Working Paper

Choice of Monetary Policy Regime
In Ghana

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BANK OF GHANA

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Abstract

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Monetary aggregate targeting as a major monetary policy tool, is principally based on a stable and predictable relationship between inflation and monetary aggregate(s). However, structural changes in the economy generally and the financial sector in particular (with financial innovation and increasing application of technology) have significantly weakened the relationship between inflation and money. This paper reviews issues associated with the choice of the current policy framework in Ghana, in particular, focusing on the factors associated with the choice and also the practical aspects of implementation as well as its effects on the performance of inflation and output and on the trade-off between inflation and output variability.

The paper finds support for the current framework both on institutional and technical grounds and that the practical aspects of implementation of inflation targeting in Ghana remain similar to those of other inflation targeting countries. Some differences however exist, notable among which is the publishing of forecasts to help anchor inflation expectations.

The new regime has set inflation on a downward path even though meeting the announced inflation targets has proved elusive. The new policy regime enhanced the transparency of the monetary policy process, improved the communication strategy of the Bank with the public and thus helped anchored inflation expectations. There has also been an increased convergence towards the inflation targets with significantly reduced volatility in not only inflation, but also real economic variables such as real GDP growth underpinned perhaps by improved credibility with the new regime. Indeed and most strikingly, is the finding that the MPC's policy rate decisions showed a higher weight for output stabilization compared to deviations of estimated inflation from its target. This perhaps, partly explains the sustained growth witnessed in the Ghanaian economy in recent times though inflation also significantly converged towards the targets.

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1.   Introduction

The Bank of Ghana recently adopted inflation targeting as its monetary policy framework[1]. The framework has been increasingly viewed as a good monetary policy framework and widely applauded by many economists and policymakers. The benefits of inflation targeting in the literature, have mainly been mentioned in two areas. Firstly, inflation targeting improves the performance of inflation and output through a lowering of the level and variability of inflation, increasing output growth but decreasing its variability, alongside a diminished persistence of inflation (Hu 2003). Put differently, inflation targeting minimizes the problem of "inflation bias" that arises under economic agents' uncertainty concerning the credibility of the central bank's commitment. Neumann and von Hagen (2002) for instance compare statistics for inflation targeters and non-targeters across different periods and find that inflation targeting reduces the volatility of inflation, output, and interest rates. The second follows from the first in that inflation targeting by providing a nominal anchor for monetary policy reduced variability, enhances inflation forecasting by reducing the level of expected inflation and/or increasing its predictability (Corbo, Landerretche, and Schmidt-Hebbel, 2001; Johnson, 2002; and Mishkin and Schmidt-Hebbel, 2001).

On the other hand, an almost equal number of studies claim not to find clear evidence supporting the benefits of inflation targeting, though their results do not provide arguments against it either. Ball and Sheridan (2003) for example, examine changes in the level and variability of inflation and output as well as the persistence of inflation for seven inflation targeters and 13 non-targeters among industrial countries. They conclude that countries on average improved their performance in the 1990s, but there is no significant evidence that inflation targeters performed better than nontargeters. Cecchetti and Ehrmann (1999) argue based on a study of 23 countries (including nine inflation targeters) over the 1984–97 period that inflation aversion increased, but inflation targeting made little difference in the 1990s. The resulting empirical difference in the inflation targeting literature is partly because of the relatively small number of inflation targeting countries and the short history of this new monetary framework. The occurrence and persistence of major shocks in the global economy as is being witnessed in 2008 with food and energy prices could serve as a major test of the resilience of this framework.

While inflation targeting central banks adopted the framework for several reasons, two factors, namely, institutional and technical incentives can be identified (Horská, 2004).

The institutional incentives followed a realignment of the institutional and legal frameworks of central banks, allowing for an increased commitment towards price stability. The rationale for this has mostly been a realization that the best contribution of monetary policy in the long run is price stability and that in the process of achieving this, central bank credibility and transparency tend to be crucial.

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[1] The formal announcement was made in May 2007 even though the framework had been implemented since the latter part of 2002. The medium term target is 5 per cent CPI inflation with movements in a core measure of the CPI (that excludes energy and utility prices) to be monitored closely.

The second kind of incentives is of a *technical character* relying on the loss of a nominal anchor (i.e. declining effectiveness of exchange rate - or money-based policy regimes following structural changes in the economy) (ibid.). Profound changes in financial markets and increasing integration of economies alongside the spreading information technology deepened market integration and made the financial markets more effective. The emergence of new financial instruments, new types of transaction or new market players made the money demand function unstable and thus resulted in a weakening of the links between the intermediate target (monetary aggregate) and the final target (inflation). Besides, the unstable monetary transmission mechanism complicates the implementation of monetary targeting and communications with the public, which in turn hampers transparency and credibility and thus its ability to influence inflation expectations. These and other related obstacles to the conduct of monetary policy motivated inflation targeting in, for example, New Zealand, Canada, Israel, Australia, Poland and Hungary to adapt new monetary policy regime (ibid.). Other countries such as the United Kingdom, Sweden, Finland, Spain, the Czech Republic, Brazil, Chile and South Africa mention the loss of a nominal anchor – the fixed exchange rate - as the main reason for adopting inflation targeting.

This paper investigates issues associated with the choice of the current policy framework in Ghana. In particular, it focuses on the factors associated with the choice and also the practical aspects of implementation and its effects on the performance of inflation and output and on the trade-off between inflation and output variability. The paper is organized as follows. Section 2 re-examines the demand for money and its implications for policy in Ghana. Section 3 explores the general issues associated with inflation targeting while section 4 examines the practical aspects, implementation and outcomes of inflation targeting in Ghana. Conclusions and recommendations follow in section 5.

2.   A Re-examination of the Demand for Money in Ghana:

Nature and Implications for Policy

As conventionally agreed, the effectiveness of monetary policy based on monetary targeting crucially depends on finding a stable money demand function. A stable money demand function ensures a predictable impact of money supply on other economic variables such as inflation, national income, private investments, etc. (Driscoll and Ford, 1980). Therefore, the stability issue in money demand function becomes an interesting research area for researchers to test the effectiveness of a given monetary programme.

Figure 1: Ghana: Broad Money as per cent of GDP

In most economies, however, it has been observed over the
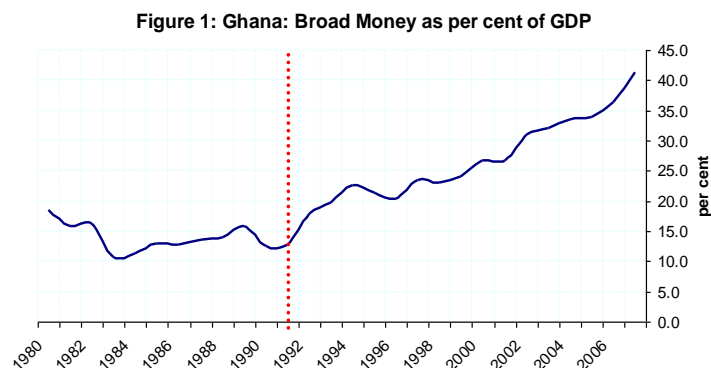
past couple of decades that the relationship between monetary aggregates and inflation weakened and resulted in instability in the money demand function. This weak relationship between monetary aggregates and inflation therefore made it impossible to target monetary aggregates with the view to controlling inflation. The probability of missing the final target (inflation) by achieving a specific intermediate target (monetary aggregate) significantly increased and thus resulted in central banks abandoning this framework. This was succinctly described in the words of Bouey (1983), former Governor, Bank of Canada as *"we did not abandon M1, M1 abandoned us"*. Ghana's economy since the inception of the structural adjustment programme in 1983 has undergone a period of consistent substantial deregulation, culminating in the adoption of the use of indirect instruments in the conduct of monetary policy in 1992 and increased monetization of the economy (Figure 1). One of the sectors that saw major transformation was the financial sector with the launch of the Financial Sector Adjustment Programme (FINSAP) in 1988.

Recent trends in the monetary aggregates reveal very strong growth path, occasionally, overshooting targets even though inflation continues to be low (Panel 1)[2]. High growth rate in liquidity alongside continued low inflation raises a question on the stability of the demand for money. In this section, an attempt is made to empirically re-examine the demand for money function for Ghana – its nature and policy implications - using the Johansen cointegration technique.

Panel 1: Ghana, Evolution of the relationship between money supply growth rate and inflation
This panel shows the long-run positive relationship between money supply and inflation. The positive relationship from the charts seemed particularly strong prior to 2001 and less so, especially from 2002. This thus points to a declining role of monetary aggregates in the inflation dynamics in the economy.

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[2] A situation underpinned by pronounced financial deepening with significant deposit-funded private sector credit expansion.

2.1   Theory and Empirical Methodology

Given its pivotal role in the policy setting, the demand for money is one of the most widely researched topics in monetary economics. Stability of the money demand function is sine qua non if the transmission mechanism for monetary policy is to be effective under a monetary targeting regime. In this regard, in most developed and developing countries, policy makers have frequently questioned whether or not the demand for money is stable with considerable effort being spent on establishing the stability of the money demand function. In general, the popular view of the studies in developed countries during the 1990s was that of instability in demand for money following the financial liberalization and innovations. This has thus led to a downgrading of the role of the monetary aggregates as policy targets in the conduct of monetary policy. The notable exception however is that of the ECB, with its two pillar approach. There have been mixed results on the stability of the money demand function in developing countries in the face of considerable reforms.

2.1.1   The Model:

In most studies, the demand for money is specified as a function of income, interest rates and the exchange rate. The exchange rate captures the effect of depreciation on the demand for money. The basic model is of the form:

$$(M^d / P) = f(Y, R, E) ....(1)$$

where M^d is the demand for nominal money balances, P is the price level, Y is the scale variable (income, wealth or expenditure, in real terms); R is a vector of expected rates of return (within and outside money) and E represents the nominal effective exchange rate.

For the purpose of this study the variables of interest are broad money supply *(M2+)* and own rate of return (deposit rate), return on alternative assets including treasury bills and inflation (return on physical assets), the nominal effective exchange rate and return on foreign securities. The expected rate of return on foreign securities is often added as an explanatory variable due to the increasing financial globalization and also the empirical evidence on portfolio balance models in open economies (Nachega, 2001).
Equation (1) is re-specified in specific variables and log linearized form as:

$$(m - p)_t = \alpha_0 + \alpha_1 y_t + \alpha_2 \Delta p_t + \alpha_3 td_t + \alpha_4 tbill_t + \alpha_5 LIBOR_t + \alpha_6 ner_t + \varepsilon_t ....(2)$$

where the lower case variables are in logs. *y* represents the log of real GDP, *Δp* is the inflation rate (a proxy for the return on holding real sector assets); *td* and *tbill* respectively represent the deposit rate and treasury bill rate whilst libor (annualized three-month London interbank offered rate) is a proxy on foreign interest rate; *ner* denotes nominal effective exchange rate.
The expected signs of the α's are: $\alpha_1, \alpha_3 > 0; \alpha_2, \alpha_4, \alpha_5, < 0$. Parameter of the exchange rate (α_6) is indeterminate ex-ante. A depreciation of domestic currency (an increase in *ner*) may result in an increase in domestic currency value of foreign financial assets held by

domestic residents which, in turn, may lead to an increase in the demand for cash balances. The positive coefficient of the exchange rate variable also supports the wealth effect argument in the literature; see for example Arango and Nadiri (1981) and Arize et al. (1999). However, depreciation of domestic currency may also induce expectation of additional depreciation which result in a decrease in the demand for money, implying a negative coefficient for the exchange rate.

2.2   Integration and Cointegration

2.2.1   Time series analysis

We used quarterly data of the variables in the model from 1980:1 through 2007:1. Thorough preliminary investigation of the time series properties of the data was conducted using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results suggest that with the exception of inflation, all the series are integrated of order 1.

2.2.2   Cointergation Analysis

Using the methods developed by Johansen (1988, 1991) and Johansen and Juselius (1990)[3] the following long-run open economy demand for real broad money was estimated:

$$(m-p)_t = 1.22 * y_t - 0.17 * tbill_t + 0.07 * ner_t - 0.01 * LIBOR_t + 0.0015 * trend + 4.98 .....(3)$$
$$\quad\quad [2.19] \quad\quad\quad [-3.85] \quad\quad\quad [1.82] \quad\quad\quad [-1.97] \quad\quad\quad [0.25]$$

All the coefficients have the expected signs. The demand for real broad money is positively related to income and the exchange rate and negatively related to the return on treasury bills and the libor rate. The income elasticity of real broad money is 1.22 which is close to unity and significantly different from zero. This is consistent with the quantity theory of money hypothesis. In the long run while the exchange rate has a low impact on the demand for real broad money as suggested by the small exchange rate elasticity, the effect of the interest rate is stronger as the elasticity of interest rate is larger. Strikingly, our long-run demand for money equation reveals that over the sample period, external rates of return have partly influenced the demand for money.

Weak exogeneity test suggest the variables are weakly exogenous, implying a single equation modelling of equation (3) will not lead to biased estimates.

2.2.3   Short-run demand for money: Error correction model

Having established the existence of cointegration and in accordance with the Granger representation theorem, we proceed to model changes in broad money as a response to departures from the stationary linear combination of the variables included in the cointegrating vector, as well as by any other stationary variable, such as inflation.

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[3] The approach has been used in several money demand studies including Hayo (2000), Nachega (2001), Katafono (2001) and Akinci (2003).

$$\Delta(m-p) = 0.179\Delta(m-p)_{-1} + 1.993\Delta ry_{-3} + 1.361\Delta ry_{-5} - 0.124\Delta ner_{-4}$$
$$- 0.050\inf + 0.049\inf_{-1} - 0.199 ecm_{-1} - 0.0795 dum83 + 0.097 seas(3)$$
$$+ 0.178 seas(4) + 0.118 dum_{impulse}\ldots\ldots\ldots(4)$$

The results suggest that real GDP can affect broad money with a lag of up to five quarters. Other variables including inflation, changes in the exchange rate as well as dummies (seasonal and impulse) also affect money demand but with varying lags as shown in equation (4). Demand for money remains sensitive to current as well as lagged inflation. In the short run, a weaker currency leads to a fall in the demand for money. The negative coefficient of the ECM is significant, thus validating the cointegrating relationship between the variables. It essentially implies that when an exogenous shock disturbs the equilibrium condition, about 20 percent of its effect is adjusted in one period.

In general, the standard diagnostic tests such as error autocorrelation and autoregressive conditional heteroscedasticity (ARCH), the normality test (Jaque-Bera) were conducted and these are quite satisfactory.
However, tests on parameter stability indicate significant shifts in the parameters of the short-run model. In particular, parameter constancy tests implemented via the recursive estimation of the coefficients and the residuals of the model exhibit volatility in the coefficients since 1998 with the standard error interval widening quickly. Similarly, recursive residual tests also confirm parameter shifts as the recursive residuals fluctuate widely within the band. Thus, the model exhibits parameter instability with evidence of major instability since 2000 (Appendix 2)[4].

In sum, results of the empirical study point to significant parametric shifts in the demand for money in Ghana since the late 1990s, accentuating from 2000. This has followed a period of consistent structural reforms and deregulation of the financial sector. The finding has an important consequence on the viability of framing monetary policy around monetary aggregates as it showed that money growth rates are poor predictors of future inflation and real output.

Indeed, the foregoing probably lends support to the current policy framework – inflation targeting – which has been increasingly viewed as a good monetary policy framework and widely applauded by many economists and policymakers, whereby a plethora of indicators rather than only money supply are considered in taking monetary policy decisions.

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4 Further tests conducted to establish the source of the shifts using intercept and slope dummy variables suggests that instability in the money demand function is caused by the changing relationship with both scale variable as well as opportunity cost variables. While structural shift in intercept appears to be a function of gradual and steady monetization in the economy, the instability in slope dummies is attributed to a number of factors. In particular, monetary policy and structure of the financial sector in Ghana witnessed fundamental changes during the last couple of decades. The first significant policy change was the FINSAP in 1987, with progressive de-regulation of measures, culminating in the institutionalization of a market based system of monetary management in early 1992

3. General Issues about Inflation Targeting

Generally speaking, inflation targeting is simply a formalized comprehensive framework defining precisely the coordinated effort needed to contain inflation in pursuit of the broader economic objectives of sustainable high economic growth and employment creation. This is predicated on the well-known view in economics of the long-run neutrality of money and that there is no long-run trade-off between unemployment and inflation. However, there is nevertheless a trade-off between inflation variability and output variability in the short run.

Box 1: Basic Issues about Inflation Targeting

According to Mishkin (2001), "inflation targeting is a recent monetary policy strategy that encompasses five main elements:

1. A public announcement of medium-term numerical targets for inflation;
2. An institutional commitment to price stability as the primary goal of monetary policy, to which other goals are subordinated;
3. An information inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate, are used for deciding the setting of policy instruments;
4. Increased transparency of the monetary policy strategy through communication with the public and markets about the plans, objectives, and decisions of the monetary authorities; and
5. Increased accountability of the central bank for attaining its inflation objectives".

Carare and Stone (2003) provide three broad classifications of inflation-targeting regimes based on clarity and credibility of the central bank's commitment to the inflation target[5]. These are Full-fledged inflation targeting, eclectic inflation targeting and inflation targeting lite.

Full-fledged inflation targeting is defined in accordance with the definition of inflation targeting by Mishkin.

Eclectic inflation targeting countries, on the other hand, are described as countries that "have so much credibility that they can maintain low and stable inflation without full transparency and accountability with respect to an inflation target. Their record of low and stable inflation and high degree of financial stability affords them the flexibility to pursue the objective of output stabilisation, as well as price stability" (ibid, 2003).

Inflation targeting lite countries "announce a broad inflation objective but owing to relatively low credibility are not able to maintain inflation as the foremost policy objective" (ibid, 2003). They differ considerably in stating their objectives in the operation of monetary policy, and are normally prone to economic shocks, financial instability and a weak institutional framework.

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[5] Clarity is gauged by the public announcement of the inflation target, and by the institutional arrangements in support of accountability of the target while credibility is proxied by the actual inflation outturn and by market ratings of long-term local currency government debt.

On the basis of this classification, Ghana could be regarded as a full-fledged inflation-targeter as will be seen in section 4.

3.1   Mechanics of implementation of Inflation targeting

In general, under inflation targeting, a central bank reacts to deviations of targeted inflation from a forecasted inflation by adjusting its policy instrument, mostly a short term interest rate. The magnitude of adjustment in policy rate in turn depends on a view on the level of the deviation and more importantly, a view of the transmission mechanism of monetary policy. This makes inflation targeting a forward-looking strategy of monetary policy[6] (Diagram 1 below).

Diagram 1:
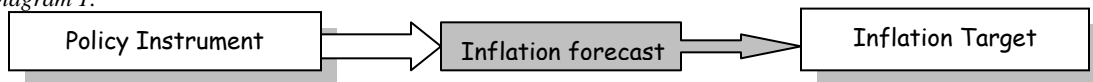
Following Horská (2004), a typical inflation targeting regime could thus be expressed explicitly via the equation:

$$i_t = \alpha_0 (\mathrm{E}[\pi_{t+n}/\Omega_t] - \pi_{t+n}^*) + \alpha_1 (\mathrm{E}[x_t/\Omega_t] - x_t^*) \ldots\ldots\ldots\ldots(5)$$

Or with interest rate smoothening (i.e. central bank applies a policy of small changes or places some weight on its preceding policy rate decisions), we re-write equation (3) as:

$$i_t = \alpha_0 (\mathrm{E}[\pi_{t+n}/\Omega_t] - \pi_{t+n}^*) + \alpha_1 (\mathrm{E}[x_t/\Omega_t] - x_t^*) + \alpha_2 i_{t-n} \ldots\ldots\ldots\ldots(5')$$

where
- i_t denotes the instrument of monetary policy (e.g. short-term nominal interest rates).
- "$E[\pi_{t+n}|\Omega_t] - \pi^*_{t+n}$" represents the deviation of the inflation prediction (π_{t+n}) from the target inflation rate (π^*_{t+n}).
- The prediction is based on information set (Ω_t), which the central bank has at its disposal at time *"t"*.
- Thus, the central bank's forecast can be characterized as a rational one, incorporating all available information at the time.
- Parameter "α_0" measures the sensitivity of the interest rate to the inflation deviation, or it quantifies how much the interest rate should be changed to eliminate one percentage point of inflation gap.
- "$E[x_t|\Omega_t] - x^*_t$" in the equations (5) and (5') represents the deviation of the other forecasted macroeconomic variables (e.g. output) - the other policy goals - from

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[6] This reliance on forecasted inflation in setting the policy instrument is however sometimes seen as a weakness of inflation targeting.

their equilibrium level (x^*_t) for the same period. The parameter $''\alpha_1''$ measures the weight placed on deviations of these goals from their equilibrium levels.

- $''\alpha_2''$ measures consideration of past policy rate decisions on the current policy decision.

Given the above conceptual framework, two forms of practical implementation of inflation targeting are often identified: *'strict inflation targeting'* and *'flexible inflation targeting'*. The former is a case in which the parameter $''\alpha_1''$ equals zero whilst with 'flexible inflation targeting', parameter $''\alpha_1''$ will tend to range between zero and one, which case the central bank in addition to targeting inflation, also places some weight on other macroeconomic variables. As most central banks tend not to disregard other macroeconomic variables, it means that flexible inflation targeting is the general case. However, it generally makes sense that in the early phase of inflation targeting, a greater weight is put on inflation as credibility is built up. The question that naturally follows will be how flexible, or what weight is assigned to output in the reaction function (South African Reserve Bank, 2002).

3.2 Pre-requiresites for inflation targeting

In order to be able to serve its purpose as nominal anchor, and to be successful, some prerequisites need to be met. There is wide spread information on these in the literature but could be categorized broadly as: the basic (relating to the relationship between government and the central bank) and other prerequisites. The basic prerequisites are a strong degree of central bank independence, the absence of fiscal dominance and a clearly defined objective of achieving price stability together with the absence of other nominal objectives. The others include a well-developed financial and money markets, reasonably low inflation, public support for price stability, and the capacity of the central bank to model and forecast inflation.

Independence of the central bank here is seen essentially in relation to instrument independence (i.e. the ability of the central bank to choose the instruments) independently of political pressures. Additionally, the absence of fiscal dominance will imply minimal burden of financing government deficits on the central bank or generally that the fiscal policy does not dictate monetary policy. In this respect, most central bank legal frameworks in inflation-targeting countries tend to limit or even prohibit financing of government borrowing from the central bank. Ways in which countries have tended to approach this issue has generally been to maintain strong fiscal discipline and or developing deep financial markets with the capacity to absorb the public sector's borrowing requirement. Similarly, fiscal reforms to maintain broad revenue base and thus reduce the need for seignorage revenue become crucial.

It is equally important to ensure that the objective of monetary policy remains price stability. A number of issues arise including a clear definition of price stability with respect to the price index chosen (CPI or some core CPI); whether a point or range target and the time horizon. As there are trade-offs in the choice of one or another of these options, it becomes important to strike a good balance in order to ensure credibility and transparency to anchor expectations.

Other prerequisites include the ability of the central bank to model and forecast inflation and presence of well developed financial markets. Since inflation targeting countries react to deviations of forecasted inflation from the target, accurately forecasting the inflation becomes crucial in the process. Monetary policy impulses are also carried through the financial market and therefore the process will work better with well developed financial system (see Table 1 for some key financial indicators of developed and emerging market countries).

4.   Inflation targeting in Ghana

"If an independent central bank is to be perceived as credible it must be possible for outsiders to understand its decisions and to assess its activities" (Riksbank 13/06/2008).

Ghana was the second Sub-Saharan Country to adopt the inflation targeting regime following South Africa. The Bank of Ghana was motivated by the Bank of Ghana Act of 2002, (granting the Bank operational independence) and the less than satisfactory performance of the then policy framework based on monetary targeting[7]. The following sections examine the practical aspects of implementation of the new framework and economic performance prior and post the adoption of the regime.

Box 2: Brief overview of the conduct of monetary policy in Ghana

As with other central banks, implementation of monetary policy in Ghana has undergone a number of phases, evolving from the controlled regime (with the use of direct instruments) to the use of indirect instruments[8] under the monetary targeting arrangements and currently inflation targeting. The objective of monetary policy – price stability – has remained basically unchanged over the past couple of decades though the degree of commitment to achieving this objective has been different. As regards the instruments of monetary policy, there has been substantial transformation in line with developments within the financial system as well as global factors. The instruments of monetary policy have been improved and more indirect and market based instruments have been developed (Yahya, 2001). Bank of Ghana shifted from the use of direct instruments to indirect instruments for its conduct of monetary policy in 1992. The shift was introduced as part of a financial sector adjustment programme (FINSAP) that began in 1988. By 1992, interest rates and credit had been decontrolled and institutional arrangements to facilitate the system of indirect monetary management put in place. The framework for monetary policy conduct then became the IMF's financial programming technique. The framework used high powered money as the operational target whilst broad money served as the intermediate target[9]. The key assumptions under this framework are a stable velocity of money and multiplier (i.e. the existence of stable relationship between the intermediate target and the ultimate target (inflation) on the one hand, as well as between the operational target and the intermediate target).

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[7] See section 4.3 ahead.

[8] With the launch of the Economic Recovery Program (ERP) in 1983

[9] The definition of the money supply was variously adjusted in an attempt to take account of new financial assets that resulted from the liberalization and innovation process and functioned as close substitutes for the monetary assets.

The results of the various monetary policy measures pursued in Ghana since the ERP/SAP have been mixed. The main constraint to monetary policy for the most part of the review period has been the need to accommodate unplanned fiscal requirements[10].

Profound changes in the financial architecture of Ghana following the FINSAP alongside the spreading information technology deepened the financial system with an extension of the supply of financial instruments. The emergence of new financial instruments, new types of transaction or new market players made the money demand function unstable. Thus the links between the intermediate target (monetary aggregate) and the final target (inflation) became less predictable and reliable (See Panel 1 and section 2 above).

The costs of inflation[11] alongside an increased commitment to fighting it led, among others, to the passage of the Bank of Ghana, Act 2002 (Act 612) granting the Bank operational independence. This has been predicated on the realization that the best contribution of monetary policy in the long-term is price stability. The re-orientation of the Bank of Ghana act toward price stability coupled with the less than satisfactory performance of the then policy framework based on monetary targeting[12] led Bank of Ghana to adopt the current inflation targeting regime. Ghana thus became the second Sub-Saharan Country to adopt the framework following South Africa. The question that arises here is whether the preconditions (including absence of fiscal dominance, sufficient independence of the central bank, a clearly defined objective of price stability and the absence of other nominal anchors as well as a well-developed financial system) for this framework were met.

4.1 Ghana and the pre-requiresites for inflation targeting

Independence of the central bank: This has usually been seen in terms of instrument / operational independence. The BOG Act grants the Bank operational independence and explicitly states the objective of monetary policy as "The primary objective of the Bank is to maintain stability in the general level of prices". In addition, the law states "Without prejudice to the above, the Bank shall support the general economic policy of the Government and promote economic growth and effective and efficient operation of banking and credit systems in the country, independent of instructions from the Government or any other authority". The law also made provision for the establishment of a Monetary Policy Committee (MPC) to be in charge of initiating policies for the conduct and implementation of monetary policy. These provisions thus grant the Bank of Ghana sufficient independence to deploy its instruments of monetary policy in the best ways possible to achieve its primary goal of price stability.

Fiscal Dominance: Like many other developing countries, one of the key challenges to monetary policy as identified by many studies[13] has been accommodation of huge fiscal deficits. Government fiscal deficit between 1996 – 2000 averaged 6.5 per cent of GDP. At the same time seigniorage revenues rose to an average 2.5 of GDP between 1996 – 2000 from 2.1 per cent of GDP for the period 1991-1995. Not surprisingly, inflation

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[10] Yahya (2001) notes the seasonal injection of liquidity from the cocoa crop in the last quarter since 1994, as one of the key challenges to the conduct of monetary policy in the country.

[11] Inflation remained relatively high on average and volatile as well. High and volatile inflation tends to be costly in terms of general economic welfare and performance as it typically introduces or at least exacerbates distortions in the real economy.

[12] See section 4 for recent economic performance.

[13] See Yahya (2001)

remained high, averaging at some 24.7 per cent for the period 1996 – 2000. To deal with the issue of fiscal dominance which had plagued monetary policy, the Bank of Ghana Act placed explicit limits on central bank financing of Government deficits[14]. At the same time and perhaps to ensure fiscal consolidation, fiscal policy was anchored on the path of domestic debt reduction. This was however short-lived as the falling trends in

Figure 2: Ghana: Fiscal Deficits and Domestic Debt (gross) as per cent of GDP

both fiscal deficits and domestic debt were reversed after 2005 partly reflecting the impact of the energy crisis and 'one-off expenditure'[15] items that accompanied the crisis in the period.
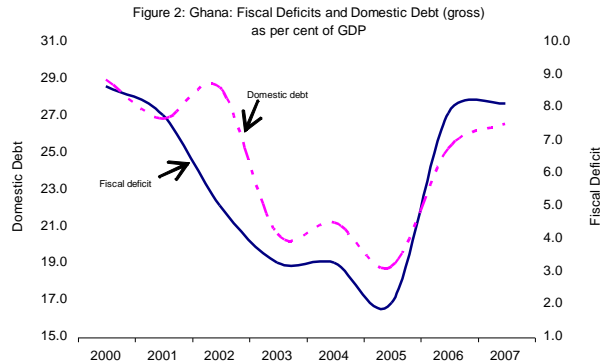
Relatively developed financial sector: the financial system tends to play a crucial role in the transmission of monetary policy impulses in the economy. In this regard, the inflation targeting framework therefore works better with well developed financial system. Table 1 compares some key financial indicators of the Ghanaian economy with those of some developed and emerging market countries including South Africa. The Ghanaian financial system remains relatively well-developed and compares favourably with indicators in other inflation targeting countries.

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[14] Central bank was not to finance more than 10 per cent of the fiscal year's revenue.

[15] These relate to the hosting of the AU summit, Golden Jubilee celebration and CAN 2008 among others.

Table 1: Key Financial Ratios for Inflation Targeters

	Time of the adoption of IT	Seignorage to GDP 1980-95	Fiscal Balance to GDP	Quasi-Money to GDP	Private Credit to GDP	Reserve Money to GDP	Stock Market Capitalization to GDP 1997
Industrial Countries							
Australia	April-93	0.42	-5.6	43.3	69.5	5.3	153
Canada	February-91	0.19	-7.2	35.8	51.6	4.2	88
Finland	February-93	NA	-7.1	32.3	83.6	7.9	59
New Zealand	July-89	0.12	-3.7	32.1**	68.9**	2.3**	99
Spain	November-94	1.61	-6	44.4	77.7	N/A	50
Sweden	January-93	0.65	-11.8	49.1	43.7	11.4	115
United Kingdom	October-92	0.2	-6.5	86.4	114.2	3.9	147
Average		*0.58*	*-6.9*	*46.2*	*72.7*	*5.8*	*101.6*
Emerging Market Countries							
Brazil	June-99	5.13	-5.7	24.8	28.4	6.6	29.7
Chile	September-99	1.66	-1.5	40.5	66.2	37.7	92.3
Czech Republic	December-97	2.13*	-1.2	45	65.7	20.5	28.6
Hungary	June-01	1.24*	-3	28.2	33.8	10.5	35.8
Israel	June-97	1.57	-4.3	78.7	73.9	56.7	41.2
Poland	September-98	1.22*	-0.9	28.5	23.6	8.6	9.8
Average		*2.16*	*-2.8*	*41.0*	*48.6*	*23.4*	*39.6*
Sub-Sahara Africa							
South Africa	February-00	0.68	-1.9	26.6	73.0	4.9	192.2
Ghana***	May-07	2.31	-8.1	20.2	23.6	12.5	88.4

Source: (Horska 2004); Masson and others (1997), p. 26; seignorage calculated by using the monetary concept; IMF International Financial Statistics (different years); ICEG European Center, Hungary; Unless it is directly specified, the data refer to the time of inflation

* Source: F. Schobert (2001); seignorage calculated by using an opportunity cost concept at the time of IT adopting except for Hungary, for which the data are available up to 2000.

** Data from 1990.

*** Source: Bank of Ghana Data and Author's Computations (end-2007). Seignorage computed using monetary comcept and covered 1981 - 1995. Quasi-money includes foreign currency deposits.

4.2 Practical aspects of implementation of inflation targeting in Ghana

Inflation targeting countries tend to differ in the practical aspects of implementation of the strategy. This particularly relates to issues bothering on definition and setting of the target variable, monetary policy decision making process, degree of transparency and level of accountability. In general, strategies are designed in ways that help anchor inflation expectations.

4.2.1 The determination and announcement of the target

Inflation targeting countries differ widely with respect to the determination and announcement of the inflation target. While in some countries, the target is determined and announced by government, in others government does so in consultation with the central bank. In a few cases, the target is determined by the central bank (see Table 2). In Ghana, the target is determined jointly by government and the central bank during the preparation of the annual budget. This remains similar to the practice by countries such as South Africa, New Zealand, Hungary, Canada and the Republic of Korea where the target is determined jointly by government and the central bank. Joint target determination has the advantage that it would strengthen the target's credibility by indirectly committing the

government to conduct fiscal policy in a way that would support the achievement of the inflation objective. Unstable fiscal policy hinders not only the effective management of monetary policy but also hurts the credibility of inflation targets as witnessed in past regimes. A downside risk to credibility is that government may tend to have short term incentives to alter the target and therefore impair long term credibility. In general however, irrespective of how the target is set, the central bank is ultimately held responsible for achieving it.

Table 2: Inflation Targeting Countries

	Since	Target set by:	Instrument independent	Current target (per cent)/2	Target variable
Australia	1993	Government & central bank	Yes1	2–3 (b)	CPI
Brazil	1999	Government	Yes	4.5 ±2.0 *3(p)*	CPI
Canada	1991	Government & central bank	Yes1	2 ±1 (p)	CPI
Chile	1990	Central bank	Yes	2–4 (b)	CPI
Colombia	1999	Central bank	Yes	3.5–5.5 */4*	CPI
Czech Republic	1997	Government & central bank	Yes	2–45 (b)	CPI
Ghana	2002	Government & central bank	Yes	7 - 9 /7	CPI
Hungary	2001	Government & central bank	Yes	4 ±1 (p)	CPI
Iceland	2001	Government	Yes	2.5 ±1.5 (p)	CPI
Israel	1991	Government	Yes	1–3 (b)	CPI
Mexico	1995	Central bank	Yes	3 ±1 (p)	CPI
New Zealand	1990	Government & central bank	Yes1	1–3 (b)	CPI
Norway	2001	Central bank	Yes1	2.5 (p)	CPI
Peru	2002	Central bank	Yes	2.5 ±1 (p)	CPI
Philippines	2002	Government & central bank	Yes	4–5 (b)	CPI
Poland	1998	Central bank	Yes	2.5 ±1 (p)	CPI
Republic of Korea	1998	Government & central bank	Yes1	3 ±1 (b)	UND /6
South Africa	2000	Government & central bank	Yes	3–6 (b)	CPIX
Sweden	1993	Central bank	Yes	2 ±1 (p)	CPI
Thailand	2000	Central bank	Yes1	0–3.5 (b)	UND /6
U.K.	1992	Government	Yes1	2 (p)	CPI (HICP)

1 Normally but government can intervene.

2 p = point target, b = band target.

3 For 2006

4 For 2005.

5 Through 2005, thereafter 3% point target.

6 CPI excl. food and oil prices.

7 For 2007.

In terms of the target variable, the CPI has been used in all inflation targeting countries. However, there are differences in the range of items included in the measurement of the CPI. A number of countries have opted for a "core" consumer price index, which excludes prices affected by exogenous shocks over which the central bank has no direct control, the first-round effects of indirect tax changes and the first-round effects of interest rate changes. The major consideration in this case is preferably to include the range of products that fully reflect the domestic cost of living and generally accepted by the public.

While the Bank of Ghana targets the CPI inflation officially, it also critically monitors developments in a number of core inflation series before taking its interest rate decisions[16]. The CPI inflation targets are currently specified in ways that tend to reinforce the current disinflation process.

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[16] In particular the CPI excluding energy and utility prices.

4.2.2   *The decision-making process*

The decision on the appropriate monetary policy stance is taken by the Monetary Policy Committee (MPC). This committee was constituted shortly before Ghana adopted the inflation targeting framework for monetary policy. The Committee consists of 7 members: The Governor, two deputy governors, the heads of monetary policy analysis and banking operations of the Bank and two independent members. The Committee normally meets every other month (or six times per year) and had its first meeting in November 2002; and has to date[17] held 30 meetings.

The MPC meetings are normally held over three days, during which period a wide range of indicators are presented and carefully analysed. For the first two days, staff members of the bank make presentations on a wide range of economic indicators and present conditional forecast of inflation to the committee. The information is carefully examined by committee members and then follow it up with a deliberation and appropriate positioning of the bank's prime rate. The decision is currently taken by consensus.

In general, information usually presented the committee includes among others detailed assessment of developments under the following broad headings:
- a.   Global economic outlook and Ghana's external sector developments;
- b.   Fiscal developments;
- c.   Monetary and financial developments;
- d.   Financial stability reports (Banking sector, Non-banks and credit conditions surveys)
- e.   Real sector developments (including the composite indicator of economic index, business and consumer confidence surveys);
- f.   Inflation outlook and developments including inflation forecast.

In forecasting inflation, a number of models are used including an autoregressive (AR) forecasting model, error correction forecasting model, a macroeconometric model and currently a calibrated macroeconomic model (being developed)[18]. Results from these models are then used to construct a fan chart with varying degrees of probabilities. The final decision can nevertheless not be based mechanically on the forecasts, but usually one of judgemental after a careful analysis of all economic data and risks.

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[17] May 2008.

[18] This reliance on forecasting in making decisions is sometimes regarded as a weakness of the inflation-targeting framework.

Table 3: MONETARY POLICY MEETINGS AND MINUTES

	No. of members	Decision taken by:	Press notice	Minutes published
Australia	9	Consensus	Yes	No
Brazil	9	Vote /1	Yes	Yes, after 8 days
Canada	6	Consensus	Yes	No
Chile	5	Vote /1	Yes	Yes, 12 weeks
Colombia	7	Vote	Yes	No
Czech Republic	7	Vote /1	Press conference	Yes, after 11 days
Ghana	7	Consensus	Press conference	No
Hungary	Maximum 6	Vote /1	Yes	No
Iceland	3	Vote /2	Yes	No
Israel	5	Governor	Yes	No
Mexico	5	Vote	Yes	No
Norway	7	Consensus	Yes	No
New Zealand	Varies	Governor	Speech by Governor	No
Peru	7	Vote	Yes	No
Philippines	7	Vote	Yes	No
Poland	10	Vote	Press conference	Yes, after 6 weeks
Republic of Korea	7	Vote	Press conference	Yes, after 3 months
South Africa	8	Vote /1	Press conference	No
Sweden	6	Vote /1	Yes /3	Yes, after 2 weeks
Thailand	7	Consensus	Press conference	No
U.K.	9	Vote /1	Yes	Yes, after 2 weeks

1 The Governor has the casting vote, reservations are published in the minutes.

2 The monetary policy committee is an advisory body with no vote.

3 For an interest rate adjustment there is also a press conference.

Sources: Central banks' web sites, Fracasso, Genberg & Wyplosz (2003) and Horska (2004).

Table 4: Inflation Report / Monetary Policy Reoprt

	Freqency	Accountable for report	Explicit targeting horizon	Inflation forecast
Australia	4/year	Bank as a whole	No	Yes
Brazil	4/year	Monetary policy committee	After target deviation	Yes
Canada	2 + 2 / year	Executive board	6- 8 quarters	Yes
Chile	3/year	Executive board	8 quarters	Yes
Colombia	2/year	Executive board	No	Yes
Czech Republic	4/year	Executive board	No	Yes
Ghana	4 - 6 / year	Staff	No	No
Hungary	4/year	Staff	No	Yes
Iceland	4/year	Bank as a whole	After target deviation	Yes
Israel	2/year	Executive board ans staff	After target deviation	Yes
Mexico	4/year	Bank as a whole	No	Yes
New Zealand	4/year	Governor	In practice 6 - 8 quarters	Yes
Norway	3/year	Governor and excutive board	4 - 12 quarters	Yes
Peru	3/year	Bank as a whole	No	Yes
Philippines	4/year	Monetary policy committee	After target deviation	Yes
Poland	4/year	Staff	No	Yes
Republic of Korea	4/year	Monetary policy committee	No	Yes
South Africa	4/year	Staff	No	Yes
Sweden	4/year	Executive board	Normally 4 - 8 quarters	Yes
Thailand	4/year	Monetary policy committee	No	Yes
U.K.	4/year	Monetary policy committee	After target deviation	Yes

Sources: Central banks' inflation reports and Fracasso, Genberg & Wyplosz (2003) and Horská (2004).

4.2.3   *The transparency and accountability of monetary policy*

One of the key aspects of inflation targeting is its ability to anchor expectations. This is usually expected to be achieved through the central banks commitment and consistent policy arrangements, bolstered by its policies regarding transparency and accountability. Increased communication with the public about the monetary policy decision making process keeps the public well informed and therefore anchors their expectation. Various approaches are adopted by various central banks including the advance publication of monetary policy meeting dates, publication of minutes of the MPC, press conferences or press releases and publication of monetary policy reports. The Bank of Ghana's communication strategy includes a press conference after the MPC meetings, press releases and publication of detailed monetary reports covering all the sectors of the economy after every MPC meeting. This information is also available on the Bank's website. A major difference however is that, except for Ghana, all countries implementing inflation targeting appear to publish their inflation forecasts in the monetary policy reports usually expected to anchor the public's inflation expectations. As well, limited lectures are delivered by MPC members and staff on the current policy regime. The inflation targeting framework thus improves the accountability of the Bank of Ghana because it provides an explicit and publicly known benchmark that must be reached over a specific time frame. Unlike in other countries however, the Bank does not currently write an open letter or report when the target is missed. In communicating with the public (particularly at the press conferences) however, the Governor and Chairman of the MPC explains the possibilities and progress being made to achieve the target or factors that may result in the target being missed.
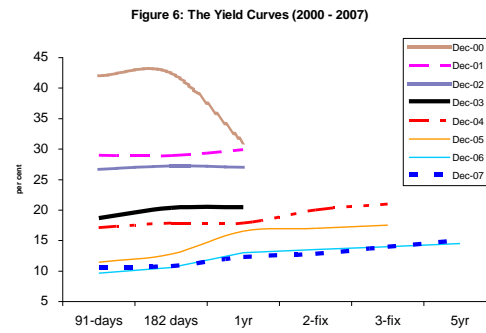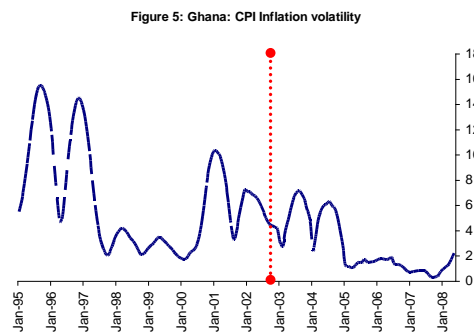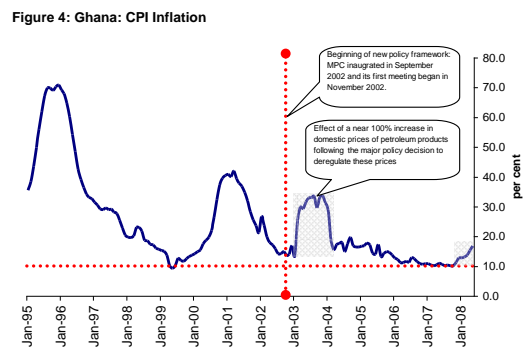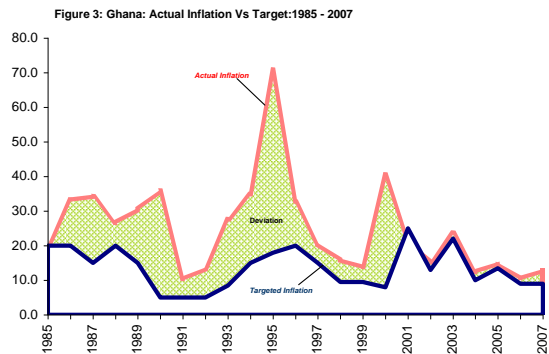
Table 5: ACCOUNTABILITY

	Hearing in parliament	Open letter or report when off target
Australia	Yes	No
Brazil	No	Yes
Canada	Yes	No
Chile	Yes	No
Colombia	Yes	No
Czech Republic	Yes	No
Ghana	**No**	**No**
Hungary	Yes	No
Iceland	No	Yes
Israel	Yes	Yes
Mexico	Yes	No
New Zealand	Yes	Yes
Norway	Yes	Yes
Peru	No	No
Philippines	Yes	Yes
Poland	Yes	Yes
Republic of Korea	Yes	No
South Africa	**No**	**No**
Sweden	Yes	Yes
Thailand	No	No
U.K.	Yes	Yes

Sources: Horska (2004), Truman (2003) and Heikensten (1999).

From the foregoing, it is clear that the practical elements of implementation of inflation targeting in Ghana remain similar to practices in other inflation targeting countries. Some differences however exist, notable among them is the publishing of forecasts.

4.3   *Practical experience with inflation targeting in Ghana*

The adoption of inflation targeting in Ghana, very much like the case in most emerging market economies engineered a significant disinflation process except for a few short periods of inflation jumps in Ghana in the first quarters of 2003 and 2005. The reason for these jumps was the strong external oil price shocks as well as the realignment at the onset of and subsequent implementation of deregulation in administered domestic pricing of petroleum products. The new policy regime enhanced the transparency of the monetary policy, improved communication strategy with the public and improved the monetary policy framework. The general goal of the new regime to set inflation on a downward path has been achieved even though meeting the announced inflation Target has proved to be elusive (figure 3). However, figure 3 further demonstrates that there has been an increased convergence towards the targets perhaps due to improved credibility with inflation expectations well anchored to an extent. At the same time there has been significantly reduced volatility in not only inflation, but also real economic variables such as real GDP growth.
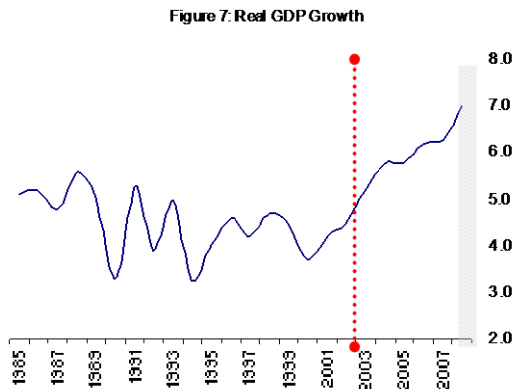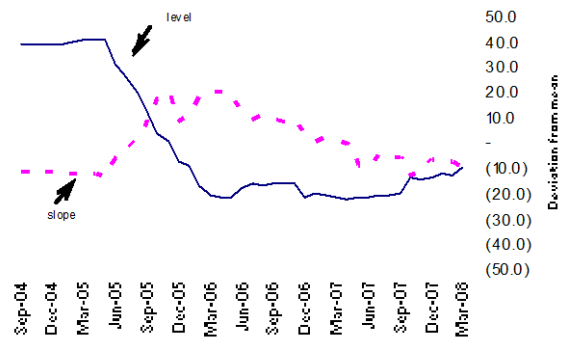

Figure 3: Ghana: Actual Inflation Vs Target:1985 - 2007

Figure 4: Ghana: CPI Inflation

Figure 5: Ghana: CPI Inflation volatility

Figure 6: The Yield Curves (2000 - 2007)

Figure 7: Real GDP Growth

Figure 8: Inflation Expectations Dynamics and Spreads in the Money Market Using Level and Slope of the Yield Curve

4.4 Empirical analysis of the MPC's policy rate decisions

In this section, an attempt is made to empirically investigate the form of inflation targeting that Bank of Ghana has so far implemented. As noted earlier, the MPC has since its inauguration held 30 meetings by May 2008. An analysis of the policy rate decisions show that the MPC stayed-put on its policy rate some 53 per cent of the time (16 times). Rates were cut in some 30 per cent of the time (9 times). The MPC hiked rates on 5 occasions (or 16.7 per cent of the time) over the period. Clearly, with inflation expectations firmly anchored over the period (figures 6 and 8 above), the MPC's rate decisions thus tilted more towards rate cuts than hikes, consequently providing some strong impetus for output growth (figure 7).

As Svensson (2007) notes, there is in practice never a 'strict' inflation targeting but always 'flexible' inflation targeting. Practically, all inflation targeting central banks not only aim at stabilizing inflation

Figure 9: Analysis of MPC rate decisions
(November 2002 - May 2008)

Figure 10: Trends in monetary tightening or easing
(cumulative prime rate changes)

around the inflation target but also put some weight on stabilizing the real economy, for

instance, implicitly or explicitly stabilizing a measure of resource utilization such as the output gap between actual output and 'potential' output. Thus, the 'target variables' of the central bank include not only inflation but other variables as well, such as the output gap (ibid.). This has thus been conceptualized explicitly as with interest rate smoothening in section 2 as:

$$i_t = \alpha_0(\mathrm{E}[\pi_{t+n}/\Omega_t] - \pi^*_{t+n}) + \alpha_1(\mathrm{E}[x_t/\Omega_t] - x^*_t) + \alpha_2 i_{t-n} \ldots\ldots\ldots\ldots(3')$$

Estimates of equation (3') using monthly data for the period 2002:1 – 2008:3 revealed interesting results as in equation (4) (see detailed estimation results in Appendix).

$$i_t = 0.26 + 0.31*\tilde{\pi}_t + 0.69*\tilde{x}_t + 0.88*i_{t-1} \ldots\ldots\ldots\ldots(4)$$

Where $\tilde{\pi}_t$ and $\tilde{x}_t$ respectively represent the deviation of inflation prediction from the target inflation rate and the output gap[19]. Equation (4) clearly shows that the single most important factor in the MPC policy rate decision making process has been a consideration of its immediate past policy decisions with an elasticity of 0.88, consistent with the long lags in the monetary policy transmission process. Perhaps, most strikingly is the estimated high weight of 0.69 placed on output gap, with some estimated weight of 0.31 for deviations of estimated inflation from its target. This perhaps, partly explains the sustained growth witnessed in the Ghanaian economy in recent times though inflation also significantly converged towards the targets.

Conclusions

The purpose of this paper has been to investigate issues associated with the choice of the current policy framework in Ghana. It focuses on the factors associated with the choice, practical aspects of implementation, its effects on the performance of inflation and output and on the trade-off between inflation and output variability.

The paper finds support for the current framework both on institutional and technical grounds. The former has been underpinned by the Bank of Ghana Act 2002, Act 612. The latter resulted from the profound changes in the financial architecture of Ghana following the FINSAP as well as fast spreading information technology that have deepened the financial system with an extension of the supply of financial instruments. Thus the links between the intermediate target (monetary aggregate) and the final target (inflation) became less predictable and reliable.

The practical aspects of implementation of inflation targeting in Ghana remain similar to practices in other inflation targeting countries. Some differences however exist, notable among which is the publishing of forecasts to help anchor inflation expectations.

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[19] This is measured as the hptrend of the composite index of economic activity from the actual, annualized.

The experience has been that the new regime set inflation on a downward path even though meeting the announced inflation targets have proved elusive. While it may be difficult to isolate the role of other favourable external factors, it is clear that the new policy regime enhanced the transparency of the monetary policy process, improved the communication strategy of the Bank with the public and thus helped anchor inflation expectations. And there has been an increased convergence towards the inflation targets with significantly reduced volatility in not only inflation, but also real economic variables such as real GDP growth underpinned perhaps by improved credibility with the new regime.

Most strikingly however, an analysis of the MPC's policy rate decisions showed a higher weight for output stabilization as opposed to that placed on deviations of estimated inflation from its target. This perhaps, partly explains the sustained growth witnessed in the Ghanaian economy in recent times though inflation also significantly converged towards the targets.
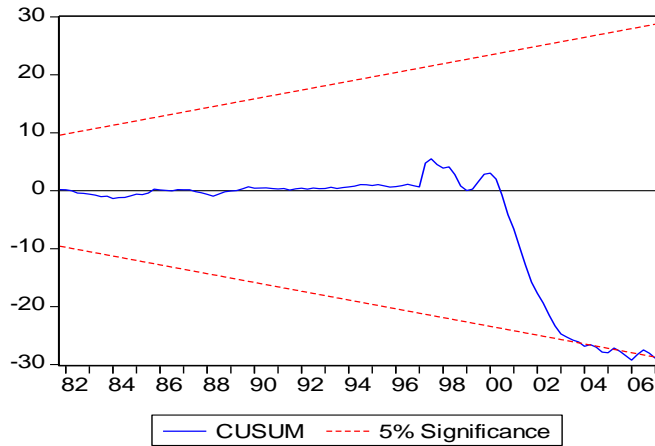
Appendices

Appendix 1: Monetary indicators
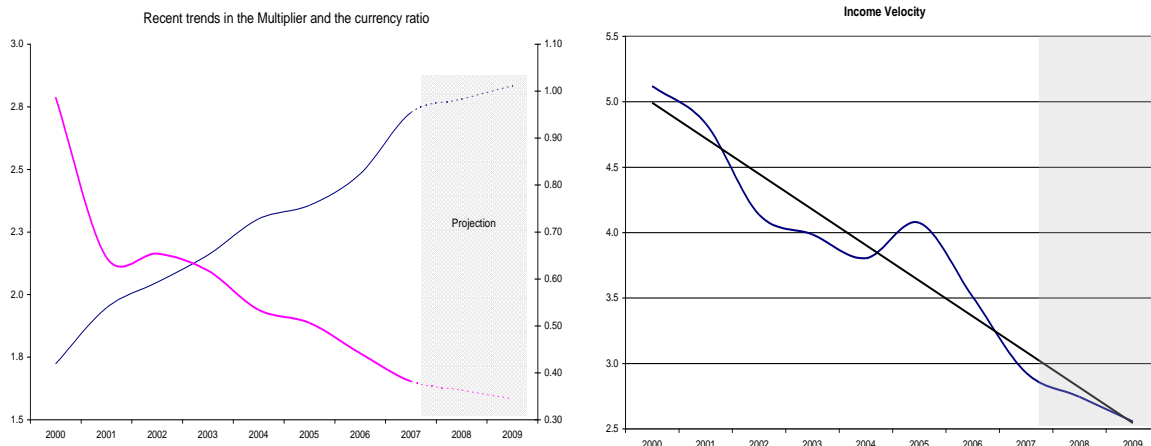
Appendix 2a: Tests on parameter stability

Recursive coefficients
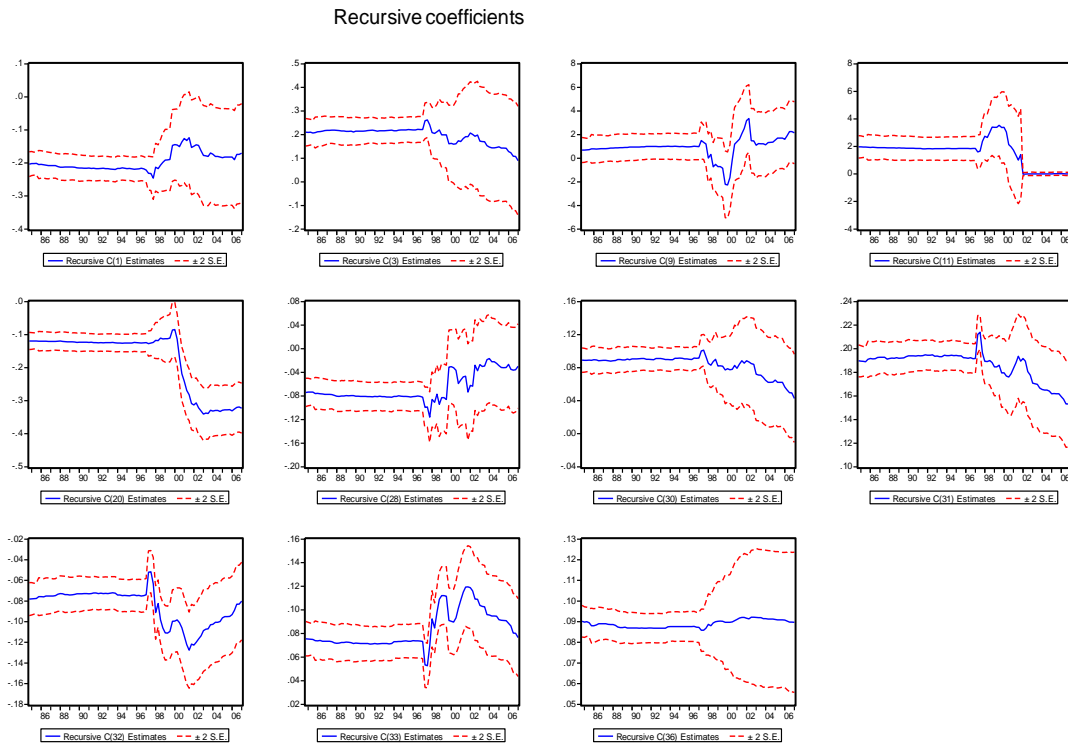
Appendix 2b: Tests on parameter stability

Appendix 3a: Detailed ARMA Estimation for deriving expected inflation

Method: Least Squares

Date: 06/27/08   Time: 12:14

Sample (adjusted): 2003M02 2008M03

Included observations: 62 after adjustments

Convergence achieved after 19 iterations

Backcast: 2001M09 2001M11

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.016646	0.001060	-15.70183	0.0000
AR(1)	-0.390010	0.127728	-3.053437	0.0034
SAR(12)	-0.438969	0.075018	-5.851480	0.0000
MA(2)	-0.300970	0.083446	-3.606766	0.0007
MA(3)	-0.666008	0.080697	-8.253192	0.0000

R-squared	0.475107	Mean dependent var	0.000000
Adjusted R-squared	0.438273	S.D. dependent var	0.144857
S.E. of regression	0.108568	Akaike info criterion	-1.525668
Sum squared resid	0.671863	Schwarz criterion	-1.354125
Log likelihood	52.29571	F-statistic	12.89840
Durbin-Watson stat	1.860913	Prob(F-statistic)	0.000000

Inverted AR Roots	.90+.24i	.90-.24i	.66-.66i	.66-.66i
	.24-.90i	.24+.90i	-.24+.90i	-.24-.90i
	-.39	-.66+.66i	-.66+.66i	-.90+.24i
	-.90-.24i			
Inverted MA Roots	.99	-.49-.66i	-.49+.66i	

Appendix 3a: Model stability Tests

Inverse Roots of AR/MA Polynomial(s)
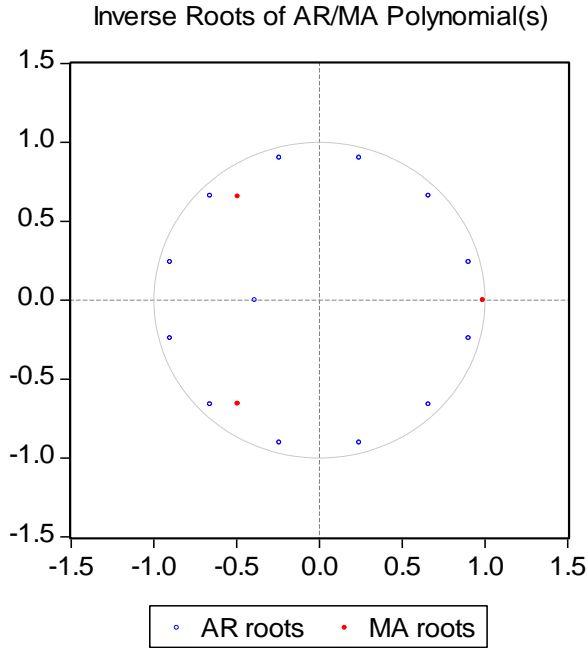
Appendix 3b: Model stability Tests

Inverse Roots of AR/MA Polynomial(s)

Specification: D(LINF) C AR(1) SAR(12) MA(2)

MA(3)

Date: 06/29/08   Time: 17:29

Sample: 2001M12 2008M03

Included observations: 62

AR Root(s)	Modulus	Cycle
-0.241657 ± 0.901875i	0.933690	3.428571
-0.901875 ± 0.241657i	0.933690	2.181818
0.241657 ± 0.901875i	0.933690	4.800000
-0.660219 ± 0.660219i	0.933690	2.666667
0.660219 ± 0.660219i	0.933690	8.000000
0.901875 ± 0.241657i	0.933690	24.00000
-0.390010	0.390010	

No root lies outside the unit circle.

ARMA model is stationary.

MA Root(s)	Modulus	Cycle
0.987595	0.987595	
-0.493797 ± 0.656154i	0.821202	2.835454

No root lies outside the unit circle.

ARMA model is invertible.

Dependent Variable: LPR

Method: Least Squares

Date: 06/30/08   Time: 11:50

Sample (adjusted): 2002M01 2008M03

Included observations: 75 after adjustments

LPR=α(1)+ α(2)* INFDEV+(1- α(2))*OUTPUTGA+ α(4)*LPR(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
α(1)	0.256011	0.138562	1.847633	0.0688
α(2)	0.305872	0.052625	5.812334	0.0000
α(4)	0.880268	0.048122	18.29229	0.0000

R-squared	0.834209	Mean dependent var	2.892000
Adjusted R-squared	0.829604	S.D. dependent var	0.276933
S.E. of regression	0.114315	Akaike info criterion	-1.460532
Sum squared resid	0.940898	Schwarz criterion	-1.367833
Log likelihood	57.76995	Durbin-Watson stat	0.549349

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