Neo-Keynesian

The neo-Keynesian theoretical exposition combines both aggregate demand and aggregate supply. It assumes a Keynesian view on the short-run and a classical view in the long-run. The simplistic approach is to consider changes in public expenditure or the nominal money supply and assume that expected inflation is zero. As a result, aggregate demand increases with real money balances and, therefore, decreases with the price level. The neo-Keynesian theory focuses on productivity, because, declining productivity signals diminishing returns to scale and, consequently, induces inflationary pressures, resulting mainly from over-heating of the economy and widening output gap.

4. Empirical Framework

Omoke and Ugwuanyi (2010) tested the relationship between money, inflation and output by employing cointegration and Granger-causality test analysis. The findings revealed no existence of a cointegrating vector in the series used. Money supply was seen to Granger cause both output and inflation. The result suggest that monetary stability can contribute towards price stability in Nigerian economy since the variation in price level is mainly caused by money supply and also conclude that inflation in Nigeria is to much extent a monetary phenomenon. They find empirical support in context of the money-price-output hypothesis for Nigerian economy. M2 appears to have a strong causal effect on the real output as well as prices.Using Okun's law "each percentage point of cyclical unemployment is associated with a loss equal to 2% of full-employment output; if full-employment output is $10 trillion, each percentage point of unemployment sustained for one year costs $200 billion". Williams and Adedeji (2004) examined price dynamics in the Dominican Republic by exploring the joint effects of distortions in the money and traded-goods markets on inflation, holding other potential influences constant. The study captured the remarkable macroeconomic stability and growth for period 1991 to 2002. Using a parsimonious and empirically stable error-correction model, the paper found that the major determinants of inflation were changes in monetary aggregates, real output, foreign inflation, and the exchange rate. However, there was an incomplete pass-through of depreciation from the exchange rate to inflation. The authors established a long-run relationship in the money and traded-goods markets, observing that inflation was influenced only by disequilibrium in the money market.

5. Methodology and Data

Data

The data used for this paper/study are basically time series data covering 1970– 2010, that is thirty-three(41) years. The data were sourced from Central Bank Nigeria (CBN) Statistical Bulletin.

Model specification

Model 1

Following Romer (1990) inflation is considered as independent factor of production. This is presented in Cobb-Douglas production function with constant returns to scale as:

$GDP = \alpha INFLA^{B1}\mu$ ---------- (1)

Where GDP is defined as gross domestic product (output), α is the total factor productivity; INFLA is the rate of inflation in Nigeria;B_1 is the constant elasticity coefficient of inflation. The logarithmic conversion of the equation above yields the structural form of production function as:

$LOGGDP = LOG\alpha + B_1 LOGINFLA + LOG\mu$ ---------- (2)

Where LOGGDP = Log of Gross Domestic Product.

$LOG\alpha = B_0$ is the intercept.

LOGINFLA = Log of inflation.

Logμ = Log of white noise error term which is assume to be 1.

μ = white noise error term.

Apriori Expectation: $B_0 > 0$, $B_1 > 0$.

Model 2

The model of causality test is thus specified as follows:

$LOGGDP = \sum \phi i\ LOGINFLAt\text{-}1 + \sum \Theta j\ LOGGDPt\text{-}1 + \mu t1$ ---------- 1

$LOGINFLA = \sum \alpha i\ LOGINFLAt\text{-}1 + \sum đj\ LOGGDPt\text{-}1 + \mu t2$ ---------- 2

Apriori Expectation: $\phi i < 0$, $\Theta j > 0$, $\alpha i < 0$ and $đj > 0$.

Econometric Diagnostic test

Unit Root Test

Macroeconomic time series data are generally characterized by stochastic trend which can be removed by differencing. Thus, this paper used or adopt Augmented Dickey-Fuller (ADF) Techniques to test and verify the unit root property of the series and stationarity of the model.

Causality Test

In order to determine which variable in the model cause which Granger causality test is be used. The F-statistics is used to reject or accept the null hypothesis of no causation between the variables when F-statistics is greater than 2 and less than 2 respectively.

6. Results and Discussion

Table 2 in the appendix contains simple regression results for the growth model. The results indicate that the coefficient of inflation is statistically insignificant and the constant is statistically significant. Precisely, the coefficient of inflation is found to be statistically insignificant at 30 percent level as indicated by its probability value 0.2966 and rightly signed (positive). This therefore, implies that 1 percent increase in inflation raises the economic growth (GDP) by 51 percent. The coefficient of inflation though not statistically significant but is consistent with the theoretical expectation and found to be positive (i.e. $B_1 > 0$). This high probability value implies that the presence of that effect that can invalidate the parameter is high (30 percent). The constant is statistically significant implying that GDP does not only depend on inflation but other variables may affect GDP. The F-statistics 1.12, which is a measure of the joint significance of the explanatory variables, is found to be statistically insignificant at 30 percent level as indicated by the corresponding probability value 0.2966. The R^2 0.028 (2.8%) implies that 2.8 percent total variation in GDP is explained by the regression equation. Coincidentally, the goodness of fit of the regression remained too low after adjusting for the degree of freedom as indicated by the adjusted R^2 (R^2 = 0.003 or 0.3%).

The Durbin-Watson statistic 0.031 in table 2 is observed to be higher than R^2 0.028 indicating that the model is non-spurious (meaningful). The Durbin-Watson statistics 0.031 is very low indicating the presence of autocorrelation; therefore, the unit root test became important to make the data to be stationary.

The results of unit root test are contained in table 3, and 4. The results revealed that all the variables of the model are found to be stationary at both 1 percent, 5percent, and 10 percent level with first difference (d(1)), which is indicated by ADF results at all levels less than the critical values in negative direction. The ADF value for LOGGDP is -5.3389 and the critical values are -3.6105, -2.9390 and -2.6079 at 1, 5, and 10 percent respectively. The ADF value for LOGINFLA is -6.4609 and the critical values are -3.6156, -2.9412, and -2.6091.

The results of causality are contained in table 5 in appendix. The results revealed that inflation does not granger causes GDP, the null hypothesis is accepted at 65 percent indicated by the high probability value 0.65324. The results also revealed that GDP causes inflation, the null hypothesis is rejected at 13 percent indicated by the probability value 0.13197 and this is confirmed by the F-statistics value 2.15. This result therefore indicates one-way causation flowing from GDP to inflation.

7. Concluding Remarks

This paper investigates the impact of inflation on economic growth and development in Nigeria through the application of Augmented Dickey-Fuller technique in testing the unit root property of the series and Granger causality test of causation between GDP and inflation. The results of unit root suggest that all the variables in the model are stationary and the results of Causality suggest that GDP causes inflation and not inflation causing GDP. The results also revealed that inflation possessed a positive impact on economic growth through encouraging productivity and output level and on evolution of total factor productivity. A good performance of an economy in terms of per capita growth may therefore be attributed to the rate of inflation in the country. A major policy implication of this result is that concerted effort should be made by policy makers to increase the level of output in Nigeria by improving productivity/supply in order to reduce the prices of goods and services (inflation) so as to boost the growth of the economy. Inflation can only be reduced to the barest minimum by increasing output level (GDP).

References

Adamson, Y.K.(2000). ‘‘Structural Disequilibrium and Inflation in Nigeria: A Theoretical and Empirical Analysis’’. Center for Economic Research on Africa. New Jersey 07043: Montclair State University, Upper Montclair.

Agenor, P. and Hoffmaister, A.W. (1997). ‘‘Money, Wages and Inflation in Middle-Income Developing Countries’’. IMF Working Paper: WP/97/174.

Alesina, A. and Summers, L.H. (1993). ‘‘Centra Bank Independence and Macroeconomic Performance: Some Comparative Evidence’’. Journal of Money, Credit and Banking, Vol. 25, Number 2, May.

Colander, D.C. (1995). Macroeconomic. Second Edition. United States of America: Richard D. Irwin, Inc.

Cukierman, A. et al (1992). ‘‘Measuring the Independence of Central Banks and its Effect on Policy Outcomes’’. The World Bank Economic Review, Vol.6, Number 3.

Dornbusch, R. et al (1996). Macroeconomic. Sydney: The McGraw-Hill Companies, Inc.

Essien, E.A. (2005). ‘‘Exchange Rate Pass-Through to Inflation in Nigeria’’. West African Journal of Monetary and Economic Intergration (First Half),Vol. 5, Number 1, Accra: West African Monetary Institute.

Grilli, V. et al (1991). ‘‘Political and Monetary Institutions and Public Financial Politics in the Industrial Countries’’. Economic Policy, Number 13,pp.341-92.

Hamilton, A. (2001). ‘‘Exploding Inflation’’. Zeal Intelegence.

Melberg, H.O. (1992). ‘‘Inflation: an overview of Theories and Solutions’’. (www.geocities.com/hmelberg/papers/921201.htm).

Moser, G. (1995). ‘‘Money Demand in Nigeria: 1970 1994’’. Appendix II in Nigeria: Experience with Structural Adjustment, IMF Occasional Paper Number 148, by Gary Moser, Scott Rogers and Reinhold van Til (Washington: International Monetary Fund), pp.55-62.

Odusola, A.F. and Akinlo, A.E. (2001). ‘‘Output, Inflation, and Exchange Rate in Developing Countries: An Application to Nigeria’’. The Developing Economies, June.

Ojo, M.O. (2000). ‘‘The role of the Autonomy of the Central Bank of Nigeria (CBN) In Promoting Macroeconomic Stability’’. Central Bank of Nigeria Economic and Financial Review, Vol.38, Number 1, March.

Olafin, S. (2001). An Introduction to Macroeconomics. Malthouse Social Science Series, Lagos; Malthouse Press Limited.

Omeke, P.C. and Ugwunyi, C.U. (2010) Money, Price and Output: A Causality Test for Nigeria. American Journal of Scientific Research ISSN 1456-223X, Issue 8, pp.78-87. Euro Journals Publishing, Inc.

Phillips, A.W. (1958). ‘‘The Relationship between Unemployment and Rate of Change in Money Wage Rates in the United Kingdom’’. Economica 25,November.

Piana, V. (2001). Inflation Economic. Web Institute.

Thomas, P. (2006). ‘‘Does the US have a Handle on Inflation?’’. Street Insight.

Vegh, C. (1992). ‘‘Stopping High Inflation: an analytical Overview’’. IMF Staff Paper 39.

Williams, O. and Adedeji, O.S. (2004). ‘‘Inflation Dynamics in the Dominican Republic’’. IMF Working Paper, WP/04/29, Western Hemisphere Department: Washington, D.C.,February.

Appendix

Table 1: Raw Data

years	inflation rate	GDP	LOGGDP	LOGINFLA
1970	1.7	5,281.1	3.72	0.23
1971	1.6	6,650.9	3.82	0.2
1972	9.4	7,187.5	3.86	0.97
1973	4.6	8,630.5	3.94	0.66
1974	13.5	18,823.1	4.28	1.13
1975	33.9	21,475.2	4.33	1.53
1976	21.1	26,655.8	4.43	1.32
1977	21.5	31,520.3	4.5	1.33
1978	13.3	34,540.1	4.54	1.12
1979	11.6	41,974.7	4.62	1.06
1980	10.0	49,632.3	4.7	1
1981	21.4	47,619.7	4.68	1.33
1982	7.2	49,069.3	4.69	0.86
1983	23.2	53,107.4	4.73	1.37
1984	40.7	59,622.5	4.78	1.61
1985	4.7	67,908.6	4.83	0.67
1986	5.4	69,147.0	4.84	0.73
1987	10.2	105,222.8	5.02	1.01
1988	56.0	139,085.3	5.14	1.75
1989	50.5	216797.5	5.34	1.7
1990	7.5	267550	5.43	0.88
1991	12.7	312139.8	5.49	1.1
1992	44.8	532613.8	5.73	1.65
1993	57.2	683869.8	5.84	1.76
1994	57.0	899863.2	5.95	1.76
1995	72.8	1933211.6	6.29	1.86
1996	29.3	2702719.1	6.43	1.47
1997	10.7	2801972.6	6.45	1.03
1998	7.9	2708430.9	6.43	0.9
1999	6.6	3194023.6	6.5	0.82
2000	6.9	4537637.2	6.66	0.84
2001	18.9	4685912.2	6.67	1.28
2002	12.9	5403006.8	6.73	1.11
2003	14.0	6947819.9	6.84	1.15
2004	15.0	11411066.9	7.06	1.18
2005	17.8	14610881.5	7.17	1.25
2006	8.2	18564594.7	7.27	0.91
2007	5.4	20657318	7.32	0.73
2008	11.6	24296329	7.39	1.07
2009	12.4	24712670	7.39	1.09
2010	13.7	29108024.45	7.46	1.14

Source: Cbn Bulletin 2010

Table 2: Regression Results

Dependent Variable: LOGGDP
Method: Least Squares
Date: 04/03/12 Time: 15:32
Sample: 1970 2010
Included observations: 41

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.014966	0.575695	8.711152	0.0000
LOGINFLA	0.508514	0.480636	1.058001	0.2966

R-squared	0.027901	Mean dependent var	5.592439
Adjusted R-squared	0.002975	S.D. dependent var	1.173890
S.E. of regression	1.172143	Akaike info criterion	3.203095
Sum squared resid	53.58284	Schwarz criterion	3.286684
Log likelihood	-63.66344	F-statistic	1.119366
Durbin-Watson stat	0.031132	Prob(F-statistic)	0.296564

Computer Output

Table 3: Unit Root Tests Results For Loggdp

Null Hypothesis: D(LOGGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.338893	0.0001
Test critical values:	1% level	-3.610453	
	5% level	-2.938987	
	10% level	-2.607932	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGGDP,2)
Method: Least Squares
Date: 04/03/12 Time: 15:39
Sample(adjusted): 1972 2010
Included observations: 39 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGGDP(-1))	-0.871270	0.163193	-5.338893	0.0000
C	0.081219	0.020461	3.969405	0.0003

R-squared	0.435147	Mean dependent var	-0.000769
Adjusted R-squared	0.419881	S.D. dependent var	0.110867
S.E. of regression	0.084442	Akaike info criterion	-2.055572
Sum squared resid	0.263830	Schwarz criterion	-1.970261
Log likelihood	42.08365	F-statistic	28.50378
Durbin-Watson stat	1.966477	Prob(F-statistic)	0.000005

Computer Output

Table 4.Unit Root Test Results for Loginfla

Null Hypothesis: D(LOGINFLA) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.460888	0.0000
Test critical values:	1% level	-3.615588	
	5% level	-2.941145	
	10% level	-2.609066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGINFLA,2)
Method: Least Squares
Date: 04/03/12 Time: 15:43
Sample(adjusted): 1973 2010
Included observations: 38 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGINFLA(-1))	-1.444144	0.223521	-6.460888	0.0000
D(LOGINFLA(-1),2)	0.314632	0.150385	2.092178	0.0437
C	0.014462	0.055663	0.259816	0.7965

R-squared	0.624120	Mean dependent var	-0.018947
Adjusted R-squared	0.602641	S.D. dependent var	0.542052
S.E. of regression	0.341690	Akaike info criterion	0.765831
Sum squared resid	4.086323	Schwarz criterion	0.895114
Log likelihood	-11.55079	F-statistic	29.05745
Durbin-Watson stat	1.965337	Prob(F-statistic)	0.000000

Computer Output

Table 5: Causality Tests Results

Pairwise Granger Causality Tests
Date: 04/03/12 Time: 15:35
Sample: 1970 2010
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
LOGINFLA does not Granger Cause LOGGDP	39	0.43119	0.65324
LOGGDP does not Granger Cause LOGINFLA		2.15073	0.13197

Computer Output