INFLATION TARGETING AND MONETARY POLICY INSTRUMENTS: EVIDENCE FROM NIGERIAN AND GHANA

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ABSTRACT

This paper attempts to examine whether or not one of the preconditions for a successful inflation – targeting framework is present in Nigeria and Ghana. That is, the paper wants to find out whether or not a stable and predictable relationship exists between inflation and monetary policy instruments in these countries. In achieving this objective, vector autoregressive models are built in line with the work of Goltschalk and Moore (2002) and Tutar (2002). Specifically, three VAR models are estimated starting with a two-variable model including money supply and prices, and then, adding some financial variables such as nominal exchange rate and interest rates in order to see their contribution to a VAR system for Nigeria and Ghana. It is observed from the VAR two-variable model that inflation is an inertial phenomenon in Nigeria and Ghana, and money innovations are not strong and statistically important is determining prices when compared will price shocks themselves. When adding financial variables like exchange rates and interest rates to the models, the paper does not observe any significant improvement in the model. In the short run, innovations in prices are mostly explained by their own shocks, the monetary policy instruments, such as interest rates and exchange rates, have little or no effect on prices. Therefore policy linkage between inflation and monetary policy instruments in Nigeria and Ghana is not strong in the short run and thus, these countries are not yet candidates for inflation targeting.

Keywords*: Inflation Targeting, Monetary Policy, Price shocks.*

Overview of the Study

Focus on inflation targeting is increasing as a framework for implementing monetary policy in literature. Bernanke et al (1999) defines inflation targeting as: "a framework for monetary policy characterized by the public announcement of official quantitative targets for the inflation rate over one or more time horizons, and by explicit acknowledgment that low, stable inflation is

monetary policy's primary long-run goal". Among other important features of inflation targeting are vigorous efforts to communicate with the public about the plans and objectives of the monetary authorities, and in many cases, mechanisms that strengthen the central bank's accountability for attaining those objective

From this definition, the authors take some care to describe inflation targeting as a framework and not as a rule. In other words, inflation targeting fits somewhere between the extremes which feature in the rules versus discretion" debate which vaged in monetary policy circles in earlier years. Inflation targeting is not automatic in the sense of a Friedman – like rule by which growth in the money supply is governed in order to achieve the ultimate goal of price stability (Sharwn, 2000). But inflation targeting does not allow the central bank full discretion to take decisions in any ad-hoe or unconstrained fashion. Rather, inflation targeting can be described as a form of "constrained discretion". (Sharwin, 2000). The quote Bernanke et al (1999), "by imposing a conceptual structure and its inherent discipline on the central bank, but without criminating all flexibility, inflation targeting combines some of the advantages traditionally ascribed to rules with those ascribed to discretion.

The implementation of inflation targeting depends, among other things, on the following conditions: (1) The assignment of the target, (2) The interaction of the target with other policy goals; (3) the appropriate definition of the target (4) the role of inflation forecasts, and (5) the degree of the accountability of the central bank to achieve the target (Tutor, 2002) Accountability is also an essential ingredient to inflation targeting. Inflation targeting regime increases the accountability of the policy makers by increasing the transparency. In order to make monetary policy more effective in the inflation targeting framework, it is necessary to announce explicitly policy changes. Thus, it becomes more apparent whether any breach of the inflation target resulted from an error of the central bank or whether the breach was predictable at the time of the policy decision (Debelle, 1997). The increased accountability of the inflation targeting enables the monetary authority to monitor and enhance the understanding of expectations. It also decreases the possibility of time inconsistency trap, which leads to deviation from monetary authority's long-term objective and provides a good benchmark that can easily be observed by the agents in the economy (Hazirolan, 1999)

Another important precondition for inflation targeting is the existence of stable and predictable relationship between monetary policy instruments and inflation. In developing countries, it is observed that this condition is difficult to fulfill due to the use of seigniorage revenues as an important source of financing public debts, coupled with lack of commitment to low inflation as a primary goal by monetary authorities and lack of substantial operational independence of the central bank (ADEBYI, 2011). Thus, this paper aims at assessing empirically whether or not a stable and predictable relationship exists between monetary policy instruments and inflation in Nigeria and Ghana. In achieving this, objective, the statistical linkages between monetary policy instruments and inflation in these countries are analyzed using vector autoregressive models. These econometric models are built in line with the work of Gothschalk and Moore (2001) and Tutar (2002). Specifically, three different VAR models are estimated starting with a two-variable model of money supply and prices. Subsequently, some financial variables such as nominal exchange rates or interest rates are added in order to see their contribution to a VAR system for Nigeria and Ghana.

The vest of this paper is structured a follows: Section 2 reviews relevant literature by examining inflation targeting in developing economies and the relationship between the independence of central banks and inflation, while section 3 provides the methodology including co-integration and vector auto-regressive model. The empirical analysis of the relationship between monetary policy instruments and inflation is enumerated and discussed in section 4, while the summary and conclusion are contained in the last section.

2.0 Review of Related Literature

Some studies analysed the relevance of inflation target to developing countries. Mosson, Savastano, and Shatma (1997) examined the applicability of inflation targeting to developing countries. They argue that in most of the developing countries, the requirements of inflation target are absent due to the seigniorages being an important source of financing or due to the lack of consenses on low inflation as a primary objective. Kadioglu, Ozdemir, and Yilmaz (2000) discussed the applicability and prerequisites of inflation targeting in developing countries by analyzing the general aspects of inflation targeting regime in developing countries, the preconditions of inflation targeting are not fulfilled and that developing countries lack powerful models to make successful inflation forecasts. Although, they claim that it was too early for

some developing countries to apply inflation targeting regime, they provided some country cases where inflation targeting has been successfully introduced in developing countries. They relate the success in Chile to the absence of fiscal deficits, the rigerous regulations and supervision of financial system and substantial hardening of the targets (Tutar, 2002).

Jones (1998) justifies the use of inflation targeting in Czech Republic and Poland. The reasons, according to the author, were the inadequacy of exchange rate targeting due to the increasing capital mobility in the 1990s and of monetary targeting due to financial innovations and the desire of these countries to join the European Monetary Union. Mishkis (2000) explains that inflation targeting may not be appropriate for many emerging countries due to weak central back accountability arising from long lags of monetary policy instruments. Another reasons financial instability resulting from flexible exchange rate, which is a requirement for inflation targeting. Also, Miskhis reveals that fiscal dominance and high degree of dollarization, which may create severe problems for inflation targeting regime are common features of emerging market economies.

In judging whether or not inflation targeting is feasible, Hozirolan (1999) assesses the applicability of the inflation – targeting regime for Turkish economy and gives a proposal to implement it in Turkey. According to him, Turkey could only achieve satisfactory results from inflation targeting if she addresses her inflation problem. Jonsson (1999) examines the implications and relative merits of inflation targeting for South Africa. He concludes that although south Africa satisfies the main prerequisites of inflation targeting, she still needs to refine her inflation forecasting framework before the implantation of inflation targeting. Woglom (2000) provides empirical evidence to judge whether or not South Africa is a good candidate for inflation targeting. Using vector auto-regression (VAR) to analyze the dynamic interaction of the variables of interest and making comparisms between South Africa and pre-target periods of New Zealand and Canada, the researcher argues that South African is not a good candidate for inflation targeting.

To examine the links between the monetary policy instruments inflation in Poland, Gottschalk and Moove (2007) made use of VAR in order to provide empirical evidence. By examining the effects of an exchange rate shock and interest rate shock on the price level, they find out that although the exchange rate seems to be effective with respect to output and prices, the direct

linkage between the interest rate and inflation do not appear to be very strong. This requires a better understanding of the links between the monetary policy instruments and inflation target.

However, Christftersen, Slok and Wescott (2001) claim that Poland appears to be ready for inflation targeting. By analyzing the statistical linkages between monetary policy instruments and inflation, and also between leading indicators of inflation and inflation itself and performing Granger causality tests, they observe that there are significant relationship between the consumer price index (CPI) and various leading indicators of inflation. They also reveal that although there is a predictable linkage between the exchange rate and inflation measures the relationships between the changes in the short-term interest rates and change in inflation are weak. However, they argue that as the polish economy matures and stabilization is completed the relationship between the policy interest rates and inflation will be more regular (Tutar, 2002).

In order to assess the predictability of inflation in Korea, Hottmaister (1999) makes an empirical exploration using the VAR model to calculate impulse responses to exogenous monetary policy. The study examines the impulse response to a negative M_2 shock of inflation, output, real interest rate, real exchange rate, and capital flows it is reported that inflation in korea is a predictable as it was in inflation targeting prior to their adoption of inflation targeting. It is concluded that the empirical evidence supports the feasibility of inflation targeting in Korea (Tutar, 2002).

Economic performance and Central Bank Independence

It may be noted that there was an explosion of studies on Central Bank independence particularly in the late 1990's owing to the variations in the indicators and methodology used and the set of countries and sample period studied, the results are mixed. Findings of negative and zero correlations between inflation and Central Bank independence have been reported. Cukiarman (1992) and Webb and Neyapti (1992) have contributed immensely to the debate on the subject. Defining Central bank independence as freedom to peruse the objective of price stability and not unconditional independence from the Government, Cukierman (1992) identifies four different ranking of independence of central banks and finds legal independence as an important and statistically significant determinant of price stability in the industrially developed countries, but not in the developing countries. In the latter countries, the spirit of legal independence has not

always been strictly adhered to (Ojo 2007). The rate of turnover of central bank governors was also found to contribute significantly to explaining inflation. The combination of legal and turnover information was found to contribute significantly to explaining cross - country variations in the rate of inflation. Also, central banks is developing countries were found to be less independent then those in industrially developed countries.

These finding were subsequently confirms by pollard (1993) and Alogina and Summers (1993). Pollard reviews some empirical and theoretical works and fields a negative correlation between central bank independence and long-run average inflation. Also, pollard finds negative correlation between independence of GDP on the other hand, Alesina and Summers (1993) concluded from their study that monetary discipline associated with central bank independence reduces the level and variability of inflation but did not find any systematic relationship between central bank independence and real macroeconomic performance (Ojo, 2004).

Other studies have found that the relationship breaks down under alternative measures of central bank independence (Campillo and Miron, 2007) or when influential observations are excluded (Sturm and de Haon, 2001) and when controlling for additional macroeconomic variables (Ejiffinger, Rooji and Schaling, 1997, Fubrer, 1997, Lougani and Sheets, 1997, Hall and Franzese, 1998 and Ismiban and Ozkan, 2003). Franzese (1999) found that central bank independence has the strongest (negative) effect on inflation when the government is leftist, union density is high economy is not open, inflation abroad is high, financial sector is small and wage bargaining coordination is low. Recently, Jacome and Vazquez (2009) using penal regressions found a negative relationship between legal central bank independence and inflation in 24 Latin American and Caribbean countries but failed to find a causal relationship running from central bank independence to inflation. In transition economies, central bank independence is not related with inflation in the early stages though the relationship is negative when controlled for price deregulation, wars and sustained levels of liberalization, (Cukierman, Miller and Neyapti, 2002). Lybek (2009) found a negative relationship between central bank independence and inflation for the former soviet union. Daunfaldt and de Luna (2003) report that in a majority of the OECD countries price stability was achieved before more independence was given to the central banks. The evidence on economic growth and central bank independence is rather tenuous. Most studies find no correlation but one or two studies have found tragile or

positive relation between growth and central bank independence (Fujiki, 1996, and Akhand, 1998). Fuhror (1997) shows that central bank independence is related to lower levels of growth and higher unemployment rate. Jordan (2007) reports central bank independence only matters during disinflation periods. The more sacrifice ratio and output loss are higher the more independence in the central bank. This finding is corroborated by Down (2004). The ambiguity in the empirical evidence on central bank independence and growth necessitate the needs to clarity the nexus between central bank independence and growth rate. However, in the long run, high and variable inflation and reduces economic growth. Studies confirming a negative correlation between inflation and economic growth rate include Cukierman et al (1993), Rudebusch and Wilcox (1994), Barro (1995) and Bruno and Easterly (1998). From the foregoing, it is glaring that there is no conclusive evidence of causality between central bank independence and macroeconomic performance generally and the need to undertake more rigorous analysis of the issues involved. For example, it is known that central bank independence is only one of several institutional factors that could affect the rate of inflation. Other important factors that determine inflation rate are exchange rate arrangements and external shocks which are not always within the control of an independent central bank. It should be noted, however, that the role of central bank autonomy in controlling inflation should be interpreted with caution due to difficulties in measuring central bank independence. On this aspect, Pollard (1993) identified some critical issues such as the weights applied to the factors related to independence and the possible error in measuring independence that may not reflect the central bank's actual level to independence.

3.0 Methodology

This study employs annual data in Nigeria and Ghana Spanning 1966 to 2010. The variables included in the models are the narrow money supply (M1), consumer price index (CPI), nominal exchange rate (ER) and the interest rates on 3 months time deposit (DR). These variables are obtained from IMF's international monetary statistics, publication of World Bank. The paper conducts investigation using unit root and cointegration tests, and the multi-equation VAR framework. Variance decompositions (VDC) are also used in order to explore the dynamic structure of the system.

3.1 Vector Autoregressive (VAR) Models

VAR models are the best methods for investigation shock transmission among variables because they provide information on impulse responses (Advangi and Allender (1998). Zellner and Palm (1974) shows that any linear structural model can be writen as a VAR model. Therefore, a VAR model serves as a flexible approximation to the reduced form of any wide variety of simultaneous structural models.

Considering two economic time services Y_1t and Y_2t which represent the relationship between inflation (Y_1 t) and monetary policy variable such as the interest rate (Y_2t), the VAR model with only one lag in each variable (suppressing constants,) would be (Moddala, 1988).

$Y_1 t = a_{11} Y_1 t - 1 + a_{12} Y_2 t^{-1} + E_1 + \ldots\ldots\ldots\ldots$ (3.1)

In practice, there would often be more than two endogenous variables and often more than one lag. In this case with K endogenous variable and P lags, we can write VAR model in matrix notation as:

$Y_t = A_1 Yt\text{-}1 + \ldots\ldots\ldots + Ap\ Y\ t\text{-}p + Et \ldots\ldots\ldots\ldots$ (3.2)

Where Yt and its lagged values, and Ef are K x 1

Vectors and A1 …….. Ap are K x K matrices of constant to be estimated

Using two-equation system (3.1), we can write the system in terms of lag operator L as

$$1 \begin{vmatrix} -a_{11}L & -a_{12}L \\ -a_{12}L & 1 - a_{22}L \end{vmatrix} \begin{vmatrix} Y_1t \\ Y_2t \end{vmatrix} = \begin{vmatrix} E_1t \\ E_2t \end{vmatrix}$$

This gives the solution

$$\begin{vmatrix} Y_1t \\ Y_2t \end{vmatrix} = \begin{vmatrix} 1 & -a_{11}L & -a_{12}L \\ & & \\ & -a_{21}L & 1 - a_{22}L \end{vmatrix}^{-1} \begin{vmatrix} E_1t \\ \\ E_2t \end{vmatrix}$$

$$= \begin{vmatrix} 1 & 1 - a_{22}L & -a_{12}L \\ & & \end{vmatrix} \begin{vmatrix} E_2t \\ \\ \end{vmatrix} \quad E_1t$$

$$\Delta \quad a_{21} L \quad 1 \quad - a_{11} L \quad E1\ t \quad \text{……..(3.3)}$$

Where $\Delta = (1 - a_{11} L)\ (1 - a_{22} L) = (a_{12} L)\ (a_{21} L)$

$$= 1 - (a_{11} + a_{22})L + (a11\ \ a_{22} - a_{12}\ \ a_{21})L^2 = (1 - H_1<)\ (1 - H_2 L)$$

Where H_1 and H_2 are the roots of the equation

H^2 - $)a_{11} + a_{22})$ H + (a11 $a_{22} - a_{12}\ a_{12}$) = 0

To have a convergent expansion for Y_1 t and Y_1 t in terms of E_1t and E_2t H1< 1 and 1 H_2 1 < 1. One the condition from stability is satisfied, Y_1t and Y_2t can be expressed as a function of the current and legged values of E_1t and E_2t. These are known as the impulse response function (Gujarata, 1995:747, Maddala, 1988:578). Impulse response functions show the current and lagged effects over time of change E_1t and E_2t on Y_1t and Y_2t.

Two results which are obtainable mechanisms are impulse response function and forecast error variance decompositions. The impulse responses tell us how macro variables respond to shocks is the policy variables while the variance decompositions show the magnitude of the variations in the macro variables due to the policy variables. VAR models are routinely. Used to perform impulse response analysis, which allow us to measure the various period impact of the Y_{t-1} on Y1t and Y_2t. Impulse response analysis requires a vector moving average (VMA) representation of a VAR. The UMA allows us to trace out the time path of the various shocks on the variables of the VAR system. To produce reliable VAR estimates and impulse response analysis, variables of the model are required to be stationary, i.e not have unit roots.

In using VAR model, the selection of lag order, P, is very essential without a formal method, the selection of lag order in a VAR model will be arbitrary and could lead to specification error (fair and Schiller, 1990, and Dunke, 1990). Several criteria, similar to those used in the distributed lag models, are suggested to determine the model dimension. This paper uses the minimum Akaike information criteria (AIC) to determine the optimum lag length.

The economic importance of a variable in VAR model can be measured by looking at the size of the sum of the estimated coefficients, by means of the forecast error variable decomposition and

by the impulse response functions. For instance, the forecast error variance decomposition of the price (CPI) measures the response of the CPI over time in response to a VAR shock to the variables in the model. If most of the variation in CPI can be explained by the lagged values of the CPI itself, one can conclude that lagged variables such as money supply narrowly defined (MI) or nominal exchange rate (ER) are not important in explaining the variations in CPI. Besides this, the CPI equation in the VAR is useful for measuring the strength and predictability of the monetary policy linkage and changes in inflation outcomes. If there is a strong and predictable relationship between the monetary policy instruments and future CPI inflation, then it can be said that the lagged changes in the monetary policy instruments are economically important and statically significant in explaining the CPI (Tutar, 2002).

3.2 Cointegration technique

The econometric framework used for analyzing the paper is the Johansen – Juselius (Maximum – Likehood) cointegration technique, which tests both the existence and the number of cointegration vectors. The multivariate cointegration test by Johansen (1980) can be expressed as:

$$Rt = X_0 + X_1 \Delta Rt_{-1} + X_2 \Delta RT_{-2} + \ldots. + Xp_{-1} \Delta Rt - p + 11\ R + -p + Et \ldots\ldots.. (3.4)$$

Where:

Rt = (M1, CPI, Dr, ER)

R = is a 4 x 1 vector of variables that are integrated of order one (i.e 1(1);

X = is a 4 x 4 matrix of coefficients

$\prod$ = 4 x 4 matrix of parameters, and

Et = is a vector of normally and independently distributed error term

The presence of r cointegrating vector between the elements of R, implies that $\prod$ of the real r (< or <4) and hence $\prod$can be decomposed, according to Odhiambo (2005), as:

$$\prod = \beta\ 1 \ldots\ldots\ldots\ldots\ldots\ldots.. (3.3)$$

a = the matrix cointegrating vectors

β = the adjustment matrix

a and β = 4 matrices

The above equation can now be written as:

Rt = $X_0 + X_1 + X_1 \Delta Rt_{-1} + X_2 \Delta RT_{-2} + \ldots. + Xp_{-1} \Delta Rt - p + 0 (B + -p$

$+ Et$ …….. (3.6)

The rows of β are interpreted as distinct cointegrating vectors such that β2t form linear stationary process and a 's are the vector correction coefficients (Odhiambo, 2005). The problem with the β's presented in equation (3.6) is that they are correstricted and hence this system cannot identify typical long-run economic relationships. Each vector therefore requires at least r restrictions, one of which is the normalization restriction. These normalization restrictions must be motivated by economic theory so that the identified cointegrating vectors can be interpreted as long-run economic relationships.

3.3.1 Trace and maximum Eigenvalue Tests

The Johansen and Juselius method uses two tests to determine the number of co-integrating vectors, namely the likelihood ratio Trace test and the maximum Eigenvalue test

The likelihood trace statistics can be expressed as:

$$LRT = -T \sum_{1-1+1}^{n} \text{in}(1 - \mu_1) \ldots\ldots\ldots\ldots\ldots\ldots (3.7)$$

The null hypothesis in this case is that the number of cointegrating vectors is less than or equal to r, where r is 0, 1, or 2 …. Etc. In each case, the null hypothesis is tested against the general hypothesis. That is, the full real r = n

The maximum eigenvalues test on the other hand is expressed as:

ME = $-T \text{ in } (1 - \mu_r)$…….. (3.8)

In this case, the null hypothesis of the existence of r cointegrating vector is tested against the alternative of r + 1 cointegrating vector. If there is any divergence of results between the trace test and the maximum eigenvalue test, it is advisable to rely on the evidence based on the maximum eignevalue test because the latter is more reliable in small samples. The results of co-

integration test using Johansen and Juselius maximum likelihood procedure is presented in section 4.

4.0 EMPIRICAL ANALYSIS

4.1 Augmented Dickey Fuller (ADF) and Phillips Peron (PP) Unit Root Tests

The paper tests for unit roots comprising consumer price index (CPI), money supply narrowly defined (Ml), nominal exchange rate (ER) and interest rate on three months time deposits (Dr). Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) are employed to perfume the tests. The results of the stationarily tests of variables at levels are presented in Table I

Table 4.1 (a); Unit Root Test Using Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) Tests in Nigeria: 1966 - 2010

Variables	ADF Test at Level	95% ADF Critical Level	Order of Integration	PP Test at Level	95% PP Critical Level	Order of Integration
CPS	-1.64	-3.52	1(1)	-1.70	-3.52	1(1)
M_1	-2.70	-3.52	1(1)	-2.46	-3.52	1(1)
ER	-0.47	-3.52	1(1)	-0.38	-3.52	1(1)
DR	-2.16	-3.52	1(1)	-2.85	-3.52	1(1)

Notes: One lag of each variable is used. The variables are defined as follows: CPI stands for the consumer price index;
Ml is the money supply narrowly defined; ER is the norminal exchange rate and exchange rate and DR stands the interest rate on three months time deposits
Source: Own Computations

Table 4.1 (a); Unit Root Test Using Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) in Ghana: 1966 - 2010

Variables	ADF Test at Level	95% ADF Critical Level	Order of Integration	PP Test at Level	95% PP Critical Level	Order of Integration
CPS	-2.90	-3.52	1(1)	-2.42	-3.52	1(1)
M_1	-2.87	-3.52	1(1)	-2.67	-3.52	1(1)
ER	-2.17	-3.52	1(1)	-2.17	-3.52	1(1)
DR	-1.08	-3.52	1(1)	-1.14	-3.52	1(1)

Notes: One lag of each variable is used. The variables are defined as follows: CPI stands for the consumer price index;

Ml is the money supply narrowly defined; ER is the norminal exchange rate and exchange rate and DR stands the interest rate on three months time deposits
Source: Own Computations

The above results in Table 4.1(a) and 4.1(b) show that all the variables are non-stationary at levels both in Nigeria and Ghana. The unit root tests applied to the variables at levels reject the null hypothesis of stationarity of all the variables used. The variables are therefore differenced once in order to perform stationarity tests on difference variables. After differencing the variables once, all the variables were confirmed to be stationaiy. The ADF and PP tests applied to the first difference of the data series accept the null hypothesis of stationarity for all the variables used. It is, therefore, worth concluding that the variables are integrated of order one.

4.2 Vector Auto-regression Models including M1 and CPI

To provide an empirical insight into the relationship between money and price, two- variable VAR model is specified using M1 and CPI. The results of the cointegration tests are reported in Table 4.2(a) and 4.2(b). The results suggest that the null hypothesis of no cointegration between M1 and CPI cannot be rejected at the 5% level in Nigeria in Ghana Given the strong evidence that the series are non-stationary and do not cointegrate, the paper shows that the relationship between the money supply and the price level is unstable in Nigeria and Ghana.

Table 4.2(a): Johansen Cointegration Test for M1 and CPI in Nigeria

Sample (adjusted): 1968 – 2010
Included observations: 43 after adjusting endpoints
Trend assumption: Linear deterministic trend
Series: Ml CPI
Lags interval (in first differences): Ito 1

Unrestricted Cointegration Rank Test
Hypothesized Trace 5 Percent

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**5 percent Critical Value**	**1 Percent Critical Value**
None	0.084348	4.218552	15.41	20.04

At most 1	0.009937	0.429416	3.76	6.65

Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**5 percent Critical Value**	**1 Percent Critical Value**
None	0.084348	3.789136	14.07	18.63
At most 1	0.009937	0.429416	3.76	6.65

NOTES: VAR includes two lags on each variable and a constant term. The estimation period is 1960-2004. None of the deterministic variable is restricted to the co-integration space; the maximum eigenvalue and trace test statistics are adjusted for degrees of freedom.

Table 4.2(b): Johansen Cointegration Test for M1 and CPI in Ghana

Sample (adjusted): 1968 - 2010

Included observations: 43 after adjusting endpoints

Trend assumption: Linear deterministic trend

Series: Ml CPI

Lags interval (in first differences): 1 to I

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**
None	0.089932	5.524492	15.41	20,04
At most 1	0.033662	1.472367	3.76	6.65

Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistics**	**5 Percent Critical Value**	**1 Percent Critical Value**
None	0.089932	4.052125	14.07	18.63
At most 1	0.033662	1.472367	3.76	6.65

Source: Own computations

Notes VAR includes two lags on each variable and a constant term. The estimation period is 1960-2004. None of the deterministic variable is restricted to the co-integration space; the maximum eigenvalue and trace test statistics are adjusted for degrees of freedom

Having tested for cointegration, the paper estimates unrestricted vector autoregressive model in levels using two lags of each variable and including a constant. Tables 4.3(a) and 4.3(b) in Nigeria and Ghana respectively display the regression results of this model. The model explains changes in prices reasonably well with an adjusted R-squared of 99 per cent. Especially in the short-run, shocks to the price level are major determinant of the inflation in Nigeria and Ghana. There is an indication of inertia in the inflation process and proxying for inflation expectations because it has an almost one for one impact on itself at the first lag and it is statistically significant. The money supply appears to have little predictive information on the price level in both Nigeria and Ghana since it is not statistically significant at all lags.

Table 4.3(a): Vector Auto-regression Estimates of M1 and CPI in Nigeria

Sample (adjusted): 1968 - 2010
Included observations: 43 after adjusting
Endpoints
t-statistics in [ ]

Ml(-1)	1.321 182 [8.66591]	6.316313 [2.14809]
CP1(-1)	-0.008433 [-1.23028]	1.637727 [12.38821
C	-0.008239 [-0.06173]	-3.273946 [-1.27197]
Sum sq. resides	1.044965	388.7111
Akaike AIC	-0.646781	5.272071
Schwarz SC	-0.441991	5.476862

Table 4.3(b): Vector Auto-regression Estimates of M1 and CPI in Ghana

Vector Auto regression Estimates
Sample (adjusted): 1968 – 2010
Included observations: 43 after adjusting
Endpoints
Standard errors in ( ) & t-statistics in [ ]

	CPI	**MI**
LCPI (-1)	1.231109 (0.16904) [7.28285]	0.257070 (0.10705) [2.40144]
LMI (-1)	0.426668 (0.26738) [1.59571]	1.094246 (0.16932) [646244]

C	-0.262793 (0.27283) [-0.963211	0.151496 (0.17277) [0.876841
Adj. R-squared Akaike AIC Schwarz SC	0.996640 -0.142425 0.062365	0.998691 -1.056168 -0.851377

Source Own computations

The paper captures the qualitative features of the model by computing the variance decomposition. This helps in assessing whether the money supply contains information about the price level sufficiently far into the future to be operationally meaningful. Tables 4.4(a) and 4,4(b) reveals the results,

Table 4.4(a): Variance Decompositions for the VAR Model of Ml and (71 in Nigeria

Variance Decomposition of CP1

Period	**SE**	**CPI**	**MI**
1	0.094767	100.0000	0.000000
2	0.182322	90.77218	9.227824
3	0.266640	80.58345	19.41655
4	0.342 162	72.71133	27.28867
5	0.408158	66.81196	33.18804
6	0.466015	62.25923	37.74077
7	0.517533	58.60255	41 .39745
8	0.564273	55.55760	44.44240
9	0.607417	52.94920	47.05080
10	0.647821	50.66809	49.33191

Source: Own Computations

Table 4.4(b): Variance Decompositions for the VAR Mode) of Ml and CPI in Ghana

Variance Decomposition of CPI: Period

Period	**SE**	**CPI**	**MI**
1	0.213392	100.0000	0.000000
2	0.360368	97.84104	2.158963
3	0,483168	95.86056	4.139437
4	0.583173	93.92010	6.079900

5	0.664618	91 .97734	8.022662
6	0.731737	90.00132	9.998678
7	0.788085	87.98398	12.01602
8	0.836436	85.92967	14.0703 3
9	0.878881	83.84918	16.15082
10	0.916976	81.75590	18.24410

Innovations to money explain a 0 percent of the variance of the prices in the first period in Nigeria and Ghana, and this increases to 27 percent and 6 percent respectively in the fourth year. On the other hand, the prices have 73 and 93 percent of their forecast-error variance explained by own innovations in the fourth year in Nigeria and Ghana respectively, indicating the inertia. In the short run, the paper observes that money does not have predictive information on prices, and inflation seems to have a very strong prediction and inertial nature that might be caused by expectations.

4.3 VAR Models for Money (M1), Price (CPI) and Deposit Rate (Dr)

To further verify the predictive ability of monetary policy instruments on price, interest rate variable is added to money supply and price.

Co-integration Test for Money (M1), Price (CPI) and Deposit Rate (Dr)

The tests for cointegration of money, prices, and interest rates are undertaken in Tables 4.5(a) and 4.5(b). The Tables show the results of the cointegration tests. The tests results imply that the null hypothesis of no cointegration against the alternative of cointegration of money, prices, and interest rates cannot be rejected at the 5% and 1% level in both Nigeria and Ghana.

Table 4.5(a): Co-integration Tests for M1, CPI and Dr in Nigeria

Sample (adjusted): 1968 – 2010

Included observations: 43 after adjusting endpoints

Trend assumption: Linear deterministic trend

Series: CPI M1 Dr

Lags interval (in first differences): I to 1

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**

None	0.381263	2545457	2968	35.65
At most 1	0.100917	4.811363	15.41	20.04
At most 2	0.005497	0.237004	3.76	6.65

Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**
None	0.381263	20.64321	20.97	25.52
At most 1	0.100917	4.574359	14.07	18.63
At most 2	0.005497	0.237004	3.76	6.65

Source: Own Computations

Notes: VAR includes four lags en each variable and a constant term. The estimation period is 1986:1-2003: 4. None of the deterministic variable is restricted to the co-integration space; the maximum eigenvalue and trace test statistics are adjusted for degrees of freedom.

Table 4.5(b): Co-integration Tests forM1, CPI and Dr in Ghana

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**
None	0.132161	12.65365	29.68	35.65
At most 1	0.101884	7.125453	15.41	20.04
At most 2	0.072487	2.934672	176	6.65

Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**
None	0.132161	5.528193	20.97	25.52
At most 1	0.101884	4.190782	14.07	18.63
At most 2	0.072487	2.934672	3.76	6.65

The unit root and cointegration tests show that there is non-stationarity of variables. The strong evidence of no cointegration of the series M1, CPI, and Dr implies the instability of the relationships among the money supply, the price level and interest rates. Tables 4.5(a) and 4.6(b) estimate a VAR in levels using one lag of each variable and having a constant. The Tables show the regression results of this model. Interest rates have a lower R-squared compared with Ml and CPI in both countries. While the coefficient of CPI lagged one period is statistically, those of money supply (Ml) and deposit rate (Dr) are not statistically significant at 5 percent level of significance in Ghana In Nigeria, the coefficient of deposit rate lagged one period is also not statistically significance at 5 percent. This implies that interest rates provide no information

about price changes in Nigeria and Ghana. Also, M1 has no predictive power for the prices in Ghana. In both countries, the highest predictive information about prices comes from the prices themselves at which the coefficient is high and statistically significant at 5 percent level.

These results support the existence of inertia in the inflation process especially in the short run. The paper observes that prices do respond very slowly to both interest rates and money innovations in Ghana. Also, the prices responds very slowly to interest rates in Nigeria which imply that interest rates do not contain information on inflation sufficiently to allow policy maker use it as a monetary policy instrument in Nigeria and Ghana

Table 4.6(a): Vector Auto-regression Estimates of Ml, CPI and Dr in Nigeria

Vector Auto-regression Estimates

Sample (adjusted: 1967 – 2010)
Included observations: 44 after adjusting endpoints
Standard errors m ( ) & t-statistics in [ ]

	CPI	**MI**	
LCPI (-1)	0.863434 (0.04343) [19.8824]	-0.044062 (0.06879) [-0.64057]	-0.601733 (1.00091) [-0.60119]
LMI (-1)	0.101966 (0.03569) [2.856791]	1.027888 (0.05653) [18.1817]	0.927343 (0.82264) 11.12727]
DR(-1)	-0.016455 (0.00492) [3.34360]	0.011753 (0.00780) [1.50780]	0.729756 (0.11343) [6.43368]
C	-0770684 (0.27887) [-2.763611	-0.106772 (0.44171) [-0.241731	-5.386980 (6.42735) [-0.838131
Adj. R-squared Akaike AIC Schwarz SC	0.997762 -1.532206 -1 .370007	0.996192 -0.612402 -0.450202	0.811199 4.742948 4. 905147

Source: Own computations

Table 4.6(b): Vector Auto regression Estimates of Ml, CPI, and Dr in Ghana

Vector Auto regression Estimates

Sample (adjusted): 1966 – 2010

Included observations: 39

Excluded observations: 4 after adjusting endpoints

Standard errors in ( ) & t-statistics in [ ]

	CPI	**MI**	**DR**
LCPI (-1)	1.172124 (0.19651) [5.9791]	0.203063 (0.11359) [1.78762]	0.717296 (3.13016) [0.22916]
LMI (-1)	0.355022 (0.31431) [1.12953]	1.093917 (0.18169) [6.02077]	-1.074179 (5.00661) [-0.21455]
DR(-1)	-0.001709 (0.01 109) [-0.15415]	0.003319 (0.00641) [0.51779]	0.858545 (0.17664) [4.86052]
C	-0.111981 (0.32584) [-0.34367]	0.192698 (0.18836) [1.02305]	7.366848 (5.19029) [1.41935]
Adj. R-squared Akaike AIC Schwarz SC	0.996392 0.029814 0.328402	0.998838 -1.066325 -0.767737	0.769800 5.566093 5.864681

To throw more light into analysis, the paper estimates the variance decomposition of CPI in Table 4.7(a) and 4.7(b). The paper does not report the variance decompositions of money supply (Ml) and deposit rates (Dr) because our interest is to examine the impact and predictive ability of Ml and Dr on CPI. This Table throws further light on the relationships among the price level, interest rates, and money supply. At the 2-period horizon, 1 percent of the variance in prices is accounted for by monetary shocks and about 7 percent is due to interest rate shocks in Nigeria.

Similarly, in Ghana, 1 percent variation in price is explained by money supply, while deposit rate accounted for 0 percent. However, at the 2-period horizon, 98 percent and 92 percent variance in prices is accounted for by price shocks themselves in Nigeria and Ghana respectively. This implies that in the short run, changes in prices are explained by innovations in its own shocks and that money supply and interest rates have little or no predictive power over price changes in Nigeria and Ghana

Table 4-7(a): Variance Decomposition for the VAR Models of Ml, CPI, and Dr in Nigeria

Variance Decomposition of CPI

Period	**SE**	**CPI**	**MI**	
1	0.107712	100.0000	0.000000	0.000000
2	0.154094	91.79661	1.215238	6.988152
3	0.195848	79.80050	3.865822	16.33368
4	0.236378	68.25329	7.492738	24.25398
5	0.276095	58.39768	11.71034	29.89197
6	0315017	5027932	16.24749	33.47319
7	0.353179	43.62716	20.91105	35.46179
8	0.390663	38.14700	25.55907	36.29393
9	0.427566	3159401	30.08747	363 1852
10	0.463978	29.77846	34.42281	35.79873

Source: Own Computations

Table 4-7(b): Variance Decomposition for the VAR Models of Ml, CPI, and Dr in Ghana

Variance Decomposition of CPI

Period	**S.E**	**CPI**	**MI**	**DR**
1	0.226592	100.0000	0.000000	0.000000
2	0.366123	9859593	1.376765	0.027306
3	0.474188	95.63791	3.379147	0.982942
4	0.563352	90.31402	5.992265	3.693717
5	0.642321	83.23588	9.047873	7.716243
6	0.715216	75.44320	12.36563	12.19118
7	0.783712	67.75777	15.80280	16.43943
8	0.848499	60.64965	19.26111	20.08925
9	0.909950	54.31881	22.67570	23.00549
10	0.968371	48.80261	26.00373	25.19366

5.4 VAR Models for Money (M1), Price (CPI) and Exchange Rate (ER)

Further analysis is carried by estimating another three-vaiiable VAR model by using M1, CPI, and ER to analyze the response of prices to nominal exchange rate. This is done to further

determine whether or not there will be a change in the response of prices to money innovations when interest rate is excluded and nominal exchange rate is included as monetary policy instruments. The cointegration tests in Tables 4.8(a) and 4.8(b) show the existence of no cointegration using both the Trace and Max-Eigen value tests. This shows that there is no long run and predictable relationship between money supply (Ml), price (CPI) and exchange rate (Er) in both Nigeria and Ghana.

Table 4.8 (a): Johansen Co-integration Test for M_1, ER and CPI in Nigeria

Sample (adjusted): 1996 – 2010

Included observations: 43 after adjusting endpoints

Trend assumption: Linear deterministic trend

Series: CPI Ml ER

Lags interval (in first differences): Ito I

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**
None	0.298955	20.66625	29.68	35.65
At most 1	0.093098	5.393402	15.41	20.04
At most 2	0.027327	1.191413	3.76	6.65

Hypothesized No. of CE(s)	**Eigenvalue**	**Max-Eigen Statistic**	**5 Percent Critical Value**	**1 Percent Critical Value**
None	0.298955	15.27285	20.97	25.52
At most 1	0.093098	4.201989	14.07	18.63
At most 2	0.027327	1.191413	3.76	6.65

Source: Own Computations

Table 4.8 (b): Johansen Co-integration Test for M1, ER and CPI in Ghana

Sample (adjusted): 1966 – 2010

Included observations: 43 after adjusting endpoints

Trend assumption: Linear deterministic trend

Series: Ml CPI ER

Lags interval (in first differences): I to I

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.383437	28.62250	29.68	35.65
At most 1	0.150266	7.827937	15.41	20.04
At most 2	0.019029	0.826144	3.76	6.65

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None	0.383437	20.79456	20.97	25.52
At most 1	0.150266	7.001793	14.07	18.63
At most 2	0.019029	0.826144	3.76	6.65

Source: Own Computations

To further buttress this point, the paper estimates vector autoregressive model in Tables 4.9(a) and 4.9(b). From the Tables, the coefficients of inflation and money supply lagged one period are statistically significant at 5 percent level, while that of exchange rate is not. This implies that while money supply and inflationary expectation have important effects on price, that of nominal exchange rates do not. This shows that there is inertia in the inflation process.

Table 4.9(a): Vector Auto-regression Estimates of Money (M_1) Price and Nominal Exchange Rate (ER) In Nigeria

Vector Autoregression Estimates
Sample (adjusted): 1967 – 2010
Included observations: 44 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

	CPI	M_1	ER
CPI (-1)	0.906649 (0.04947) [18.3277]	-0.028692 (0.07421) [-0.38664]	9.273790 (4.64628) [1.99596]
MI (-1)	0.108082 (0.03875) [2.78887]	1.037893 (0.05814) [17.8526]	-5.312604 (3.63998) [-1.45952]
ER (-1)	-0.001356 (0.00073) [-1.87054]	-0.000255 (0.00109) [-0.23481]	0.920338 (0.06811) [13.5126]

C	-0.712744 (0.30623) [-2.32749]	-0.113537 (0. 45938) [-0.24715]	43.25297 (28.7621) [1.50382]
Adj. R-squared	0.997367	0.995981	0.926733
Akaike AIC	-1.369601	-0.558499	7.715367
Schwarz SC	-1.207402	-0,396300	7.877566

Source: Own Computations

Table 4.9(b): Vector Auto-regression Estimates of Money (M1) Price (CPI) and Nominal Exchange Rate (ER) In Ghana

Vector Autoregression Estimates

Sample (adjusted): 1966 – 2010

1rJuded observations: 43 after adjusting endpoints

Standard errors in ( ) & t-statistics in [ ]

	CPI	**MI**	**ER**
CPI (-1)	0.703438 (0.18019) [190381]	0.184445 (0.14728) [1.25235]	-0.504320 (0.37589) [-1.34166]
MI (-1)	0.493847 (0.21 161) [2.33372]	1.101443 (0.17296) [6.36813]	-0.046930 (0.44144) [-0.10631]
ER (-1)	-0.111054 (0.07469) [-1.48694]	0.020017 (0.06104) [0.32790]	0.696940 (0.15580) [4.47330]
C	-0.012340 (0.23469) [-0.05258]	0. 141130 (0.19183) [0.735721	1.686851 (0.48958) [3.44548]
Adj. R-squared	0.997904	0.998640	0.990668
Log likelihood	19.37364	28.04649	-12.24323
Akaike AIC	-0.575518	-0.978907	0.895034
Schwarz SC	-0.288811	-0.692200	1.181741

Source: Own Computations

Furthermore, the paper estimates the variance decomposition for this model in Tables 4.10(a) and 4.10(b). At 2-year horizons, 98 percent and 92 percent of the variances in prices in Nigeria and Ghana respectively are explained by their own shocks while money supply and exchange

rate jointly explains 2 percent and 8 percent variation in prices in Nigeria and Ghana respectively. These results suggest that at the aid of two years that are considered to be relevant for inflation targeting, the exchange rates and money supply do not provide predictable information about the price changes.

Table 4.10(a): Variance Decomposition for the VAR Models of M1, CPI and ER in Nigeria

Variance Decomposition of CPI:

Period	**S.E**	**CPI**	**M_1**	**ER**
1	0.116835	100.0000	0000000	0000000
2	0.166087	98.35114	0.901998	0.746866
3	0.205754	94.83982	3.012761	2.147422
4	0.241 569	89.93531	6.215733	3.848957
5	0.275733	84.12390	10.30513	5.570976
6	0.309295	77.84448	15.03508	7.120432
7	0.342780	71.45296	20.16031	8.386731
8	0.376434	65.21187	25.46268	9.325446
9	0.410345	59.29699	30.76432	9.938691
10	0.444502	53.81241	35.93043	10.25716

Table 4.10(b): Variance Decomposition for the VAR Models of M,, CPI and ER in Ghana

Variance Decomposition of CP1:

Period	**S.E**	**CPI**	**M_1**	**ER**
1	0.168529	100.0000	0.000000	0.000000
2	0.230278	91.67218	5.61 1074	2.716746
3	0.315480	76.81496	9.716585	13.46846
4	0.412094	65.03931	14.68680	20.27389
5	0.509559	56.02687	19.99205	23.98108
6	0.603883	49.07367	25.30003	25.62630
7	0.691988	43.61274	30.60386	25.78340
8	0.772144	39.20450	35.84262	24.95287
9	0.843811	35.56936	40.91)37	23.51927
10	0.907247	32.52769	45.69208	21 .78023

5.0 SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

This paper examines one of the prerequisites of inflation targeting in Nigeria and Ghana. That is whether or not there is a stable and predictable relationship between price and monetary policy instruments in Nigeria and Ghana using VAR models. The econometric model was constructed in line with Tutar (2002) approach in Turkey. The author's paper provides VAR evidence to find

the relations between the instruments of monetary policy such as short-term interest rates and nominal exchange rates, output and inflation rate in Turkey.

The unit root tests were performed along with the other statistical tests and the findings show that the data for money supply (M11, price (CPI), exchange rate (ER) and deposit rate (Dr) are no stationary, which is an indication that these variables have a stochastic trend. Following to these tests, the paper estimates three different VAR models starting with a simple two-variable model that incorporate money (M1) and price (CPI) only. Subsequent VAR models were performed by adding one financial variable after the other and examine the relationship between inflation and monetary policy instruments, such as interest rates and exchange rates.

It is observed from the VAR two-variable model that inflation is an inertial phenomenon in Nigeria, and money innovations are not strong and statistically important determinants of prices when compared with price shocks themselves. When adding financial variable like exchange rates into the models, the paper does not observe any significant improvement in the model. In the short run, innovations in prices are mostly explained by their own shocks, the monetary policy instruments have little or no effect on prices. The implication is that policy linkage between inflation and monetary policy instruments is not strong and predictable in the short run in Nigeria and Ghana. Putting it differently, monetary policy instruments of money supply, interest rates, and exchange rates do not contain any predictable information about inflation, and they do not show a stable and predictable linkage with inflation in Nigeria and Ghana. These findings are similar to Tutar (2002) in Turkey.

This implies that Nigeria and Ghana are not good candidates for inflation-targeting regime. The empirical results reveal that inflationary expectations are the major causes of high inflation in these countries. To address this issue, therefore, the monetary authorities must reduce the influences of inflationary expectations by pursuing more transparent policies. This can be achieved by frequently informing the public about the changes in monetary policy and explaining the reasons for those changes, The public must be well informed about the monetary policy performance and if there are deviations from the targets the government must be sincere to explain the reasons of the deviations. Also, since price changes in Nigeria and Ghana are

mostly from inflationary expectations, the Central Banks of these countries must develop powerful models to forecast price changes capable of focusing on inflationary expectations.

REFERENCES

Adebiyi, M.A. (2010). Inflation Targeting: can we established estate on predictable relationship in Nigeria and Ghana. Journal and Monetary of Economics vol. 2

Adrangi, B. and M. Allender (1998). "Budget Deficits and Stock Prices. International Evidence". *Journal of Economics,* vol. 22 Number 2-3, Pp. 57- 66.

Akhand, H. A. (1998). Central Bank Independence and Growth: A Sensitivity Analysis, Canadian Journal of Economics, Vol. 31, pp. 303-317

Aiesina, Alberto and Lawrence H. Summers. (1993), "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence". Journal of Money, Credit and Banking Vol. 25, No. Z May.

Barro, Robert (1995). Inflation and Economic Growth, Bank of England Quarterly Bulletin, Vol 35, pp. 166-176.

Baneijee, A., Dolado, J., Gaibraith, J.W. and Hendiy, D. (1993). Cointegration, Error Correction and the Econometric Analysis of Non-stationary Data, Oxford University Press.

Bruno, M. and Easterly, W. (1998). Inflation Crises and Long-Run Growth, Journal of Monetary Economics, Vol. 41, pp. 3-26.

Campillo, M. and Miron, J. (2007). Why Does Inflation Differ Across Countries? in Reducing Inflation: Motivation and Strategy, edited by Christina Romer and David Romer, Chicago: University of Chicago Press; pp. 335-357.

Christoffersen, P., T. Slok and K. Wescolt (2001), "Is Inflation Targeting Feasible in Poland?," Economics of Transition Vol. 9, No. 1

Cukierman, A. (1992a), Central Bank Strategy, Credibility and Independence: Theory and Evidence. Cambridge, Mass: MIT Press.

Cukierman, A.. (1992(b)), "Commitment through Delegation and its Effect on Policy: The Case of Central Bank Independence". Paper Presented at the Conference on Coalitions and Bargaining. Tel Aviv University, Department of Economics.

Cukierman, A., Miller, G. P. and Neyapti, B. (2002). Central Bank Reform, Liberalization and Inflation in Transition Economies - An International Perspective. Journal of Monetary Economics, Vol. 49, No. 2, pp. 237-264.

Cukierinan, A, Kalaitzidakis, P., Summers, L. H. and Webb, S. B. (1993). Central Bank Independence, Growth, Investment and Real Rates, Carnegie- Rochester Conference Series on Public Policy, Vol 39 (Dee), pp. 95-140.

Daunfeldt, S-O and de Luna. X. (2003). Central Bank independence and Price Stability: Evidence from 23 OECD Countries, Unpublished paper, The Swedish Research Institute of Trade, Department of Statistics, Umea University, Sweden.

Debelle, G.(1997).Inflation Targeting in Practice,. IMF Working Paper WP/97/35, Washington D.C., March

Debelle, G. and C. H. Lim (1998). Preliminary Considerations of an Inflation Targeting Framework for the Philippines,. IMF Working Paper WP198139, Washington D.C., March.

Down, 1. (2004), Central Bank Independence, Disinflations and the Sacrifice Ratio, Comparative Political Studies, Vol 37, No. 4, pp. 399-434.

Dutta, D. and Ahmed, N. (1997). An Aggregate Import Demand Function for Bangladesh: A Cointegration Approach, Working Paper in Economics, University of Sydney

Eijffinger, S., van Rooij, M. and Schaling, E, (1997). Central Bank Independence: A Panel Data Approach, Public Choice, Vol. 89, pp. 163-182.

Fair Ray C. and Robert J. Schiller (1990). "Comparing Information in Forecasts from Econometric Models," The American Economic Review, 80, no. 3, (June), 375-389.

Franzese, R. J. Jr. (1999). Partially Independent Central banks, Politically Responsive Governments, and Inflation, American Journal of Political Science, Vol. 43, No. 3, pp. 681-706.

Fujiki, H. (1996). Central Bank Independence Indexes in Economic Analyses: A Reappraisal, Bank of Japan Monetary and Economic Studies, Vol 14, pp. 79-99.

Fuhrer, J. C. (1997). Central Bank Independence and Inflation Targeting: Monetary Policy Paradigms for the Next Millennium?, New England Economic Review, Vols 1&2, pp. 19-36.

Funke, Michael (1990). "Assessing the Forecasting Accuracy of Monthly Vector Autoregressive Models: The Case of five OECD countries," international Journal of Forecasting, 6: 363-378.

Gottschalk, J. and D. Moore (2007). "Implementing Inflation Targeting Regimes: The Case of Poland," Journal of Comparative Economics Vol. 29, No. 1, March.

Gujarati, D.N (1995). Basic Econometrics, McGraw-Hill, mc, Third Edition Part 5, chapter 22.

Hall, P. A. and Franzese Jr., K. J. (1998) Mixed Signals: Central Bank Independence,, Coordinate Wage Bargaining and European Monetary Union, International Organization, Vol 52, No. 3, pp. 505-536

Hazirolan, U.(1999).Inflation Targeting Japanese Case and Prospects for Turkey,. Under secretariat of the Treasury, Ankara, Turkey, Mimeo, 1999.

Hoffimaister, A. W. (1999). Inflation Targeting in Karea An Empirical Exploration,. JMF Working Paper WP/99/7, Washington D.C., August

Ismihan, M. and Ozkan, F. G. (2003). Does Central Bank Independence Lower Inflation?, Unpublished paper, Department of Economics, University of York, Heslington, York, UK.

Jacome, L. I. and Vazquez, F. (2009). Any Link between Legal Central Bank Independence and Inflation? Evidence from Latin America and the Caribbean, IMF Working Paper 05/75, Washington: International Monetary Fund. Johansen, S. (1988). Statistical Analysis of Co-integration Vectors. Journal of Economic Dynamics and Control, 12: 231-254

Jonas, J. (2000). "Inflation Targeting in Transition Economies: Some Issues and Experience," Czech National Bank, Prague, August.

Jonsson, G. (1999).The Relative Merits and Implications of Inflation Targeting for South ca,. IMF Working Paper WP/99/116, Washington D.C., August

Jordan, T. J. (2007). Disinflation Costs, Accelerating Inflation Gains and Central Bank Independence, *Weliwirtschajliches* Archly, Vol. 133, pp. 1-21.

Judge, G.G., Griffiths, W.E., Hill, RC., Lutkepohl, H. and Lee, T-C. (1985), The theory and practice of Econometrics. New York: John Wiley, 2nd ed.

Kadioglu, F., N. Ozdemir and G. Yilmaz (2000). Inflation Targeting in Developing Countries,. The Central Bank of the Republic of Turkey, Discussion Paper, September.

Loungani, K P. and Sheets, N. (1997). Central Bank Independence, Inflation and Growth in Transition Economies, Journal of Money, Credit and Banking, Vol. 29, pp. 381-399.

Lutkepohl, Helmut (1985). "Comparison of Criteria for Estimating the Order of A Vector •9 Autoregressive Process," Journal of Time Series Analysis, 6, no.1, 3 5-52.

Lybek, T. (2009). Central Bank Autonomy and Inflation and Output Performance in the Baltic States, Russia and Other Countries of the Former Soviet Union, 1995-97, IMF Working Paper 99/4, Washington: International Monetary Fund.

Maddala, G.S. (1988), Introduction to Econometrics, Second Edition, Macmillan Publishing Company, New York.

Masson, P. K., M. A. Savastano and S. Sharma (1997).The Scope for Inflation Targeting in Developing Countries, IMF Working Paper WP/97/130, Washington, D.C., October.

Mishkin, F. S. (2000). Inflation Targeting in Emerging Market Countries,. NBER Working Papers, No. 7618, March.

Odhiambo, N.M. (2005). Financial Liberalization and financial Deepening: Evidence from Three Sub-Saharan African (SSA) Countries. African Review of Money Finance and Banking (Saving and Development Supplement, 2005), Pp 5-23.

Ojo, M.O. (2007). The Role of the Autonomy Of The Central Bank Of Nigeria (CBN) In Promoting Macroeconomic Stability, CBN Economic & Financial Review, Vol. 38 No. I

Palm, Franz (1983). "Structural Econometric Modelling and Time Series Analysis," in: Arnold Zeilner, Applied Time Series Analysis of Economic Data, Economic Research Report ER-5 (Us Department of Commerce, Washington, DC), 199-233.

Pollard, Patricia S. (1 993). "Central Bank independence and Economic Performance" Federal Reserve Bank of St. Louis Economic Review, July August.

Rudebusch, G. D. and Wilcox, D. W. (1994). Productivity and Inflation: Evidence and Interpretations, Unpublished paper, Federal Reserve Board (May).

Sherwin, M. (2000). Institutional Frameworks for Inflation Targeting: in: "Practical Experiences on Inflation Targeting" Bank of Thailand Symposium.

Sturm, J-E. and de Haan, J. (2001). Inflation in Developing Countries: Does Central Bank Independence Matter? New Evidence Based on a New Data Set,

Tutar, E. (2002). Inflation Targeting in Developing Countries and Its Applicability to the Turkish Economy. M.Sc Dissertation, Faculty of the Virginia Polytechnic Institute and State University, July

Woglom,, G. (2000). "Inflation Targeting in South Africa: A VAR Analysis," Journal for Studies in Economics and Econometrics Vol. 24, No.2, August

Zeliner Arnold (1979). "Statistical Analysis of Econometric Models," Journal of the American Statistical Associate on, 74, no. 367, (September), 628-643.