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Is Depreciation or Appreciation of the Bangladeshi Taka Expansionary?

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Abstract: *Applying an extended IS-LM model, this paper finds that real depreciation raisedoutput during 1991-2006 whereas real appreciation increased output during 2007-2018. In addition, a higher government borrowing to GDP ratio, more real money supply, a higher stock price, a higher real oil price or a lower expected inflation tends to raiseoutput. The positive impact of real appreciation on output during 2007-2018suggests that its positive effects of lower domestic inflation or capital inflows outweigh its negative effect of less exports. These results suggest that either real depreciation or real appreciation may raiseoutput depending upon the stage of economic development.*

Keywords: *Real Depreciation or Appreciation, Fiscal Policy, Monetary Policy, Stock Prices, Oil Prices*

JEL Classification: *F41, E62*

1. INTRODUCTION

Bangladesh's economy showed both progress and concerns. According to the World Economic Outlook (2018), its real GDP grew rapidly at an annual rate of 7.137% in 2017 and more than 6% since 2010. Even during the global financial crisis during 2008-2009, its growth rates were still above 5%. The government net borrowing as a percent of GDP was 3.34% in 2017 and was less than 4% since 2009. The government debt-to-GDP ratio was on the decline from 44.322% in 2003 to 32.414% in 2017, suggesting that the government pursued a relatively conservative fiscal policy. The current account showed surpluses since 2012 except for a deficit of 1.208% of GDPin 2017 largely due to a trade deficit as imports were greater than exports.

The inflation rate of 5.676% in 2017 was higher than many advanced countries but was much lower than a high of 11.646% in 2011. Its per capita GDP of US$1,602 in 2017 ranked relatively low worldwide. The unemployment rate of 4.2% in 2017 was relatively low and remained relatively stable since 2010. The exchange rate versus the U.S. dollar has been on the rise in the long run from 15.4541 takas per U.S. dollar in 1980 to

80.4375 in 2017. Whether the depreciation of the taka would help or reduce aggregate output will be the focus of this paper.

The main objective of this paper is examine the impact of real depreciation or appreciation on output. Other relevant variables will be considered. An extended IS-LM model is applied in the formulation of a theoretical model. The impacts of the stock market and supply shocks are incorporated in the model. Binary variables will be used to test if there would be any structural break of the relationship between output and the real exchange rate.

2. LITERATURE SURVEY

Several studies have examined the effect of currency depreciation on real output or other macroeconomic variables for Bangladesh or other related countries. Based on a sample of 42 or 48 developing nations including Bangladesh, Nunnenkamp and schweickert (1990) revealed that the hypothesis of contractionary devaluation can be rejected whereas more exchange rate volatility had a negative impact on real output.Evaluating the impact of stabilization programs on output for 28 developing countries including Bangladesh, Morley (1992) showed that devaluations were contractionary mainly due to significant decrease in investment spending whereas import growth and the terms of trade had positive impacts. Fiscal and monetary policies played minor roles.

Studying the effect of depreciation on output for 23 LDCs including Bangladesh, Bahmani-Oskooee (1998) found that cointegration could only apply to 17 countries, that there was a long-term relationship between aggregate output and the real or nominal effective exchange rate in Bangladesh, and that the causality ran from the real effective exchange rate to real output.

Using a sample of 188 countries, Rodrick (2008) showed that currency undervaluation promoted economic growth, which is especially applicable to developing countries. This result continues to hold when different measures of exchange rates and different methodologies were employed.

Using an annual data during 1981-2012 in Bangladesh, Mamun, Chowdhury and Basher (2013)showed that a 1% real depreciation raised real output by 0.84% and the consumer price index by 0.27%. Hence, real depreciation causes a tradeoff between rising real output and higher inflation.

Rahman and Banerjee (2017) indicated that the net impact of the real effective exchange rate on industrial production in Bangladesh is negative, suggesting that the net effect of real depreciation is positive. In addition, time series variables are cointegrated, and there is evidence that short-run values adjusted to the long-term equilibrium.

Razzaque, Bidisha and Khondker(2017) found that a 1% real depreciation would lead to a 0.2771% increase in real output in Bangladesh in the long run (PHFMOLS) whereas a 1% real deprecation would result in a 0.059% decrease in real output in the short run. Although the long-run effect of real depreciation on real output is positive, its effect on rising domestic inflation cannot be overlooked.

To the author's best knowledge, few of the previous studies have applied an extended IS-LM model to examine the effect of real depreciation or appreciation on output. As these previous findings are inconclusive, it is worth studying the subject based on a different approach.

3.   THE MODEL

We can express the IS, LM and expectations-augmented aggregate supply functions as:

$$Y = f(Y, T, G, R, S, \varepsilon) \tag{1}$$

$$M = g(R + \pi^e, Y, S, \varepsilon) \tag{2}$$

$$\pi = h(\pi^e, Y - Y^p, E, \varepsilon) \tag{3}$$

where

Y	=	real GDP,
T	=	government tax revenue,
G	=	government spending,
R	=	the real interest rate,
S	=	the stock price,
ε	=	the real exchange rate (Units of the Bangladeshi taka per U.S. dollar times relative prices in the U.S. and Bangladesh. An increase means real depreciation.)
M	=	real money supply,
π^e	=	the expected inflation rate,
π	=	the inflation rate,
Y^p	=	potential real GDP, and
E	=	the real oil price.

Suppose that potential real GDP is a constant in the short run. Solving for Y, R and simultaneously, we can express equilibrium real GDP as:

$$\overline{Y} = h(\varepsilon, G - T, M, S, E, \pi^e)$$
$$\quad\; ?\quad\; ?\quad\; +\; +\; ?\; - \tag{3}$$

The sign beneath each exogenous variable represents the partial derivative of equilibrium real GDP with respect to an exogenous variable.

Real depreciation tends to stimulate exports, reduce imports, increase import prices and domestic inflation, and reduce net capital flows. Hence, the net impact is uncertain. Deficit-financed government spending increases aggregate demand but may raise the interest rate and crowd out private spending (Cebula, 1997, 2010, 2014a, 2014b). Thus, the sign is ambiguous. A higher stock price is expected to increase private spending due to the wealth effect, the household liquidity effect, Tobin's q theory and the balance sheet channel (Mishkin, 2013).A higher real oil price tends to lead to a negative supply shock and shift aggregate supply to the left. However, if a higher real oil price is driven by a global aggregate demand shock, it may have a positive effect on aggregate output. Hence, the sign is unclear (Kilian, 2008a, 2008b).A higher expected inflation rate tends to shift aggregate supply to the left and reduce equilibrium real GDP.

4. EMPIRICAL RESULTS

The data were obtained from the International Financial Statistics and the World Economic Outlook Database published by the International Monetary Fund (2019). Real GDP is measured in billion takas. The real exchange rate is equal to units of the taka per U.S. dollar times the relative prices in the U.S. and Bangladesh. The index for the real effective exchange rate is not available. G – T or the government deficit is represented by government borrowing as a percent of GDP. Real money supply is represented by real M1 money measured in billions. The equity index is selected to represent the stock price. The real oil price is calculated as the nominal oil price in the U.S. dollar times the exchange rate and adjusted by the consumer price index. The expected inflation rate is represented by the average inflation rate of the past three years. The annual data during 1991-2018 are used due to lack of adequate quarterly data for real GDP. The data for the money supply before 1991 are not available.

Figure 1 shows that real GDP and the real exchange rate seemed to have a nonlinear relationship and that real depreciation of the taka raised real GDP during 1991-2006 whereas real appreciation of the taka increased real GDP during 2007-2018. Figure 2 indicates that real GDP and the government borrowing-to-GDP ratio appeared to have a positive relationship, suggesting that expansionary fiscal policy would raise real GDP.

Due to the structural break of the relationship between real GDP and the real exchange rate, a slope binary variable and an intercept binary variable are included in the following estimated equation:

$$\overline{Y} = h(\varepsilon, \varepsilon \times B, B, G - T, M, S, E, \pi^e) \tag{4}$$

where B = 0 during 1991-2006 and B = 1 during 2007-2018.

According to the ADF test on the regression residual with an intercept and a trend, the value of the test statistic is estimated to be -3.9389 and the critical value is -3.6220 at the 5% level. Therefore, these time series variables are cointegrated and have a long-term stable relationship.

Regression results are reported in Table 1. The GARCH process is employed in order to correct for autoregressive conditional heteroscedasticity in time series data. The right-hand side variables can explain approximately 97.11% variation in real GDP. All the coefficients are significant at the 1% or 5% level. Real GDP has a positive relationship with the real exchange rate during 1991-2006, the intercept binary variable, the government borrowing-to-GDP ratio, real money supply, the stock price, and the real oil price and a negative relationship with the real exchange rate during 2007-2018and the expected inflation rate.
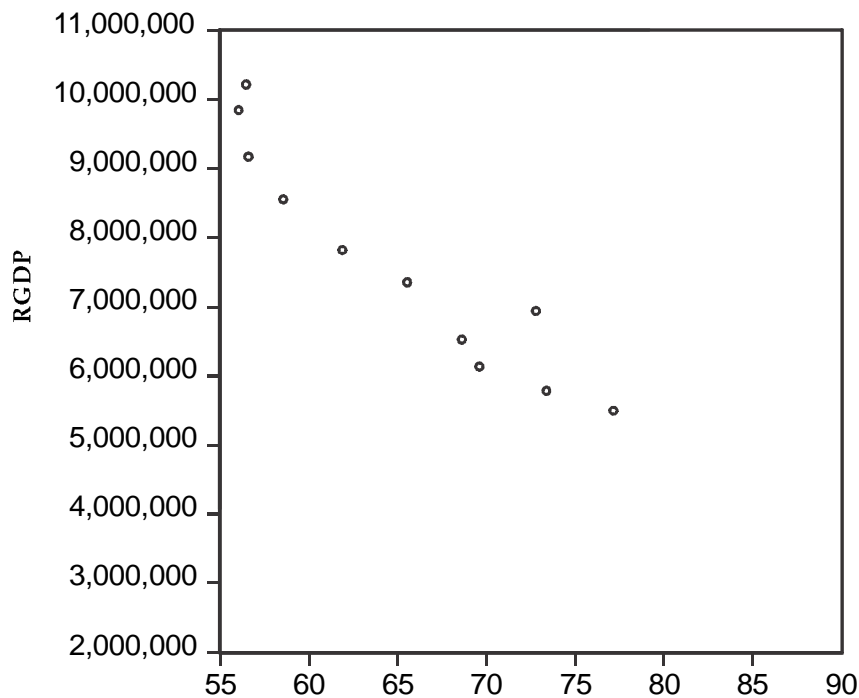

Figure 1: Scatter Diagram between Real GDP (RGDP) and the Real Exchange Rate (RER)
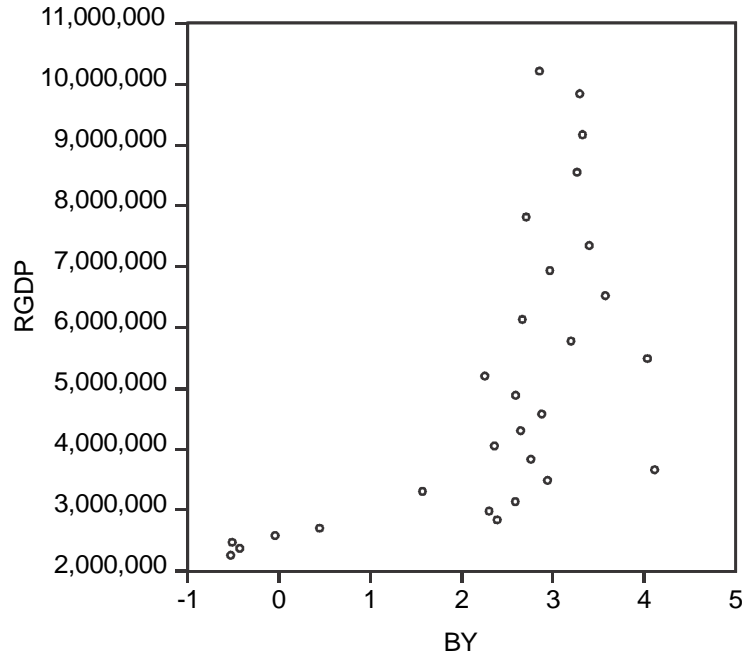
Figure 2: Scatter Diagram between Real GDP (RGDP) and the Government Borrowing-to-GDP Ratio (BY)

If the real exchange rate rises 1%, real GDP would increase 1.1486% during 1991-2006 but decline 1.9198% during 2007-2018. These results suggest that a 1% real depreciation would increase real GDP by 1.1486% during 1991-2006 whereas a 1% real appreciation would raise real GDP by 1.9198% during 2007-2018. The positive significant coefficient of the borrowing-to-GDP ratio indicates that deficit-financed spending has a positive impact on real output. A 1% increase in real money supply raises real GDP by 0.0159%, suggesting that monetary expansion is effective. Performance of the stock market also affects aggregateoutput positively because of increases in consumption and investment expenditures due to the wealth effect, the household liquidity effect, Tobin's q theory and the balance sheet channel. The positive significant coefficient of the real oil price may suggest that the positive effect due to a strong aggregate demand tends to be greater than the negative effect due to a decrease in aggregate supply. The negative significant coefficient of the expected inflation rate shows that a higher expected inflation ratewould shift aggregate supply to the left, raise the inflation rate, and reduce real GDP.

In comparison, expansionary depreciation found in this study during 1991-2006 is consistent with Bahmani-Oskooee (1998), Rodrick (2008),

Mamun, Chowdhury, and Basher (2013), Rahman and Banerjee (2017) and Razzaque (2017) in the long run whereas contractionary depreciation (or expansionary appreciation)in this study during 2007-2018 is in line with Morley (1992) and Razzaque, Bidisha, and Khondker(2017) in the short run.

Several other versions were considered. If the slope and intercept binary variables are not included in the estimated regression, the coefficient of the real exchange rate is estimated to be -1.3386 and is significant at the 1% level. However, the value of R-squared decreases to 0.9079. The negative significant coefficient may be misleading as it does not consider the positive relationship observed during 1991-2006. If the expected inflation rate is replaced with the weighted inflation rate of the past four years with declining weights of 0.4, 0.3, 0.2 and 0.1, its negative coefficient of -0.0095 is significant at the 10% level.

Table 1
Estimated Regression of Log(Real GDP) in Bangladesh

Variable	Coefficient	z-Statistic	Probability
C	8.8423	9616.0960	0.0000
Log(real exchange rate)	1.1486	6638.4980	0.0000
Log(real exchange rate) x Binary variable	-3.0684	-50.2115	0.0000
Binary variable	13.6680	57.6755	0.0000
Government borrowing-to-GDP ratio	0.0578	8.1144	0.0000
Log(real money supply)	0.0159	2.6397	0.0083
Log(stock price)	0.0454	2.1419	0.0322
Log(real oil price)	0.1277	4126.3220	0.0000
Expected inflation rate	-0.0419	-8.2519	0.0000
R-squared	0.9711		
Adjusted R-squared	0.9590		
Akaike information criterion	-2.1803		
Schwarz criterion	-1.6570		
Sample period	1991-2018		
Methodology	GARCH		

Notes: An increase in the real exchange rate means real depreciation of the Bangladeshi taka, and a decrease in the real exchange rate means real appreciation of the Bangladeshi taka.
The binary variable = 0 during 1991-2006, and the binary variable = 1 during 2007-2018.

5. CONCLUSIONS

This paper has examined the impacts of real depreciation or appreciation of the Bangladeshi taka and other relevant variables on output. The results show that real depreciation during 1991-2006 or real appreciation during 2007-2018 raised output. In addition, a higher government borrowing-to-

GDP ratio, more real money supply, a higher stock price, a higher real oil price and a lower expected inflation tends to increase output.

There are several policy implications. Real depreciation raisedoutput during 1991-2006 mainly because the positive impact of increased exports dominated thenegative impacts of higher import costs/domestic inflation andless capital inflows. On the other hand, real appreciation increasedoutput during 2007-2018mainly because the positive effects of lower import costs/domestic inflation and rising capital inflows outweighed the negative effect of less exports. These results suggest that at the presentdevelopment stage, real appreciation of the Bangladeshi taka would be the correct policy. Although deficit-financed government spending had a positive effect on output, the authorities may need to exercise prudence in order to make expansionary fiscal policy sustainable in the long run. Monetary expansion was effective in raising output, lowered the real interest rate, caused real depreciation, and was conducive to exports. Because the stock price had a positive impact on real output, the government may need to provide a healthy investment environment by reducing irregularities and frauds.

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