ESTIMATING THE MONETARY POLICY REACTION FUNCTION IN EGYPT

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Abstract:

This paper estimates the Egyptian monetary policy reaction function, by applying the Taylor (1993) rule and its open-economy version which employs co-integration analysis to estimate Taylor's function in the long run. Also, this analysis is concerned with measuring this function in the short run by employing the Error Correction Mechanism (ECM). The analysis relies on the annual data obtained from the International Financial Statistics (IFS) published by the IMF for the period 1970-2007. When the simple Taylor rule was estimated for Egypt, the output gap and inflation coefficients were statistically significant, and their signs were found to be consistent with theoretical rationale. When the open-economy Taylor rule was estimated, the coefficients of the output gap, inflation and exchange rate had statistical significance with the expected signs. Therefore, the inflation rate has played an important role in conducting the Egyptian monetary policy.

Key words:

monetary policy
reaction function,
Taylor rule,
Egypt.

INTRODUCTION

Egypt has experienced challenges and made some progress in pursuing economic growth. Since 1983, except for 1991 and 1993, its economic growth rate has been above 3.00%. The annual growth rate of 4.18% in 2004 suggests that Egypt's macroeconomic conditions were favourable. Its inflation rates were in the double-digit range during the 1980s and early 1990s.

During the period 1997-2003, inflation rates dropped to below 5%. However, the inflation rate of 11.26% in 2004 has caused some concerns. After 1992, the authorities pursued fiscal discipline by controlling the ratio of government deficit spending to GDP to below 3.00%. One area that could dampen economic growth is the relatively high interest rate level, such as the discount rate of 10.00%, and the lending rate of 13.38% in 2004. The pound-to-US dollar exchange rate was stable during the 1990s.

To switch from the pegging of its pound to the U.S. dollar, to a flexible exchange rate regime in year

2000, the pound-to-USD exchange rate rose from 3.69 in 2000 to 6.13 in 2004. In the financial sector, the stock price index went up from 63.80 in 1997 to 199.23 in 2004 or 212.27%. This implies that the increased financial wealth may enhance the consumption and investment spending due to the wealth effect and the balance-sheet effect (Hsieh, 2006).

Between July 2004 and March 2005, the government was engaged in economic reforms in order to (1) create a foreign exchange inter-bank market, (2) cut tariffs and eliminate surcharges and fees for imports and create qualified industrial zones, (3) raise prices of electricity and fuels, modify income tax law to simplify tax codes and reduce tax rates, (4) pursue bank reforms through mergers, sales of joint ventures, raise capitalization to 500 million, and resolution of non-performing loans (NPLs), (5) privatize most state-owned enterprises including 17 non-financial firms, and (6) others (Hsieh, 2006).

The monetary policy reaction function shows the relationship between the real interest rate set by the central bank and the level of inflation (Cecchetti,

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2008). Taylor (1993) showed in his seminal work a policy rule by which the Federal Reserve adjusts the policy rate in response to the lagged inflation and the real GDP gap. Taylor found that this rule described the actual policy performance in the late of 1980s and early 1990s.

Since 1993, several studies have applied and developed Taylor rule to examine the policies of the central banks in the developed countries such as Clarida et al. (1998) and Fendel and Frenkel (2006). However, there have been few studies about the monetary policy rules in Egypt and developing countries.

This paper is organized as follows. Section 1 provides a brief background information concerning the Egyptian economy and conduct of monetary policy by the Central Bank of Egypt (CBE). Section 2 outlines some relevant information concerning the methodology. Section 3 presents the estimation results while the last section gives the conclusions.

A BRIEF BACKGROUND OF THE ECONOMY AND CONDUCT OF MONETARY POLICY IN EGYPT

Background of the Egyptian economy

Under comprehensive economic reforms initiated in 1991, Egypt has relaxed many price controls, reduced subsidies and inflation, cut taxes, and

partially liberalized trade and investment. Manufacturing has become less dominated by the public sector, especially in heavy industries. A process of public sector reform and privatization has started to enhance opportunities for the private sector. Agriculture, mainly in private hands, has been largely deregulated, with the exception of cotton and sugar production. Construction, non-financial services, and domestic wholesale and retail trades are largely private. All this has greatly contributed to maintaining a steady increase of GDP and the annual growth rate.

The Government of Egypt tamed inflation, bringing it down from double-digit to a single digit. Currently, GDP is rising smartly by 7% per annum due to the successful diversification. Gross domestic product (GDP) per capita based on Purchasing Power Parity (PPP) increased fourfold between 1981 and 2006, from US\$ 1355 in 1981, to US\$ 2525 in 1991, to US\$ 3686 in 2001 and to an estimated US\$ 4535 in 2006. Based on the national currency, GDP per capita at constant 1999 prices increased from EGP 411 in 1981, to EGP 2098 in 1991, to EGP 5493 in 2001 and to EGP 8708 in 2006. Relying on the current US\$ prices, GDP per capita increased from US\$ 587 in 1981, to US\$ 869 in 1991, to US\$ 1461 in 2001 and to an estimated US\$ 1518 (which translates to less than US\$ 130 per month) in 2006. According to the World Bank Country Classification, Egypt has been promoted from the low income category to the lower middle income category.

Figure 1 GDP Growth rate, Inflation and Unemployment rate in Egypt, 2001-2008

Source: Ministry of Economic Development

Figure 1 shows some recent data about the GDP growth rate, inflation rate and unemployment rate in Egypt for the period 2001-2009. Namely, the GDP growth rate rose from 3.5 in 2001 to 7.2 in 2008. On the other hand, both the inflation rate and the unemployment rate have also increased during the same period.

Conduct of Monetary policy in Egypt

Since the conclusion of the stabilization program in 1996, the CBE has been concerned with achieving multiple objectives simultaneously, which were conflicting in several instances (Al-Mashat and Billmeier, 2008). These objectives included attaining high economic growth while maintaining low inflation and preserving a stable exchange rate. The multiplicity of objectives in the presence of increasing capital mobility (which manifested primarily as inflows) made the conduct of an independent monetary policy virtually impossible, and clouded the measurement of the monetary policy stance during that period (1996–2005).

During the period 1996- 2005, the CBE's operational targets were excess reserves of banks, and given the strong link between monetary aggregates and inflation, growth in M2 was the intermediate target. In its toolkit, the CBE used various quantitative and price instruments at different points in time to achieve its multiple objectives, leading to a lack of consistency in monetary management. These instruments included reserve requirements, government securities, repo and reverse repo operations, and the CBE's discount rate. The structure of the banking sector made the linking of the policy decisions to macroeconomic outcomes more complicated.

Until very recently, the dominance of the state in the banking sector tended to create rigidities in the interest rate structure. Therefore, the quantitative measures adopted by the CBE at various junctures are likely to have played a more important role in the transmission mechanism when compared to price instruments, mainly interest rates. In addition, the exchange rate was the key nominal anchor and policies were geared to maintain its stability vis-à-vis the U.S. dollar, which in turn theoretically supported price stability (as long as low inflation prevailed in the United States). As shown in the empirics, the exchange rate channel of monetary transmission was more effective than the interest rate channel (Al-Asraj, 2004). Under the inflation targeting regime, central banks commonly use price

instruments as they are expected to be the most effective tool for conducting monetary policy. In addition, inflation targeting relies on a well-functioning and competitive banking system (Al-Mashat and Billmeier, 2008).

Only in these circumstances can the interest rate channel become strong and, thus, the most convenient mechanism since the exchange rate channel cannot be relied upon actively. Under IT, the exchange rate is abandoned as the nominal anchor and replaced by an explicit price-stability objective. Being easy to interpret and communicate to the public, interest-rate decisions and the interest rate transmission channel have become important. Schmidt-Hebbel and Tapia (2002) argue that central banks need to thoroughly understand the intensity and lags with which their policy interest rate impacts the economy, and in particular, the dynamics of their policy objectives.

METHODOLOGY

The aim of this paper is to estimate the monetary policy reaction function for Egypt for the period 1970-2007. Moreover, one of the main objectives of this paper is to estimate empirically a Taylor - type monetary policy reaction function in Egypt, during the period 1970-2007. I have also been particularly interested in measuring this function in the short run by using the Error Correction Mechanism (ECM). Namely, I will start with the simple Taylor rule. The simple Taylor rule is shown as follows:

$$r_t = b_0 + b_1\pi_t + b_2y_t, b_1 > 0, b_2 > 0 \quad (1)$$

Where r_t is the nominal interest rate at time t , π_t is the inflation rate at time t , and y_t is the output gap at time t , according to the rule, both b_1 and b_2 should be positive. That is, the rule indicates a relatively high interest rate when the inflation is above its target or when the output is above its potential level, and a relatively low interest rate when the inflation is below its target or when the output is below its potential level.

Following Taylor (1993) and Chadha et al. (2004), I empirically analysed the role of the exchange rate as the next step. Here, the simple Taylor rule was extended so that it included the exchange rate as an additional explanatory variable as follows:

$$r_t = b_0 + b_1\pi_t + b_2y_t + b_3e_t, b_1 > 0, b_2 > 0, b_3 < 0 \quad (2)$$

In this augmented rule, e_t represents the real effective exchange rate at time t , and its coefficient is expected to have a negative sign. This indicates a relatively high interest rate when the real exchange rate depreciates and a relatively low interest rate when the real exchange rate appreciates.

This paper uses annual data from the period 1970- 2007. The data source for the interest rate is the Central Bank of Egypt (CBE) and the rest of data is collected from the International Financial Statistics (IFS).

I calculate the output gap in the following way. Firstly, I regress the output on a constant and a time trend.

$$y_t = 100 \times (\ln(Y_t) - \ln(Y_t^*)) = 100 \times \left(1 + \frac{Y_t - Y_t^*}{Y_t} \right) \cong 100 \times \frac{Y_t - Y_t^*}{Y_t} \quad (5)$$

As a preliminary analysis, I carried out the Augmented Dickey-Fuller (ADF) tests for the output gap, interest rates, inflation rates, and the real effective exchange rate. As a result, the level of each variable was found not to have a unit root. Thus, I can say that each variable is a non-stationary variable with a unit root.

EMPIRICAL RESULTS

Simple Taylor Rule

First of all, I conducted the co-integration analysis. Table 1 shows the results of (ADF) tests in the first difference based upon the Mackinnon p values- at various lag lengths. The preferred lag length is based upon the Akaike information Criterion (AIC). These indicate that co-integration is generally accepted.

ADF figures show the Mackinnon approx p-value

Table1 shows the estimation results. As is evident from this table, the output coefficient is estimated to be positive (0.026) and statistically significant at 1% level. The inflation rate coefficient is estimated to be positive (0.212) and statistically significant at 5% level.

$$\ln(Y_t) = \alpha + \beta \times \text{time} + u_t \quad (3)$$

When Y_t is the output at time t , time is the time trend, and u_t is the error term with mean 0 and finite variance. The potential output is described as the predicted value of Equation (3).

$$\ln(Y_t^*) = \hat{\alpha} + \hat{\beta} \times \text{time} \quad (4)$$

Where (Y_t^*) is the potential output, $\hat{\alpha}$ and $\hat{\beta}$ are estimates of α and β . I then calculate the output gap as the deviation of output from its potential level as follows:

Table 2 shows the dynamic Simple Taylor function by using the Error Correction Mechanism (ECM). It indicates a positive relationship between the interest rate and both the output gap and inflation rate. Most importantly, of course, the lagged error is negative and significant. This confirms the acceptance of the long-run relationship; which is further validated provided there are no problems with any of the diagnostic tests presented (the AR (1) test for the first order residual autocorrelation, the ARCH(1) test for autogressive conditional heteroscedasticity and the Jarque-Bera test for normality).

Open-economy Taylor Rule

The Egyptian monetary policy reaction function will be next analysed by applying the Taylor rule augmented with the exchange rate. Table 1 shows the results of the co-integration. As it is evident from the table, the output coefficient is estimated to be positive (0.022) and statistically significant at 1% level. The inflation rate coefficient is estimated to be positive (0.215) and statistically significant at 5% level. It is noted that the coefficient of the real effective exchange rate is estimated to be negative (0.212) and statistically significant at 10% level.

Table 1 - Long run simple Taylor rule and Open-economy

Co-integration Analysis							
		Simple Taylor Rule		Open-economy Taylor Rule			
Dependent Variable	r_t	Coefficient	sig	r_t	Coefficient	sig	
Independent Variable							
Inflation Rate	π_t	0.212	**		0.215	**	
Output Gap	y_t	0.026	***		0.022	***	
Exchange Rate	e_t				-0.348	*	
CRDW		1.05			1.27		
		Favoured lag Length=2			Favoured lag Length=2		
ADF Tests							
ADF(0)		0.007			0.002		
ADF(1)		0.007			0.002		
ADF(2)		0.069			0.002		
ADF(3)		0.105			0.144		
***= significant at 1%							
**= significant at 5%							
*= significant at 10%							

Table 2 - Short run simple Taylor rule and Open-economy

Error Correction Mechanism (ECM)							
		Simple Taylor Rule		Open-economy Taylor Rule			
Dependent Variable	dr_t	Coefficien	sig	dr_t	Coefficien	sig	
Independent Variable							
First difference of Inflation Rate	$d\pi_t$	0.177	**		0.106	**	
First difference of Output Gap	dy_t	0.009	***		0.008	***	
First difference of Exchange Rate	de_t				-0.298	*	
Lagged Error	E_1	-0.849	***		-0.944	***	
no of observation		37			37		
F-statistics		9.47			6.81		
Pr>F-statistics under Ho		0.000			0.001		
Adjusted R2		0.74			0.71		
DW		2.32			2.27		
AR(1)		1.72			1.62		
ARCH(1)		1.88			1.23		
Normality		2.66			2.12		
***= significant at 1%							
**= significant at 5%							
*= significant at 10%							

Table 2 shows the dynamics of the open-economy Taylor function. It indicates a positive relationship between the interest rate and both the output gap and inflation rate. As expected, there is a nega-

tive relationship between the interest rate and the exchange rate. Most importantly, of course, the lagged error is negative and significant.

CONCLUSIONS

This paper empirically analyses the Egyptian monetary policy reaction function by implementing the simple Taylor rule and its open –economy version which employs both long run and short run analysis (ECM). The analysis uses annual data from the period 1970 - 2007.

When the simple Taylor rule was estimated for Egypt, the output gap and inflation coefficients were statistically significant, and their signs were found to be consistent with theoretical rationale. When the open-economy Taylor rule was estimated, the coefficients of the output gap, inflation and exchange rate had statistical significance with the expected signs.

The aforementioned information implies that the Central Bank of Egypt (CBE) could respond appropriately to internal supply-demand gaps, external competitiveness and changes in price level.

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PROCENA FUNKCIJE REAKCIJE MONETARNE POLITIKE EGIPTA

Rezime:

Ovaj rad se bavi procenom funkcije reakcije monetarne politike Egipta, služeći se Tejlorovim pravilom (1993) i njegovom verzijom u otvorenoj privredi koja primenjuje kointegracionu analizu kako bi se izvršila procena Tejlorove funkcije na duže staze. Takođe, ova analiza je usmerena i ka proceni ove funkcije za kratkak vremenski period korišćenjem mehanizma za ispravljanje grešaka (ECM). Analiza se oslanja na godišnje podatke dobijene od Međunarodne finasijske statistike (IFS) koju objavljuje Međunarodni monetarni fond (MMF) za period 1970-2007. Kada je izvršena procena jednostavnog Tejlorovog pravila za Egipat, koeficijenti proizvodnog jaza i inflacije su bili statistički značajni, a njihovi predznaci u skladu sa teorijskim obrazloženjem. Kada je izvršena procena Tejlorovog pravila u otvorenoj privredi, koeficijenti proizvodnog jaza, inflacije i kursa su bili statistički značajni i imali su očekivane predznake. Stoga, možemo reći da je stopa inflacije odigrala bitnu ulogu u sprovođenju monetarne politike Egipta.

Ključne reči:

funkcija reakcije monetarne politike, Tejlorovo pravilo, Egipat.

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