



Monetary Policy Rule and its Performance under Inflation Targeting in Algeria

Cheddad azzeddine*	Mekidiche Mohammed
cheddad.azzeddine@cumaghnia.dz	mkidiche@yahoo.fr
LEPPESE research laboratory University Centre of Maghnia (Algeria)	LEPPESE research laboratory University Centre of Maghnia (Algeria)

Submitted: 06/04/2023

Accepted:19/05/2023

Published:04/06/2023

Abstract:

The aim of this study is to reassess the efficacy of inflation targeting in Algeria by utilizing the Autoregressive Distributed Lag Bound Test (ARDL) model to analyze the Taylor rules. Our findings reveal that the implementation of inflation targeting in Algeria's monetary policy does not yield a significant immediate impact on inflation. Nonetheless, there is evidence of a gradual adjustment towards attaining the targeted inflation rate over time.

Key words: Monetary Policy, Inflation Targeting , Taylor rules , ARDL model

JEL Classification Codes: C22, E17, E43, E52, E58.

*Corresponding author

Introduction:

According to (Beju & Ciupac-Ulici, 2015), , the main aim of monetary policy in the majority of emerging countries is to ensure price stability, and achieving this goal requires central banks to adhere to the principles of monetary policy. This assertion is supported by (Barro & Gordon, 1983; Kydland & Prescott, 1977).

The accumulated experience and evidence suggest that monetary policy has an indirect impact on inflation rates through traditional methods that focus on controlling intermediate variables, such as targeting exchange rates and monetary aggregates. However, due to the inability to achieve long-term price stability, the use of these methods has decreased, leading to a shift towards direct measures to combat inflation. To achieve this goal of combating inflation directly, central banks often adopt the strategy of inflation targeting, which involves setting a publicly announced inflation target and ensuring a high level of transparency and accountability in the policy-making process , The inflation targeting policy has been highly successful in stabilizing both inflation and the economy (Svensson, 2010), This strategy was first introduced in New Zealand in 1990, The success of this strategy has encouraged several countries to adopt this policy, including Finland, Sweden, Canada and Spain, In reality, central banks that practice inflation targeting are never completely inflexible, but rather operate with some flexibility. This is because in addition to their goal of maintaining stable inflation around the target rate, they also consider the need to stabilize the real economy. To implement inflation targeting policy successfully, certain institutional and initial conditions are required. These conditions include the independence of the central bank, the stability and soundness of the banking system, the public announcement of a specific target for inflation, and strict accountability mechanisms to ensure that the central bank meets its inflation target.

Since 2010, the National Bank of Algeria's monetary policy regime has been inflation targeting. Among the rules of monetary policy, the Taylor Rule (Taylor, 1993), is considered one of the most important, as it uses a linear mathematical model to determine the level of interest based on changes in domestic product and the inflation rate.

Emerging market economies may face difficulties in implementing inflation targeting policy due to exchange rate fluctuations. For example, inflation targeting requires the provision of monetary policy autonomy in a floating exchange rate regime with free movement of capital. However, emerging market economies face the problem of "float fear" (Calvo & Reinhart, 2002), as the financial and government system is worried that the local currency will be exposed to fluctuations and deterioration if the

market is left to set the exchange rate freely, So the question is whether the inflation targeting policy can be effective in emerging countries, specifically looking at Algeria's experience

To paraphrase, the study has put forward three research hypotheses:

The first hypothesis is that implementing inflation targeting policy can enhance macroeconomic performance. The second hypothesis is that the inflation rate decreases following the adoption of inflation targeting policy. The third hypothesis is that the inflation targeting strategy promotes financial stability. The objective of this study is to utilize Taylor rule (Taylor, 1993) in order to simulate the effects of implementing inflation targeting policy by applying Autoregressive Distributed Lag Models (ARDL).

The remainder of this paper is organized as follows. The literature review in Section 2. The sample and collected data, variables, and estimation model are addressed in Section 3. The results of the model, discussion in Section 4. The conclusion and policy implications are addressed in Section 5.

Literature review:

There have been numerous theoretical and empirical studies that have examined the concept of inflation targeting :

(Mishkin, 2004, 2008) has argued that implementing inflation targeting in emerging market economies can be more complex, but it can still contribute to achieving macroeconomic stability. The purpose of these studies is to identify the reasons why the economies of emerging countries differ significantly from those of developed countries. , In another study by (Gonçalves & Salles, 2008) the researchers analyzed 36 emerging market economies and compared countries that targeted inflation with those that did not. They found that the countries that targeted inflation experienced a greater reduction in inflation and saw less fluctuation in economic growth. The data suggests that these countries achieved better economic performance compared to those that did not target inflation. To put it simply, countries that targeted inflation performed better in terms of economic outcomes. A similar conclusion was drawn by a study conducted by (Owoundi et al., 2021) in 63 countries between 1990-2014. The study found that the inflation-targeting policy is an effective tool for monitoring inflation and ensuring financial stability. In other words, the study supports the idea that targeting inflation can be an effective policy tool for maintaining stable economic conditions. (Stojanovikj & Petrevski, 2021) examined the economic impact of inflation targeting policy in 44 emerging market economies from 1970-2017 using a

dynamic panel data model. The study found that implementing an inflation targeting strategy can lead to a reduction in fluctuations in inflation. In other words, the study suggests that the inflation targeting policy can contribute to achieving greater stability in emerging market economies.

According to (Svensson, 2000, 2003) findings, the conventional Taylor rule may not be suitable for open economies because of the significant number of external shocks they experience. (Kim & Mehrotra, 2018) analyze the impact of monetary policy and prudential policies on macro variables in the Asia-Pacific region. They found that the effects of both types of policies on the major macroeconomic indicators are comparable. The study by (Taguchi & Wanasilp, 2018) analyzed the foundation and effectiveness of Thailand's monetary policy since the adoption of the inflation targeting system in 2000, utilizing self-regression procedures of the structural-oriented panel. The primary outcomes of their analysis indicate that the monetary policy in Thailand is forward-looking, and its response to inflation and exchange rate fluctuations is consistent with the estimated policy reaction function.

Literature review will be summarized in the table 01

Table 01 : Literature review

Author	Data Frame	Sample size	Method	Findings
(Mishkin, 2004)	/	Chile and Brazil	Theoretical studie	Inflation targeting is more complicated in emerging market countries, however, it can help macroeconomic stability.
(Mishkin, 2008)	/	Emerging Market Countries.	Theoretical studie	There is a risk that certain developing countries may implement inflation targeting without undertaking the required institutional changes to make it effective in achieving its objectives.

(Gonçalves & Salles, 2008)	1980 to 2005	36 EES (13 IT economies)	Multiple regression	Countries that adopted an inflation target saw a more significant reduction in inflation rates and a more substantial decrease in growth fluctuations. The available data suggest that these countries performed better economically compared to others.
(Akyurek et al., 2011)	1994:M1– 2008:M7	Turkey	OLS	There was a decrease in both production fluctuations and inflation fluctuations during the period when inflation targeting was implemented.
(Käfer, 2014)	1999-2013	Eurozone	Theoretical studie	The effect of interest rate changes on economic activity and inflation has become more predictable and consistent with economic theory, leading to an improvement in the ability of monetary policy to transmit its effects.
(Kim & Mehrotra, 2018)	-(Q1:2000– Q2:2012). -(Q1:2002– Q2:2012) -(Q1:2005– Q2:2012)	- span - Australia and Korea - Thailand and Indonesia	SVAR	The effects of both monetary policy and macro prudential policy shocks on significant macroeconomic variables are comparable.
(Taguchi & Wanasilp, 2018)	Q2 2000 - Q2 2017	Thailand	VAR and SVAR	In Thailand, the monetary policy rule under inflation targeting is described as a forward-looking rule that responds to both inflation and exchange rate changes.
(Owoundi et al., 2021)	1990-2014	63 Countries	OLS	The policy of inflation targeting is a useful tool for ensuring price stability and maintaining financial stability.
(Stojanovikj & Petrevski, 2021)	1970-2017	44 EES (17 IT economies)	GMM	The adoption of an inflation targeting strategy leads to a decrease in the fluctuations of inflation.

- OLS : Method of Ordinary Least-squares
- VAR : Vector Autoregression
- SVAR : Vector Autoregression Structural
- GMM : Generalized Method of Moments
- IT : Inflation Targeting

Source: Authors' identification following individual literature

Methodology and data:

Methodology :

In 1993, the Taylor-type monetary policy rules were introduced by (Taylor, 1993), and it proved to be an effective tool for policymakers. (Orphanides, 2001) noted that the Taylor Rule was widely used by policymakers to evaluate monetary policies in different countries during that period.

$$i_t = r^* + \beta(\pi_t - \pi^*) + \gamma(y_t - y_t^*) \dots \dots \dots (01)$$

- i_t : **The Federal Reserve rate is called the Taylor rate.**
- r^* : **Real interest rate**
- π_t : **The inflation rate .**
- π^* : **The target inflation rate .**
- y : **Real domestic product**
- y_t^* : **Estimated domestic product.**
- β : **Parameters**

The interest rate that should be applied to the economy is determined based on the degree of deviation of both the production gap and the deviation of inflation from the set target.

In the present study, we first estimate the following linear Taylor rule using ARDL (Autoregressive Distributed Lag Bound Test) model as in (Altunöz, 2022) . From the first quarterly period in 2000 to the fourth quarterly period in 2021.

Models are shown in the following Eqs. (02):

$$MMR_t = r_t + \beta CPI_t + \delta Outputgap_t + \varepsilon_t \dots \dots \dots (02)$$

Data:

Data is collected π^t (General Consumer Price Index (CPI)) and The money market rate (MMR) is used as an alternative to the interest rate r_t and the nominal GDP (NGDP), which is further addressed in the GDP gap (Outputgap) by Hodrick- Prescott (hp) filter (Ravn & Uhlig, 2002), All variables are described in Table 02 .

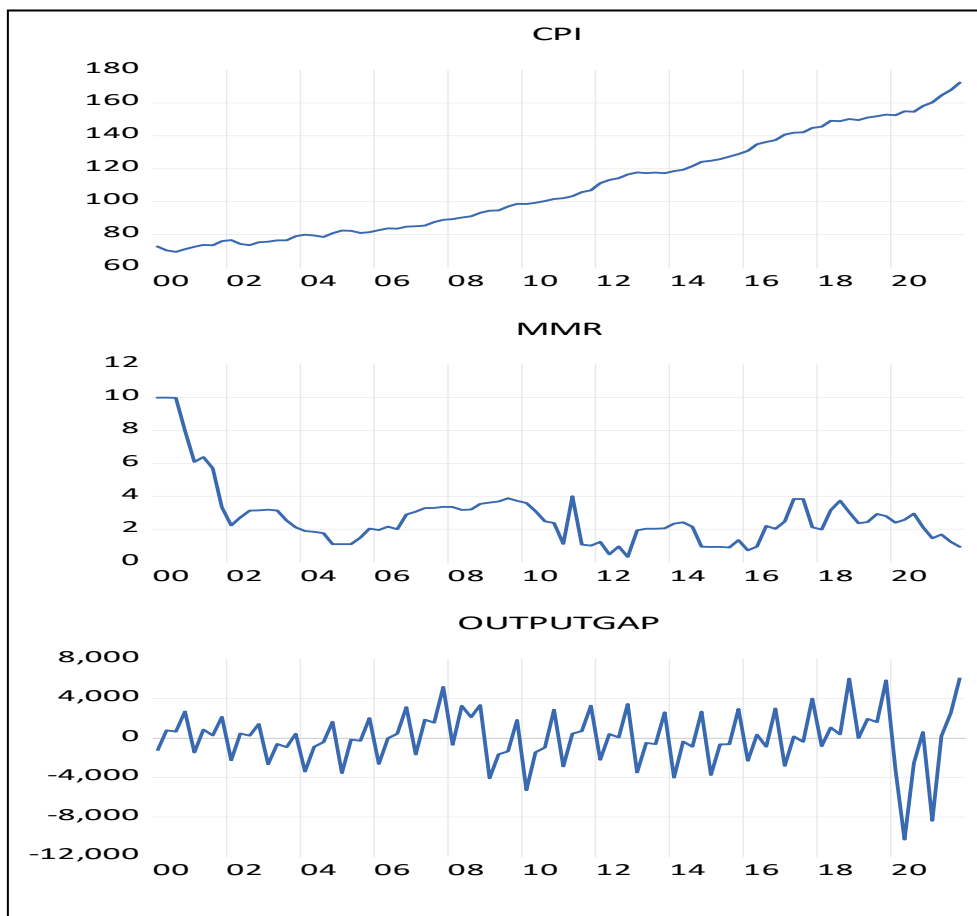
Table 02 : List of Variables and Data Source

	Variables	Data source (IMF/WB)
MMR	The money market rate	This rate includes the rediscount rate, interbank borrowing interest rate, certificate of deposit interest rate, commercial paper interest rate, and other related rates.
CPI	General Consumer Price Index	The rate is expressed as an annual percentage change (when predicting inflation, actual inflation data is used based on logical forecasts) with a base year of 2010, where the index value is set to 100.
NGDP	nominal GDP	The GDP gap or output gap is further analyzed using the Hodrick- Prescott filter

Source: Authors' description

The MMR, experienced significant fluctuations between the first quarter of 2000 (reaching 9.99%) and the fourth quarter of 2012 (dropping to 0.31%). During this period, there was a noticeable increase in the CPI, indicating significant inflation due to an increase in money supply and wages without a corresponding increase in production. The Output gap, which is affected by external factors such as economic and political crises as well as high oil prices, also exhibited significant fluctuations during this period. **figure 01**

Figure 01 : The evolution of variables over 2000Q1-2021Q4



Source : Made by Authors'

Empirical results:

Prior to estimating the Taylor rule, it is important to examine the characteristics of the time series data. To assess the stability of the variables, standard unit root tests (KPSS, ADF, PP) were conducted and the results are presented in Table 03. We note that all variables are constant.

Table 03 : Linear unit roots tests.

Unit root tests,		ADF Test		PP Test		KPSS Test	
Variables		Intercept	Intercept and Trend	Intercept	Intercept and Trend	Intercept	Intercept and Trend
MMR	t-Statistic	-4.0754	-3.8464	-4.1858	-3.8612	0.4671	0.1396
	Prob.	0.0017 ***	0.0186 **	0.0012 ***	0.0179 **	**	*
CPI	t-Statistic	3.7299	-1.1532	3.7299	-1.1532	1.1878	0.2962
	Prob.	1.0000 n0	0.9132 n0	1.0000 n0	0.9132 n0	***	***
Outputgap	t-Statistic	-3.3802	-3.3859	-9.3925	-9.3365	0.0330	0.0330
	Prob.	0.0146 **	0.0606 *	0.0000 ***	0.0000 ***	n0	n0

note : The lag length for the ADF test is chosen based on the AIC criterion. The PP and KPSS tests are estimated on the basis of the Bartlett-kernel, using the Newey-West bandwidth (Newey and West, 1994). The null hypothesis of the ADF and PP tests is that the series is nonstationary, while the null hypothesis is stationarity against the alternative of a unit root for the KPSS test. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Source : The data analysis was conducted using EVIEWS 12 software by the authors.

- Long run results

Based on Table 04, it can be observed that the CPI coefficient is statistically significant at both 1% and 5% levels of significance. The negative sign indicates an inverse relationship between the CPI (independent variable) and the interest rate (dependent variable). This implies that a 1% increase in the CPI is associated with a 0.3% decrease in the money market rate.

On the other hand, the output gap coefficient is not statistically significant and has a positive sign, indicating a centrifugal relationship between it and the dependent variable (interest rate). This implies that a 1% increase in the output gap is associated with a 0.04% increase in the money market rate, but this relationship is not significant based on the results.

$$EC = MMR - (-0.0039 * CPI + 0.0004 * OUTPUTGAP + 2.7016)$$

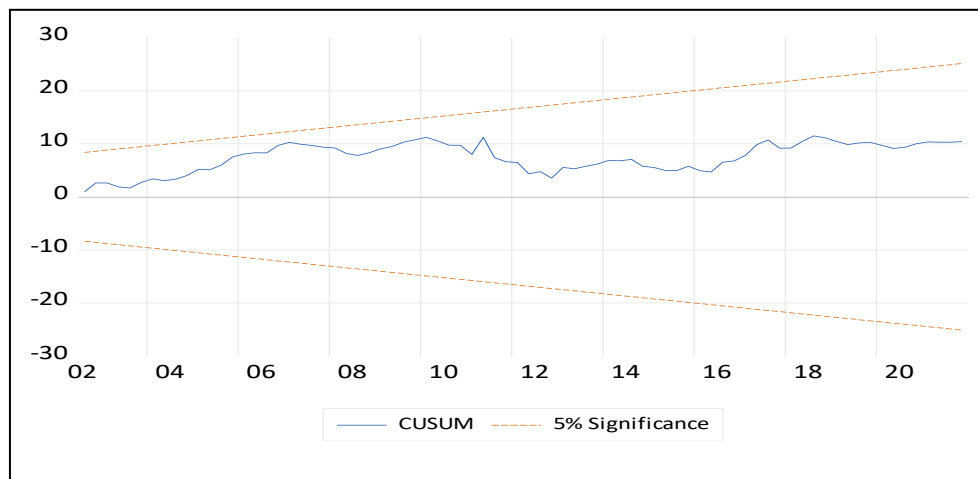
According to the aforementioned **figure 02** , CUSUM and CUSUMSQ statistics are within the critical limits of 5% meaning level, it is understood that the long-term parameters calculated by the ARDL method, and the residual variance of the model are stable and that the model can be estimated without using artificial variables due to the absence of structural changes

Table 04 : Long run results

Variables	Coefcient
C	2.7016
CPI	-0.0039*
Outputgap	0.004

Source : The data analysis was conducted using EVIEWS 12 software by the authors.

Figure 02: CUSUM and CUSUM-SQ Test Results



Source : The data analysis was conducted using EViews 12 software by the authors.

The interpretation of the estimate suggests that the Central Bank of Algeria has implemented a monetary policy that is responsive to inflation, following the principles of inflation targeting. In Algeria, this policy is identified by a gradual response to changes in inflation, with a slow adjustment towards achieving the target inflation rate.

Conclusion:

This article examines the foundation of monetary policy with a focus on inflation targeting since the year 2000. It further investigates the effects of this strategy on both inflation and financial stability, utilizing the ARDL model.

The findings of the analysis reveal that the implementation of inflation targeting in Algeria's monetary policy does not have a significant immediate effect on inflation. This may be attributed to the slow adjustment towards achieving the policy rate target, and the lack of autonomy of the central bank. Although the study discovered that the policy is responsive to inflation, forward-looking, and counter-cyclical in the face of inflation, the advantages of inflation targeting in emerging markets such as Algeria appear to be restricted due to weak institutional and macroeconomic conditions, as well as unfavorable external shocks.

Inflation targeting is a useful approach for combating price fluctuations and promoting financial stability. However, for it to be effective, certain prerequisites must be in place. One of these requirements is the use of an extended taylor rule, which includes additional explanatory and auxiliary variables to provide a more accurate depiction of the response of the Central Bank of Algeria.

Referrals and references:

- Altunöz, U. (2022). Describing of central banks' monetary policy in the context to linear and nonlinear taylor rule: the case of Turkey. *Quality & Quantity*, 56(6), 4641-4662.
- Barro, R. J., & Gordon, D. B. (1983). Rules, discretion and reputation in a model of monetary policy. *Journal of Monetary economics*, 12(1), 101-121.
- Beju, D.-G., & Ciupac-Ulici, M.-L. (2015). Taylor rule in emerging countries. Romanian case. *Procedia Economics and Finance*, 32, 1122-1130.
- Calvo, G. A., & Reinhart, C. M. (2002). Fear of floating. *The Quarterly journal of economics*, 117(2), 379-408.
- Gonçalves, C. E. S., & Salles, J. M. (2008). Inflation targeting in emerging economies: What do the data say? *Journal of Development economics*, 85(1-2), 312-318.
- Kim, S., & Mehrotra, A. (2018). Effects of monetary and macroprudential policies— Evidence from four inflation targeting economies. *Journal of Money, Credit and Banking*, 50(5), 967-992.
- Kydland, F. E., & Prescott, E. C. (1977). Rules rather than discretion: The inconsistency of optimal plans. *Journal of political economy*, 85(3), 473-491.
- Mishkin, F. S. (2004). Can inflation targeting work in emerging market countries? In: National Bureau of Economic Research Cambridge, Mass., USA.
- Mishkin, F. S. (2008). Challenges for inflation targeting in emerging market countries. *Emerging Markets Finance and Trade*, 44(6), 5-16.
- Orphanides, A. (2001). Monetary policy rules based on real-time data. *American Economic Review*, 91(4), 964-985.
- Owoundi, J.-P. F., Mbassi, C. M., & Owoundi, F. (2021). Does inflation targeting weaken financial stability? Assessing the role of institutional quality. *The Quarterly Review of Economics and Finance*, 80, 374-398.
- Ravn, M. O., & Uhlig, H. (2002). On adjusting the Hodrick-Prescott filter for the frequency of observations. *Review of Economics and Statistics*, 84(2), 371-376.
- Stojanovikj, M., & Petrevski, G. (2021). Macroeconomic effects of inflation targeting in emerging market economies. *Empirical Economics*, 61(5), 2539-2585.
- Svensson, L. E. (2000). Open-economy inflation targeting. *Journal of international economics*, 50(1), 155-183.
- Svensson, L. E. (2003). What is wrong with Taylor rules? Using judgment in monetary policy through targeting rules. *Journal of Economic Literature*, 41(2), 426-477.
- Svensson, L. E. (2010). Inflation targeting. In *Handbook of monetary economics* (Vol. 3, pp. 1237-1302). Elsevier.
- Taguchi, H., & Wanasilp, M. (2018). Monetary policy rule and its performance under inflation targeting in Thailand. *History*, 19, 28.
- Taylor, J. B. (1993). Discretion versus policy rules in practice. Carnegie-Rochester conference series on public policy,

Annex 1: Estimate Equation (ARDL Model)

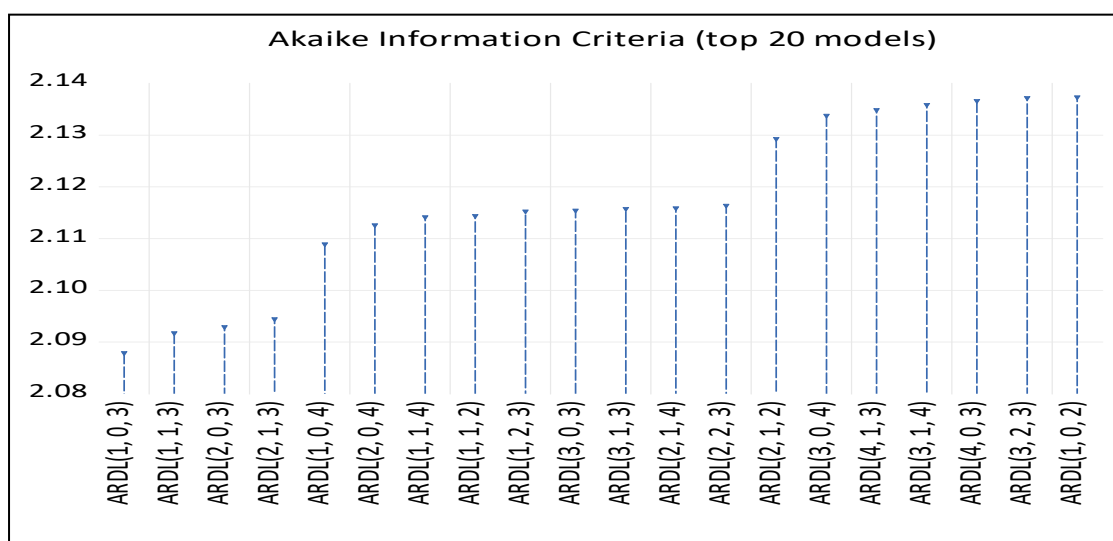
Dependent Variable: MMR
 Method: ARDL
 Date: 04/04/23 Time: 16:53
 Sample (adjusted): 2000Q4 2021Q4
 Included observations: 85 after adjustments
 Maximum dependent lags: 4 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (4 lags, automatic): CPI OUTPUTGAP
 Fixed regressors: C
 Number of models evaluated: 100
 Selected Model: ARDL(1, 0, 3)
 Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
MMR(-1)	0.707494	0.050413	14.03406	0.0000
CPI	-0.001150	0.002590	-0.444058	0.6582
OUTPUTGAP	-2.31E-06	2.63E-05	-0.088049	0.9301
OUTPUTGAP(-1)	-2.59E-05	2.65E-05	-0.976096	0.3320
OUTPUTGAP(-2)	6.93E-05	2.67E-05	2.598921	0.0112
OUTPUTGAP(-3)	6.51E-05	2.73E-05	2.386881	0.0194
C	0.790244	0.356972	2.213742	0.0298

R-squared	0.768414	Mean dependent var	2.487524
Adjusted R-squared	0.750600	S.D. dependent var	1.316060
S.E. of regression	0.657240	Akaike info criterion	2.077228
Sum squared resid	33.69322	Schwarz criterion	2.278388
Log likelihood	-81.28221	Hannan-Quinn criter.	2.158140
F-statistic	43.13470	Durbin-Watson stat	2.279785
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Annexe 2: Akaike Information Criteria



Annexe 3:long Run From and Bounds Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	9.560910	10%	2.63	3.35
k	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
Finite Sample: n=80				
Actual Sample Size	85	10%	2.713	3.453
		5%	3.235	4.053
		1%	4.358	5.393

Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.003932	0.008664	-0.453789	0.6512
OUTPUTGAP	0.000363	0.000195	1.858563	0.0669
C	2.701632	1.000413	2.700516	0.0085

EC = MMR - (-0.0039*CPI + 0.0004*OUTPUTGAP + 2.7016)