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Application of the monetary policy function to output fluctuations in Bangladesh

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Abstract

Applying the monetary policy function, this paper finds that real GDP in Bangladesh is positively associated with real deprecation, real financial stock price, and world output and negatively influenced by the world real interest rate. The coefficient of the ratio of government consumption spending to nominal GDP is insignificant, suggesting that expansionary fiscal policy may not be effective.

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1. Introduction

Like many other developing countries, the recent world financial crisis caused Bangladesh to experience declining real output, exchange rate volatility, decreasing exports and imports, declining financial assets, large government deficits, high unemployment, and other negative developments. While the timing of future recovery remains unknown, it may be interesting to study the impacts of changes in some of the macroeconomic and external variables on real GDP for Bangladesh. This paper has several different focuses. First, the well-known money policy function (Romer, 2000, 2006; Taylor, 1993, 1999, 2001) is used to replace the LM curve so that monetary policy plays an important role in determining real output. The choice of the monetary policy function is justified. Bangladesh Bank formulates monetary policies consistent with the forecast CPI inflation and real GDP growth every year and regularly uses the repo and reverse repo interest rates to change the quantity of money in order to affect output and price (Bangladesh Bank, 2009). Second, comparative static analysis is applied to determine the possible sign of a change in one of the exogenous variables on the equilibrium real GDP.

There are several recent articles studying the effects of exchange rate depreciation or appreciation, fiscal policy, monetary policy, and other related subjects for Bangladesh. Rahman and Islam (2006) show that exchange rate depreciation would initially deteriorate the trade balance significantly and improve the trade balance slowly in the long run. Hence, exchange rate depreciation may not achieve the objective in the short run as some would expect.

In studying the Bangladesh economy, Maroney, Hassan, Basher, and Isik (2004) reveal that monetary policy plays a more important role than fiscal policy, that foreign aid needs to be allocated to efficient uses to make contribution to growth, and that the export sector needs to be diversified and broadened. Chowdhury (2005) finds that expansionary fiscal policy in Bangladesh does not influence the interest rate level significantly, tends to reduce the price level by a very small magnitude, and does not affect the exchange rate level. Hence, the crowding-out effect due to an expansionary fiscal policy would not be a concern.

Chowdhury, Dao, and Wahid (1995) present several major findings regarding the relationships among output, monetary policy, inflation, and exchange rates for Bangladesh. Neither the structuralist model nor the monetary model can exclusively explain the inflationary process. Monetary policy Granger causes real output unidirectionally and has a strong but short-term impact on inflation. Monetary policy and inflation play significant

roles in exchange rate fluctuations. They suggest that monetary tightening may slowdown the economy, although it would contain inflation and stabilize international trade.

Hassan and Tufte (1998) study export growth for Bangladesh based on exchange rate volatility, export and import prices, and world trade. They find that export growth in Bangladesh is positively affected by the amount of world trade and negatively influenced by exchange rate volatility in the long run and that short-run variations in export growth cannot be explained by any of these variables. Using the error-correction model and the cointegration technique, Al Mamun and Nath (2005) find that there exists a unidirectional causal relationship from exports to economic growth in Bangladesh in the long run.

2. The Model

Extending Romer (2000, 2006), Taylor (1993, 1999, 2001), and other studies, we can express an open-economy IS function, a monetary policy function, and an augmented aggregate supply function as:

$$Y = X(Y, R, G, T, S, E, W) \qquad (1)$$
$$+ \quad - \quad + \quad - \quad + \quad + \quad +$$

$$R = F(\pi, Y, E, R') \qquad (2)$$
$$+ \quad + \quad + \quad +$$

$$\pi = \pi^e + \lambda(Y - Y^*) + \phi E \qquad (3)$$
$$+ \qquad\qquad +$$

where

Y = real GDP,
R = the real interest rate,
G = real government spending,
T = real government tax revenues,
S = real financial stock value,
E = real exchange rate (BDT/USD exchange rate times the relative price),
W = world output,
π = the inflation rate,
R' = the world real interest rate,
π^e = the expected inflation rate,

Y^* = potential real GDP, and
λ, ϕ = parameters.

Solving Y, R, and π simultaneously, we can express the equilibrium real GDP as:

$$\overline{Y} = \overline{Y}(E, S, G, T, R', W, \pi^e; \lambda, \phi, Y^*) \tag{4}$$

The impact of real depreciation on real GDP is given by:

$$\partial \overline{Y} / \partial E = (X_E + \phi F_\pi X_R + F_E X_R) / |J| < or > 0. \tag{5}$$

where $|J|$ is the Jacobian for the endogenous variables and has a positive value. Note that the sign in (5) is ambiguous because the first term in the numerator is positive whereas the second and third terms in the numerator are negative.

The respective effects of a change in S, G-T, R', W, or π^e on the equilibrium real GDP are given by:

$$\partial \overline{Y} / \partial S = X_S / |J| > 0. \tag{6}$$

$$\partial \overline{Y} / \partial G - \partial \overline{Y} / \partial T = (X_G - X_T) / |J| > 0. \tag{7}$$

$$\partial \overline{Y} / \partial R' = F_{R'} X_R / |J| < 0. \tag{8}$$

$$\partial \overline{Y} / \partial W = X_W / |J| > 0. \tag{9}$$

$$\partial \overline{Y} / \partial \pi^e = F_\pi X_R / |J| < 0. \tag{10}$$

These theoretical analyses suggest that a higher real stock price, more government deficit, a lower world real interest rate, more world output, and a lower expected inflation rate are expected to increase real output. A higher real stock price would affect real output via the wealth effect and the balance-sheet effect (Mishkin, 1995). Deficit-financed government spending may not be effective due to Ricardian equivalence theory, crowding-out, uncertainties, and other related factors (Barro, 1989; Taylor, 2000).

3. Empirical Results

All the data were taken from the *International Financial Statistics* that is published by the International Monetary Fund. Real GDP is measure in billions at the 2000 price. The real

exchange rate is equal to the BDT/USD nominal exchange rate (units of the taka per U.S. dollar) times the relative price in the U.S. and Bangladesh. An increase in the real exchange rate means real depreciation of the taka. The nominal stock price index based on the Dhaka Stock Exchange is divided by the consumer price index to derive the real stock price. Due to lack of compete data for government spending and tax revenues, government consumption spending as a percent of nominal GDP is selected as a proxy for the fiscal policy variable. The real federal funds rate in the U.S. is chosen to represent the world real interest rate. Industrial production in advanced countries is used to represent world output. The expected inflation rate is the lagged inflation rate derived from the consumer price index. Because quarterly data for real GDP, government spending, and government tax revenues are not available, annual data are used. The sample ranges from 1988 to 2007. The data for the stock price and the expected inflation rate derived from the CPI are not available before year 1988. The data for 2008 for real GDP and the stock price index are not available at the time of writing this paper. The VAR or vector-error correction model is not employed in empirical work due to the small sample size.

Table 1 presents estimated coefficients, t-statistics, the adjusted R^2, and other related statistics. Because we estimate a reduced-from equation without including endogenous variables on the right-hand side and because it is assumed that exogenous variables are uncorrelated with the error term, the endogeneity of any regressor is not a concern. To correct for autocorrelation and heteroskedasticity simultaneously when their forms are unknown, the Newey-West (1987) method is applied. The explanatory power of the regression seems to be relatively high as the value of the adjusted R^2 is estimated to be 0.984. The coefficients of the real exchange rate, the real stock price, the real federal funds rate, and world output are significant the 1% or 5% level whereas the coefficients of the ratio of government consumption spending to nominal GDP and the expected inflation rate are insignificant even at the 10% level. Real depreciation of the taka, a higher real stock price, a lower federal funds rate, and more world output would result in a higher real GDP for Bangladesh. To test the stability of the regression, the CUSUM and CUSUMSQ tests are presented in Table 2. The cumulative sum of recursive residuals or the cumulative sum of recursive residuals squared lie within the critical lines. Hence, the estimated regression parameter or residual variance is stable.

Several comments can be made. First, The Bangladesh economy is heavily influenced by external variables such as the exchange rate, the international stock market, the real federal funds rate, and world output. Hence, in setting economic policy, external variables need to be considered. Second, recent trends of less volatility of exchange rates, lower world real interest rates, rising stock prices, and other positive developments are expected to help the

Bangladesh economy. Third, the insignificant coefficient of the fiscal policy variable may suggest that as the government spends more as a percent of GDP, there is no impact on real GDP. Fourth, the insignificant coefficient of the expected inflation rate may imply that the role of inflation in the monetary policy function may need to be examined further.

The monetary policy function employed in this paper is consistent with Chowdhury, Dao and Wahid (1995) that monetary tightening may cool off the economy but would contain inflation and stabilize international trade. This study shows that expansionary fiscal policy is ineffective whereas Chowdhury (2005) indicates that expansionary fiscal policy does not generate any crowding-out effect. This paper finds that real depreciation would increase real output whereas Rahman and Islam (2006) reveal that real depreciation deteriorates the trade balance in the short run and improves the trade balance slowly in the long run.

4. Summary and Conclusions

This paper has examined the impacts of changes in several major macroeconomic and external variables on real output for Bangladesh. The monetary policy function is included in the simultaneous-equation model. The comparative static analysis is applied to determine the possible sign of a change in one of the exogenous variables on the equilibrium real GDP. We find that real depreciation, a higher real stock price, a lower real federal funds rate, and more world output would increase real output. The coefficients of the ratio of government consumption spending to nominal GDP and the expected inflation rate are insignificant at the 10% level.

There are several policy implications. To stimulate net exports and real output, real depreciation of the taka is appropriate. Maintaining a healthy stock market is important as higher stock prices would generate the wealth and balance-sheet effects. The authorities need to pursue fiscal prudence as expansionary fiscal policy is ineffective. Current monetary easing by the U.S. Federal Reserve Bank and gradual recovery of the world economy expect to help Bangladesh's economy.

The results should be regarded as preliminary due to a relatively small sample size and need to be re-estimated when the sample size increases. If the data are available, other potential variables such as foreign debt may be considered. The expected inflation rate or the real exchange rate may be constructed with more sophisticated methods. The LM function may be considered in the formulation of a different model (Siddiki, 2000).

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Table I. Estimated Regression of Real GDP for Bangladesh
(The dependent Variable is Real GDP)

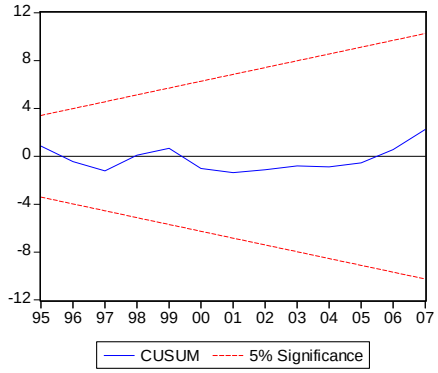
Variable	Coefficient	t-statistic	Prob.
Real exchange rate	0.607	3.051	0.009
Real stock price	0.069	2.348	0.036
Ratio of government Consumption to GDP	0.036	1.058	0.309
Real federal funds rate	-0.018	-2.670	0.019
World output	2.063	12.513	0.000
Expected inflation rate	0.002	0.732	0.478
Constant	-4.403	-8.275	0.000
Adjusted R^2	0.984		
D-W	1.685		
F-statistic	191.575		
Sample period	1988-2007		

Notes: The Newey-West method is employed in order to yield consistent estimates for the covariance and standard errors.

The log scale is used except for the real federal funds rate and the expected inflation rate due to actual or potential negative values.

Table II. Stability Tests

CUSUM Test



CUSUMSQ Test