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The Impact of Money Supply on Nigeria Economy: A Comparison of Mixed Data Sampling (MIDAS) and ARDL Approach

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Abstract: The study investigates the long and short run relationships between broad money supply and real aggregate output (GDP) in Nigeria from 1981 to 2015. This study set to investigate the perplexity whether or not money supply as the major monetary policy measures actually impact on the Nigerian economy. This work made use of data of different frequencies (yearly and quarterly) in order to reveal some hidden facts that data of the same frequency might fail to show. An unrestricted version of Mixed Data Sampling (U-MIDAS) technique and Autoregressive Distributed Lag (ARDL) technique were employed. The ADF unit root test revealed that the yearly real GDP and quarterly broad money supply contained a unit root and this permit the testing of cointegration among the variables. The U-MIDAS results affirm the existence of a long and short-run relationship between yearly real GDP and quarterly broad money supply at different season while the ARDL result affirm that money supply impacted significantly on real GDP in the long run only. The study concluded that the disequilibrium correction terms from the two analytical approaches showed the evidence that there is a tendency for growth targeting in Nigeria which is one of the major objectives of Nigeria economy though at a slower rate. It was therefore recommended that monetary authority should maintain the level of inflation targeting in the economy and the volume of money to be supply should be monitored as too much money supply in the economy will lead to skyrocketing inflation and also the periodic money multiplier should be made efficient by supplying the money into the circulation regularly so as to co-trend with the real GDP growth by making cash available for business transactions and other economic activities, this will by means improve the real GDP of Nigeria economy.

Keywords: Economic Growth, Seasonal Stability, Unrestricted Mixed Data Sampling (U-MIDAS)

JEL Classification: E51; E52

1. Introduction

The effort of the monetarist over the years on the investigation of the impact of money supply on the economic growth cannot be overemphasized. The topic had received many attentions over the years in the field of monetary economics. It has been in existence even before Keynes and Friedman. The classical dichotomy theory opined that money supply has no effect on the economic real variable (monetary neutrality). The notion of the impact of money supply on economic growth varies among the economist. One school of thought advocated that money supply could drive the growth of an economy and act as economic stabilizer tools (Friedman) while some school of thought advocated that money supply could do harms to the economy than the goods. Simon Kutnez (1995) opined that financial market will experience growth when the economy grows toward the maturity stage.

The Keynesians in their view regarded the function of money in an economy to be limited due to the very low rate of investment (liquidity trap) so the multiplier effect of income will raise the transaction demand for money and hence, there is increase in the volume of money in circulation.

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Retrospectively, in Nigeria, there are empirical pieces of evidence that some relationships exist between the volume money in circulation and real GDP growth rate. Since 1970, Nigeria has been controlling her economy through the variation in her volume of money. Between 1970 and 2014, real money supply growth rate maintained an irregular trend; it rose from 18.25% in 1970 to 46.1% in 1980. While it decreased to 8.6% in 1996 due to the banking system crises, but it picked up again to 38.0% in 2009 and stood at 19.9% in 2014. Nigeria, in the last one decade, has contended with a number of socio-economic challenges including: dropped in Oil Price (the mainstay of the Nigerian economy), Stock Market Crash, Banking Sector Crisis, Political challenges, Militancy in the Niger Delta and Boko Haram insurgencies in the North and the Eastern part of the country. Despite all these, the country has continued to record significant growth over the years. Real GDP fell between the year 1981 and 1984 by 1.6% and rose between 1984 and 1985 by 8.1%. It further decreased by 10.3% within the period of 1985 and 1987 by 10.3% and rose between 1987 and 1989 by 6.7%. Real GDP maintained a smooth trend as from the year 1990 and experience a structural change in the year 2003. Between these periods, the growth of GDP was 2.5% on average and it also maintained a nearly perfect smooth trend between 2004 and 2014 with a growth rate of 6% on average.

The controversy on whether or not monetary policy measures actually have impact on the Nigerian economy is yet to be resolved. This study attempts to resolve this. Previous studies in Nigeria had adopted various methodologies but with data of the same frequency. The main thrust of this study is to investigate the impact of stock of the money on real GDP in Nigeria using mixed frequency data where real GDP is measured yearly and the broad supply of money is measured quarterly. The result obtained will be compared with the ARDL result with real GDP and money supply both measured annually. This would go a long way in assessing the extent to which the money supply has impacted on the growth process of Nigeria during the scope of the study. Therefore, this paper is divided into five sections; following the introduction is section two which is the literature review. The third section deals with the methodology, while section four discusses the analysis and the result interpretation. Finally, section five presents the conclusion and recommendations from the study.

2. Literature Review

2.1. Theoretical Review

A. The Quantity Theory of Money

The classical quantity theory of money states that the price level is a function of the supply of money. Algebraically, MV=PT, where M, V, P and T are the supply of money, the velocity of money, price level and the volume of transactions (or real output) respectively. The equation tells us that the total money supply MV equals the total value of output PT in the economy (Jhingan, 2012). In this theory, the classical economists believe in the long-run economy, where full employment is attained. They recognized the existence of unemployment in the event of a downward rigidity of money wages. Such a situation could be corrected by an expansionary monetary policy. Suppose the monetary authority increases the money supply, given the velocity of money and the level of real output, with the income in the money supply, liquidity rises with the people who increase the demand for goods and services, this, in turn, raises the price level. The rise in price level reduces the real wage which provides incentives for employers to expand employment and output towards the full employment level.

B. The Keynesian Theory

Keynes (1936) rejected the Quantity Theory of Money in the short run because their assumptions (Y was fixed at full employment and V was fixed) do not apply in uncertainty real world with high level of unemployment. Keynes argues that changing in money supply is not the only reason for changing in

the general price level, but there is another variable affects the price level which is the employment of production factors. In the case of absence of full employment, the increase in the money supply will lead to increase in total spending and then increased the total output. When the economy reaches the level of full employment, the increase in money supply only leads to higher prices. Thus, the money supply is non-neutral when the economy operated at less than the full employment level, where there is indirect effect of money supply on economic activity, through the influence of money supply on interest rates, and the investment and output (Iwedi Marshal, 2016)

2.2 Empirical Review

There are many empirical evidences across countries both the developed and the developing on the impact of money supply on real GDP; some are discussed in this work.

Abdul-Raziq (2003) tests the impact of real GDP, government spending, price level, and international reserve on the money supply in Qatar. They found significant relationship between real GDP and money supply which is an indication that, the changes in GDP in Qatar help in explaining the changes in money supply and not the opposite for the period of study. Hussein (2005) studied the causal relationship between money growth, inflation, currency devaluation and economic growth in Pakistan during the period (1954-2002). His findings revealed that, there is short run bi-directional causality between money supply growth and inflation and between currency devaluation and inflation. For the complete sample period, the causality running from inflation to narrow money supply growth was stronger than that from narrow money supply growth to inflation. Also, El-Seoud (2014) tested the relationship between money supply and GDP in Bahrain for the period of 13 years. Using Cointegration, Error Correction model and granger causality techniques, the findings revealed the existence of a long run equilibrium between real GDP and real money supply while the Error term and F-test indicates unidirectional causality running from real GDP to real money supply in the short run as well as in the long run.

Obaid (2007) tests the causality relationship between money supply (M3) and real GDP in Egypt during the period (1970-2006) by using Granger test. Findings from his study revealed that there is no causality between the nominal money supply and nominal GDP during the study period, while when he used the real money supply and real GDP, he found that there exist mutual causality relationship between real money supply and real GDP in Egypt (non-neutral money), and thus the monetary policy is an effective policy on the real GDP in Egypt, the mutual causality relationship could help to forecast the GDP behavior within assumed volume of money supply by the economics policy making in Egypt. Ogunmuyiwa and Ekone (2010) investigated the impact of money supply on economic growth in Nigeria using annual data for the period 1980 to 2006. Applying Econometric technique (Ordinary Least Squares(OLS), Granger Causality test and Error correction Model), the results revealed that although money supply is positively related to growth, the result is however insignificant in the case of GDP growth rates on the choice between contractionary and expansionary money supply.

Chukwu (2009) analyzed the effect of monetary policy innovations in Nigeria. The study used a Structural Vector Auto-Regression (SVAR) approach to trace the effects monetary policy stocks on output and prices in Nigeria. The study also analyzed three alternative policy instrument, that is, broad money (M2), minimum rediscount rate (MRR), and the real effective exchange rate (REER). The study found evidence that monetary policy innovations have both real and nominal effect on economic parameter depending on the policy variable selected. Adefeso and Mobolaji (2010) also investigated fiscal -monetary policy and economic growth in Nigerian by employing Johansen Maximum Likelihood Co-integration procedure. The result shows that there is a long – run relationship between economic growth, degree of openness, government expenditure and broad money supply (M2). Hence, it can be deduced form the above empirical review that, despite plethora empirical evidences on the impact of money supply on economic growth, none of these works in Nigeria to the best of our

knowledge has used mixed frequency data approach in analyzing this situation and therefore represent the gap this study intend to fill.

2.3 Theoretical Framework

This study is anchored on the theoretical framework of Irvin fisher quantity theory of money. In the fisher equation, real supply of money is proportional to real output (GDP). In another word, fisher equation of exchange stated that the product of nominal money supply and the velocity of money equate the nominal output (GDP). This was later modified by the neoclassical economist to show that inflation is caused by the increase in money supply. Milton Friedman got his popular saying from this equation by concluding that inflation is always and everywhere a monetary phenomenon. This theory can be expressed mathematically thus:

Equation 2.1

$$M^s V = PY$$

Equation 2.2

$$Y = V \times \frac{M^s}{P}$$

Giving the velocity of money *v* to be constant, output *Y* is a function of money supply.

Where:

Y = output proxy with real gross domestic product (GDP)

P = price level

V = velocity of money

M^s =money supply

3. Methodology

3.1. Model Specification and Estimation Techniques

The model for this study is specified as follows:

Equation 3.1

$$GDP = f\,(M2)$$

Where GDP = log of yearly real GDP and M2 = log of quarterly Broad money supply

In order to examine the influence of the seasonal impact of money supply on real GDP, the model specification above is presented below in a Mixed Data Sampling (MIDAS) form developed by Ghysels, Sinko and Valkanov (2007). Mixed data sampling (MIDAS) regressions allow us to estimate dynamic equations that explain a low frequency variable by high frequency variables and their lags. (Foroni & Marcellino, 2013)

Equation 3.2

$$GDP_t = \beta_0 + \beta_1 B\left(L^{\frac{1}{m}}; \theta\right) M2_t^{(m)} + \varepsilon_t$$

Where GDP_t the dependent variable is a yearly data while $M2_t$ the regressor is a quarterly data, (*m)* denotes the frequency, ε is the disturbance and $B\left(L^{\frac{1}{m}};\theta\right)$ is a lag distribution, for instance the Beta function or the Almon Lag.

The ADL form of the above equation can be represented as below

Equation 3.3

$$A(L)GDP_t = \beta_0 + \beta_1 B\left(L^{\frac{1}{m}};\theta\right) M2_t^{(m)} + \varepsilon_t$$

We can rewrite this mixed-frequency ADL in an error correction format of the following form:

Equation 3.4

$$A^*(L)\Delta GDP_t = \alpha_0 - A(1)\left(GDP_{t-1} - \frac{B(1)}{A(1)} M2_{t-1-\frac{i}{m}}^{(m)}\right) + B^*\left(L^{\frac{1}{m}}\right)\left(\Delta^{\frac{1}{m}}\right) M2_t^{(m)} + \varepsilon_t$$

In analogy to the concept of dynamic cointegration (see Gourieroux and Monfort, 1990, p. 419), we will refer to these as *dynamic mixed-frequency (MF) cointegrating relationships* (Götz, Hecq & Urbain, 2014). More formally, dynamic MF cointegrating relationship is presented below:

Equation 3.5

$$GDP_{t-1} - \frac{B(1)}{A(1)} M2_{t-1-\frac{i}{m}}^{(m)} \text{ For } i = 0 \text{ to } m-1$$

However, the unrestricted version of the MIDAS (U- MIDAS) is adopted in this work (see Foroni and Marcellino, 2013).

Equation 3.6

$$GDP_t = \beta_0 + \sum_{j=1}^{K} \beta_j M2_{t-h-(j-1)/m}^{(m)} + \varepsilon_t$$

The reason for the adoption of equation (3.6) is that currently fashionable restrictions on the parameters of the independent variables, like the Almon structure or the Logit expressions, potentially have no particular meaning. The parameters in the high-frequency Data Generating Process (DGP) can lead to a wealth of different parameter configurations in the MIDAS regressions, and particular systematic patterns might be rare. Also in some cases, the parameters in the MIDAS regression are informative about the true parameters in the high-frequency Data Generating Process (DGP). This can lead to proper estimates of carryover effects, short-run effects, and cumulative effects (Franses, 2016).

4. Analysis and Interpretation

4.1. Unit Root Test

Before one pursue formal tests, it is always advisable to plot the time series under study as it may reveal the integrating nature of the series. These variables (both GDP and M2 are in log form) are examined graphically below.

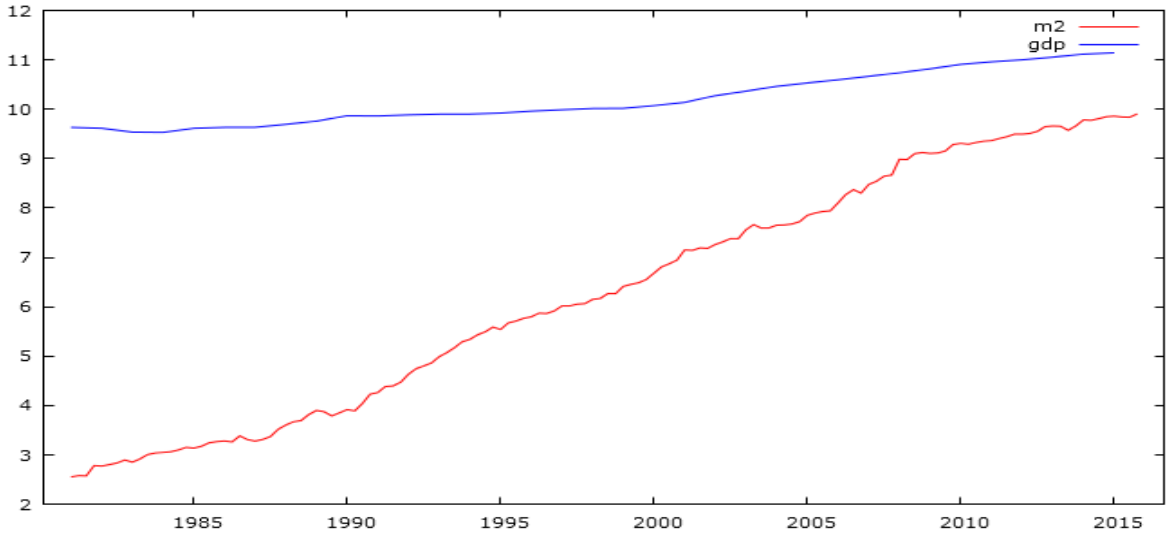

Figure 4.1. The log of quarterly broad money supply (m2) and the log of yearly real GDP (gdp)

The figure 4.1 depicts the log of Quarterly money supply (m2) and log of yearly real gross domestic product (gdp) from 1981-2015.The data were sourced from CBN annual statistical bulletin (2015). It can be seen that log of yearly real GDP and the log of quarterly broad money supply possess upward trend from 1981-2015 and this suggested that they were not stationary in nature and there is a need for difference filtering in order to archive stationarity. Moreover, the figure revealed that the m2 rose faster than gdp from 1981-2015 and they did not move in parallel to each other. The implication of this is that, though cointegration may exist between the two variables but the speed of adjustment back to equilibrium may be slow and even not significant.

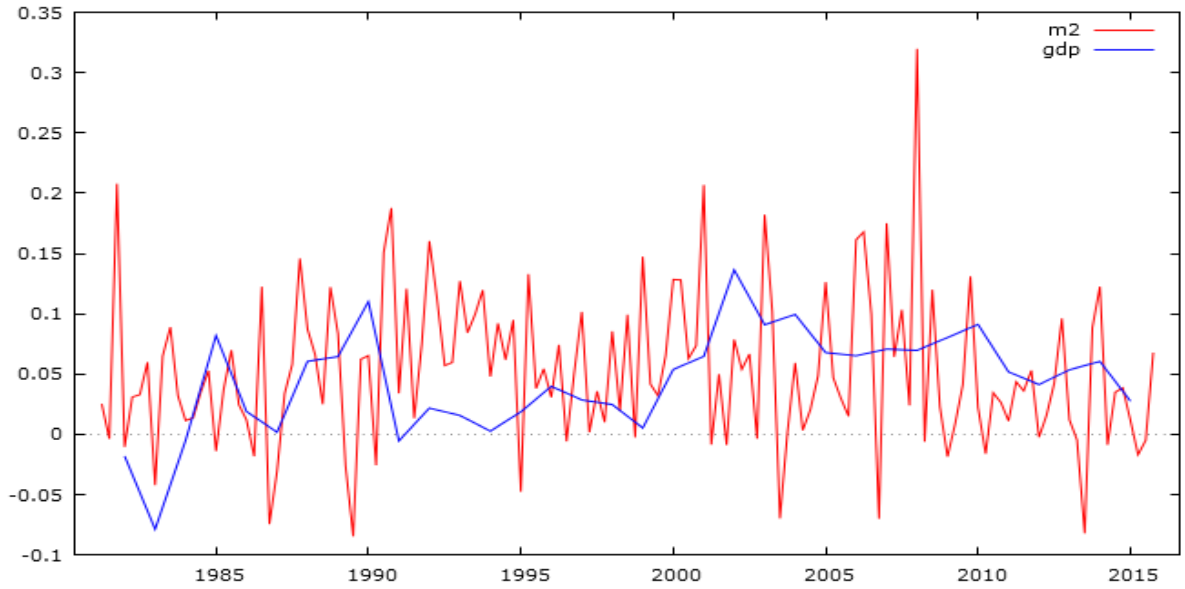

Figure 4.2. High frequency difference log of quarterly broad money supply (m2) and the yearly difference log of real GDP (gdp)

Figure 4.2 depicts the high frequency difference log of Quarterly money supply (m2) and the yearly difference log of real gross domestic product (gdp) for the period of 1981-2015. It revealed that they

do not possess any visible trend after difference filtered and this suggested that they are stationary after first difference filtering.

Table 4.1. Augmented Dickey Fuller (ADF) unit root test result

Level			Difference		
Variable	ADF test stat	Prob value	ADF test stat	Prob value	remark
gdp	-2.219401	0.4639	-3.602994	0.0450 **	I(1)
m2	-1.463451	0.8374	-12.32104	0.0000 ***	I(1)

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1% respectively

Source: Authors' computation

From the Table 4.1, it can be shown that gdp and m2 are I(1) at 5% and 1% level of significance respectively. This conformed to the graphical illustration in Figure 4.1 and Figure 4.2 that the series would become stationary after first difference filtering. Since both gdp and m2 are I(1) variables, there is a tendency for cointegration to exist among the two. Following the cointegration principle, there can only be one cointegrating vector as just only two variables were involved (Marno Verbeek, 2004). Due to this, the Augmented Engle-Granger (AEG) approach to mixed frequency cointegration test will be adopted.[1]

4.2. Seasonal Stability in Money Supply

Seasonal patterns are common in many time series data (e.g. macroeconomic or meteorological data). One of the issues to be analyzed when working with seasonal data is whether the seasonal pattern remains relatively stable over the sample period or whether it changes across time. Canova and Hansen (1995) proposed a test statistic for the null hypothesis that the seasonal pattern is stable. The test statistic can be formulated in terms of seasonal dummies or seasonal cycles. The former allows us to identify seasons (e.g. months or quarters) that are not stable, while the latter tests the stability of seasonal cycles (e.g. cycles of period 2 and 4 quarters in quarterly data) (Javier Calle, 2017). In this paper, Canova and Hansen (1995) dummies version of LM (Lagrange Multiplier) test is adapted to test for the seasonal stability of broad money supply in Nigeria from the first quarter of 1981 to the last quarter of the year 2015.

Table 4.2. Canova-Hansen seasonal stability test

Statistics	**Probability value**	**Season**
L1 = 0.4909	0.04059 **	1
L2 = 0.1998	0.28350	2
L3 = 0.0818	0.72539	3
L4 = 0.2647	0.18077	4

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1% respectively

Source: Authors' computation

H_0: m2 seasonal pattern is stable

H_1: m2 seasonal pattern is not stable

It can be seen that the first seasonal pattern of log broad money supply in Nigeria is significant and the remaining three seasons were not significant. This lead to the rejection of stability for season 1 of broad money supply and the acceptance of seasonal stability of broad money supply in season 2, 3 and

[1] See (Almkvist, 2016).

4. In another word, broad money supply is seasonally stable in Nigeria in the last three quarters of every year.

4.3. Mixed Frequency Cointegration Relationship

Table 4.3. Dependent variable: gdp

Variable	**Estimate**	**Standard error**	**t-ratio**	**p-value**
Constant	8.8839	0.0748	118.8	1.14e-041 ***
m2_Q4	0.7111	0.3493	2.036	0.0507 *
m2_Q3	−0.7989	0.4716	−1.694	0.1006
m2_Q2	−0.6004	0.5614	−1.070	0.2934
m2_Q1	0.8977	0.3943	2.277	0.0301 **

	Statistics	Prob value
R^2	0.956232	
F-stat	163.8590	6.36e-20
Normality	2.10414	0.349214
D.W	0.503730	1.87038e-008

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1% respectively

Source: Authors' computation

From table 4.3, m2 in the first and the fourth quarter had a positive impact on gdp in the long run while m2 in the second and the third quarter had a negative impact on gdp in the long run respectively. Also, a percentage increase in m2 in the first and the fourth quarter will bring about 0.89% and 0.71% increase in gdp while a percentage increase in m2 in the in the second and the third quarter will bring about 0.60% and 0.79% decrease in qdp in the long run respectively. However, only the effects (coefficients) of the broad money supply in the first and the fourth quarter were statistically significant at 5% and 10% level while the effects (coefficients) of m2 in the second and the third quarter were not significant at conventional statistical level.

The R^2 value (0.956232) revealed that more than 95% of the variation in gdp is explained by the high-frequency broad money supply. The probability value of the F-stat is practically zero and this revealed that all the slope coefficients are indeed different from zero and jointly significant. The assumption of normality has to be ascertained so that the inferences made will remain valid. In this spirit, the probability value of the J-B test is not significant at both 5% and 10% conventional level, and this means the acceptance of the null hypothesis of normality. However, the value of the R^2 is far greater than the value of the Durbin-Watson statistics. This may reveal the spuriosity of the model as convened by R.F Engle and C. Granger (1957). There is need to check for high-frequency cointegration using the AEG (check above) approach. Rejection of the AEG test indeed will reveal the spuriosity of the model while its acceptance means the presence of cointegrating relationship among the variables.

4.4 AEG Cointegration Test

As stated earlier there is need to test for the presence of cointegrating relationship among the variables. As it is advisable that, before one pursue formal tests, it is better to plot the time series under study as it may reveal the integrating nature of the series. Figure 4.3 shows the residual from the estimated unrestricted MIDAS regression model. It can be seen that the residual hoover around zero line and it shows no sign of a trend. This signifies that the residual is mean reverting or weakly stationary. In cointegration language, there is a cointegrating relationship between the yearly gdp and the quarterly

m2. The formal test that follows shows the ADF unit root test without trend and intercepts to test for the stationarity of the residual from the unrestricted MIDAS regression model.

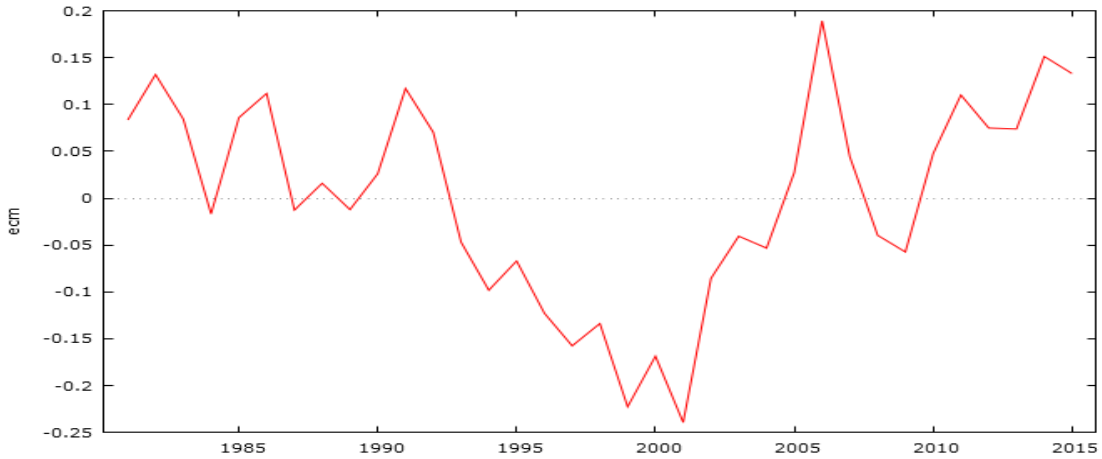

Figure 4.3. Residual (ECM) graph

Table 4.4. ADF unit root test for ECM

Level without constant and trend		
Variable	**ADF test stat**	**Prob value**
ECM	-2.102823	0.0358 **

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1% respectively

Source: Authors' computation

From the Table 4.4 presented, the computed ADF test statistics is significant at 5% level of significance and based on this, we may reject the null hypothesis. This is interpreted as there is a long-run relationship between the variables (gdp and m2) which imply that the estimated long-run cointegrating vector (Parameter estimates in Table 4.3) is valid and we may proceed to the short-run dynamic and error correction analysis.

4.5. U-Midas Ecm Result

Table 4.5. U-MIDAS ECM Dependent variable: Δgdp

Variable	**Estimate**	**Standard error**	**z-ratio**	**p-value**
Constant	0.0415092	0.0132396	3.135	0.0017 ***
ecm(-1)	−0.142148	0.0828550	−1.716	0.0862 *
Δm2_Q4	0.0432305	0.120533	0.3587	0.7198
Δm2_Q3	−0.0499015	0.0956181	−0.5219	0.6018
Δm2_Q2	−0.227179	0.115681	−1.964	0.0495 **
Δm2_Q1	0.165151	0.0775185	2.130	0.0331 **
	Statistics	**Prob value**		
R2	0.306040			
F-stat	2.196743	0.082970		
Normality	0.420479	0.81039		

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1% respectively.

Source: Authors' computation

From the Table 4.5, m2 in the first and the fourth quarter had a positive impact on gdp in the short run while m2 in the second and the third quarter had a negative impact on gdp in the short run respectively. Also, a percentage increase in m2 in the first and the fourth quarter will bring about 0.17% and 0.04% increase in gdp while a percentage increase in m2 in the second and the third quarter will bring about 0.22% and 0.05% decrease in gdp in the short run respectively. It is observed from the Table 4.5 that, m2 in the first and second quarter, was significant in the short run at 5% level while m2, in the third and fourth quarter, were not statistically significant in the short run; This is an indication that m2, in the third and fourth quarter did not contribute to gdp in the short run.

The result in table 4.5 indicates that the coefficient of the error correction term ECM(-1) has the correct sign and significant at 10% level. The value of the coefficient is -0.142148 and this means about 14.2% of the disequilibrium in gdp of previous year's shock adjust back to the long run equilibrium in the current year. In another word, qdp adjust to equilibrium with lags (not instantaneously) and only about 14.2% of the discrepancy between the long run and the short run gdp in Nigeria is corrected within a year. This is indeed a slow rate of adjustment. However, this result is not surprising as the graph in Figure 4.1 had suggested earlier.

4.6. Ardl Analysis (Gdp and M2 Are in Log and Are Measured Yearly)

Table 4.6. Pesaran ARDL Bound Cointegration Test Result

F-stat	Degree of Freedom	Critical Value Bounds	Pesaran et al., (1999)a		Conclusion
			I(0) Bound	I(1) Bound	
4.798484	1	10 %	3.02	3.51	Cointegrated
		5%	3.62	4.16	
		2.5%	4.18	4.79	
		1%	4.94	5.58	

Source: Authors' computation

From the table 4.6, the computed F-stat 4.798484 is greater than the Upper Bound table value at both 5% and 10% level of significance except for the 1% level and the null hypothesis of no cointegration may be rejected i.e. there is a long-run relationship between the variables. The result signifies that we may proceed to the long run and the short run analysis of gdp and m2.

Table 4.7. CO-INTEGRATING (LONG RUN) Coefficients Table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	8.871883	0.198427	44.711161	0.0000 ***
m2	0.252388	0.041329	6.106744	0.0000 ***

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1% respectively.

Source: Authors' computation

From the Table 4.7, m2 had a positive impact on gdp in the long run. Also, a percentage increase in m2 led to 0.25% increase in gdp in the long run. It can also be shown from the Table 4.7 that m2 was highly significant in the long run. This signifies that on average m2 impacted significantly on gdp in the long run.

Table 4.8. The Short-Run Dynamic and the Error Correction

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.113456	0.035777	-3.171184	0.0036 ***
Δgdp(-1)	0.382558	0.141660	2.700549	0.0114 **
Δm2	-0.011610	0.040641	-0.285658	0.7772

Note: * (**) (***) denotes null hypothesis at 10%, 5% and 1% respectively.

Source: Authors' computation

In Table 4.8 above, the lagged value of the gdp had a positive impact on the current gdp in the short run while m2 had a negative impact on gdp in the short run respectively. Also, a percentage increase in m2 will lead to 0.012% decrease in gdp in the short run. It can also be shown from the table 4.8 that m2 did not significantly impact on gdp in the short run. The error correction term ECM (-1) has the correct sign and significant at 10% marginal level. The value of the coefficient is -0.0113456 and this means about 11% of the disequilibrium in gdp of previous year's shock adjust back to the long run equilibrium in the current year. In another word, deviated gdp adjust to equilibrium with lags and only about 11% of the discrepancy between long and short run gdp in Nigeria is corrected within a year. This is a very slow rate of adjustment

4.7. Comparison of Ardl Ecm And U-Midas Ecm

Table 4.9. Comparison of ARDL ECM and U-MIDAS ECM

Model	ECM(-1)	Probability value	Akaike criteria
ARDL	-0.11	0.0036 ***	-3.793642
U-MIDAS	-0.14	0.0862*	−119.8393

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1% respectively.

Source: Author's computation

In the Table 4.9 above, the ARDL result showed that about 11% of the disequilibrium in qdp of previous year's shock adjust back to the long run equilibrium in the current year while the U-MIDAS result showed that about 14% of the disequilibrium in qdp of previous year's shock adjust back to the long run equilibrium in the current year. The probability value showed significances' of both ECM, but with ARDL highly significant. The Akaike information criteria show that the U-MIDAS model minimize information losses than the ARDL model. The discrepancies may be as a result of the high-frequency data employed to reveal the rich hidden dynamic that may not be revealed in the aggregated data. Based on these findings, one could conclude that the U-MIDAS ECM performed better than the ARDL ECM.

5. Conclusion and Policy Recommendations

The general conclusion that can be made based on the empirical findings in this work is that the impact of money supply on real GDP manifests in a different season. The ARDL results using an annualized data revealed that money supply impacted significantly on real GDP in the long run only while the story is different for the mixed frequency data. The mixed frequency data approach revealed that the impact of broad money supply on real GDP depends on the season which the money is distributed into the circulation. The mixed frequency data approach showed that only the broad money supply in the circulation in the first and the last quarter impacted significantly on real GDP in the long run while only the broad money supply in the circulation in the first and second quarter impacted on real GDP in the short run respectively. Moreover, the information criterion in the comparison table shows that the U-MIDAS outperformed the ARDL model and the error correcting term also reveals that the U-MIDAS model adjust back to steady state faster than the ARDL model. However, this study suggested that the impact of money supply on real GDP cannot be overemphasized. Also, the disequilibrium correction terms show the evidence that there is a tendency for growth targeting in Nigeria which is one of the major objectives of Nigeria economy though at a slower rate. In order to attract both domestic and foreign investment which will create employment opportunities for the Nigerian populace and in turn lead to the expansion of the industries in the country, the monetary authority should maintain the level of inflation targeting in the economy and the volume of money to be supply should be monitored as too much money supply in the economy will lead to skyrocketing

inflation and also the periodic money multiplier should be made efficient by supplying the money into the circulation regularly so as to co-trend with the real GDP growth by making cash available for business transactions and other economic activities, this will by means improve the real GDP of Nigeria economy.

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