

Restating Milton Friedman's Quantity Theory of Money: An Error Correction Approach (1970-2008)

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Abstract

This study tests the validity of Milton Friedman's restatement of quantity theory using Nigerian data. The justification for the study is in the determination of major explanatory variables that affect the demand for money in Nigeria. This will assist policy makers and users of the information in knowing how to control those variables to achieve the desired level of money demand. The study made use of time series data spanning thirty-nine years from 1970 to 2008. And because of serial/auto correlation that is normally associated with time series data, co-integration econometric technique was adopted. The unit root test conducted confirmed the existence of non-stationarity in the data. This was, however, corrected after first differencing to avoid spurious result at the end of the study. The result obtained from the OLS estimates shows all the variables apart from that of non-human wealth to human wealth (w) are in conformity with Friedman's model. Whereas the original model specifies a positive relationship between demand for money and that of human wealth to non-human wealth, the result shows a negative relationship which to our thinking follows the declining situation of the Nigeria's Per Capita Income (PCI) over the years. The reason for this assertion is that human wealth from our model was proxied by Per Capita Income (PCI) and since the PCI forms the numerator, the lower its value over the years, the more it exerts negative impact on the demand for money. Other major conclusion from the work includes the fact that whereas price is positively related to demand for money, change in price over time is negatively related to it. In sum, the study confirms the validity of Milton Friedman's restatement of Quantity theory of money with the exception of the contrary relationship that existed in the variable mentioned above.

Keywords: demand for money, quantity theory, Milton Friedman, co-integration, error correction.

INTRODUCTION

The importance of money and its allied studies in any given economy cannot be over emphasized. It was important in the days of old, it is relevant now and it will be relevant in the millennium to come. This is because central to the macroeconomic objectives of any nation is the issue of money. Be it developed or developing nation it is very doubtful if increased national output or what is called economic growth can be achieved without money. A nation's economic team's worries on how to maintain price stability are all about money. Generating employment in a given economy is a function of money, while attempt to improve on a nation's BOP is nothing other than money. These underscore the fact that money and all the debate on it was not a useless argument and it will not be. However, jumping into the discussion on the specification of its demand will be premature without first examining some critical issues that led to it.

Money to a layman bestows status as it commands goods and services. To an economist at the beginner's level, it is anything that is generally acceptable in exchange for goods and services and

settlement of debt. A probe into this definition will reveal that it is nothing short of trying to explain money in terms of its functions. Because if one is to state the functions of money, apart from mentioning the fact that it is a store of value and a unit of account, two other most important functions that come into one's mind is the fact that money performs the functions of means of payment and medium of exchange. The last two functions aptly captured in the above beginner's definition. Therefore it may be safe to define money as what money does. (Jhingan, 1994)

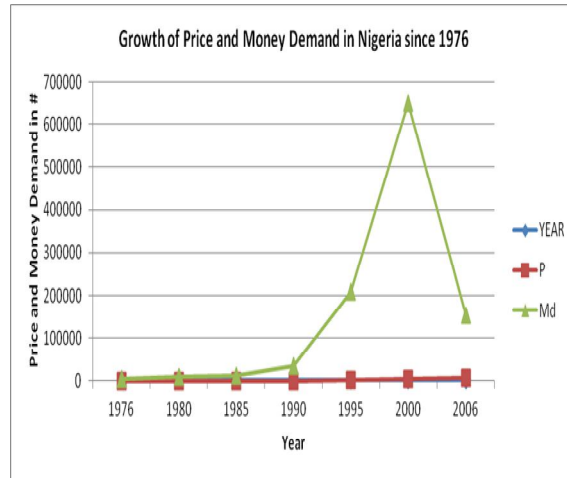
The apparent importance of demand for money is manifested on its impact of the monetary policy of any given economy and by extension on the macroeconomic policies. So important is the demand for money is role in the line of monetary transmission mechanism, as it affects supply of money, the price level, employment as well as output. The apparent simultaneous growth in the money demand and price level is shown in the table 1 below:

Table 1. Price and Money Demand Trend in Nigeria 1976-2006

YEAR	P	Md
1976	25.6	3,728
1980	42.3	9,227
1985	100	13,227
1990	293.2	34,540
1995	2040.4	207,509
2000	3923.8	649,684
2006	8059.6	152,986

Source: CBN Statistical Bulletin 2006

The above table can be represented in the diagram as shown below:



From the two figures above, it is clear that both money demand and the price level followed the same upward trend from 1976 to year 2000, although there was apparent decline in the demand for money from 2000 to 2006, the bottom line from graphical analysis above is that demand for money has a strong impact on the price level and as such a visit to the demand for money specification is of paramount importance to economic analysis.

This study therefore attempts to empirically test the Quantity theory of money as restated by Milton Friedman, with a view of confirming the relationship between demand for money and its determinants as stated by the model using Nigerian data.

The paper is divided into five sections. Section I is the introduction. Section II examined theoretical issues concerning demand for money. Section III surveys the literature on the subject matter, while Section IV considers methodological approach and model specification. Section V presented and discussed the empirical result, while Section VI contains the conclusion and policy recommendation.

Theoretical Issues

Demand for money refers to the total amount of money balances that people want to hold for certain purposes (Keynes 1936). They are either expressed in nominal money balances (M^d) or real balances. The

latter taking cognizance of the price level as it is expressed as M^d/P . According to Iyoha (2002) one best way to examine the theoretical issues of demand for money is juxtapose the position of the classical school vis-à-vis neo classical school. Notable among the classical theory of demand for money is the Say's law of demand for money, Walrasian law of demand for money and the Quantity theory of money. Say's law propounded by J.B. Say posits that supply creates its own demand. The law guarantees that all goods produced in the economy will be purchased, hence any increase (or decrease) in output will generate an equivalent increase (or decrease) in spending. The conclusion here is that people hold money for transaction purposes.

In the position of Leon Walras, aggregate excess demand must be equal to zero in every market. This law forms the foundation of General Equilibrium Theory. The postulations go further by stating that excess demand for money balances and aggregate money value of excess demand for commodities are identically equal to zero for each individual. In essence, Walras law reinforces Say's law, and the bottom-line for the two laws is that people hold money for transaction purposes.

Associated with the notion of the two stated laws was the Quantity theory of money in its crude form. The theory made popular by Irving Fisher uses equation of exchange to explain why people demand for money. With M , V , P and T as variables of interest, theory concluded that price level is a function of money supply. This particular theory had undergone series of transformation and empirical testing. Chief among the theories that have emanated from the Fisher's equation of exchange was the Cambridge version of the theory. The Cambridge version is otherwise called the Cash Balances approach; a product of the neo-classical school changed the focus of the quantity theory without changing its underline assumption. Anyawu (1993). The conclusion of the neo-classical is nothing other than the confirmation of the Quantity theory, as they conclude that price level is proportional to the supply of money.

One other extension of the Quantity theory which actually forms the basis of this research work is the modern quantity theory of demand for money. The work which is a restatement of the quantity theory was presented in 1956 by Milton Friedman. In that work, a completely new model of demand for money was specified and the validation of that model using Nigeria data is what this research work is all about.

Studies on the theory of demand for money will however be incomplete without mentioning the

1 M =Total money in circulation, V =Velocity of transaction, P =Price level and T =Total transaction in the economy

contribution of John Maynard Keynes. The work, liquidity preference was formulated based on the perceived flaw noticed from the Quantity Theory. Keynes opined that the quantity theory's framework was too rigid to analyze the effect of changes in the money supply on expenditures and price level. He then developed alternative theory of demand for money which is now a milestone in annals of monetary economics. The theory postulated that people demand money for three reasons: transaction purposes, precautionary purposes and speculative purposes. Whereas for the first two reasons, money demand is seen as a function of income and that that demand for money is positively related to income level, demand for money is seen as function of income and rate of interest under the third reason. For speculative demand for money, demand for money is positively related to income and inversely related to interest rate.

LITERATURE REVIEW

Theoretical Literature

As noted in the preceding sub-section, what later became a topical issue started with the Say's law of supply creating its own demand. The tenet of the classical theory is that goods produced in an economy will be purchased hence any increase or decrease in output will generate an equivalent increase or decrease in spending. The bottom line is that people demand money for transaction purposes. (Anyawu, 1993). Followed from the above is the Walras law which states that aggregate excess demand must equal to zero in every market. This means that excess demand for money balances and the aggregate money value of excess demand for commodities are identically equal to zero for each individual consumer. These two laws re-inforces each other.

Closely related to the notion of Say's law is the Quantity theory of money of Irving Fisher. The Fisherian equation of exchange $MV=PT$ establishes that the level of prices is a function of the money supply. An extension of this theory is found in the Cambridge version that modified the Fisherian version into what is known as the Cash Balances approach. The Cambridge version concluded that money supply is proportional related to the price level. Other earlier attempts made on the theory of demand for money The Real Balance Effect of A.C. Pigou and The Milton Friedman's restatement of the Quantity theory of money.

The Keynes liquidity preference theory marked the turning point in the debate on the theory of demand for money. The theory postulates three motives for holding money; the transaction motive, the precautionary motive and the speculative motive.

Where $M_T=f(Y)$, $f'(Y)$ is the transaction demand for money, $M_P=f(Y)$, $f'(Y)>0$ is the precautionary demand for money and $M_T=f(Y, r)$, $f'(Y)>0$, $f'(r)<0$ the speculative demand for money. Post Keynesian models of demand for money include Baumol's Inventory model of Cash Management, Tobin's Portfolio Balance Approach, Tsiang's Inventory Theoretical Analysis, Karl Brunner and Allan Meltzer's Wealth Adjustment Process Approach to mention a few. All these theories have come out with models of demand for money with money demand as the dependent variable.

Further improvement on the studies of demand for money is in the area of the stability of demand for money specified. Andersen (1985) focuses on the analytical problem related to disequilibrium in money market. The paper made a distinction between a conventional approach which estimates the behavior of money shocks as if they were demand determined, and an alternative or disequilibrium approach which regards short term changes in money balances as being determined in the supply side. One major contribution of the study is the inclusion of rate of inflation in the money demand function. The rate of inflation will serve as a proxy for uncertainty and the associated precautionary motive for holding money. The rate is expected to be positive related to demand for money.

Empirical Literature

As a background for general studies on modeling of demand for money, Ericsson (1998) provides a framework for doing such. With illustrations of new results on the demand for narrow money in the United Kingdom, a good model of demand for money should be based on a sound understanding of economic theory, data measurement, parameter constancy, the opportunity cost of holding money, cointegration, model specification, exogeneity and inferences for policy.

Hendry and Ericsson (1991) presents congruent error correction models of M_1 demand in the UK and the US over the past three decades with a view to explaining several puzzles in the literature and provides weights into the role of money demand for policy. Backing their study up with the replication of 1988 model of demand for money in UK by Hendry, a congruent model of money demand for the UK was developed with the aim of remedying puzzles and issues that are associated with demand for money model. With the employment of Chow statistics for stability test, it was concluded that two conditional models of money demand in the UK and the US have remained remarkably constant and otherwise well specified in the presence of substantial data revisions.

Rose (1985) attempted at providing an alternative solution to the "case of the missing money" using the

2 Where M =Total Money in Circulation, V =Velocity of Transaction, P = price level and T =Total transaction in the economy.

methods of Hendry (1979). The work sought to explain empirical difficulty without presenting a new theoretical model of demand for money. Specifically the study attempted finding answers to the questions of – was there actually a shift, or a series of shifts in the demand for money? If not, why have other investigations concluded that there was in fact a shift? The conclusion was that a different sort of econometric methodology effectively eliminates the problem of missing money episode.

In a classic article, Hallman et al (1991) examined the relationship between the price level and the M2 monetary aggregates in the long run. With a starting equation reminiscent of the Fisherian equation of exchange, and with data from 1955 to 1988 on one hand, and extension of the data to as far back as 1870 to the period of Korean war on the other hand, the study concluded among other things that embedding the long run relation between the levels of money and prices in the model has a significant pay-off in terms of tractability of the model and its forecasting performance for the period since the Korean War.

Ericson et al (1994) examined demand for money in UK from a different perspective. While acknowledging all previous studies on narrow money demand in the UK, the point of departure is in the area of using seasonally unadjusted data for money, prices and expenditure. The study employs the method of cointegration, error correction, general to specific modeling dynamic specification, model evaluation and testing, parameter constancy and exogeneity. The study also establishes theoretical and empirical relationship between seasonally adjusted and unadjusted data and so between models using those data. Finally, an encompassing test for comparing models using adjusted data with models using unadjusted data was derived and implemented. Unlike the ‘standard’ encompassing framework, it concluded that variance dominance is not always a necessary condition for encompassing.

Ahumada (1992) models money in the complex, highly inflationary environment of Argentina using 1977 – 1988 data. The paper enables the long run determinant using information set which include interest rates, domestic prices and transaction volumes. Cointegration techniques proposed by Engle and Granger (1987) and extended by Johansen (1988), are applied to evaluate the long run hypothesis that real money, real income and inflation rate are cointegrated. The data are then used to specify the dynamics of the model following the “general – to – specific” methodology developed by Hendry et al. The conclusion is that there is a stable relationship over the major policy changes from July 1985 to December 1988. The study also came out with a conclusion on the exogeneity issues after applying several tests. The conditional model of real

cash balances appears constant, so the empirically non constant univariate marginal models for inflation and the interest rate imply the super exogeneity of those valuables in the conditional model. This is in contrast to Engle and Hendry’s variable – addition test that is less conclusive.

Studies conducted on the Nigerian economy were pioneered with the popular TATOO debate of the 70s. The first of the series of the debate was Tomori (1972). The work attempted to examine the factors which have influenced the demand for money in the Nigerian economy between 1960 and 1970. Other objectives of the paper were to establish whether there is or a stable demand for money function in Nigeria and to actually specify the demand for money function in Nigeria. Using annual data from 1960 to 1970 and testing 2 sets of data 1960 – 1970 and 1966 to 1970 to isolate the effect of the civil war in Nigeria, the study concluded among others:

- 1) That income is a significant variable in determining the variation in the demand for money in Nigeria.
- 2) The narrow definition of money seems to perform better than the wider definition.
- 3) That income is better or more important in explaining the demand for money than the rate of interest.

As a reaction to Tomori (1972), Ajayi (1974) in addition to criticizing Tomori’s paper pointed out a number of theoretical and methodological problems. These problems include among other things, what Ajayi considered as a wrong conclusion on what constitute a better definition of money in Nigeria. This is due to the fact that Tomori concluded that M which he called narrow definition of money performs better than a broad definition of money than M*. To Ajayi, that M performs better than M* is no evidence of M being a better definition of money than M*, it should be interpreted within the context of institutional realities. The issue of non-reportage of Durbin –Watson by Tomori was equally identified. The work then re-specified demand for money in Nigeria and concluded as follows:

- i) Income alone explains about 81% of the demand for money when narrow definition of money is used as opposed to 85 – 86% when the wider definition is used.
- ii) When the interest rate is entered in a multiplicative form it was found out that it came with the wrong signs and it statistically insignificant and the wider definition of money still perform better than the narrow definition.
- iii) That interest elasticity of the demand for money is very low and that demand for money is not sensitive to short term interest rate changes.

Teriba (1974) is also a knock on Tomori (1972). According to the study, the pioneering work of

Tomori suffered from several methodological pitfalls and interpretational defects, including the problem of inadequate model specification. The study picked hole on the choice of discount rate as a proxy for interest rate in the model specification. The argument of non – availability of data on interest rate from CBN and the cases of fragment reports on interest rates were debunked. To remedy some of the defects in Tomori's work and to present some evidence contrary to those of Tomori, Teriba (1974) re-specified a demand for money function and concluded among other issues that the civil war period had no significant effect upon the demand for money or its components. The negative sign of the co-efficient indicates the impact of inflation at that period which made real asset more attractive. Income is the most significant variable in the demand for money or its components in Nigeria

Ojo (1974a) was more of a rejoinder to an earlier publication. The work was also meant to point out some other errors not mentioned by the others above. First was to correct the notion that Keynes and his cohorts dethrone money and that the neo classical were trying to reverse the situation. The study pointed out that at no point in time did Keynes emphasize unimportance of money. Also a possibly typographic error or writing Y/P as YP was mentioned. Lastly and most importantly too the paper argued that real rate of interest was better specified as

$$r = i - \frac{1}{P} \frac{dP}{dt}$$

Instead of r/P as stated by Tomori

Where i = money rate of interest

r = real rate of interest

$\frac{1}{P} \frac{dP}{dt}$ = rate of change of the price level.

Pdt

Odama (1974) criticized the econometric technique adopted by Tomori emphasizing error in approaches. Specifically his comments focused on two aspects of Tomori's results. The first concerned the formulation of an alternative model and the reference of such a model for policy actions. The seconds relates to the statistical results and the conclusions there from. The paper cautioned that the result in Tomori's work should be interpreted with utmost caution.

METHODOLOGY AND MODEL SPECIFICATION

The methodology that will be used for this research is that of econometric and the research technique is Cointegration and Error Correction Model. The models for the study are specified as follows:

$$M^d = f(r_b, r_e, P, 1/P(dP/dt), w, W, u) \quad (1)$$

This model is based on the original specification by Friedman (1956) as cited in Anyawu (1993).

Where, M^d = money Demand

r_b = interest return on yield or bonds

r_e = rate of returns on equity

P = the price level

$1/P(dP/dt)$ = the rate of price change over time.

w = ratio of human to non human wealth

W = Wealth of the economic actor or permanent income, u = taste and preferences

Where Prime Lending Rate (PLR) was used to proxy r_b , rate of return on Treasury Bills was used to proxy r_e , price level (P) was as obtained from CBN Statistical Bulletin of various edition, per capita income as obtained from World Development Indicator (2007) was used to proxy Wealth of the economic actor (W), The ratio of Per Capita Income to Gross Capital Formation was used to proxy ratio of human to non human wealth to derive (w), and a dummy variable of 0 and 1 was used to proxy taste and preferences. 1 was attached for any positive change in the price level while 0 was used to proxy a negative change in the price level. The above model when linearly expressed is given as

$$M^d = \alpha + \beta r_b + \delta r_e + \theta P + \rho 1/P(dP/dt) + \sigma w + \phi W + \Omega u + e_t \quad (2)$$

Where e_t is the stochastic term

The a priori expectation for the model is such that

$\beta < 0, \delta < 0, \theta > 0, \rho < 0, \sigma > 0, \phi > 0, \Omega > 0$ or $\Omega < 0$

EMPIRICAL RESULTS

This section focuses on the empirical relationship between money demand and its determinants as postulated by Friedman. The data used has been that of 1970 -2008 spanning 39 years. It is a time series which from the knowledge in economic literature is prone to serial or autocorrelation. To avoid that, unit root test was conducted based on Augmented Dickey Fuller (ADF) to test for the stationarity or otherwise of the variables in the model.

Unit Root Test

The table below shows the result of the ADF conducted on all the variables. The test shows that all the variables have unit roots i.e. the variables are non-stationary. Stationarity was, however, obtained by differencing the variables. The result is as tabulated below:

Table 2: Augmented Dickey Fuller for Unit Root Test (1960-2008)

Variables	At levels	1 st Difference	2 nd Difference	Order of Integration
M^d	-1.546668	-4.3338*	-6.645130	I(1)
r_b	-1.68268	-6.6658*	-9.983083	I(1)
r_e	-1.71096	-5.01046*	-9.231472	I(1)
P	4.08926*	-1.64512	-8.117849	I(0)
$1/P(dP/dt)$	-3.62128*	-6.315126	-7.945056	I(0)
w	0.67115	-2.31799	-11.00449	I(2)
W	-1.621257	-3.228114**	-5.268818	I(1)
U	-4.301163*	-7.035624	-8.944272	I(0)

Source: Own Computation using E-Views 4.1

Critical values at 1%, 5% and 10% respectively are -3.6229, -2.9446 and -2.6105

*Significance at 1%, **Significance at 5%

From the above table, all the variables have unit roots. The variables are however made stationary by differencing. While real money demand (M^d/P), rate of returns on bond (r_b), rate of return on equity (r_e) and the ratio of non-human to human wealth are all integrated of order 1, the price level (P), rate of change in price level over time [$1/P(dp/dt)$] and taste and preferences (u) are integrated of order 0. Only human wealth (W) was found to be integrated of order 2.

Table 3: Johansen Co-integration Test

Sample: 1970 2008

Included Observation: 37

Test Assumption: Linear Deterministic Trend in the Data

Series: M^d/P , r_b , r_e , P , $1/P(dp/dt)$, w , W , u

Lag Interval: 1to1

Eigenvalues	Likelihood Ratio	5% Critical Value	1% Critical Value	Hypothesised No of CEs
0.789	212.012	156.00	168.36	None **
0.672	154.435	124.24	133.57	At most 1 **
0.641	113.189	94.15	103.18	At most 2 **
0.583	75.269	68.52	76.07	At most 3 *
0.435	42.882	47.21	54.46	At most 4
0.379	21.773	29.68	35.65	At most 5
0.105	4.138	15.41	20.04	At most 6
0.000	0.0134	3.76	6.65	At most 7

Source: Own Computation

Note: *(**) denotes rejection of the hypothesis at 5% (1%) significance level

From the above result, it can be confirmed that real money demand and its determinants are subject to an

Co-Integration Test

Having established the existence of unit root in the variable, co-integration tests were conducted on the model using the Johansen co-integration test. In determining the number of cointegrating vectors, the study adopted degree of freedom adjusted version of the maximum eigenvalues and trace statistics. The Likelihood Ratio test indicates four cointegrating equations at 5%. The table is as presented below:

equilibrating relationship and are both positively and negatively related to each other in the long run. Following the above the regression result that shows the estimate of the parameters of the model is as shown in the table below:

Table 4: Ordinary Least Square Regression Result for the model
Dependent Variable (M^d/P)

Variable	Coefficient	Std Error	t- statistic	Prob
Constant	-35.229	15.895	-2.216	0.034
r_b	-1.633	0.725	-2.252	0.032
r_e	-1.336	0.798	-1.676	0.104
P	0.016	0.003	5.506	0.000
$1/P(dp/dt)$	-25.909	14.320	-1.809	0.080
W	0.047	0.007	7.048	0.000
w	-237.089	54.401	-4.358	0.000
U	10.844	9.134	1.187	0.244
R- Squared		0.849	Mean dependent var	58.965
Adjusted R-Squared		0.815	S.D. dependent var	20.226
S.E. of regression		8.700	Akaike info criterion	7.345
Sum squared resid		2346.340	Schwarz criterion	7.686
Log Likelihood		-135.231	F-statistic	24.913
Durbin-Watson Stat		1.816	Prob(F-statistic)	0.000

The above result can be expressed in a linear form as follows:

$$M^d/P = -35.23 - 1.633r_b - 1.336r_e + 0.016P - 25.909/P(dp/dt) + 0.0467W - 237.09w + 10.844u$$

(-2.22) (-2.25) (-1.68) (5.51) (-1.81)

(7.05) (-4.36) (1.19)

The above is a product of time-series data concerning the values of demand for money represented by M^d/P , return on bond (r_b), return on equity (r_e), the

price level (P), change in price level over time ($1/P dp/dt$), human wealth (W), ratio of human to non human wealth (w) and taste and preferences (u). With a priori expectation as stated previously, it is observed all the signs came out as expected with the exception of the sign of w which is negative contrary to the expected positive sign. The signs are not just as expected but also significant judging the t statistics reported in parenthesis above.

From the result a 1% increase in returns on bond will depreciate demand for money by 1.633million naira. Likewise a 1% increase in return on equity reduces demand for money 1.336million naira. A #1 change in the price level bring about #0.0161million change in money demand, while a #1 change in price over time about #25.91 negative change in money demand. A naira increase in human wealth increases money demand by #0.0466million, while a 1% increase in the ratio of human to non human assets reduces money demand by #237.088. Taste and preferences show that people prefer to hold more money by as much as #10.844million when their taste is in favour of activities within the economy.

It is noted R^2 , which is a measure of overall goodness of fit in the analysis is very high. At a high level of 0.85 or what can be regarded as 85%, it means that the proportion explained by the independent variable is 85% while the remaining 15% was explained by error term. We equally see that the adjusted R^2 that allows for degree of freedom is equally high. This R^2 allows to compare equations with different explanatory variables and equally to determine that one-to-one relation between R^2 and the residual variance. The R^2 is most useful in a simultaneous equation with the best predictive ability.

Reported in parenthesis are t-values. The t-values are obtained by the ratio of the estimated parameters to the standard error of the parameters. Therefore the t test is a test to determine whether or not a given independent variable belongs to a particular equation. It is a good or reliable indicator of the dependent variable. From the result, it is seen that t -ratio of r_b , r_e , P , $1/P(dp/dt)$, W , w and u are (-2.22), (-2.25), (-1.68), (5.51), (-1.81), (7.05), (-4.36) and (1.19) respectively. Using the rules of thumb that gives significance to the t-value higher than 2 at 5%, we may be forced to conclude that the t-values of all the explanatory variables with the exception of that of taste and preferences (u) are significant. at 5%. However a proof of this is found that the t tabulated t values at 5% i.e. $t_{5\%,39} = 1.68$. Since the t value of 1.68 is greater than on the t-calculated of 1.19, it

shows that the t value is significant for all the variables except that of u .

The F ratio is an improvement over the t-ratio is a test of significant linear relationship between the independent variables taken together and the dependent variables. Whereas the t -ratio tests variable by variable in the equation, the F-ratio takes the whole independent variables in bulk and test. Using the F test, the tabulated F is equal to $F_{31,39,5\%}$ is 3.34. Since our F calculated of 24.91 is greater than 3.34, the test is significant and the independent variables put together are good and reliable indicators of the dependent variables. The Durbin-Watson test statistics is used to test for serial correlation or autocorrelation in the data used to run a regression. The result which can be interpreted to mean that any regression with significance of autocorrelation means that the successive data in the series are dependent on one another. From the result the DW is 1.81 and the tabulated DW 0.8152 for lower value and 1.579 for upper value. It therefore suggests that the data used is devoid of serial correlation and that the regression estimates are unbiased..

Error Correction Model

In order to establish the long run relationship between the dependent variable and the independent variables of the model, equation 2 can be transformed into an econometric model under the ECM framework as follows:

$$dM^d/P = \pi_0 + \pi_1 \sum_{a=0}^m dr^a + \pi_2 \sum_{b=0}^m dre^b + \pi_3 \sum_{c=0}^m dP + \pi_4 \sum_{d=0}^m d\left(\frac{P dp}{dt}\right) + \pi_5 \sum_{e=0}^m dW + \pi_6 \sum_{f=0}^m dw + \pi_7 \sum_{g=0}^m du + \pi_8 ECM(-1) + \varepsilon_t \quad (3)$$

d in the equations stand for first differencing, while ECM is the error correction mechanism for the model. The significance of the ECM in the model is to indicate how disequilibrium in demand for money can be adjusted in the short run. The result of the ECM for the model is presented in the table below:

Table 5: Parsimonious Error Correction Model Dependent variable is $d(M^d/P(-1),2)$

Variables	Coefficient	Std Error	t- Statistic	Prob
$d(rb(-1),2)$	-0.327104	0.448877	-0.728715	0.4724
$d(re(-1),2)$	0.390990	0.528891	0.739264	0.4661
$d(P(-1))$	0.001547	0.003082	0.501920	0.6198
$d(1/P dp/dt(-1))$	-64.10082	11.77986	-5.441562	0.0000
$d(W(-1),3)$	-0.021751	0.008384	-2.594428	0.0151
$d(w(-1),2)$	-211.2734	116.2376	-1.817600	0.0802
$d(u(-1))$	26.35852	4.412114	5.974126	0.0000
$d(ECM(-1))$	-0.481208	0.171935	-2.798771	0.0094

Source: Author's Computation

As stated earlier, the significance of ECM is to indicate how the departure from the long run

disequilibrium is corrected in the short run. To do this, the coefficient of the ECM comes handy. As shown in table 4, the coefficient of ECM is -0.48,

which is a reasonably good adjustment process. The speed of adjustment which is significant at both 5% and 1% suggests that about 48% of the disequilibrium in the previous year's shock adjusts back to the long run equilibrium in the current year.

CONCLUSION

This study tests the validity of Milton Friedman's restatement of quantity theory using Nigerian data. The study made use of time series data spanning thirty-nine years from 1970 to 2008. And because of serial/auto correlation that is normally associated with time series data, co-integration econometric technique was adopted. The unit root test conducted confirms the existence of non-stationarity in the data. This was however corrected after first differencing to avoid spurious result at the end of the study.

The result obtained from the OLS estimates shows all the variables apart from that of the ratio of non-human to human wealth are in conformity with Friedman's model. Whereas the original model specifies a positive relationship between demand for money and that non-human wealth to human wealth, the result shows a positive relationship. The deviation to our thinking follows the declining situation of the country's per capita income over the years. The reason for this assertion is that human wealth from our model was proxied by Per Capita Income in the variable of human to non-human wealth. and since the PCI forms the numerator, the lower its value over the years, the more it exerts negative impact on the demand for money.

In sum, the study confirms the validity of Milton Friedman's restatement of Quantity theory of money with the exception of the contrary relationship that existed in the variable mentioned above.

REFERENCES

- Adebiyi, M.A. (2004). Stability of Money Demand and Monetary Policy in Nigeria: An Error Correction Analysis Model. *The Journal of Social and Management Scientist*, 1(1): 53-70.
- Adubi, A. A. and Okumadewa, F. (1999) "Price, exchange rate volatility and Nigeria's Agricultural Trade flows: A Dynamic Analysis" AERC Research Paper 87
- Ahumada H., (1992) "A Dynamic Model of the Demand for Currency: Argentina 1977 – 1988" *Journal of Policy Modeling*, Vol. 14, No3, pp. 335 – 361.
- Aizenman, J. (1998) "Monopolistic Competition and Labour Market Adjustment in the Open Economy" www.nber.org/chapters/c8058
- Ajayi, S.I (1974) "The Demand for Money in the Nigeria Economy: Comments and Extension," *Nigerian Journal of Economic and Social Studies* Vol. 16, No1 pp. 165-173
- Ajayi, S.I (1977) "Some Empirical Evidence on the Demand for Money in Nigeria" *American Economist* (Spring)
- Ajayi, S.I (1978) "Money in a Developing Economy: A Portfolio Approach to Money Supply determination in Nigeria." University of Ibadan Press Limited.
- Anyanwu, J. C. (1993) "Monetary Economics: Theory, Policies and Institutions" Hybrid Publishers Limited, Onitsha, Nigeria.
- Baumol, W. J. (1952) "The Transaction Demand for Cash: An inventory-theoretic approach", *Quarterly Journal of Economics*.
- Engle, R. and C., Granger (1987) "Cointegration and Error Correction: Representation, Estimation and Testing" *Econometrica*, 35, pp. 251-276
- Ericsson Neil R, David F. Henry and Hong Anh Tran (1994) "A cointegration seasonality, Encompassing and the demand for money in the United Kingdom" @ chapter 7 in Colin Harygreaves ed. *Nonstationarity, Time Series Analysis And Cointegration* (Oxford; GP pp. (179 – 224)
- Ericsson Neil R, (1998) "Empirical Modeling of Money Demand" *Journal of Empirical Economics*, vol 23, No3 pp. 295 -315.
- Ericsson Neil R, and S. Sharma (1998) "Broad Money Demand and Financial Liberalization in Greece" *Journal of Empirical Economics* Vol. 23, No 3 pp. 417 – 436.
- Fakiyesi, T. (1980), "Demand for Money in Nigeria: Analysis of Distribution Lag Structure", *Nigerian Journal of Economic and Social Studies*, Vol. 22, No.1, 23-39.
- Friedman, Milton (1956), "The Quantity Theory of Money: A Restatement" in *Studies in the Quantity Theory of Money*, edited by M. Friedman.
- Granger, C., and P. Newbold (1974) "Spurious Regressions in Econometrics" *Journal of Econometrics*, Vol 2, pp 111-120.
- Hallman, Jeffery J; Richard D. Peter and David H. Small (1991). "Is the price level tied to the M_2 Monetary Aggregate in the long run?" *American Economic Review* Vol. 81, Issue 4, pp. 841 – 858).

Henry, David F. & Neil R. Ericsson (1991) "Modeling the Demand for Narrow Money in the United Kingdom and the United States" *Economic Review* Vol. 35, No 4 pp. 833 – 881.

Iyoha, M. A.(2002) "Macroeconomics: Theory and Practice" Mareh Publishers, Benin City, Nigeria.

Keynes, J. M. (1936) "The General Theory of Employment, Interest and Money" Harcourt, Brace and World, New York City.

Odama J.S. (1974), "The demand for Money: A Comment," *Nigerian Journal of Economic and Social Studies*, Vol.16, No 1,pp.175-178.

Ojo, O (1974a) "The Demand for Money in Nigeria Economy: Some Comments", *Nigeria Journal of Economic and Social Studies*, Vol.16, No 1, 149-152.

Rose, A. K. (1985) "An Alternative Approach To The American Demand For Money" *Journal of Money, Credit and Banking* Vol. 17 No4 part 1 pp 439 – 455.

Taylor, J. B. (1995) "The Monetary Transmission Mechanism: An Empirical Framework" *Journal of Economic Perspective* 9/4, pp 11-26

Teriba, A.O (2003), "Another Look at the Transactions Demand for Money in Nigeria" A. PhD Thesis submitted to the Department of Economics and Finance, University of Durham, Durham England.

Tomori, S. (1972) "The Demand for Money in the Nigerian Economy" *Nigerian Journal of Economics and Social Studies* (November)

Tobin, James (1958). "Liquidity Preference as behaviour Towards Risk" *Review of Economic and Statistics*.