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Macroeconomic Variables and Money Supply: Evidence from Nigeria

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Abstract

This paper reviews the effect and implication of selected Macroeconomic variables on Money supply (M2), using derived secondary data gotten from the Central Bank statistical Bulleting (2013). Coupled with the application of econometric technique such as; O.L.S., causality test and Co-integration of time series data to estimate the

long and short run relationship and causality of employed variables. The results revealed that all variables were stationary at various lags and there exists a long run relationships between variables employed and it was discovered that apart from inflation having an inverse significance with Money supply (M2) and Exchange Rate (EXR), all other variables such as Gross Domestic Product (GDP) were found to have a positive impact on Money Supply. It was therefore recommended that Nigeria Banks should be committed to the mission of price stability as well as improving the regulatory and supervisory frameworks to secure a strong financial sector for efficient intermediation in other to avoid the inflationary impacts government should control the excessive expansion in broad money supply in Nigeria.

Key words: money supply, inflation, GDP, Exchange Rate

Introduction

Background of the Study

A vital issue to Policy Makers and economist is the special role of money in the economy, due to its stupendous importance as a change in its amount can have a significant effect on the major macroeconomic indicators. Inflation, unemployment, economic growth, exchange rates and vice versa (Yunana *et al*, 2014), The convergence between money supply and various Macroeconomic variables has been receiving increasing attention in the field of monetary and financial economics in recent years as Economist and finance scholars differ on the relationship between money supply and various economic variables (Owolabi and Adegbite, 2014).

Various assertion has been downplaying the position of money in an economy, and have constrained the Stance of money to that of a means to economic development without seeing it intrinsically as an end in itself which could react to volatility in economic variables, while some agreed that variation in the quantity of money is the most important determinant of economic factors such as inflation and economic growth, and that countries that devote more time to studying the behaviour of aggregate money supply rarely experience much variation in their economic activities (Harding and Pagan 2001). Others are sceptical about the role of money or gross national income. Financial markets start growing as the economy approaches the intermediate stage of growth process and develop once the economy becomes matured (Kuttner 2001). This connotes that economic growth stimulate increased financial developments.

As a matter of fact a study of this nature is habitually necessitated by the existence and continuation of certain problem. In the nation, it could be noted that he collapse of the oil price has cause damaged the level of economic output and caused economic rigidity, the irregular rise in inflation rate in the nation and the Output of the economy in the form of Gross Domestic Product (GDP) has caused an imbalance in the monetary base of the nation (Owolabi and Adegbite, 2014).

The economy is characterized by structural rigidities and bottleneck. Most of our exports and imports are characterized by inelasticity either on the demand supply side or both. The Nigerian economy is import dependent, thus pressure on forex demand will inevitably create the alternative market, hence different rates. Non-oil export is under-reported and proceeds are hardly repatriated into the country, thus compounding the supply and output rigidity. The guidelines of the CBN on the purchase of foreign currency are often cumbersome, causing some frustrated potential foreign exchange users to patronize the parallel market causing leakages which consequently reflects on the inflation rate by bringing it up and continue to a weak exchange rate for the nation, this and others constitute a problem to the monetary base and a gap between the aforementioned Macro economic variables and Money supply level in the nation.

Objective of the Study

The major objective of this paper is to evaluate the impact of selected Macro economic Variables on Money Supply in Nigeria. This paper is specifically aimed at achieving certain objectives which are stated below:

- To determine the impact of inflation on the level of Money Supply in Nigeria.
- To ascertain the effect of Gross Domestic Product on the level of Money Supply in Nigeria.
- To find the implication of Exchange Rate on the level of Money Supply in Nigeria.

Hypothesis of the Study

The study is guided by the following null hypothesis denoted using **Ho**:

H_{01}: There is no significant relationship between Inflation and Money Supply in Nigeria

H_{02}: There is no significant relationship between Gross Domestic product and Money Supply in Nigeria

H_{03}: There is no significant relationship between Exchange Rate and Money Supply in Nigeria

To the academia, this study hopes to assist in the knowledge and provide help for other researchers to complete their study. Thus, it will be of immense benefit to student who intent to do more research in this area and thus serve as reference material in the areas.

Paper Structure

After this brief introduction, the paper is structured as follows. Section 2 provides a brief theoretical and empirical framework to this study, Section 3 highlight the methodology involved in the study Section 4 analyses and interprets output for inferences finally; section 5 summarizes the paper and proffers important policy recommendations.

Literature Review

Theoretical Framework

The prime theory backing this paper is the renowned quantity theory of money as explained as follows:

> The quantity theory of money has since the 16th century been utilized in explaining and predicting the correlation between money supply and inflation. It states that there is a direct correlation between the quantity of money in an economy and the level of prices of goods and services sold (WAMA, 2009).

Its Model and Assumption

In its simplest form the theory could be expressed as MV=PQ (a variant of the Fisher equation) where:

M = Money supply in an economy during a period, say a year

V = Velocity of money in final expenditures

P = Price level associated with transactions for the economy during the period

Q = Real output

The theory assumes that V and Q are constant in the short term. The model also assumes that the quantity of money, which is determined exogenously, is the main influence of economic activity in a society. It also assumes an economy in equilibrium and at full employment in which economic activity is determined by the factors of production-labour, capital, natural resources, technology and organization.

Essentially, these assumptions imply that the value of money is determined by the amount of money available in an economy an increase in money supply results in a decrease in the value of money because of its inflationary implications and consequential loss in purchasing power.

Conceptual Literature

Money supply

Money is a collection of liquid assets that is generally accepted as a medium of exchange and for repayment of debt. In that role, it serves to economize on the use of scarce resources devoted to exchange, expands resources for production, facilitates trade, promotes specialization, and contributes to a society's welfare (Thornton, 2000 as cited in Singh *et al* 2011).

The supply of money at any moment is the total amount of money in the economy at a point in time (Jhingan, 2006). In Nigeria, the narrow money supply (M1) is defined as currency outside bank plus demand deposits of commercial banks plus domestic deposits with the central banks less Federal Government deposits at commercial banks. In simple terms, M1 is defined as;

M1 = C+D

Where:

M1 = Narrow money supply

C = Currency outside banks

D = Demand deposits.

Ajayi (1978) contends that M2 is the appropriate definition of money in Nigeria. M2 includes not only notes and coin and bank current accounts, but also 7-days bank deposits and some building society deposits. In the Nigerian context board money (M2) is defined as M1 plus quasi money. Quasi-money as used here is defined as the sum of savings and time deposits with commercial banks. Symbolically shown as; M2 = C + D + T + S Where: M2 = Board money T = Time deposit S = Savings deposits C and D as defined above. According to Anyanwu and Oikhenam (1997), broad money is that which can be easily converted to cash with little or no loss.

Empirical Literature

Asogu (1998) examined the relationship between money supply, government expenditure and Gross Domestic Product. He adopted the St Louis model on annual and quarterly time series data from 1960 -1995. He finds money supply and export as being significant. This finding according to Asogu corroborates the earlier work of Ajayi (1974) Nwaobi (1999) while examining the interaction between money and output in Nigeria between the periods 1960- 1995. The result indicated that unanticipated growth in money supply would have positive effect on output.

Tyrkalo and Adamyk (1999) and Doroshenko (2001), consider relations between both money supply and inflation and between money supply and GDP. Their

findings confirm a long-run relationship between money growth and inflation. The period of money expansion and high inflation in the decade of the 1990's was accompanied by contraction of output. Novoseletska (2004) also discusses this issues taking note of the break point in the statistical relationship. In a more recent period of financial stability (1999-2003) rising monetary aggregate were accompanied by falling inflation and a rebound of output. Novoseletska and Myhaylychenko (2004), note that nominal exchange rate stability could contribute to moderate growth rates of prices during the last few years.

Moreover, Gosh et al (1997) found evidence that the average rate of inflation was lower in countries with pegged exchange rate than in countries with more flexible rate. Aghevli et al. (1991) obtained similar results but note that many countries with pegged exchange rate regimes have experienced high rate of inflation as a result of inappropriate fiscal policies.

Mahamadu and Philip (2003), explore the relationship between monetary growth, exchange rates and inflation in Ghana using Error Correcting Mechanism. The empirical result confirms the existence of a long run equilibrium relationship between inflation, money supply, exchange rate and real income.

A similar model was employed for Ghana by Chibber and Shafik (1990) covering 1965 to 1988. Their results suggest that growth in money supply is one principal variable that explains the Ghanaian inflationary process. Such variables as official exchange rate and real wages could only exert negligible influence on inflation. However, significant positive relationship was found between the parallel market exchange rate and the general price level.

Sowa and Kwakye (1993) also undertook a study of inflationary trends and control in Ghana. A simple model was employed to determine the relative effects of monetary factors and structural elements on the general price level. Their results indicate that monetary expansion exerted little influence on inflation. On the effect of exchange rate (official), this variable could not have a significant direct relationship with price inflation.

Canetti and Greene (2000) separated the influence of monetary growth from exchange rate changes on prevailing and predicted rates of inflation. The sample covers ten African countries: Using the Vector autoregression analysis, they suggest that monetary dynamics dominate inflation levels in four countries, while in three countries; exchange rate depreciations are the dominant factor.

London (1989) had examined the role of money supply and exchange rate in the inflationary process in twenty-three African countries. The application of the pure monetarist model of the Harberger-type, reveals that the growth of money supply, expected inflation and real income were significant determinants of inflation for the

period between 1974 and 1985. Ndung'u (1993) estimated a six variable VAR model with the following - money supply, domestic price level, exchange rate index, foreign price index, real output, and the rate of interest- in an attempt to explain the inflation movement in Kenya. He observed that the rate of inflation and exchange rate explained each other.

Yahya (2000) concluded in his work that despite the distorting effects of a civil war followed by an oil commodity broom and burst, Nigeria's inflationary experience could be traced ultimately to excessive monetary growth. Using a basic macroeconomic accounting framework, he developed a framework for analyzing Nigeria's inflationary experience, and found that any adjustment policy that does not take into account the role of money and credit is likely to fall short of the overall goal of non-inflationary economic growth.

Identified Knowledge Gap

Judging by the foregoing, it can be seen that so many studies have been carried out related to the study at hand, But it is to be noted that most studies sees money as a means (Independent variable) rather than an end (Dependent variable) and practically few to none have actively combined the selected variables for this study, and majority of scholars usually consider money supply as a predictor rather than a criterion variable, and this paper eliminates the need to develop explicit economic models by imposing apriori restrictions thus this study intends to put the viability of this to assist researchers and add to the dearth of knowledge in this area.

Methodology

Research Design

The study design used for this paper is the Ex post facto which is a quasi-experimental design as a pre-existing group is compared on a dependent variable and the variables data are past events.

Data Collection Technique

In this research, secondary data has been used. Secondary data is collected from the Central bank Statistical Bulletin and federal bureau of statistics. In which there are four variables Money supply (M2), Gross Domestic Product (GDP), Exchange rate (EXR) and Inflation (INFL).

Sample Size

The study covers a period of 33 years (1981 to 2013), which is above the required minimum of 30 observations and selected based on its statistical relevance and convenience of researcher.

Statistical Test

The researcher employed the use of Statistical package: E-view 8 to analyse the data by using the Ordinary Least Square regression Model, stationarity test using Augmented Dickey Fuller to determine if employed data have a unit root and the Co-integration to check for long term relationship between variables with a topping of Granger causality to .

Operational Measures of Variables

i. Dependent Variable

Money Supply: This is the total amount of money in circulation or in existence in a country.

ii. Independent Variable

Inflation: The rate at which the ordinary level of prices for goods and services is rising and afterwards, purchasing power is falling.

Gross Domestic Product: GDP is the total market value of all final goods and services which produced in a country in a given year.

Exchange Rate: the value of one currency for the purpose of conversion to another.

Model Specification:

To carry out an effective analysis on the study, a model was specified which would aid the regression analysis. The model is given as:

M2 = *f*(INFL, GDP, EXR)

Econometric model:

$M2_t = \beta_0 + \beta_1 INFL_t + \beta_2 GDP_t + \beta_3 EXR_t + \mu_t$

To create an equal base for employed variables, the log form was applied to the specified model above.

$Log(M2_t) = \beta_0 + \beta_1 Log(INFL_t) + \beta_2 Log(GDP_t) + \beta_3 Log(EXR_t) + \mu_t$

Where:

M2 = Broad Money Supply

INFL = Inflation Rate

GDP = Gross Domestic Product

EXR = Exchange Rate

β_0 = Constant term

$\beta_1 - \beta_3$ = Coefficient of the Predictor

μ_t = Error term

Log = Logarithm

Apriori Expectation: It is expected that the elasticity parameters (β_1, β_2 and, β_3) > 0. As all predictors are expected to have positive relationship with the criterion variable.

Data Analysis and Results

In this section, the data that were generated for this study was analysed. The analysis started with a unit root test to determine the stationarity of the variables employed in the variable. The result of the unit root text is presented here under:

Table 1. ***Result of Unit Root Test at Level.***

Variable	ADF t-statistics	Critical Value 5%	Order of Integration
M2	3.798057	-2.976263	I(0)
INFL	-5.373163	-2.960411	I(1)
GDP	4.399548	-2.957110	I(0)
EXR	*-4.945020*	-2.960411	I(1)

Using both 1% and 5% Significant Level

The above result shows that just two of the entire variable included in the model at level were stationary at 5% critical value, except for inflation rate (INFL) and Exchange Rate (EXR) who were differentiated at first level to be stationary. Meanwhile having established stationarity, the author moved on to conduct co-integration analysis in other to determine if there is a long run relationship between the variables under consideration.

Table 2. ***Result of Johanson Co-integration Test.***

Hypothesized No. of CE(s)	*Eigenvalue*	*Trace Statistic*	*0.05 Critical Value*	*Prob.***
*None **	*0.707670*	*61.07225*	*47.85613*	*0.0018*
At most 1	*0.304518*	*22.94625*	*29.79707*	*0.2487*
At most 2	*0.216818*	*11.68862*	*15.49471*	*0.1725*
*At most 3 **	*0.124239*	*4.112507*	*3.841466*	*0.0426*

Source: Researcher's E-view 8 result.

The result of the co-integration test shows the existence of at most 1 co-integrating equation in the model. The existences of co-integration suggest that there is a long run relationship between the variables under consideration although weak as the probability level is 0.2487. Having established con-integration among the variables, the Author move to the Regression model.

Table 3: The Result of Log Form of OLS Regression

Dependent Variable: LOG(M2)
Method: Least Squares
Date: 05/10/15 Time: 09:26
Sample: 1981 2013
Included observations: 33

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*-2.843647*	*0.535879*	*-5.306509*	*0.0000*
LOG(INFL)	*-0.087542*	*0.076712*	*-1.141174*	*0.2631*
LOG(GDP)	*1.234699*	*0.094769*	*13.02849*	*0.0000*
LOG(EXR)	*-0.155576*	*0.101028*	*-1.539919*	*0.1344*

R-squared	*0.983549*	*Mean dependent var*	*6.038055*
Adjusted R-squared	*0.981847*	*S.D. dependent var*	*2.340263*
S.E. of regression	*0.315309*	*Akaike info criterion*	*0.642684*
Sum squared resid	*2.883171*	*Schwarz criterion*	*0.824079*
Log likelihood	*-6.604292*	*Hannan-Quinn criter.*	*0.703718*
F-statistic	*577.9386*	*Durbin-Watson stat*	*0.479218*
Prob(F-statistic)	*0.000000*		

Source: Researcher's E-view 8 result.

The result of the log form of OLS regression as shown in the table above is a long-run model results which indicates that INFL is inversely (negatively) and insignificantly related to Money Supply (M2) in Nigeria. The coefficient of INFL is -0.087542, meaning that 1% increase in INFL in Nigeria will result to about 8.75% decrease in M2 in Nigeria. The result also shows that GDP is positively and significantly impacting on Money Supply (M2). The coefficient of GDP is 1.234699, implying that 1% increase in GDP will result to 123% increase in M2 in Nigeria. It can also be seen from the result that EXR has a negative and slightly insignificant impact on M2 in Nigeria. The coefficient of TCR is -0.155576, which also indicates that 1% increase in TCR will result to about 15.56% increase in M2 in Nigeria.

The result of R^2 is 0.983549, which implies that the line of best fit (Goodness of fit) is highly fitted. This means that 98.35% of the variation in GFCF is explained by the variation in all the independent variables included in the model. The Durbin-Watson statistics value of 0.479218 which is approximately less than 2 shows the absence of serial or autocorrelation in the model.

However, the result of F-stat is 577.9386 and that of the prob(F-stat) is 0.0000 which is less than 0.05 indicating that the overall regression is statistically significant at 5% level of significant.

Table 4. ***The result of the Granger Causality Test***

Pairwise Granger Causality Tests
Date: 05/10/15 Time: 09:31
Sample: 1981 2013
Lags: 2

Null Hypothesis:	*Obs*	*F-Statistic*	*Prob.*
LOG(INFL) does not Granger Cause LOG(M2)	*31*	*1.41295*	*0.2615*
LOG(M2) does not Granger Cause LOG(INFL)		*2.83224*	*0.0771*
LOG(GDP) does not Granger Cause LOG(M2)	*31*	*1.05478*	*0.3627*
LOG(M2) does not Granger Cause LOG(GDP)		*0.68243*	*0.5142*
LOG(EXR) does not Granger Cause LOG(M2)	*31*	*4.01140*	*0.0303*
LOG(M2) does not Granger Cause LOG(EXR)		*0.00688*	*0.9931*
LOG(GDP) does not Granger Cause LOG(INFL)	*31*	*2.28048*	*0.1223*
LOG(INFL) does not Granger Cause LOG(GDP)		*0.34780*	*0.7095*
LOG(EXR) does not Granger Cause LOG(INFL)	*31*	*0.52337*	*0.5986*
LOG(INFL) does not Granger Cause LOG(EXR)		*2.13287*	*0.1388*
LOG(EXR) does not Granger Cause LOG(GDP)	*31*	*4.23755*	*0.0255*
LOG(GDP) does not Granger Cause LOG(EXR)		*0.40981*	*0.6680*

Source: Researcher's E-view 8 result.

The result of the granger causality test as shown above at lag 2 judging by the probability level reviles a unidirectional granger causality between M2 and EXR and GDP and EXR, while a bidirectional causality can be seen between INFL and M2, GDP and M2, EXR and INFL But at the same time EXR does not granger causes M2,

indicating that there is a unidirectional causality or feedback effect between EXR and M2 for the period under study. On the same note, the result reviles that EXR granger causes GDP but GDP does not granger cause EXR, which indicates a case of unidirectional causality between the variables for the period under study. Other unmentioned variables show no case of causation as result of their weak f-statistics test output.

Conclusion

This study has shown the effect of selected macroeconomic variables on Money Supply in Nigeria. A Strong Goodness of fit (98%) was found amongst normalized employed variable Using the Regression analysis on historical data during the period from 1981 to 2013, Bidirectional Causality existed amongst money supply and Gross Domestic Product while unidirectional causality existed amongst money supply and Inflation rate and Exchange rate based on the Probability level. The co-integration test shows the presence of a long run relationshio amongst employed variable. The result therefore confirms to the possibility that money is actually reacting to the movement of key macro-economic variables in the nation

Recommendations

Based on the findings made in the course of this study, the following recommendations are hereby made:

i. It is therefore prudent that in seeking to promote economic growth, Nigeria Banks should be committed to the mission of price stability as well as improving the regulatory and supervisory frameworks to secure a strong financial sector for efficient intermediation.

ii. In other to avoid the inflationary impacts government should control the excessive expansion in broad money supply in Nigeria.

iii. Government should take appropriate steps to coordinate and harmonize monetary policies in Nigeria in order to facilitate the financial integration process.

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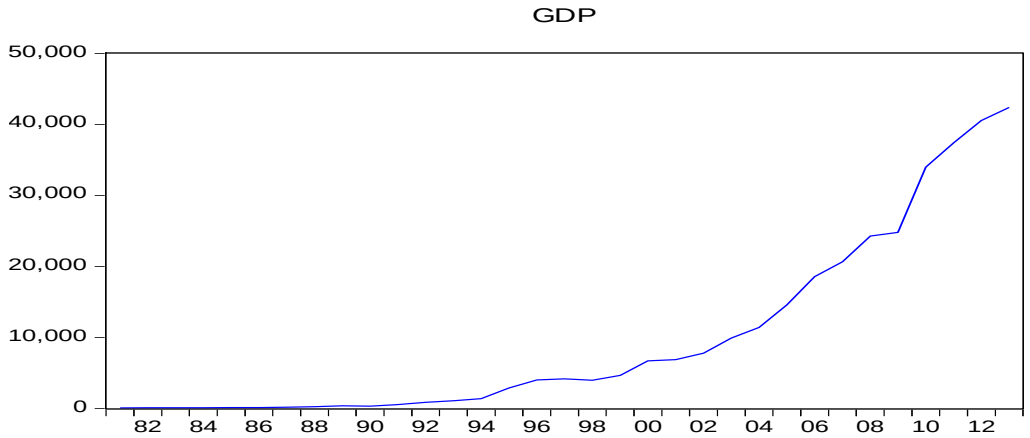
Appendix 1

YEAR	Money Supply (N' Billion)	Inflation Rate	GDP (at Basic Price) (N' Billion)	Exchange Rate
1981	14.4712	20.90	94.32502189	0.54
1982	15.78674	7.70	101.0112258	0.64
1983	17.68793	23.20	110.0640325	0.67
1984	20.10594	39.60	116.2721832	0.75
1985	22.29924	5.5	134.5855947	0.81
1986	23.8064	5.4	134.6033212	2.02
1987	27.57358	10.2	193.1262036	4.02
1988	38.3568	38.3	263.2944591	4.54
1989	45.90288	40.9	382.2614861	7.39
1990	52.85703	7.5	328.60606	8.04
1991	75.40118	13.0	545.6724113	9.91
1992	111.1123	44.5	875.3425183	17.30
1993	165.3387	57.2	1089.679717	22.05
1994	230.2926	57.0	1399.70322	21.89

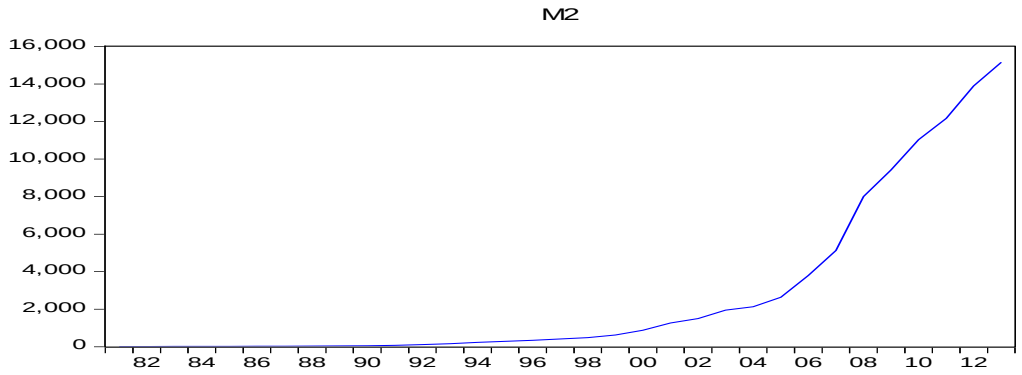
1995	289.0911	72.8	2907.35818	21.89
1996	345.854	29.3	4032.300338	21.89
1997	413.2801	8.5	4189.249771	21.89
1998	488.1458	10.0	3989.450282	21.89
1999	628.9522	6.6	4679.212051	92.69
2000	878.4573	6.5	6713.574835	102.11
2001	1269.322	18.9	6895.198327	111.94
2002	1505.964	12.9	7795.758355	120.97
2003	1952.921	14.0	9913.518187	129.36
2004	2131.819	15.0	11411.06691	133.50
2005	2637.913	17.9	14610.88145	131.66
2006	3797.909	8.2	18564.59473	127.02
2007	5127.000	5.4	20657.31767	116.30
2008	8008.000	11.6	24296.32929	130.75
2009	9420.000	16.2	24794.23866	147.35
2010	11034.94	13.7	33984.75413	148.33
2011	12172.49	10.3	37409.86061	159.31
2012	13895.39	12.0	40544.09994	160.58
2013	15158.62	8.0	42396.76571	173.21

Source: Central Bank Statistical Bulletin.

Graphical representation of Study variables



Eview Output



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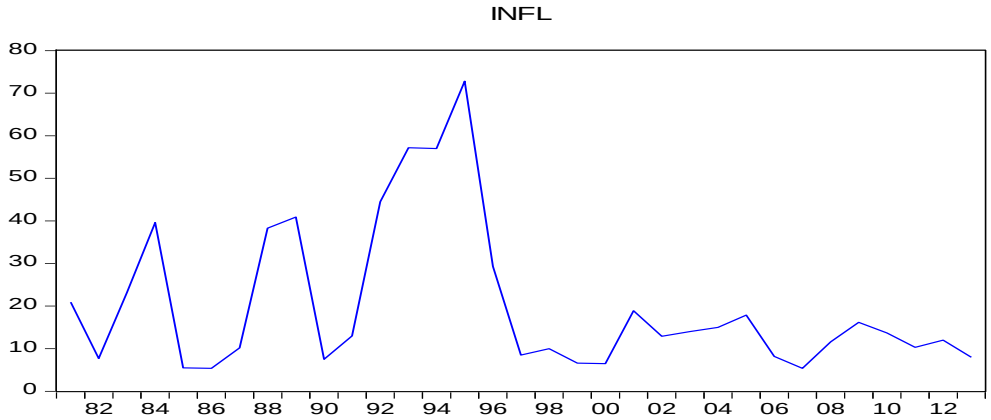
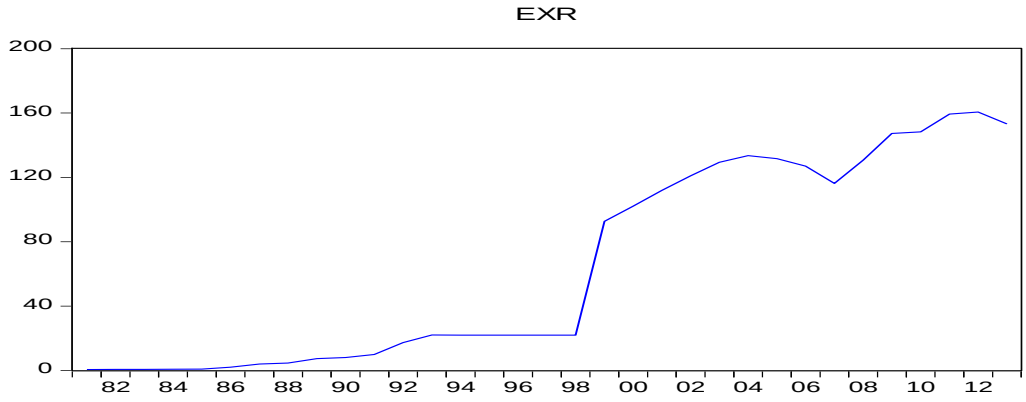


Eview Output



Eview Output

Appendix 2

Dependent Variable: LOG(M2)

Method: Least Squares

Date: 05/10/15 Time: 09:26

Sample: 1981 2013

Included observations: 33

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
C	*-2.843647*	*0.535879*	*-5.306509*	*0.0000*
LOG(INFL)	*-0.087542*	*0.076712*	*-1.141174*	*0.2631*
LOG(GDP)	*1.234699*	*0.094769*	*13.02849*	*0.0000*
LOG(EXR)	*-0.155576*	*0.101028*	*-1.539919*	*0.1344*

R-squared	*0.983549*	*Mean dependent var*	*6.038055*
Adjusted R-squared	*0.981847*	*S.D. dependent var*	*2.340263*
S.E. of regression	*0.315309*	*Akaike info criterion*	*0.642684*
Sum squared resid	*2.883171*	*Schwarz criterion*	*0.824079*
Log likelihood	*-6.604292*	*Hannan-Quinn criter.*	*0.703718*
F-statistic	*577.9386*	*Durbin-Watson stat*	*0.479218*
Prob(F-statistic)	*0.000000*		

	LOG(M2)	*LOG(EXR)*	*LOG(GDP)*	*LOG(INFL)*
LOG(M2)	*1.000000*	*0.937497*	*0.990510*	*-0.232146*
LOG(EXR)	*0.937497*	*1.000000*	*0.958365*	*-0.151222*
LOG(GDP)	*0.990510*	*0.958365*	*1.000000*	*-0.201669*
LOG(INFL)	*-0.232146*	*-0.151222*	*-0.201669*	*1.000000*

Date: 05/10/15 Time: 09:30
Sample (adjusted): 1983 2013
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LOG(M2) LOG(INFL) LOG(GDP) LOG(EXR)
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.707670	61.07225	47.85613	0.0018
At most 1	0.304518	22.94625	29.79707	0.2487
At most 2	0.216818	11.68862	15.49471	0.1725
At most 3 *	0.124239	4.112507	3.841466	0.0426

Trace test indicates 1 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	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.707670	38.12600	27.58434	0.0016
At most 1	0.304518	11.25763	21.13162	0.6216
At most 2	0.216818	7.576111	14.26460	0.4234
At most 3 *	0.124239	4.112507	3.841466	0.0426

Max-eigenvalue test indicates 1 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 Cointegrating Coefficients (normalized by b'*S11*b=I):*

LOG(M2)	*LOG(INFL)*	*LOG(GDP)*	*LOG(EXR)*
0.672410	*1.875351*	*-0.474746*	*0.016887*
-1.409464	*0.158353*	*3.766323*	*-2.421438*
-3.414738	*-0.223286*	*3.343112*	*0.590721*
-0.850193	*0.348268*	*0.473400*	*-0.026804*

Pairwise Granger Causality Tests
Date: 05/10/15 Time: 09:31
Sample: 1981 2013
Lags: 2

Null Hypothesis:	*Obs*	*F-Statistic*	*Prob.*
LOG(INFL) does not Granger Cause LOG(M2)	*31*	*1.41295*	*0.2615*
LOG(M2) does not Granger Cause LOG(INFL)		*2.83224*	*0.0771*
LOG(GDP) does not Granger Cause LOG(M2)	*31*	*1.05478*	*0.3627*
LOG(M2) does not Granger Cause LOG(GDP)		*0.68243*	*0.5142*
LOG(EXR) does not Granger Cause LOG(M2)	*31*	*4.01140*	*0.0303*
LOG(M2) does not Granger Cause LOG(EXR)		*0.00688*	*0.9931*
LOG(GDP) does not Granger Cause LOG(INFL)	*31*	*2.28048*	*0.1223*
LOG(INFL) does not Granger Cause LOG(GDP)		*0.34780*	*0.7095*
LOG(EXR) does not Granger Cause LOG(INFL)	*31*	*0.52337*	*0.5986*
LOG(INFL) does not Granger Cause LOG(EXR)		*2.13287*	*0.1388*
LOG(EXR) does not Granger Cause LOG(GDP)	*31*	*4.23755*	*0.0255*
LOG(GDP) does not Granger Cause LOG(EXR)		*0.40981*	*0.6680*

	M2	GDP	INFL	EXR
Mean	2788.412	9865.275	20.26424	65.24807
Median	413.2801	4032.300	13.00000	21.88610
Maximum	15158.62	42396.77	72.80000	160.5800
Minimum	14.47117	94.32502	5.400000	0.544500
Std. Dev.	4510.011	13039.13	17.46249	62.78226
Skewness	1.637805	1.339490	1.500413	0.278930
Kurtosis	4.258938	3.514444	4.318488	1.279217
Jarque-Bera	16.93251	10.23219	14.77213	4.499414
Probability	0.000210	0.005999	0.000620	0.105430
Sum	92017.59	325554.1	668.7200	2153.186
Sum Sq. Dev.	6.51E+08	5.44E+09	9758.034	126131.6
Observations	33	33	33	33