Developing Country Studies
ISSN 2224-607X (Paper) ISSN 2225-0565 (Online)
Vol.4, No.19, 2014

The Demand for Money, Structural Breaks and Monetary Policy in the Gambia

Michael O. Nyong
Department of Economics, University of Calabar, Nigeria
Email:nmikolo@yahoo.com

Abstract
As part of the IMF sponsored stabilization programme, the Gambia has been pursuing base monetary targeting. To ascertain whether this policy framework satisfies the necessary condition for effectiveness, this paper presents an empirical investigation into the determinants and stability of money demand (M2) in the short-run and long-run in the Gambian economy during the period 1986:1 - 2012:4. Using theoretical defensible specification of the money demand function in line with the Keynesian precautionary, transacation and speculative motives for holding money and its various extensions by Friedman, Baumol and Tobin, the paper applied Gregory -Hansen cointegration techniques allowing for structural breaks. The papers finds the existence of a long run and short-run cointegration relationship in the money demand function and its determinants namely income, interest rate, inflation and exchange rate in the Gambia. The cointegration relationship with breaks suggests a structural break which occurred in 1995:1 reflecting the military coup and fall in foreign aid in the Gambia during the period. The structural break is also clearly identifiable with the 50% devaluation of the CFA franc, the border closure and transit controls in Senegal, as well as the suspension of convertibility of the CFA franc outside the franc zone in the period 1994-1996. Through establishing the existence of a dynamic short-run error correction model we found that cointegration model with intercept shift best characterize the equilibrium relationship of the money demand function when there exists a structural break. Furthermore, by the cumulative sums of squares of recursive residuals test, the CUSUM and CUSUMSQ tests, we found that the money demand function is unstable both in the short-run and in the long-run during the period under investigation. Consequently the continued use of monetary targeting by the Central Bank of the Gambia (CBG) is misguided and suboptimal. This is even more so because there is no statistically significant relationship between money supply and inflation. The Central Bank of the Gambia (CBG) should adopt instead a flexible combination of elements of inflation targeting and monetary supply target framework to maintain price stability and promote noninflationary economic growth.

Introduction

The demand for money has attracted the attention of great economists of old. From David Hume(1752) to Irving Fisher (1896, 1911), John Maynard Keynes (1923, 1936), William Baumol(1952), Milton Friedman (1956) and James Tobin (1956, 1958) these economists have examined the determinants of the demand for money. Since then the interest in the demand for money has not abated as seen in Adekunle (1968) for developed and developing countries, Tomori(1972) for Nigeria, Wong (1977) for developing countries, Judd and Scadding (1982), in a survey, Calomiris and Domowitz (1989) for Brazil, Arize (1989) for four Asian countries, Kallon (1992) for Ghana, Adam (1992a,b) for Kenya, and Fielding (1994) for African countries. Others include Agenor and Khan (1996) for developing countries, Ericsson(1998) for United Kingdom, Lee and Chung(1995) for Korea, Simmons (1991) for five African countries, Nyong (2001) for Nigeria, Bahmani-Oskooee and Rehman(2005) for Asian developing countries, Bahmani-Oskooee and Gelan(2009) for African countries, Drama and Yao (2010) for Cote d'Ivoire, Halicioglu andUgur(2005) for developing OECD countries, Haug (2006) for Canada and Abdelnacer et al. (2013) for Algeria.

The sustained interests in the demand for money is predicated on the fact that understanding the key determinants of money demand is central to effective monetary policy formulation and implementation, irrespective of whether the economy is developed or developing. To this end stability of the money demand function is of critical importance. If money demand is stable, it becomes possible for central banks to predict the impact of monetary policy on various macroeconomic aggregates such as inflation, output, consumption, and investment. Poole (1970) argued that the rate of interest should be targeted if liquidity preference is unstable, while monetary aggregate (M1 or M2) should be targeted to stabilize the economy if money demand is stable and investment-savings relationship is unstable. Thus, the stability of the money demand function is required if monetary targeting is to become an optimal policy choice for the conduct of monetary policy. A stable money demand function implies stable money multiplier and, therefore, stability guarantees that predicting the effect of a given money supply on aggregate income is possible (Pradhan and Subramanian 2003, Narayan and Narayan 2008). Consequently, it is necessary to select the correct monetary policy instruments since selecting the wrong instruments may lead to large fluctuations in output and inflation.

The interest in money demand according to Sriram (2001) is further heightened in recent years by "the

concern among central banks and researchers" on the effect on money demand of " movement toward flexible exchange rate regime, globalization of capital markets, ongoing domestic financial liberalization and innovation, advancement in time series econometrics, and country-specific issues". Thus, the stability of money demand should be continuously evaluated in the light of these financial developments across countries.

Despite the importance of the demand for money for the conduct of monetary policy, it comes as a surprise that empirical studies on the subject in the Gambia are few. A search identifies only three, namely Ceesay (2000), Subramanian (2009), and Jammeh(2012). The first and the third are thesis submitted for the award of degrees while the second is a study a staff of IMF. While Ceesay examined the demand for narrow money (M1) alone, Subrahmanian (2009) focused on the long –run demand for broad money (M2). He observed that the demand for money in The Gambia is not stable and therefore the continued use of monetary targeting by the Central Bank of The Gambia (CBG) is clearly suboptimal. He noted that the money multiplier has also not been stable and no "clear relationship" exists "between growth in broad money and inflation". This view is consistent with an earlier findings by Worrell et al. (2008) who noted that "monetary policy [in The Gambia] is conducted in an environment of uncertainty about the stability, persistence and relative importance of the possible channels of monetary transmission".

Although Jammeh (2012) investigated the short –and long-run determinants of demand for money and its stability there are some important shortcomings that require attention. First the omissions of own rate of interest for M2 in the money demand function specification and estimation casts some doubt on the appropriateness of the estimated money demand function for the Gambia. As noted in Ericsson(1998), failure to include own rate of money often leads to break down in the estimated money demand function during periods of financial innovation. Second the failure to recognize the importance of structural breaks and endogenizing the break within the underlying cointegration framework suggests that misleading conclusion about the money demand relationship is possible. Given the various political, financial and economic shocks that hit the Gambia it is expected that such shocks must have exerted significant impact on the nature of the relationship in the money demand function as is the case in other studies (Narayan and Narayan 2008, Singh and Pandey 2009, Rao and Kumar 2009, Singh and Kumar 2010; Kumar et al. 2010, Chukwu et al. 2010, Omotor and Omotor 2011, Banafea 2012).

Given the lacunae identified in previous studies on the demand for money in the Gambia, the objective of this study is to contribute to the empirical literature on the stability of money demand by investigating and estimating money demand relationships using more up-to-date econometric methods that allows for endogenous structural breaks in the cointegrating relationship for the Gambia. Specifically, we estimate determinants of the money demand function and test for the stability of the relationship in the short- run and in the long-run. The method used is the Gregory-Hansen cointegration approach in view of its superiority to other cointegration methods such as the residual based Engle-Granger (1987) two-step approach, the Full Information Maximum Likelihood Multivariate Johansen (1988, 1992), Johansen and Juselius (1990), Pesaran and Pesaran(1996), Pesaran and Shin (1998), Pesaran and Schimdt (1999), and Pesaran et al. (2001). These and other cointegration models fail to capture endogenous structural breaks in the underlying long–run equilibrium relationship. This way our study hopes to contribute to effective monetary policy formulation and implementation in the Gambian economy.

The rest of this study is organized in five sections. Section I has been the introduction. In section II we provide a brief review of monetary policy in The Gambia and the various shocks that hit the economy. The theoretical framework and analytical methodology are articulated in section III. We present the empirical results and the analysis in section IV. We conclude the study in section V with a summary of the main results and some monetary policy implications.

II The Conduct of Monetary Policy in The Gambia

The Gambia is a small, least developed and open economy with a narrow economic base. The economy is heavily dependent on groundnut exports and tourism. After a relatively good economic performance in the early 1970s the Gambian economic and financial situations deteriorated as a result of expansionary financial policies, overvalued exchange rate and increasing imbalances in the balance of payments.

As a consequence the Government launched the economy recovery programme (ERP) in 1985. A managed floating exchange rate regime was adopted as well as interest rate deregulation in 1986. To consolidate on the adjustment reform, a programme for sustainable development was introduced in 1990. The Gambian vision 2020, adopted in 1996, remains the government's overall guiding development policy document. It calls for the transformation of the Gambian economy into a dynamic middle income country by 2020. To achieve this objective monetary policy and the Central Bank of The Gambia have crucial roles to play.

The CBG Act 2005 and the Monetary Policy Committee's (MPC) term of reference emphasizes monetary (price) stability as the core objective of monetary policy. This is important because price stability is critical in fostering macroeconomic stability which is part of the enabling environment for growth and

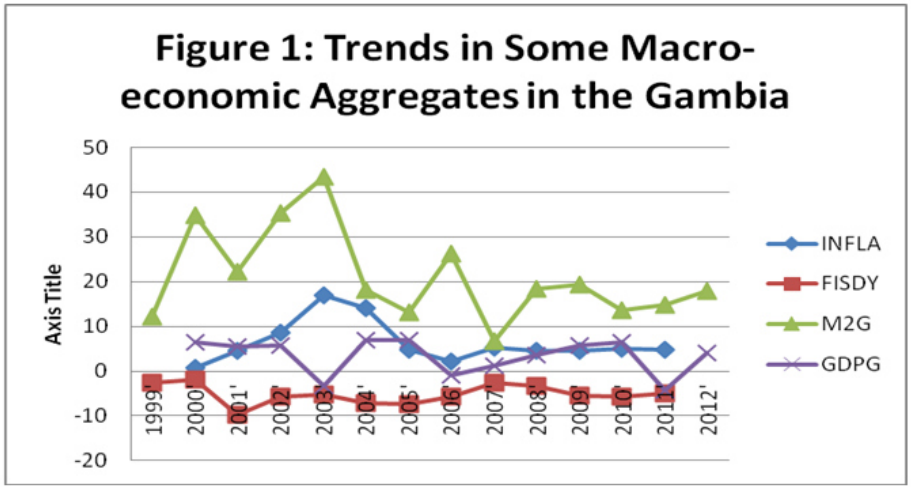
development. The Monetary Policy Committee meets every two months to decide on the level of rediscount rate which is announced by a press release. In the third quarter of 2005 the monetary policy rate was 21 percent. This was reduced to 19 percent during the fourth quarter. By fourth quarter of 2010 it has been cut to 15 percent. In this framework which assumes a stable demand for money and money multiplier, the CBG uses M2 as the intermediate target and high-powered money as operating target. The CBG continuously monitors net domestic asset (NDA) to ensure that it does not increase beyond a specified ceiling and net foreign asset (NFA) is also monitored such that it does not fall below a prescribed floor. The CBG signals its monetary policy stance by announcing the rediscount rate during the usual bimonthly meetings.

Prior to 2005, the CBG had been following an interest rate targeting regime whereby the bank rate is used as instrument to control inflation and effective demand. In 2002 the CBG increased the bank rate from 18 percent in the third quarter to 25 percent in the fourth quarter to contain effective demand and inflationary pressures which has increased from 7.7 percent to 13.4 percent. The bank rate was further increased to 28 percent by 2003:2.

As a guide to the amount of liquidity to be injected/mopped in the economy to attain operating target the MPC uses a short-term liquidity forecasting framework which takes into consideration the likely changes in government spending, the issuance of maturing treasury bills, and/or purchase/sale of foreign exchange during the forecast period (see Subramanian 2009). Although the CBG has available policy instruments such as open market operations (OMO), reserve requirements, rediscount window and purchase or sale of foreign exchange, it is OMO that is frequently used. For instance, in 2011, the objective of monetary policy was to contain inflation below 6.0 percent. To achieve the objective, open market operations was freely used as the major tool for liquidity management (WAIFEM, 2011).

As a core policy target, the outcomes of broad money (M2) growth in percent between 2006 and 2011 inclusive are 26.65%, 6.78%, 18.16%, 14.83, 17.84% and 11.20% respectively. These figures do not suggest good performance since they compare unfavourably with the targets. The broad money targets between 2006 and 2011 inclusive are 13.3%, 13.3%, 13.3%. 12.5, 12.5% and 12.5% respectively as seen in Central Bank of the Gambia statistical bulletin (various issues). The targets are also derived in part from the projections in the poverty reduction and growth facility programme (PRGF)(2006-2008). As a financial deepening variable, the ratio of credit to the private sector to GDP from 2006 to 2011 inclusive are respectively 12.8%, 12.7%, 13.5%, 13.7%, 13.1%, and 14% respectively (World Bank African Development Indicators 2013). These show modest improvements suggesting that more work needs to be done towards directing more domestic credit to the private sector. With monetary policy shift from interest rate targeting to monetary targeting framework, the policy relevance of this study is not in doubt.

In general monetary policy has largely been expansionary and accommodative with slippages from targets due to fiscal pressures. For example between 2002 and 2004, fiscal slippages, accommodating monetary policy, falling international reserves and depreciation of Dalasi by 55% in nominal effective terms led to inflation rising from 8.6% in 2002 to 17.03% in 2003 before moderating to 14.2% in 2004. Between 2000 and 2011 annual inflation averaged 6.39% and average GDP growth was about 3.37 during the same period. Average fiscal deficit/GDP ratio was about -5.19 % between 1999-2012 while money supply growth averaged 21.14% during the same period (World Bank 2013). Thus, average monetary expansion was very much in excess of the 9.8% predicted by quantity theory of money under constant velocity of circulation of money. Figure 1 highlights developments and trends in inflation rate (INFLA), growth in broad money (M2G), fiscal deficit/GDP ratios (FISDY), and economic growth (GDPG) between 1999 and 2012. There appears to be no linkage between monetary expansion and inflationary pressures in the Gambia.



The Gambia has experienced a number of shocks including (i) the 50 percent devaluation of the CFA franc in 1994 (ii) the military coup in 19994 which toppled a democratically elected civilian government, (iii) the drastic decline in foreign aid and tourism because of the coup, (iv) the presidential election of 1996, (v) the financial innovation of 2002 by which residents were permitted to have foreign currency deposits, (vi) the 55 percent devaluation in nominal effective terms in 2003 and (vii) the establishment of the Monetary Policy Committee(MPC) in 2004. The Gambian macroeconomic variables such as real GDP, broad money (M2), inflation (INFLA) and interest rates are likely to be affected by these structural changes particularly in estimating the money demand function.

III Theoretical framework and Analytical Methodology

The theoretical underpinning of the demand for money is rooted in the Keynesian liquidity preference theory of the motives for holding money (transaction, precautionary and speculative) and the extensions by the monetarists championed by Milton Friedman (1956) and others such as Baumol (1952) and Tobin(1956, 1958) in their inventory theoretic exposition. The arguments in the money demand have always included a scale variable (income) and opportunity cost of holding money which includes various forms of asset. In general the model takes the form:

M/P =f(Y, r, TBR) . . . (1)

or its extension

M/P =f(Y, r, R, TBR, INFL, EXR) . . . (2)

where M/P= real money balances, M=broad money, P=consumer price index, y=real income measured by real GDP reflecting the transaction and precautionary motives for holding money, r=own rate of interest measured by saving deposit rate, R=foreign interest rate measured by US short term interest rate capturing alternative returns on money in foreign financial assets, TBR=treasury bill rate for opportunity cost of holding financial asset in the domestic economy, INFL=inflation rate reflecting the opportunity cost of holding real assets in the goods market, and EXR=expected depreciation of the exchange rate capturing currency substitution and is measured by the exchange rate of the Dalasi against the US dollar.

The above equations captures monetary conditions in the Gambia which is a small open economy with managed floating exchange rate regime and a financial sector dominated by sixteen (16) banks as well as interest rate regime free of interest rate controls.

The econometric specification of the model for the Gambia takes the form:

$$L(M/P)_t = \lambda_0 + \lambda_1 LY_t + \lambda_2 r_t + \lambda_3 TBR_t + \lambda_4 INFL_t + \lambda_5 EXR_t + u_{1t} \quad . \quad . \quad . \ (3)$$

$$\lambda_1, \lambda_2 > 0, \lambda_3 < 0, \text{ but } \lambda_4, \lambda_5 > 0 \text{ or } < 0,$$

where t after a variable represents time, u_{it} is the stochastic error term with the usual white noise properties, and the signs for income (+), own interest rate(+) and domestic interest rate (TBR) (-) are straight forward as seen in various other studies: Arize et al. (1990), Adam(1992a,b), Kallon (1992), Arize (1992), Sriram(1999), Nacheta (2001), Akinlo(2005) Narayan and Narayan (2008), Sriram (2009) and Abdelnacer et al. (2013). However, the signs for expected inflation and expected depreciation of the exchange rate are ambiguous. When inflation is rising economic agents prefer to hold real assets rather than hold money in line with Friedman's reformulated quantity theory of money. However, the sign may turn positive in the peculiar circumstance where rising inflation leads to agents holding more money "in the expectation that their planned nominal expenditures go up". Similarly, as exchange rate depreciates domestic economic agents may substitute national currency for foreign currency. However, if depreciation heightens expectation that national currency will appreciate, this could induce residents to "hold more domestic money". Foreign interest rate (R) was excluded in equation (3) because preliminary analysis indicates this aspect of substitution is not important in the Gambia.

We first test for unit root using Ng Perron (2001) modified unit root test. The choice of the Ng Perron method is motivated by its superiority to the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests which suffer potentially severe finite sample power and size distortions. The ADF and PP tests have low power against the alternative hypothesis of stationarity or trend stationarity with a large autoregressive root(De Jong et al. 1992) and severe size distortions when the series has a large negative moving average root (Schwert, 1989). Within the Ng Perron framework the time series is detrended or demeaned by applying generalized least squares (GLS) approach which helps in improving its power and decrease the size distortions. Furthermore an optimal selection of the autoregressive truncation lag criteria is used given that the Akaike information criterion (AIC) and Schawrz Bayessian information criterion (SBIC) used in ADF and PP choose a miniscule lag length when there exists a large moving average root.

After testing for the order of integration of the variables in the money demand function we then apply the Gregory and Hansen (1996a,b) cointegration technique that considers structural break and identifies the break date. The null hypothesis of no cointegration is tested against the alternative of cointegration with breaks. We apply equation (2) to the three models considered by Gregory and Hansen (GH):

GH-1: Level Shift (Change in intercept): The Crash Model

$L(M/P)_t = \theta_1 + \theta_2 D_{tk} + \lambda_1 LY_t + \lambda_2 r_t + \lambda_3 TBR_t + \lambda_4 INFL_t + \lambda_5 EXR_t + u_{1t}$ . . . (3)

GH-2: Level shift with trend:Changing Growth Model

$L(M/P)_t = \theta_1 + \theta_2 D_{tk} + \beta_1 t + \lambda_1 LY_t + \lambda_2 r_t + \lambda_3 TBR_t + \lambda_4 INFL + \lambda_5 EXR_t + u_{1t}$ ... (4)

GH-3: Regime shift (intercept and slope coefficients change)

$L(M/P)_t = \theta_1 + \theta_2 D_{tk} + \beta_1 t + \lambda_1 LY_t + \lambda_{11} LY_t D_{tk} + \lambda_2 r_t + \lambda_{22} r_t D_{tk} + \lambda_3 TBR_t + \lambda_{33} TBR_t D_{tk} + \lambda_4 INFL_t + \lambda_{44} INFL_t D_{tk}$
$\lambda_5 EXR_t + \lambda_{55} EXR_t D_{tk} + u_{1t}$ . . . (5)

where $D_{tk} = 0$ iff $t \leq k$ (6)

$D_{tk} = 1$ iff $t > k$

D_{tk} is the shift in the slope, intercept or trend coefficient, k is the point at which the break date occurs. The break dates are attained by estimating the cointegration equations for all possible break dates within the interval grid (0.15 0.85) and a break date is selected where the absolute value of the ADF test statistic is at its maximum. Thus, for each of the models (3) – (5) the Dickey-Fuller (DF) test of equation (6) is estimated, with value employed as a resulting test statistic being the minimum value obtained for the t-ratio:

$ADF^*(q) = \inf ADF(q)$

$Z^*_b = \inf Z_b(q)$

$Z_b(q) = T(P_t - 1)$.

The crash model (GH-1) means that there is a level shift or change in intercept in the cointegration relatiohship. The parameter θ_1 represents the intercept before the shift, and θ_2 represents the change in the intercept at the time of the break. In the model with intercept and slope coefficient change λ_1 , λ_2, λ_3, λ_4, *and* λ_5 denote the cointegration slope coefficients before the regime change, and λ_{11}, λ_{22}, λ_{33}, λ_{44}, *and* λ_{55} denote the change in the slope coefficients at the time of the break.

As indicated in Cook (2006:1381) the residuals obtained from the above cointegrating regressions are used in the Dickey-Fuller test to provide a modified Engle-Granger (1987) test which allows for structural change in the cointegration relationship:

$\Delta\hat{e} = \delta\hat{e}_{t-1} + u_t$ . . . (7)

where Δ is first difference operator. The break dates are attained by estimating the cointegration equations for all possible break dates and a break date is selected where the absolute value of the ADF test statistic is at its maximum. The null hypothesis tested is no cointegration with structural breaks against the alternative of cointegration with structural breaks.

Data were sourced from Central Bank of the Gambia Annual Reports and Quarterly Bulletin (various issues), International Monetary Fund (IMF) International Financial Statistics (various issues), World bank World Economic Indicators, World Economic Outlook database. The model was estimated for the period 1986:1 -2012:4 using quarterly data.

IV Empirical Results and Analysis

Table 4.1 presents the results for the unit root test of the variables in the money demand function using Ng-Perron (2001) in conjunction with the modified Schwarz Bayesian Information Criterion. The empirical results show that all the variables (LMP, LGDP, SDR, TBR, INFL and EXR) are random walk (non stationary) in levels but stationary after first difference, whether the MZa, MZt (modified Phillip-Perron), MSB(modified Sargan Bhargava) or MPT(modified point optimal test) is used as test statistic. The similarity in the test results are not surprising given that they used generalised least squares detrended data which is actually the source of its power because as it ensures optimal selection of the autoregressive truncation lag under constant or trend or both. Table 4.2 presents the results of the Gregory-Hansen cointegration with structural break. The break dates for the three models are 1995:1, 2000:2 and 2003:3.The results of the estimation suggest that GH-1 with break date 1995:1 is the most plausible model since the null hypothesis is rejected at 1% level. The graph of Gregory-Hansen cointegration tests with break identified at 1995:1 is shown in Figure 4.1.

Table 4.1 : Ng- Perron Unit Root Tests in Levels and in First Difference

		Level				First Difference				
	Variable	MZa	MZt	MSB	MPT	MZa	MZt	MSB	MPT	I(d)
	LM2	0.8433	0.6096	0.7229	39.6529	-9.151	-2.1345	0.2333	2.69526	1
	LGDP	1.23736	1.0806	0.8734	57.3999	-28.051	-3.6922	0.13163	1.04319	1
	SDR	-3.1644	-1.2523	0.3959	7.7362	-52.499	-5.1235	0.0976	0.4669	1
	INFL	-4.5219	-1.4205	0.314	5.581	-31.555	-4.3331	0.2234	1.7295	1
	TBR	-3.224	-1.2689	0.3936	7.5984	-22.435	-10.312	0.1908	2.9273	1
	EXR	-0.9702	-0.4365	0.4499	14.1322	-15.268	-2.7269	0.18095	1.6051	1
Critical	1%	-13.8	-2.58	0.174	1.78					
Values	5%	-8.1	-1.98	0.233	3.17					
	10%	-5.7	-1.62	0.275	4.45					

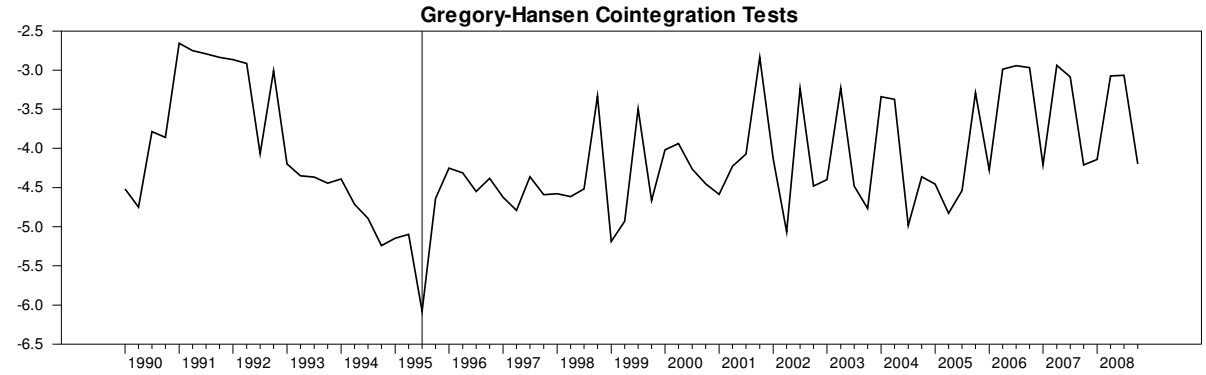
==========

Table 4.2:Gregory Hansen Cointegration results with Structural breaks 1986:1 -2012:4+

Model Type	Break Date	GH test Statistic	1%	5%	Reject Ho of no Cointegration
GH-1	1995:1	-7.312*	-6.36	5.83	Yes
GH-2	2000:2	-5.464	-6.05	-5.56	No
GH-3	2003:3	-6.647	-7.31	-6.84	No

Notes +. In the empirical estimation, a trimming region of between 15%-85% is used, giving that 15% in the beginning and 15% at the end of the data points are cut off. Thus, the sample size is effectively reduced to 70%. Significant at 1%.*

Figure 4.1: Gregory-Hansen Cointegration Tests with Break Located at 1995:1



The full estimates of the Gregory and Hansen cointegration results with the associated structural break dates are indicated in Table 4.3. It is evident that GH-1 is the preferred long-run cointegration model with break date 1995:1 because all the parameter estimates are statistically significant, they are theory consistent, data admissible and data coherent.

The structural break identified to occur in 1995:1 reflects political and economic shock arising from the military coup in 1994 which toppled a long serving civilian president Dauda Jawara, and the corresponding fall in foreign aid in the Gambia during the period. The structural break is also clearly identifiable with the 50% devaluation of the CFA franc, the border closure and transit controls in Senegal, and the suspension of convertibility of the CFA franc outside the franc zone in the period 1994-1996.

Turning now to the parameter estimates we find that the income elasticity and the saving interest rate elasticity are positive, the treasury bill rate, inflation and exchange rate elasticities are all negative as to be expected. The estimated income elasticity at about 1.810 for the demand for money is greater than unity indicating that money is a luxury good in the Gambia, a finding that is consistent with other studies such as Nwafor et al. (2007) for Nigeria (5.430), Owoye and Onafowora (2007) for Nigeria (2.067), Nell (2003) for South Africa (1.480), and Drama and Yao(2010) for Cote d'Ivoire (5.312). Similarly, in the estimated income elasticity for money in the study by Jammeh(2012) a value of about 1.8225 (see Table A3, p. 40) was obtained. According to Sriram(2009) long –run income elasticity greater than unity is to be expected for many developing countries where the financial system are underdeveloped and monetization is faster than output growth.

With respect to the estimated interest elasticity of the demand for money at -0.01168 we find that this is low,

revealing the absence of liquidity trap and hence the effectiveness of monetary policy for economic stabilization in the Gambia. It would be recalled that Jammeh obtained similar results with a long-run interest elasticity of about -0.0049575. The parameter estimates of the models (GH-2 and GH-3) are either too low and statistically insignificant as in the case of income elasticity of the demand for money in GH-2 model, or are of the wrong sign in the case of income elasticity (GH-3) and saving deposit rate elasticity(GH-2). Since GH-1 model is congruent, robust and chosen, we estimate an error correction model with an optimal lag length of 2 based on Schwarz Bayesian and Hannan - Quinn information criteria as shown in Table 4.4. After applying London School of Economics (LSE) Hendry's general to specific approach(GETS) and Granger marginalization of irrelevant variables, we obtain from the over pararameterized model a parsimonious model indicated in Table 4.5.

Most of the variables in the dynamic short-run demand for money equation are statistically significant at better than the 5% level. The only exception is the interest rate variable (TBR) which bears the appropriate negative sign but is statistically insignificant at conventional level. The poor behaviour of interest rate in the estimated short-run demand for money function may be a reason why the CBG relies more on open market operations (OMO) rather than interest rate in the manipulation of monetary policy. However, it is important to emphasize that the interest rate variable is statistically significant at better than 0.1 % level in the long –run money demand function.

Table 4.3: Cointegration Equation 1986:1- 2004:4 .

	GH-1 (1995:1)	GH-2 (2000:2)	GH-3 (2003:3)
Variable	Coefficient	Coefficient	Coefficient .
Intercept	-26.0748*	14.905*	45.219*
	(-10.1343)	(2.1968)	(5.649)
D1995:1	0.1394*		
	(5.2571)		
LY	1.8101 *	0.0484	-1.2673 *
	(15.8602)	(0.1634)	(-3.587)
SDR	0.01788*	-0.0086**	0.0245*
	(4.2984)	(-2.034)	(5.977)
TBR	-0.01168 *	-0.0097*	-0.0125*
	(-11.6350)	(-9.8010)	(-3.401)
INFL	- 0.00705*	- 0.0069*	- 0.0035*
	(-7.3651)	(-7.7940)	(-2.7454)
LEXR	-0.51917 *	0.0149 *	0.0152*
	(-10.3058)	(5.596)	(4.667)
D2000 (2001)		0.2561*	-23.688*
		(8.2891)	(-3.598)
Trend		0.0218 *	0.027*
		(8.790)	(9.273)
LGDP D2001			1.0041*
			(3.518)
SDR D2001			0.0338*
			(3.5866)
TBR D2001			-0.0017
			(-0.441)
INFL D2001			- 0.01723*
			(-6.2505)
EXR D2001			-0.0136*
			(-7.4299)

* significant at 1%, ** significant at 5%.

Table 4.4: Lag Length Selection Criteria for the Overparameterized Regression

Lag	LogL	LR	FPE	AIC	SC	HQ
0	41.18152	NA	0.000112	-0.583630	-0.271010	-0.457107
1	471.1905	799.8167	2.47e-08	-9.003810	-8.456724	-8.782395
2	570.4228	178.6181	4.07e-09	-10.80846	-10.02690*	-10.49215*
3	572.0171	2.774171	4.73e-09	-10.66034	-9.644326	-10.24914
4	575.3767	5.644156	5.31e-09	-10.54753	-9.297053	-10.04144
5	585.5687	16.51091	5.22e-09	-10.57137	-9.086426	-9.970388
6	614.0967	44.50376*	3.56e-09*	-10.96193*	-9.242522	-10.26606
7	616.1733	3.114878	4.13e-09	-10.82347	-8.869588	-10.03270
8	618.6170	3.518883	4.77e-09	-10.69234	-8.503996	-9.806678

Notes * indicates lag order selected by the criterion.
LogL=log likelihood test; LR=sequential modified LR test statistic(each test at 5% level); FPE=final prediction error; AIC=Akaike information criterion; SBIC=Schwarz Bayesian information criterion, HQ=Hannan-Quinn information criterion.

Table 4.5: Parsimonious Dynamic Short –Run Money Demand Estimates (1986Q3-2012Q4)
Dependent Variable: ΔLMP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-0.005861***	0.003051	-1.921165	0.0577
D1995	0.007780**	0.003359	2.316264	0.0227
ΔDLMP(-1)	0.617372*	0.066225	9.322296	0.0000
ΔLGDP	0.774014*	0.208302	3.715820	0.0003
ΔSDR	0.006998**	0.003140	2.228386	0.0282
ΔTBR	-0.000155	0.000859	-0.180656	0.8570
DINFL	0.003317*	0.000879	3.774828	0.0003
ΔINFL(-1)	-0.002051**	0.000865	-2.371992	0.0197
ΔLEXR	0.430039*	0.065486	6.566898	0.0000
ΔLEXR(-1)	-0.303434*	0.073324	-4.138259	0.0001
ECM3(-1)	-0.085851*	0.024843	-3.455680	0.0008

Notes: * significant at 1%; ** significant at 5%; significant at 10%.
Adj. R^2=0.775, F-ratio=37.221, AIC=-5.690, SBIC=-5.414, DW=1.922, Breusch-Godfrey SC $\chi2(2)$ 1.003(0.6056),
nn $\chi2$=0.555 (0.766),ARCH hsd $\chi2(2)$=0.269(0.874), Ramsey RESET F(2,93) 1.414(0.248).

The results further reveal that the short-run income and interest elasticities as well as the inflation expectation and currency-substitution elasticities are much lower in magnitude than their corresponding long run parameter estimates. The coefficient of the error correction variable at -0.08585 is negative, statistically significant and less than unity meaning that there is a smooth adjustment rather than cyclical adjustment to equilibrium when out of equilibrium. However, the value is low, suggesting a sluggish adjustment as only about 9 percent of the departure from equilibrium is reduced in the next quarter.

The Breusch-Godfrey SC$\chi2(2)$=1.003 indicates absence of serial correlation. There is also no functional form misspecification RESET F(2,93)=1.414(0.248), non-normality nn$\chi2$ =0.555(0.766), or heteroskedasticity ARCH hsd $\chi2$=0.269(0.874) where values are in brackets are the p-values. Thus, the estimated short-run money demand function is well determined.

The results also reveal that neither the long-run money demand function nor the short-run money demand function were stable during the period under estimation. The cumulative sums of squares of recursive residuals, the CUSUM and the CUSUM of squares tests shown in Figures 4.3, 4.3, 4.4, 4.5, and Figure 4.6 all indicate strong instability in the money demand function as the residual errors exceeded the bounds in general.

The policy implications of the results are straightforward. The continued use of monetary targeting by the Central Bank of The Gambia is inappropriate and suboptimal. Figure 4.7 shows that there is no relationship between growth in money supply and inflation. The correlation coefficient between growth in money supply and inflation rate is estimated at 0.114 and statistically insignificant with p-value 0.238. An Alternative and more flexible monetary policy framework is required. Interest rate targeting is not also a viable option given that (i) the interest rate variable is not statistically significant in the short-run money demand function and (ii) the

financial market is small, shallow, and dominated by few small banks. Uncertainty in foreign exchange flows and undiversified exports renders exchange rate targeting unviable. Inflation targeting (IT) is also is not feasible at this stage because its success factors such as government commitment to price stability, quality of data to work with and status of transparency and accountability in the CBG are weak. Much work would be needed in these areas. What may work in the Gambia at least is a flexible combination of elements of inflation targeting and monetary target as noted in Sriram(2009).

Figure 4.2: Stability Test for Long –run Money Demand (Recursive Residuals)

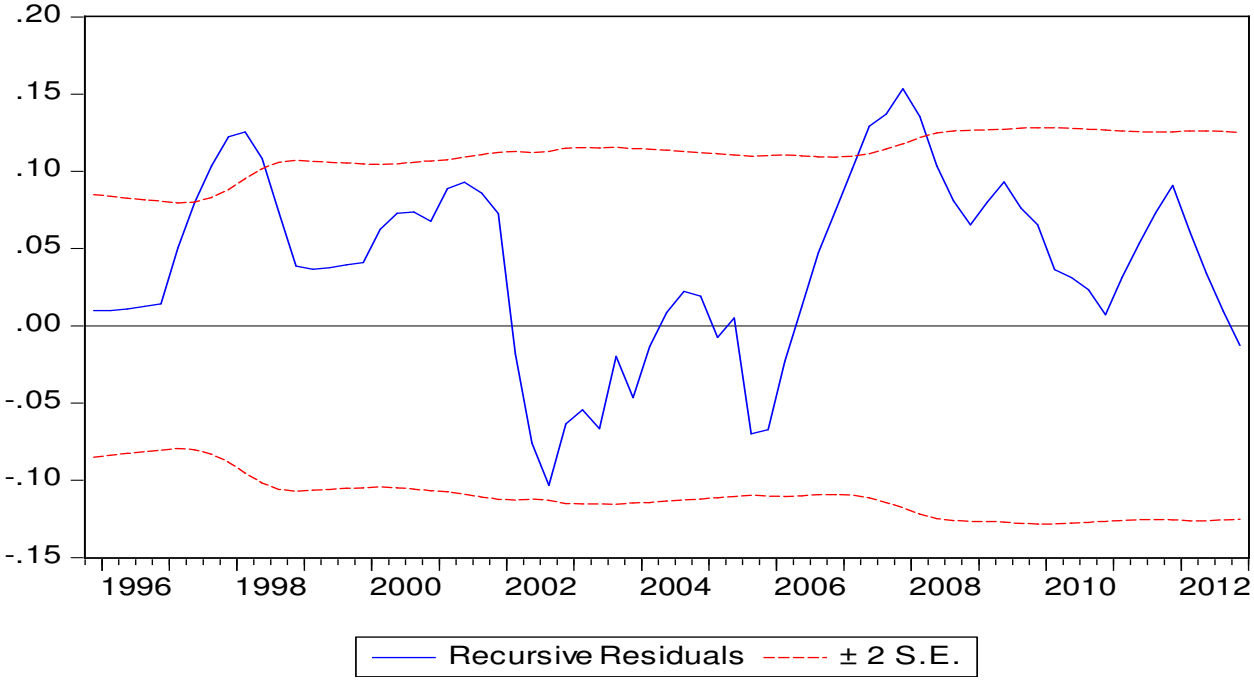


Figure 4.3: Stability Test for Long-run Money Demand Function (CUSUM)

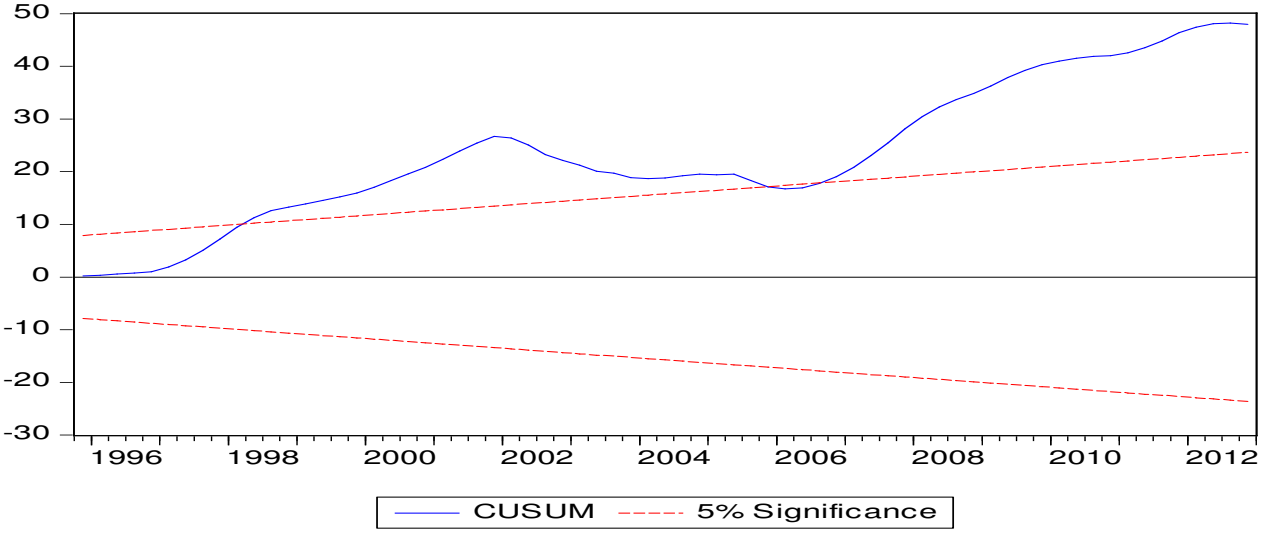


Figure 4.4: Stability Test for Short –run Money Demand (Recursive Residuals)

Figure 4.5: Stability Test for Short-run Money Demand Function(CUSUM)

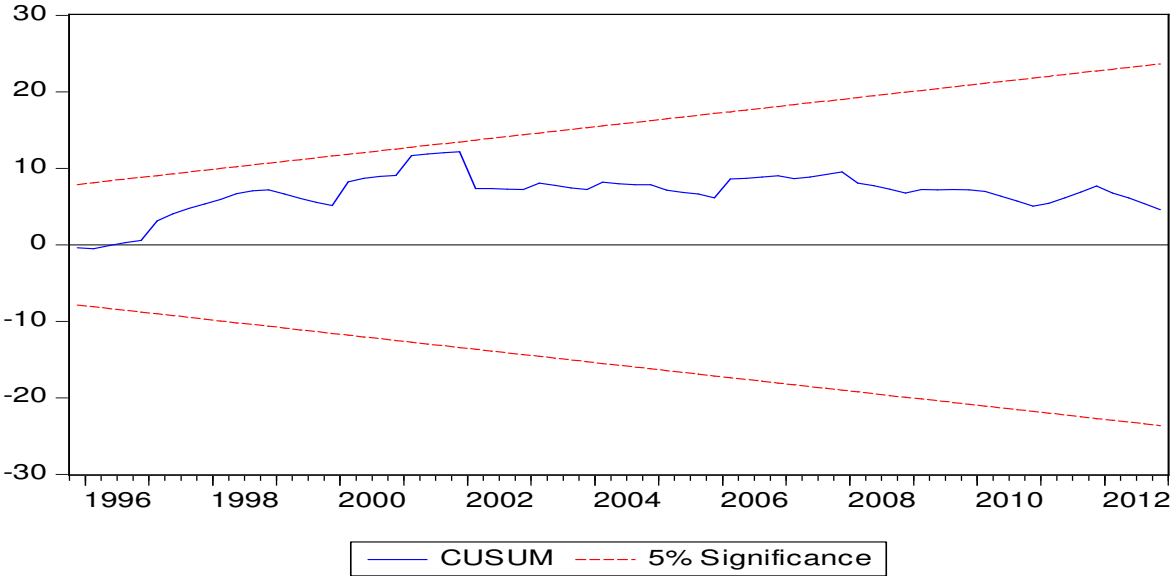


Figure 4.6 : Stability Test for Short-run Money Demand Function (CUSUMSQ)

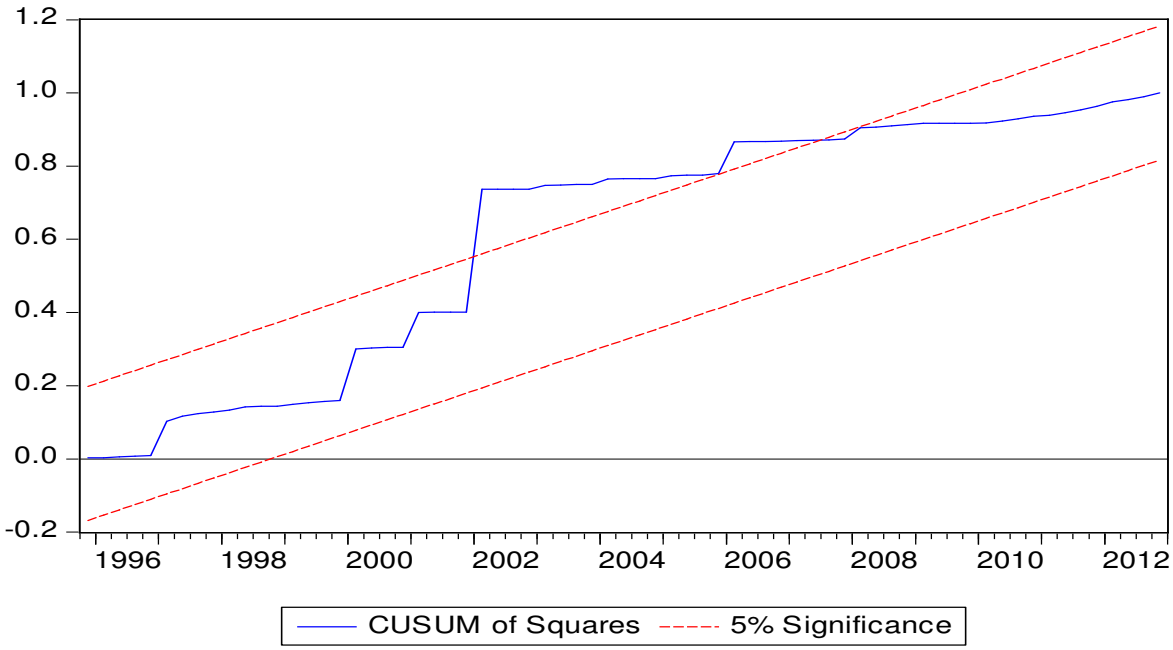
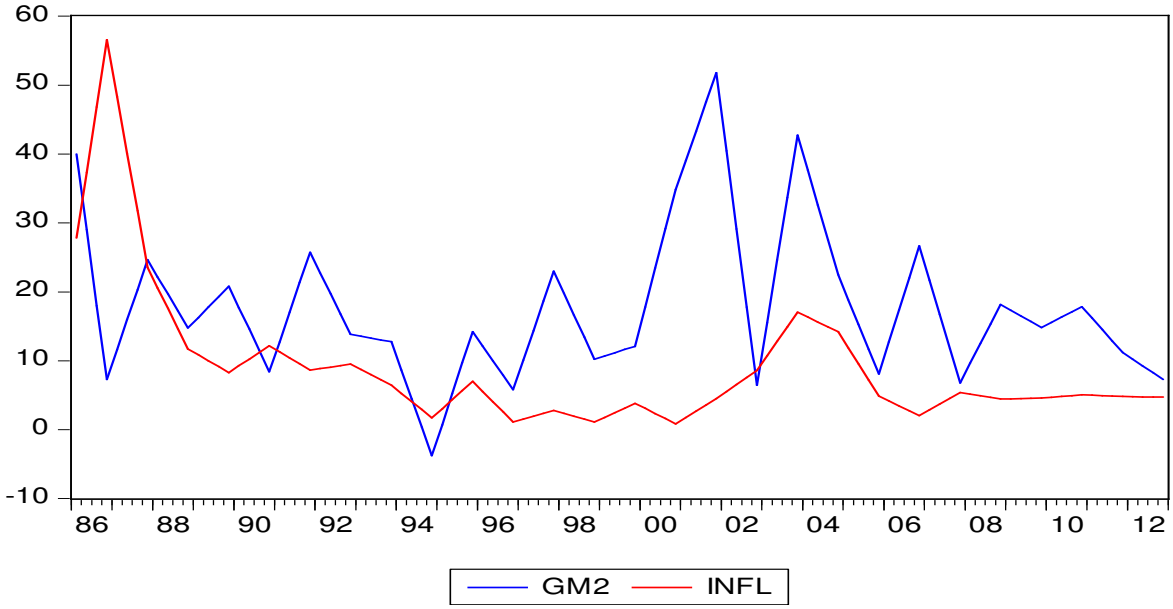


Figure 4.7: Growth in Broad Money Supply and Inflation (1986:1-2012:4)



Correlation Coefficient: r= 0.114 (t-value=1.186), p-value=0.238

V Concluding Remarks

One of the main objectives of monetary policy is to achieve price stability to promote economic growth. As part of the IMF sponsored stabilization programme the Gambia has been pursuing monetary targeting framework. To ascertain whether this policy satisfies the necessary condition for effectiveness we presented the results of an empirical investigation into the determinants and stability of money demand (M2) in the short-run and long-run in the Gambia using quarterly data during the period 1986:1 - 2012:4. Adopting a theoretical defensible specification of the money demand function in line with the Keynesian precautionary, transacation and speculative motives for holding money and its various extensions by Friedman, Baumol and Tobin, the paper applied Gregory -Hansen cointegration techniques allowing for structural breaks. The study finds the existence of a long-run cointegration relationship in the money demand function and its determinants in the Gambia. Income, saving deposit rates, inflation rate, interest rate and exchange rate were identified as the determinants of long-run and short-run money demand. The cointegration relationship with breaks suggests a structural break which occurred in 1995:1 reflecting the military coup and fall in foreign aid in the Gambia during the period.

The structural break is also clearly identifiable with the 50% devaluation of the CFA franc, the border closure and transit controls in Senegal, as well as the suspension of convertibility of the CFA franc outside the franc zone in the period 1994-1996.

Through establishing the existence of a dynamic short-run error correction model we found that cointegration model with shift in intercept best characterizes the equilibrium relationship of the money demand function when there exists a structural break. The speed of adjustment was found to be about 9 percent meaning that only 9 percent of the departure from equilibrium is reduced in the next quarter. This is indeed a very sluggish adjustment process.

Furthermore, by the cumulative sums of squares of recursive residual test, CUSUM and CUSUMSQ tests, we found that both the short-run and long-run money demand function in the Gambia were unstable for the period under investigation. Causes of instability include but not limited to (i) political instability, (ii) changes in government policies affecting money growth and inflation, and (iii) introduction of financial innovations .

Consequently the continued use of monetary targeting by the Central Bank of the Gambia (CBG) is misguided and suboptimal. This is even more so where there is no relationship between money supply and inflation. The correlation coefficient between money supply growth and inflation was estimated at 0.114 and statistically insignificant with p-value 0.238. The Central Bank of the Gambia (CBG) should adopt instead a more flexible monetary policy framework. Interest rate targeting is not also a viable option given that (i) the interest rate variable is not statistically significant and (ii) the financial market is small, shallow, and dominated by few small banks. Uncertainty in foreign exchange flows and undiversified exports renders exchange rate targeting unviable. What may work in the Gambia may be a flexible combination of inflation targeting and money supply target as noted in Sriram(2009) to maintain price stability and stimulate noninflationary economic growth.

Reference

Abdelnacer, B; B. Abdelhak and Samir Maliki(2010): The black market exchange rate and demand for money in Algeria. *International Journal of Arts and Commerce* 2(10) 71-82

Adam, S. Christopher (1992a):On the dynamic specification of money demand in Kenya. *Journal of African Economies* 1, 233-270

Adam, S. Christopher(1992b): Recent developments in econometric methods: an application to the demand for money in Kenya. *AERC special paper 15*. Centre for the study of African Economies, Oxford.

Adekunle, Joseph(1968): The demand for money: evidence from developed and less developed countries. IMF Staff papers 15(2) 251-265

Agenor, Pierre –Richard and Moshin S. Khan(1996):Foreign currency deposits and the demand for money in developing countries. Journal of Development Economics 50, 101-118

Akinlo, A,E. (2005): The stability of money demand in Nigeria: an autoregressive distributed lag approach. *Journal of Policy Modelling* 28, 445-452

Anuoro, E. (2002): Stability of the NigerianM2 money demand function in the SAP period. *Economics Bulletin* 14, 1-9.

Arize, Augustine C.; A.F. Darrat and D.J. Meyer(1990):Capital mobility, monetization and money demand: evidence from Africa *The American Economist* **XXXIV** 69-75

Arize, Augustine C. (1992):Impact of foreign monetary developments on demand for money: Partial adjustment and error correction model estimates. *International Journal of Finance*, vol. 5, No, 1 344-61

Banafea, Waheed (2012):Essays on structural breaks and stability of the money demand function. PhD thesis Kansas State University.

Baumol, William (1952):Transaction Demand for Cash: an inventory theoretic approach. *Quarterly Journal of Economics 6*6(4) 545-556

Bahmani-Oskooee, M. and H. Rehman(2005): Stability of the money demand function in Asian developing countries. *Applied Economics* 37 773-792

Bahmani-Oskooee, M. and A. Gelan (2009): How stable is the demand for money in African countries. *Journal of Economic Studies* 36, 216-235.

Calomiris, C.W. and I. Domotwitz(1989): Asset substitution, money demand and the inflation process in Brazil. *Journal of Money, Credit and Banking* 21, 78-89

Ceesay, Alieu(2000): Demand for money and interest rate liberalization in the Gambia. M.A. Thesis, Dakar, Senegal. United Nations Institute for Economic Planning and Development.

Central Bank of the Gambia: Statistical Bulletin (various issues)

Central Bank of the Gambia : Annual Report (various issues)

Chukwu, Jude Okechukwu; Cletus Agu, Felix Onah(2010): Cointegration and structural breaks in Nigerian long-run money demand function. *International Journal of Finance and Economics* 38, 48-59

Cook, Steven (2006):Testing for cointegration in the presence of mis-specificated structural change. *Statistics*

and Probability Letters 76, 1380-1384
Darrat, A.F.(1985):The Demand for money in a developing economy: the case of Kenya. *World Development* 13(19/11) 1163-1170
De Jong, David N.; John C. Nankervis; N.E. Savin and Charles H. Whiteman(1992):The power of problems of unit root test in time series with autoregressive errors. Journal of Econometrics 53(1-3) 323-343
Drama, B., G. Herve and Y. Shen (2010): The demand for money in Cote d'Ivoire: Evidence from cointegration test. *MPRA Paper* No. 20131
Engle, R.F. and C.W. J. Granger(1987):Cointegration and error correction: representation, estimation and testing. *Econometrica* 55, 251-276
Ericcsson, Neil R. (1998):Empirical modeling of money demand. *Empirical Economics* 23(3) 295-315.
Fielding, D. 91994):Money demand in four African countries. *Journal of Economics Studies* 21, 17-51
Friedman, Milton (1956):The Quantity theory of money: A restatement. in *Studies in the Quantity Theory of Money.*
Fisher, Irving (1896):Appreciation and interest. New York, MacMillan for the American Economic Association.
Granger, C.W.J.(1986): Development in the study of cointegrated economic variables. *Oxford Bulletin of Economics and Statistics,* 48(3) 313-228
Gregory, A.W. and B.E. Hansen(1996a): Residual based test for cointegration in models with regime shifts. *Journal of Econometrics* 70(1) 99-126
Gregory, A.W. and B.E. Hansen(1996a):Tests for cointegration in models with regime and trend shifts. *Oxford Bulletin of Economics and Statistics* 58(3) 555-559
Halicioglu, Ferda and Mehmet Ugur (2005): On stability of the demand for money in a developing OECD country: the case of Turkey. *Global Business and Economics Review* 7(2/3) 203-213. *Also available at:* http://dx.doi.org/10.1504/GBER.2005.007616
Haug, A.A. (2006):Canadian money demand functions: cointegration-rank stability. *Manchester School* 74, 214-230.
Hume, David (1752):Essays:Moral, Political and Literary, edited by Eugene Miller. Indianapolis. Liberty Fund.
International Monetary fund (IMF) :World Economic Outlook database. Available at www.imf.org/external/data.htm
Irving, Fisher (1911): The purchasing power of Money. New York. MacMillan
Irving, Fisher (1928): The money Illusion. New York. Adelphi
Jammeh, Kebbi (2012): Long-run and Short-run determinants of demand for money and its stability in the Gambia: An empirical investigation. B.Sc project, Department of Economics and Management Science, University of the Gambia.
Johansen, S. (1988):Statistical analysis of cointegrated vectors. *Journal of Economic Dynamics and Control* 12(203) 231-254
Johansen,S. and K. Juselius(1990):Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics* 52(2) 169-210
Judd, John P. and John L. Scadding (1992):The search for a stable money demand function. A survey of the post-1973 literature. *Journal of Economic Literature* 20(3), 993-1023
Keynes, John Maynard(1923): A Tract on Monetary Reform. London.MacMillan
Keynes, John Maynard (1936): The General Theory of Employment, Interest and Money. MacMillan Press. London
Kumar, Saten; Don J. Webber and Scott Farghar (2010):Money Demand Stability: A case study of Nigeria. MPRA N0. 26074 at http://mpra.ub.uni-muenchen-de/26074/
Nacheta, Jean Claude (2001):A cointegration analysis of broad money demand in Cameroon. *IMF Working Paper* (March) 1-39
Narayan, P. Kumar and Seema Narayan (2008): Estimating the Demand for money in an unstable open economy: the case of the Fiji Islands. *Economic Issues* 13(1) 71-91
Nell, K.S. (1999): The stability of money demand in South Africa, 1965-1997. University of Kent at Canterbury, Department of Economics, *Studies in Economics* No. 99/5.
Ng, Serena and Pierre Perron (2001): lag length selection and the construction of unit root tests with good size and power. *Econometrica* 69(6) 1519-1554
Nwafor, F., H. Nwakama, P. Nkansah and F. Thompson(2007):The quantity theory of money in a developing economy: empirical evidence form Nigeria. *African Economic and Business Review* 5(1) 1-9
Nyong, Michael (2001): The demand for money under rational expectations of inflation: the Nigerian experience. The Nigerian Journal of Economics and Social Studies 43(1) 125-143
Omotor, Douglason G. and Patience Omotor (2011): Structural breaks, Demand for money and monetary policy in Nigeria. www.csae.ox.ac.uk/conference/2011-EDIA/papers/291
Owoye, Oluwole & Olugbenga a. Onafowora (2007):M2 targeting, money demand and real GDP growth in

Nigeria: do rules apply? *Journal of Business and Public Affairs 1(2)*
Pesaran, M.H.; Shin Y, R.J. Smith(2001): Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics 16, 289-326
Pradhan, B.K. and A. Subramanian (2003): On the stability of demand for money in a developing economy: some empirical issues. Journal of Development Economics 72, 335-351
Poole, W (1970): The optimal choice of monetary policy in simple macro model. Quarterly Journal of Economics, 84(2) 192-216
Pradhan, B.K. and A. Subramanian(2003): On the stability of demand for money in a developing economy: Some empirical issues. Journal of Development Economics, 72, 335-351.
Rao, B. Bhaskara and Saten Kumar (2009): Cointegration, Structural breaks and the demand for money in Bangladesh. Applied Economics 41(10).
Schwert, W. (1989):Tests for unit roots: a monte carlo investigation. *Journal of Business and Economic Statistics* 7, 147-159.
Simmons, R. (1992):An error correction approach to demand for money in five African developing countries. Journal of Economic Studies 19, 29-48
Singh, P. and Manoj Prandey (2009): Structural breaks and demand for money stability in India. http://mpra.uni.ub.uni-muenchen.de/15425
Singh, Rup and Saten Kumar(2010): Some empirical evidence on the demand for money in the Pacific Island Countries. *Studies in Economics and Finance* 27(30 211-222
Sriram, S. Subramanian (1999): Survey of Literature on demand for money: Theoretical and empirical work with reference to error correction models. *IMF Working Paper No.* 99/64
Sriram, S. Subramanian (2001): A survey of recent empirical money demand studies. *IMF Staff Papers* 47(3) 334-65
Sriram, S. Subramanian (2009): The Gambia: Demand for Broad Money and Implications for Monetary Policy Conduct. *IMF Working Paper* WP/09/102 September.
Tobin, James (1958): Liquidity Preference as a behavior towards risk. *Review of Economic Studies,* 65-86.
Tobin, James (1956):The interest elasticity of transaction demand for cash. *Review of Economics and Statistics* 38,(3) 241-47
Tomori, Siyanbola (1972):The demand for money in the Nigerian economy. *Nigerian Journal of Economics and Social Studies* 14(3) 337-345
West African Institute for Financial and Economic Management(WAIFEM) (2011): 2011 Annual Report, Lagos, Nigeria..
Wong, Chorny-Huey (1977):Demand for money in developing countries. Some theoretical and empirical results. *Journal of Monetary Economics,* 3(1) 59-86
World Bank (2013) : African Development Indicators database. Also available at http://data.worldbank/data-catalog/africa-dev
Worrell, DeLisle, Bozena Radzewicz-Bak, and George Iden (2008):The Gambian monetary policy implementation. Money and Capital Markets Development Technical Assistance Report (Washington: International Monetary Fund, February)