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An Assessment of Exchange Rate Policy under Floating Regime in Bangladesh

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This paper examines the exchange rate policy in Bangladesh for the period 2000-2008. Regime classification of the paper suggests that Bangladesh maintained a *de facto* managed floating regime by intervening in the foreign exchange market on a regular basis. This is at odds with the Bangladesh Bank's claim of maintaining *de jure* freely floating regime since end-May 2003. A high exchange rate pass-through is observed along with high market pressure during the period of expansionary monetary policy. Given the thin foreign exchange market and high pass-through (inflation) effects, it appears difficult for Bangladesh to maintain a freely floating regime. Although Bangladesh maintained average competitiveness throughout the period with depreciating REER, the currency remained somewhat overvalued. Estimates of export demand functions suggest that with lowering the REER volatility, positive impact on overall exports rises. Moreover, net foreign assets have significant effect on the REER appreciation while terms of trade, real interest rate differential, and government budget deficit are significant to REER depreciation. Based Moreover, net foreign assets have significant effect on the REER appreciation while terms of trade, real interest rate differential, and government budget deficit are significant to REER depreciation. Based on the findings, some pragmatic policies in managing the exchange rate in Bangladesh have been suggested.

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I. INTRODUCTION

While the advantages of freely floating regime are well known, it is still debated whether this regime is suitable for less developed countries. The problem of destabilising speculation and consequent excessive exchange rate volatility appears to be exacerbated in developing countries, making a floating regime especially unviable/unsuitable, particularly in the absence of a resilient and developed financial system (Hossain 2009, Grenville and Gruen 1999). After the Asian and Latin American crises in the 1990s, there has been a growing tendency among countries to adopt a corner regime — either a fixed or a floating regime. However, many studies document that the way developing countries float is not consistent with the characteristics of clean floats (Hausmann, Panizza and Stein 2001, Hernandez and Montiel 2003).

Bangladesh adopted a freely floating regime on May 30, 2003 by abandoning the adjustable pegged system.[1] The transition to the floating regime was smooth and the first ten months can be viewed as the "honeymoon period" for Bangladesh because the exchange rate remained stable, experiencing a depreciation of less than 1 per cent from June 2003 to April 2004. Exchange rate kept on depreciating gradually from mid-2004 and it reached its peak at Tk. 70/USD in 2006 from Tk. 58/USD, accounting for a 20 per cent depreciation. Since then (2007-2009), it remained fairly stable and has been fluctuating between Taka 68 and 69. Is this behaviour consistent with the characteristics of a floating regime? Or, can the behaviour of the nominal exchange rate be explained in a way that the authority allows the nominal bilateral rate to move to its equilibrium level and then intervene only to prevent excessive volatility around that level?

Exporters often demand depreciation to offset domestic price and wage inflation and regain competitiveness. Depreciation affects the objectives of the central bank (output and inflation) through three different channels. First, depreciation directly affects the rate of inflation. The impact of depreciation on inflation will depend on the level of the pass-through. Second, depreciation affects output through a *balance sheet* effect: the depreciation increases the cost

[1]Historically, Bangladesh had been maintaining various pegged exchange rate regimes, such as pegged to pound sterling (£):1972-1979; pegged to a basket of major trading partners' currencies (£ as the intervening currency) 1980-1982; pegged to a basket of major trading partners' currencies (US$ as the intervening currency): 1983-1999; crawling band: 2000-2003; floating exchange rate: May 30, 2003- Present.

of repayment of foreign currency denominated debt, reducing profits in this period, and thus the capital stock and output in the second period. Third, a larger depreciation entails a smaller increase in interest rates. Thus, a larger depreciation increases output in the second period, since the reduction in interest rate eases the credit constraint (we call this *the credit channel* effect). The overall effect on income will depend on which of the two channels dominate. If the credit channel dominates over the balance sheet channel, depreciation is expansionary. Otherwise, it is contractionary.

Caught in this dilemma, the monetary authorities have chosen to keep the exchange rate nominally fixed or almost fixed for the last two years, by intervening in the foreign exchange market. Occasional intervention in the foreign exchange market brings some positive benefits, particularly for developing countries like Bangladesh if the intervention is targeted to achieve some economic objectives such as stable inflation or trade competitiveness. However, if nominal exchange rate moves along a continuum for a long time-it may create distortions in the market, e.g. *irrational exuberance*, which include strong growth, accelerating inflation, rising international reserves, and gradual overvaluation. This situation would be troublesome for the economy if it proceeds too far. In this context, the concern is whether the Bangladesh Taka is overvalued and to what extent. At the same time, it is of policy concern as to how *the real effective exchange rates* (REER) are managed.

To have a clear idea about exchange rate management, this paper analyses contemporary exchange rate policies of Bangladesh, particularly under the floating exchange rate regime. The paper, thus, attempts to: (i) characterise the exchange rate policies Bangladesh is currently pursuing; (ii) evaluate the appropriateness of such policies in the light of both contemporary international and domestic economic conditions; and (iii) provide some alternative policy options that might be of assistance in managing exchange rates under the floating regime. For analysis, the paper takes into account behaviour of both the nominal and real exchange rates, behaviour of economic fundamentals, intervention activities, exchange rate market pressure, exchange rate pass-through, exchange rate misalignment, impact of the real exchange rate on exports, etc. We use data from various sources including Bangladesh Bank, International Financial Statistics (IFS) of the IMF, and Direction of Trade (DOT) of the IMF.

The paper is organised as follows. Section II reviews the literature on exchange rate issues. Section III assesses the exchange rate management by analysing the behaviour of the nominal exchange rate, interest rates and international reserves

during floating and pre-floating regimes. In Section IV, we examine the *de facto* exchange rate regime of Bangladesh by characterising the extent of intervention in the foreign exchange market. Section V estimates an Exchange Market Pressure Index to understand how frequently exchange rate shocks are observed and explore the determinants of that shock and Section VI estimates the exchange rate pass-through coefficients to understand the impact of exchange rate changes on domestic price changes. In section VII, the behaviour of the REER and NEER and its implication for international price competitiveness is analysed. In section VIII, the equilibrium real exchange rate and its misalignment are estimated. Section IX estimates a set of export demand functions to examine the effect of REER volatility on exports. Section X provides some policy recommendations based on the findings that could act as guiding principles in exchange rate management. Finally, section XI concludes the paper.

II. LITERATURE REVIEW

This section surveys empirical contributions on various aspects of exchange rate policies. Based on Mundell's (1961) seminal work, many studies recognise the important role of economic fundamentals on the choice of an exchange rate regime. However, this role is not always true for the same regime in all studies. For example, Poirson (2001) find that trade openness works for fixed regime choice, but Von Hagen and Zhou (2005) find that its net effect works in the direction of a floating regime for CIS (Commonwealth Independent States: States of former Soviet Union) countries. However, a few cross-country studies show that macroeconomic fundamentals do not have significant effect on the regime choice (see Baxter and Stockman 1989, Juhn and Mauro 2002). From the mid 1980s, studies began to focus on the role of shocks in explaining the choice of a regime. Various studies argue that while nominal shocks raise the likelihood of a fixed regime, real shocks call for flexibility. Bayoumi and Eichengreen (1994) argue that symmetry of shocks is a factor that is necessary for forming an OCA (Optimum Currency Area).

Recent trends in regime transition show that shocks or crises produce only temporary transition to an alternative regime and countries often revert to the previous regime after the crisis. Some East Asian countries are notable examples of this trend (Hernandez and Montiel 2003). Ohno (1999) shows that Exchange rate overvaluation was not the primary cause of Asia's financial crisis and contagion. By counterfactual simulations over the pre-crisis period, he showed that, to stabilise competitiveness, proper adjustments for inflation by individual economies are more important than the choice of currency weights.

However, shocks appear to occur in countries having weak financial institutions. These countries often intervene in the market to shield their fledging banking industries in the face of large exchange rate movements. By analysing both *de jure* and *de facto* regime choice, Hossain (2009) interestingly finds that economic fundamentals, financial and political institutional variables can help to explain the de jure regime choices. On the other hand, *de facto* regime choices are found to be governed by the shocks economy faces.

Several studies have attempted to analyse the behaviour of exchange rates in Bangladesh. Hossain (2002) investigates the exchange rate responses to inflation in Bangladesh for the period 1973-1999. He finds that the effect of devaluation on inflation during the fixed exchange rate regime was not significant, and he claims the results to be robust for the whole sample period. By analysing the movement of the real exchange rate and trade balance in Bangladesh for the period 1973-1996, Hossain (1997) finds that the continued inflows of foreign capital-foreign aid and overseas worker's remittances-have caused an appreciation of the real exchange rate by increasing the relative demand for non-tradable.

Rahman and Basher (2001) have estimated the equilibrium real exchange rate as well as exchange rate misalignment for the period 1977-1998. They find that trade liberalisation and increase in debt service burden result in a real depreciation of the currency; while increase in capital inflow, improvement in terms of trade, and increase in government consumption of non-tradables result in a real appreciation of the currency. From the estimated long run equilibrium real exchange rate, they find that Bangladesh currency was considerably overvalued until the late 1980s. However, the real exchange rate broadly was in equilibrium during the 1990s. An ADB study concludes that the misalignment between the actual and equilibrium exchange rate for the period 1997-2001 has been small and has progressively narrowed since 1998. During 2001, the misalignment was only 2.2 per cent.

Prior to adopting floating exchange rate regime, Islam (2003) argued that the economic and institutional prerequisites of a floating exchange rate regime are not met in Bangladesh. Some recent studies have tried to explain the behaviour of nominal exchange rates of Bangladesh after its transition to the floating rate regime. By doing a correlation analysis, Rahman and Barua (2006) explore the possible explanation of the exchange rate movement. They found that there is a strong correlation (-0.40) between depreciation and export-import gap as a share of reserves; L/C openings for imports also have a positive correlation (0.45) with

volatility of the exchange rate, which implies that the higher the L/C openings the more volatile is the exchange rate. They conclude that high seasonal demand for foreign currency because of increased import bills, systematic withdrawal of excess liquidity by Bangladesh Bank, relatively faster expansion of credit and higher interest rates on various national savings instruments are the reasons behind the interest rate hike in the money market and depreciation of the nominal exchange rate.

Younus and Chowdhury (2006) made an attempt to analyse Bangladesh's transition to floating regime and its impact on macroeconomic variables. They find that output growth in Bangladesh performed well in the intermediate and floating exchange rate regimes. Inflation is lower in the intermediate regime despite higher money supply and exchange rate depreciation. They also find that currency depreciation boosted export growth in the floating regime.

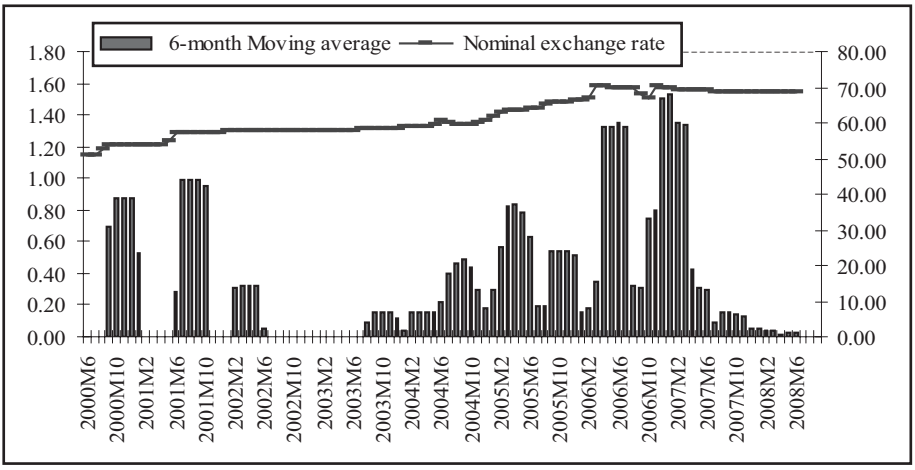
Chowdhury and Siddique (2006) have analysed the exchange rate pass-through to domestic inflation in Bangladesh. Analysing the data for the period 1997:07 to 2005:03, they have not found any significant pass-through effect of exchange rate in Bangladesh. They have applied Vector Auto Regression (VAR) technique in their analysis. If their findings are correct, its policy implication would be to allow the currency to depreciate further in order to give a boost to the economy. The findings however, appear to have been affected by measurement errors.

The above survey indicates that a systematic and comprehensive study on contemporary exchange rate policies of Bangladesh, particularly under the floating exchange rate regime, is necessary.

III. EXCHANGE RATE MANAGEMENT IN BANGLADESH (2000-2008)

This section describes how the nominal exchange rates behave by focusing on three aspects of exchange rate management: (i) the stock of reserves; (ii) the extent to which Bangladesh uses these reserves to stabilise the exchange rate; and (iii) the extent to which interest rates are used to stabilise the exchange rate. Figure 1 plots nominal exchange rate movements (level) as well as volatility of nominal exchange rate, measured by the 6-month moving average standard deviation. The figure shows that during intermediate regime (adjustable pegged regime), nominal exchange rate moves occasionally because of official devaluation and for the first six months of the floating regime, the nominal exchange rate remained almost fixed. It is seen that from April 2004 nominal exchange rate was somewhat volatile, but remained fairly stable after March 2006.

Figure 1: Nominal Exchange Rate Movement and Its Volatility



To what extent Bangladesh attempts to stabilise exchange rates by intervening in the foreign exchange market? To answer this question, we look at relative volatilities of the exchange rate, reserves, interest rates and inflation. We choose to work with relative volatilities, because we think that comparisons based solely on the volatility of exchange rates alone, or of reserves alone, could be misleading. The exchange rate could be more volatile simply because it is subject to larger external shocks. Comparing exchange rate volatilities does not provide a complete idea of the willingness of the authority to defend its parity. It may be the case that the central bank is intervening in the foreign exchange market to keep the exchange rate within certain limits, while during the period of less volatility the authority is letting the exchange rate float independently. Similarly, comparing volatility of reserves may be problematic too. It is possible for reserves during a particular period to be relatively stable due to the absence of shocks that would have warranted a movement in the exchange rate, or in case the authority intervenes heavily, if a shock warrants it. However, a possible drawback of using relative volatilities is that one does not know if the ratio is high because of the numerator being unusually high or the denominator unusually low. But intervention in the foreign exchange market is not the only channel that monetary authorities have in order to influence movements in the exchange rate. They can also affect it by tightening or loosening monetary policy. Thus, in this section we will look at relative volatility of exchange rates and interest rates as another indication of the degree to which monetary authorities are willing to let the exchange rate float freely.

As a measure of exchange rate volatility, we use the standard deviation of the level of the exchange rate. As a measure of the volatility of reserves, we use the standard deviation of the stock of reserves, normalised by the dollar value of the stock of base money (M0). As a measure of volatility of interest rates and inflation, we use the standard deviation of call money interest rate and consumer price index, respectively. Table I presents the volatility of reserves, exchange rates, market (call money) interest rate and inflation as well as their relative volatilities in terms of exchange rate volatility.

The estimates in Table I show that the nominal exchange rate remained very stable after March 2006, while it was highly volatile during earlier periods of the floating regime (April 2004 to February 2006). It is also evident from Table I that volatility of reserves and call money interest rate was higher during the period, 2004:4 to 2006:2 than the other two periods except inflation. The results indicate that relative volatilities were very low during 2006:3 to 2008:5, providing an evidence of certain amount of intervention in the foreign exchange market after March 2006.

TABLE I

RELATIVE VOLATILITIES OF THE NOMINAL EXCHANGE RATE, INTERNATIONAL RESERVE AND CALL MONEY RATE

	Volatility of exchange rate (Tk./$): ER	Volatility of reserve: R	Volatility of market interest rate: IR	Volatility of inflation: INF	Rel. vol1 (ER/R)	Rel. vol2 (ER/IR)	Rel. vol3 (ER/INF)
Pre-Floating Regime (Jan 2000-May 2003) N=41	2.65	0.052	2.97	3.30	50.96	0.89	0.80
Floating Regime (Jun 2003-Feb 2006) N=33	3.03	0.046	3.30	6.79	65.57	0.92	0.45
Floating Regime (Mar 2006-June 2008) N=28	0.71	0.061	3.62	9.10	11.64	0.20	0.08

Source: Authors' estimation based on data from Bangladesh Bank; IFS.

A comparison of volatility of Taka against major trading partners' currencies is made by estimating the coefficient of variation in Table II. The results show that the Taka remained stable against all major trading partners' currencies except the US dollar.

TABLE II
COMPARISON OF VOLATILITY OF EXCHANGE RATES (COEFFICIENT OF VARIATION)

	Taka/US dollar	Taka/ Rupee	Taka/ RMB	Taka/ Pound	Taka/ Yen	Taka/ Euro	Taka/ Sing $
Pre-Floating Regime (Jan 2000-May 2003) N=41	0.047	0.019	0.050	0.066	0.039	0.101	0.039
Floating Regime (Jun 2003-Feb 2006) N=33	0.50	0.065	0.057	0.075	0.055	0.069	0.065
Floating Regime (Mar 2006-Nov 2008) N=33	0.11	0.063	0.055	0.058	0.064	0.076	0.050

Source: Authors' estimation.

The findings in this section indicate that the way Bangladesh manages exchange rate is, by and large, not consistent with the characteristics of freely floating exchange rate regime. Evidently, Bangladesh Bank often intervenes in the foreign exchange market in order to keep the nominal exchange rate almost fixed or to allow it to move within a very narrow range (also evident in Table III). However, the extent of intervention and its impact on exchange rate regime remain unclear from the analysis of this section. Thus, we examine the *de facto* exchange rate regime of Bangladesh in the following section.

TABLE III
SALE AND PURCHASE OF FOREIGN EXCHANGE BY BANGLADESH BANK

(in million US$)

	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09 (Jul-Apr)
Sale	0	459	413.1	0	735.5	70
Purchase	313.95	147.1	0	649.5	202.5	815.2
Net Injection	-313.95	311.9	413.1	-649.5	533	-745.2

Source: Forex Reserve and Treasury Management Department (FRTMD), Bangladesh Bank.

IV. *DE FACTO* REGIME CLASSIFICATION FOR BANGLADESH

It is recognised in the literature that countries, particularly non OECD countries often deviate from their official exchange rate commitments. Therefore, some authors attempted to characterise the de facto regimes of countries (see Levy Yeyati and Sturzenegger 2002, Bubula and Otker-Robe 2002, Reinhart and Rogoff 2004). All these *de facto* classifications take the following three variables into account: *exchange rate volatility* (σ_e), *volatility of exchange rate changes* ($\Delta\sigma_e$) and *volatility of reserves* (σ_r). In this paper, we devise a *de facto* regime classification for Bangladesh following the one developed by Levy-Yeyati and Sturzenegger (2002) in Table IV.

TABLE IV
***DE FACTO* REGIME CLASSIFICATION CRITERIA**

	σ_e	$\Delta\sigma_e$	σ_r
Inconclusive	Low	Low	Low
Flexible	High	High	Low
Dirty Float	High	High	High
Crawling Peg	High	Low	High
Fixed	Low	Low	High

Source: Levy-Yeyati and Sturzenegger (2002).

Table IV sets the criteria according to textbook description. Flexible exchange rates are characterised by little intervention in the exchange rate markets together with unlimited volatility of the nominal exchange rate. Conversely, a fixed exchange rate regime occurs when the nominal exchange rate does not move while reserves are allowed to fluctuate. A crawling peg corresponds to the case where changes in the nominal exchange rates occur with stable increments (i.e. low volatility in the rate of the exchange rate) while active intervention keeps the exchange rate along that path. A dirty float should be associated to the case in which volatility is relatively high across all variables, with intervention only partially smoothing exchange rate fluctuations.

Following the methodology adopted by Levy-Yeyati and Sturzenegger (2002), we estimate *exchange rate volatility* by monthly absolute percentage change of nominal exchange rate (σ_e), *volatility of exchange rate changes* ($\Delta\sigma_e$) by the standard deviation of monthly percentage change of nominal exchange rate, and *volatility of reserves* (σ_r) by the absolute change of reserves in classifying a *de facto* regime. A word of caution is in order for reserves. Reserves are notoriously difficult to measure and there is usually a large difference between changes in

reserves and interventions. Therefore, we take particular care in reserves for intervention. First we define net reserves in dollar by subtracting foreign liabilities from foreign assets and deflating it by the nominal exchange rate (e_t) as follows:

$$R_t = \frac{Foreign\ \ Assets_t - \ \ Foreign\ \ Liabilities_t}{e_t}$$

Next we measure the monthly intervention in the foreign exchange market, r_t, as follows:

$$r_t = \frac{R_t - R_{t-1}}{Monetary\ Base_{t-1}\ \ (M_0)/e_{t-1}}$$

Our measure of volatility here is the average of the absolute monthly change in *r*, i.e. the average of the absolute monthly change in net dollar international reserves relative to the monetary base in the previous month, also in dollars.

The estimates of volatility are shown in Table V for the period 2000-2008. Following the classification criteria, we identify the *de facto* exchange rate regime of Bangladesh for the period 2000:1-2003:5 as an adjustable pegged regime. The behaviour of the nominal exchange rates and reserves for the first ten months of the *de jure* floating regime was puzzling (inconclusive) as volatilities of all the three variables were fairly low, which cannot be explained from the text-book context. One of the reasons perhaps is that Bangladesh Bank intervenes in the market not by buying or selling dollars, but by imposing some quantitative restrictions on LC margins. On the other hand, the period 2004:5 to 2006:12 was characterised by high nominal exchange rate volatility with high reserve volatility, which indicates that the *de facto* exchange rate regime was a *dirty float*. Finally, the *de facto* analysis of exchange rate regime for the recent period (2007:1-2008:6) reveals that the behaviour of exchange rates are more close to a fixed (pegged) exchange rate system. Despite some limitations of *de facto* regime classifications, it may be concluded that Bangladesh's exchange rate policy is not consistent with a freely floating regime. Rather, it can be broadly defined as a managed floating regime.

Why Bangladesh has deviated from its floating regime commitment? To answer this question, it is necessary to examine whether the economy is vulnerable to high exchange rate pass-through and high frequency of exchange rate shocks. These two issues are addressed in the following two sections.

TABLE V
***DE FACTO* CLASSIFICATION OF EXCHANGE RATE REGIME IN BANGLADESH, 2000-2008**

Period	σ_e	$\Delta\sigma_e$	σ_r	Comments
Jan 2000-May 2003	0.33 (L)	1.28 (H)	4.56 (H)	Adjustable peg
June 2003- April 2004	0.22 (L)	0.31 (L)	1.15 (L)	Inconclusive
May 2004 – Dec 2006	1.05 (H)	1.23 (H)	3.65 (H)	Dirty Float
Jan 2007 – June 2008	0.15 (L)	0.18 (L)	5.97 (H)	Fixed

Notes: We term an indicator high (H) if it exceeds its long-term estimates, otherwise it is termed as low (L). Long-term estimates are: $\sigma_e = 0.98$, $\sigma_e = 1.16$ and $\sigma_r = 4.15$.

V. EXCHANGE MARKET PRESSURE

The exchange market disequilibrium can be captured by the changes in international reserves or changes in exchange rates or combination of both. Under the fixed and floating regime, the extent of imbalance in the foreign exchange market can be estimated more directly by looking at the changes in reserves and changes in exchange rates, respectively. However, in a managed floating or an intermediate regime, monetary authorities usually allow either changes in reserves or exchange rate or combination of both in order to restore equilibrium in the foreign exchange market. The monetary approach to the balance of payments suggests that exchange market disequilibrium arises when there is an excess demand for domestic money. Based on this proposition, Girton and Roper (1977) proposes an exchange market pressure (EMP) index as the weighted sum of monthly changes in nominal exchange rate and monthly changes in the stock of international reserves scaled by monetary base in order to capture disequilibrium in the foreign exchange market. The Girton-Roper model has been extensively applied to many countries (see, Bahmani-Oskooee, Martin and Niroomand 1998, Taslim 2003).

Given that Bangladesh has been maintaining a managed floating regime instead of a freely floating as evident from our analyses in the previous sections, in this section we use the composite variable EMP (Exchange Market Pressure) as proposed by Girton and Roper (1977) to study the interaction between monetary variables and external sector and the severity of exchange rate shocks in Bangladesh during the period 2000:1 to 2008:9.

An EMP index has been calculated by taking the weighted sum of monthly changes in nominal exchange rate and monthly changes in the stock of

international reserves scaled by monetary base. The weights are inversely proportional to the relative variances of nominal exchange rate changes and international reserve changes. As proposed by Eichengreen, Rose and Wyplosz (1996), a standardized indicator of crisis (IC) is calculated based on EMP as: IC = $\frac{EMP - \mu_{EMP}}{\sigma_{EMP}}$. According to them, a crisis is signaled if IC > 1.5, while Kaminsky and Reinhart (1999) set a critical value of 3 for the IC. Both EMP and IC indices are plotted in Figure 2.

Figure 2: Exchange Market Pressure Index

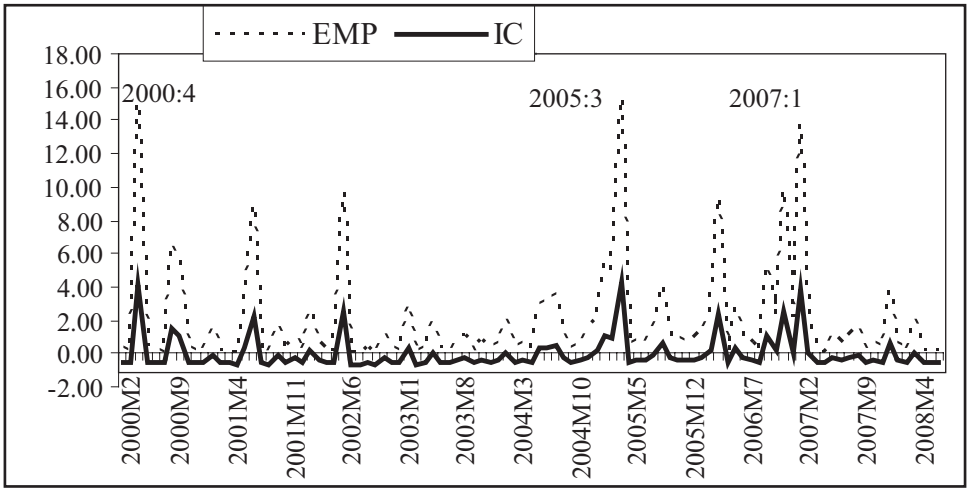


Figure 2 shows that exchange market pressure (EMP) is positive in Bangladesh during the period under consideration; however, during 2005-2006 the extent of imbalance in the foreign exchange market was severe. It appears from the index IC that shocks were more frequent and several times it crosses the crisis threshold during the period 2005-2006, which can be characterised as turbulent period. However, for the period 2007-08 the EMP is found to be very low, indicating equilibrium in the foreign exchange rate market.

The main theoretical proposition of Girton and Roper (1977) is that the domestic money market equilibrium, if disturbed, is restored through some combination of the currency depreciation/appreciation and reserves outflow/inflow. The excess domestic money supply will cause a combination of currency depreciation and reserves outflow while excess domestic money demand will cause some combination of currency appreciation and reserves

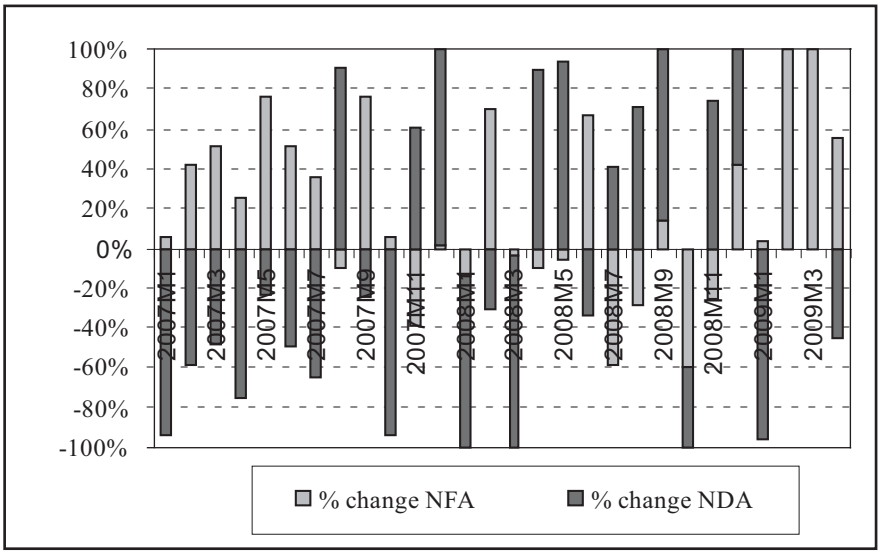
inflow to restore the money market equilibrium. Therefore, it may be hypothesised a positive and contemporaneous impact of shock to domestic credit growth upon exchange market pressure-an increase in domestic credit causes the exchange rate to depreciate or the foreign exchange reserves to deplete or some combination of the two. To this end, we plot the percentage change in net foreign asset and net domestic asset in Figure 3 to see the relationship.

From the Figure 3, it may be concluded that intervention was almost sterilised for the period 2005:8 to 2007:9. Comparing Figures 2 and 3, a positive relationship between domestic credit growth (or growth of money supply) and exchange market shock is observed. That is, when Bangladesh bank chooses to increase domestic money supply, some combination of reserve depletion or currency depreciation occurs. Since the interest rate channel of monetary policy transmission is almost ineffective, this exaggerated the situation as it prevents Bangladesh Bank from lowering the interest rate, which leads to sterilised interventions that ultimately contributes to exchange rate shocks.

From Figures 2 and 3, we may conclude that sterilised intervention in Bangladesh causes extra pressure on the foreign exchange market. However, an incomplete sterilised intervention is seen from 2007:9 onwards, which might have contributed to an increase in inflation.[2] Therefore, if there is a likelihood of exchange market pressure, it would be a good option for Bangladesh Bank to tighten the money supply through high interest rates. In what follows, Bangladesh Bank should work hard on making the financial sector more competitive in order to ensure smooth transmission of monetary policy stimuli through the interest rate channel, and only then, can they enjoy the "low inflation benefit" of non-sterilised interventions. At the same time, tight monetary policy must be accompanied by fiscal adjustments; otherwise, it might increase the burden on the inter-temporal budget and may thus be counterproductive.

[2]In a recent monetary policy statement (July 19, 2009), Bangladesh Bank admitted that they purchased 1.48 billion dollar in 2008-09 from the currency market, most of which remains unsterilised.

Figure 3: Percentage Change in Net Foreign Assets (NFA) and Percentage Change in Net Domestic Assets (NDA)



VI. EXCHANGE RATE PASS-THROUGH

In this section, we estimate the exchange rate pass-through for Bangladesh for the period 2000-2008 using a simple methodology applied for Australia by de Brower and Ericsson (1995), for Mexico by Garces Diaz (1999) and for a cross-country analysis by Hausmann *et al.* (2001). The model includes only three variables, namely mark up, wages and international prices.[3] Our sample period includes intermediate exchange rate regime (2000:1 to 2003:5) also, because during this period exchange rates were allowed to move within a narrow band.

[3]Although the model is simple, it has been widely applied in many recent publications as mentioned earlier. For drawing the complete picture of exchange rate pass-through, a complete paper is required by including some other relevant explanatory variables, which is beyond the scope of the paper. In particular, we take a simplistic approach here to estimate the pass-through coefficients because it is often observed that any change in international prices makes an instant change in domestic market prices and contributes to change in inflationary expectation. Therefore, despite its limitation, the analysis is carried out just to substantiate whether the intervention in the foreign exchange market is done in order to contain imported inflation.

We consider the model of domestic prices using a mark-up equation as follows:

$$P = \alpha W^{\theta} F^{\gamma} \quad (1)$$

where P is domestic price, W wages, F international prices in domestic currency (obtained by multiplying the exchange rate with an index of international prices) and α, θ, and γ are three parameters representing mark up and the long run elasticities of wages and external prices. By taking the natural logarithm of the above equation it is possible to estimate the long run relationship among wages, international prices and local prices. Since we do not have monthly data for wages, we estimate the following long-run equation:

$$p = ln\,(\alpha) + \gamma f\ , \quad (2)$$

where lower case letters represents the log of the corresponding upper case variables defined above.

All the series we use are monthly and can be described as having a unit root process. Hence, we need to study the long-run relationship between internal and external prices using cointegration analysis. To understand the speed of adjustment, we also estimate the error correction model.

We measure *p* using the log of the CPI of Bangladesh and use three different definitions of *f*. In the first definition, we add the log of the US dollar exchange rate to the log of an index of international non-fuel commodity prices (from IFS). In the second definition, we substitute the index of commodity prices by the U.S. CPI, and in the third definition, we substitute commodity price index by the Indian CPI. Table VI reports the results.

TABLE VI
ESTIMATES OF INFLATION PASS-THROUGH (2000-2008)

	Changes in internal prices	Changes in US prices	Changes in Indian prices
γ	0.87 (0.14)***	1.26 (0.15)***	0.95 (0.09)***
Constant	2.96	6.37	3.61
ECT (Error correction term)	-0.02 (0.005)**	-0.03 (0.01)**	-0.04 (0.02)**

*****, ** indicate significance at 1 per cent and 5 per cent level respectively.**

Table VI shows that the long run pass-through coefficient is very high and significant for Bangladesh. It is 0.87 for international price, 1.26 for the US price and 0.95 for the Indian prices, which indicates that a change in international or US or Indian prices will almost completely translate into a change in domestic prices. The estimated error correction term is negative and significant, indicating that the speed of adjustment to equilibrium is 2 per cent for international prices and 3 per cent for US prices, while it is 4 per cent for Indian prices. Although our result is based on a simple univariate analysis, we find that exchange rate pass-through has some role in explaining the low volatility (stability) of exchange rate in Bangladesh, particularly after March 2006, when the World was facing high inflationary episodes.

Up to this section, the analysis has concentrated on the behaviour of the nominal exchange rates. The following sections will focus on the behaviour of the real exchange rates.

VII. BEHAVIOUR OF THE REER AND NEER

The real effective exchange rate (REER) is the inflation-adjusted and trade-weighted exchange rate, which is used as a popular index of international trade competitiveness of a country. On the other hand, nominal effective exchange rate (NEER) is only a trade-weighted index without being adjusted for inflation, which is used to represent trade competitiveness. This section is devoted to a discussion of the movements of both the REER and the NEER. Following Bangladesh Bank's procedure, we calculated the REER and the NEER considering the year 2000 as base and using trade-weights of eight major trading partners[4], namely USA, UK, Japan, EU, China, India, Hong Kong and Singapore.[5] We have also estimated bilateral real exchange rates (RER) against major trading partners.

Figure 4 plots the REER and bilateral RERs. It shows that the REER depreciated around 20 per cent over the years in an unstable fashion. During the fixed regime, 2000-2003, the REER moved in tandem with the price differential and the movement of the US dollar vis-à-vis major currencies. The Taka gained

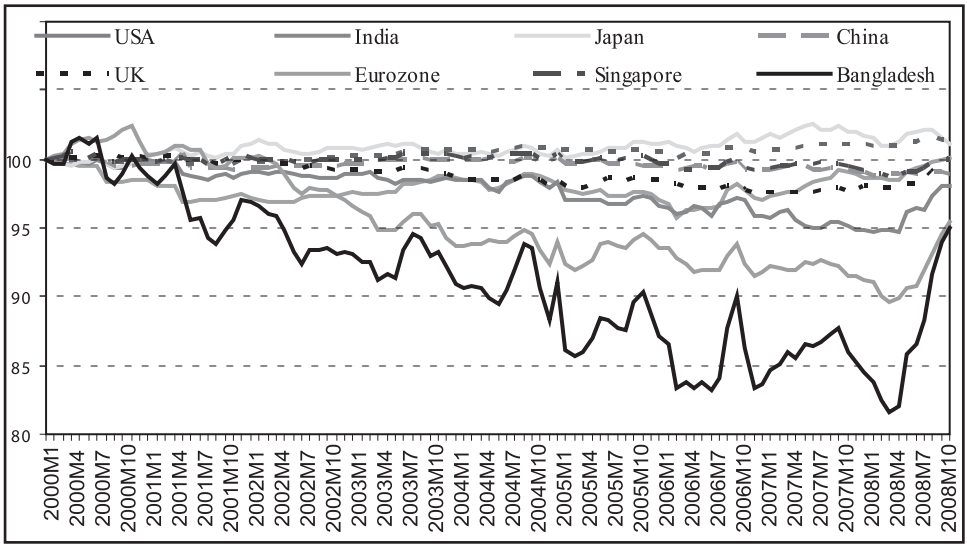
[4]Weights are as follows (see Younus 2009): China (0.0699), Singapore (0.085), India (0.1734), USA (0.2155), UK (0.0739), EU (0.2318), Hong Kong (0.0598) and Japan (0.0906).

[5]We consider the following 14 countries in the EU: Austria , Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden.

competitiveness during 2000-2003 because of the continued lower inflation differential as well as occasional devaluations. However, during the turbulent period of the floating regime (2004-2006), the taka remained competitive because of high depreciation as well as US dollar depreciation vis-à-vis major currencies despite high inflation differentials (with high domestic inflation). From 2006, the REER showed an appreciating trend for a brief period. With almost a stable nominal exchange rate of the dollar in the period 2006-2008, the REER showed slightly upward trend because of high inflation differentials and US dollar depreciation vis-à-vis major currencies. It is also observed from the trend of the REER that some periodic adjustments of taka/dollar exchange rate might have contributed to the overall trend of depreciation. A long term depreciating trend in the REER movement eventually suggests that the REER might have been overvalued to some extent.

The bilateral real exchange rate against the euro exhibits higher volatility with an overall depreciating trend. However, all other trading partners' real exchange rates remained stable. It appears that Bangladesh competitiveness vis-à-vis the European Union is particularly unstable (Figure 4).

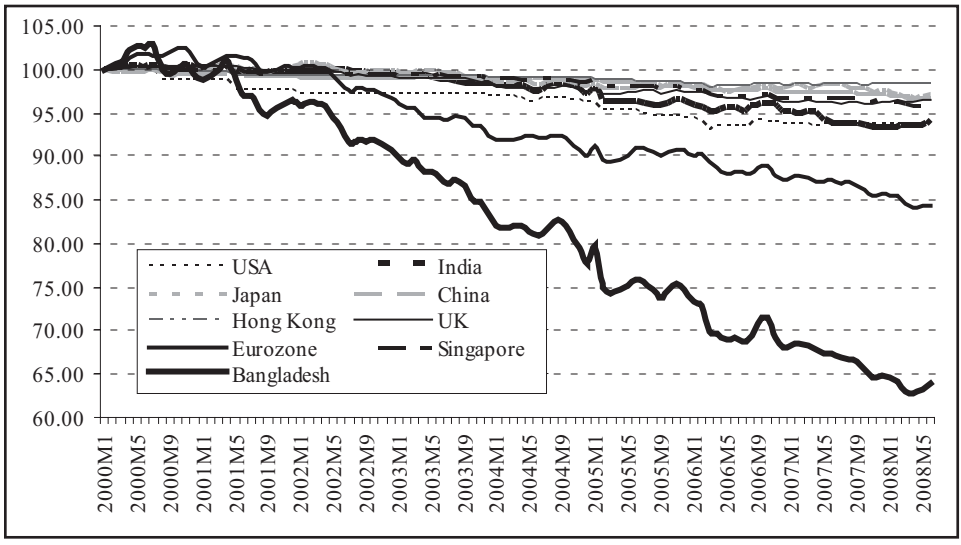
Figure 4: Bangladesh's Aggregate and Bilateral REERs Based on CPI (2000 = 100) (A Rise Indicates Real Appreciation)



Source: Authors' estimation.

The trend of the nominal effective exchange rate (NEER) movements shows the same depreciating but unstable pattern as the REER (Figure 5). The NEER is a trade-weighted index without being adjusted for inflation. Since the NEER is only a trade-weighted index, it has particular importance in stabilising the pace of competitiveness, especially when the currencies of the trading partners are more volatile.

Figure 5: Bangladesh's Aggregate and Bilateral NEERs (A Rise Indicates Appreciation)



Source: Authors' estimation.

VIII. EQUILIBRIUM REER AND MISALIGNMENT

It is important to identify whether the actual real exchange rate is over/undervalued compared to the long-run equilibrium exchange rate. We employ the behavioural equilibrium exchange rate (BEER) approach to estimate the long-run equilibrium real effective exchange rate with a view to estimating the actual over- or under valuation of exchange rate in terms of the macroeconomic fundamentals and to assess the appropriateness of current managed floating exchange rate regime in Bangladesh.

Following Clark and MacDonald (1998) and Baffes, Elbadawi and O'Connel (1999), a simple reduced form equation is examined:

$$lreer_t = f\,(ltot_t,\ lnfa_t,\ rird_t,\ bd_t), \qquad (3)$$

where *lreer* is log of the real effective exchange rate of Bangladesh, *ltot* represents log of terms-of-trade of the country, *lnfa* represents log of net foreign assets to capture the effects of external resources balances on equilibrium, *rird* is the real interest rate differential with the trading partner countries, and *bd* is the budget deficit represents the fiscal balance of Bangladesh government. For the analysis, vector error correction model (VECM) has been used.

Quarterly data are used covering the period from 2000Q1 to 2008Q2. The terms-of-trade, defined as the relative price of exports to imports, has been calculated from the mirror data of trading partners using trade as weight. The net foreign assets have been taken as a proxy to capture the effect of capital account balance on the REER. Real interest rate differential has been calculated by deducting the weighted real interest rates of USA, UK, EU, India and China from Bangladeshi real interest rate, where all real interest rates have been derived through subtracting respective inflation rate from nominal lending rate on advances. The fiscal balance of the government has been proxied by Bangladesh's fiscal deficit, expressed as a ratio of GDP. The data have been compiled from various issues of Economic Trends, Bangladesh Bank Quarterly and IFS.

VIII.1 Estimation Results

In order to apply the VECM, all variables under consideration must have to be integrated at order of one so that first difference of the variables should be stationary. To examine the order of integration of the series, two well known unit-root tests, namely the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, have been employed. There seems to be a consensus in the cointegration literature that the PP test is preferable to ADF.

In Table VII we report the ADF and PP test results to see the order of integration of the related variables.[6] According to the PP and ADF tests, almost all variables are found to be non-stationary at their levels and stationary at their first difference, which indicates that all variables are integrated at order one.

[6] A time series is integrated of order d [usually denoted as ~I(d)] with d is the number of times the series needs to be differenced in order to become stationary.

TABLE VII
ADF AND PP TESTS FOR UNIT ROOT[7]

Variables	ADF	PP	Variables	ADF	PP
lreer	-3.25**	-1.39	△lreer	-6.53*	-6.93*
ltot	-2.25	-1.89	△ltot	-5.08*	-7.60*
lnfa	-3.35*	-2.20	△lnfa	-3.52*	-3.69*
rird	-2.05	-1.97	△rird	-3.07*	-2.88*
bd	-0.86	-1.52	△dbd	-2.95*	-5.48*

Notes: 1. △ implies first difference of the respective variables. 2. * and ** imply significant at 5 and 10 per cent level respectively using MacKinnon critical Value.

To test the cointegration between real effective exchange rate and the macroeconomic fundamentals, we apply the multivariate cointegration tests developed by Johansen (1988) and Johansen and Juselius (1992). Four lags were considered for VAR following the Likelihood ratio statistic adjusted for degrees of freedom and Akaike Information Criterion (AIC). The result from the Johansen (1995) procedure to test for the existence and number of cointegrating equations is presented in Table VIII. The Johansen's Trace test for the cointegrating rank in Table VIII suggests that at least two significant cointegrating vectors exist in the system.[8] The presence of two cointegrating vector confirms the long-run relationship between the real effective exchange rate and macroeconomic fundamentals over the sample period 2000Q1-2008Q2.

[7]ADF and PP tests for lreer, ltot, lnfa and rird are applied by including an intercept as well as a linear time trend. However, since no clear trend was found for the △rird, △ bd,△ lreer, △ ltot, and △ lnfa, ADF and PP tests are performed without the trend term.

[8]The presence of multiple cointegrating vectors makes it difficult to give an economic interpretation of the estimated relationships. Moreover, due to small sample size, we could not carry out the analysis with multiple cointegrating vectors.

TABLE VIII
JOHANSEN TEST FOR COINTEGRATING RANK

Maximum Rank	Trace Statistics	1% critical value
0	112.62	66.52
1	55.33	45.58
2	19.53	29.75
3	7.17	16.31
4	0.34	6.51

Based on the estimated cointegrating vector, the long-run equilibrium equation can be written as:

$$\begin{array}{lccccc} lreer = & 6.90 & -0.51\ ltot & +0.01\ lnfa & -0.012\ rird & -0.023\ bd \_ 0.006\ t \\ \text{s.e.} & & (0.28) & (0.026) & (0.003) & (0.005) \quad (0.002) \end{array} \qquad (4)$$

where standard errors are given in parentheses. Most coefficients of the cointegrating vector are plausible in magnitude, statistically significant and correctly signed based on economic theory.

- Any improvements in terms of trade will have depreciating effect on the real effective exchange rate. A one percentage point increase in terms of trade is associated with 0.51 percentage point depreciation of the REER in the long-run.
- Increased net foreign assets will put pressure on the currency to appreciate and one percentage point increase in net foreign assets will cause 0.01 percentage point appreciation in the REER in the long-run.
- Real interest rate differential will worsen the exchange rate and 0.012 percentage point depreciation of REER will be associated with one percentage point improvement in real interest rate differential.
- As expected, Bangladesh's fiscal deficit as a ratio of GDP leads to depreciation of the REER and the magnitude of the depreciation in REER is 0.023 percentage point due to one percentage enhancement of budget deficit.
- As Montiel (1997) suggested, a time-trend is used to capture the impact of productivity growth, that is, the Balassa-Samuelson effect.[9] The

[9] The Balassa-Samuelson effect can come from two sources: (1) Productivity differential between the domestic tradable and non-tradable sectors, and (ii) productivity growth differentials relative to trading partners.

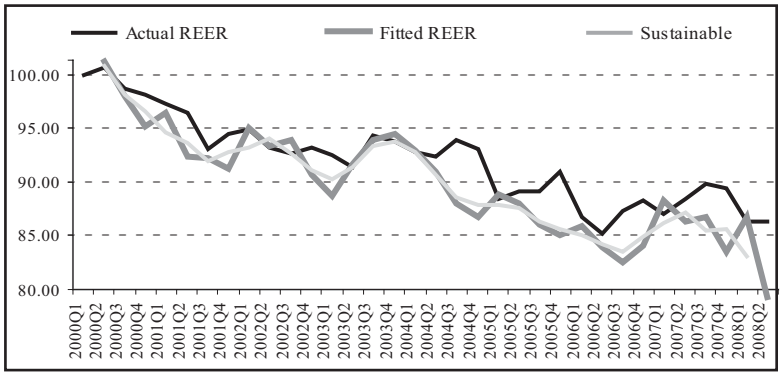
effect contends that productivity improvements will generally concentrated in the tradable sector and thus lead to an appreciation. The sign of *t* is negative and significant, that is the productivity differential is negative, which implies a higher productivity for tradable sectors that may contribute to the real appreciation. This confirms the Balassa-Samuelson effect.

- The estimated error correction term is found to be negative (-0.70) and significant. This implies that the speed of adjustment to the equilibrium is very high for each quarter, which is 70 per cent.

VIII.2 Exchange Rate Misalignment

The estimated long-run relationship of the REER and macroeconomic fundamentals allow us to estimate the equilibrium REER from the VECM specifications. The long-run elasticities have been applied to the actual values of the macroeconomic fundamentals in a given period and a series of equilibrium exchange rates obtained. The overvaluation or undervaluation of the exchange rate can be assessed by deriving the equilibrium "sustainable" real effective exchange rate and subtracting it from the actual real effective exchange rate. As sharp fluctuation in macroeconomic fundamentals is usual, equilibrium REER based on the actual values of macroeconomic fundamentals will also show sharp fluctuation. This leads us to estimate a 'sustainable' equilibrium REER, which gives an estimate of departure from actual REER in the medium-term framework. Sustainable values of the fundamentals have been derived through three quarterly moving averages.

Figure 6: Actual and Equilibrium REER



Source: Authors' estimation.

Figure 6 depicts the extent of overvaluation of the taka. The observed real exchange rate seems to have been overvalued since 2004:Q2. From 2006, it is found that the REER remains overvalued on an average 3 per cent. This indicates that the exchange rate remains very close to the equilibrium as warranted by the economic fundamentals.

IX. REER VOLATILITY AND TRADE PERFORMANCE

To examine the role of exchange rate on export competitiveness, in this section we examine the effect of real exchange rate volatility on exports. There are two primary determinants of export demand (Dornbusch 1988, Hooper and Marquez 1993). First, is the foreign income variable which measures the economic activity and the purchasing power of the trading partner country ("income effect"). Second, is the relative price or the terms to trade variable ("price effect"). Since real exchange rate volatility might have affected exports, exchange rate volatility is an additional factor that needs to be explicitly taken into account ("volatility effect"). Incorporating these determinants, the export demand function takes the form as follows:

$$x_t = \alpha_0 + \alpha_1 y_t^{world} + \alpha_2 p_t^{world} + \alpha_3 V_t + \varepsilon_t \qquad (5)$$

where x_t is the natural logarithm of real export (total export is deflated by the export price index) of Bangladesh, y_t^{world} is the natural logarithm of the trade-weighted sum of the real GDP of eight major trading partners, p_t^{world} is the trade-weighted sum of terms of trade of key trading partners, V_t is the real exchange rate volatility measured as the two-quarter moving average standard deviation[10] and ε_t is an error term.

Applying the ADF test, we find that all series, such as x_t, y_t, and p_t, exhibit I(1) process except V_t which is I(0). Thus, we go for estimating cointegration equations considering V_t as exogenous variable. The results are shown in Table X. To examine the impact of volatility, we estimate the short-term adjustment factors including REER volatility under the Vector Error Correction model. As apparels (Knit wear and Woven garments) constitutes major share of Bangladesh's export, we estimate separate cointegrating equations for Knit Wear

[10] V_t is calculated as follows: $V_t = \left[\frac{1}{m}\sum_{i=1}^{m}\left(\ln REER_{t+i-1} - \ln REER_{t+i-2}\right)^2\right]^{1/2}$

and Woven for their main destinations, such as the USA and the EU.[11] We also estimate export demand functions for other export items, such as raw hide and leather, jute products and fish.

Signs of the coefficients are found to be consistent with the theoretical predictions. The volume of exports (imports) to a foreign country ought to increase as the real income of the trade partner (domestic country) rises, and vice-versa. So we expect $\alpha_1>0$. A rise (fall) in the terms of trade of a trade partner will cause the domestic goods to become less (more) competitive than foreign goods, therefore exports will fall (increase) and imports will rise (fall). So we expect $\alpha_2< 0$.

Table IX shows that overall exports from Bangladesh are inversely related to international prices and statistically significant, implying that price support is crucial for the export sector. While only the income effect is observed on knitwear, both the income and price effect are observed on woven garments. Thus, woven exports have experienced sharper decline than knitwear in these markets in the later half of 2008 in the face of global economic recession. Although world income has significant effect on knitwear and woven exports in the USA and EU, exports of these items are expected to be less affected by the current global recession due to low income elasticity. Both income and price have significant effect on Jute and leather exports to both the EU and USA markets. However, only income of the destination countries, such as the EU and the USA, has been found significant to fish exports.

REER volatility is found to be significant and positive on overall exports as well as on fish and leather exports, albeit the impact is very low (Table IX). The low magnitude of the coefficient of volatility indicates that the less the REER volatility, the more will be the positive impact on overall exports. This finding calls for the stabilisation of the REER.

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[11]Export of Knitwear and Woven garments constituted around 70 per cent of total exports in 2007, of which 70 per cent are exported to the US (23 per cent) and EU market (47 per cent).

TABLE IX

ESTIMATED EXPORT DEMAND FUNCTION (COINTEGRATING EQUATIONS FOR QUARTERLY DATA: 2000Q1-2008Q4)

		EU						USA					
	Total Export	Knit wear	Woven	Raw hide & leather	Jute	Fish	Total export to Euro Area	Knitwear	Woven	Raw hide & leather	Jute	Fish	Total export to USA
Long-term equations													
World income	1.69	0.009*	0.002*	-0.005*	-0.005*	-0.0002*	0.014*	0.03*	0.01*	-.068*	0.012**	0.017*	0.02*
World price	-13.32*	0.012	-0.06*	-0.12*	-.067*	-0.033	-0.057*	-0.012	-0.02*	0.009***	0.03	0.004	-0.016
Constant	49.91	-0.067	-0.22	0.59	0.37	0.18	0.225	-0.32	0.05	0.60	0.22	0.15	-0.07
Short-term factors													
Vol_reer	0.11**												
Vol_rer_USA								0.000006	0.0002	0.0008**	0.000	0.0010***	0.0003
Vol_rer_EU		0.00007	-0.0001	0.000	-0.0002**	0.00006	0.0003**						
Error Correction Term	-0.19	-0.80**	-0.91*	-0.76*	-0.40***	-0.68**	-0.7**	-2.17*	-1.71*	-0.38***	-0.34	-1.21*	-1.54*

Notes: At most 1 cointegarting equation is significant at both 1 per cent and 5 per cent levels. *, **, *** indicate 1 per cent, 5 per cent and 10 per cent level of significance. Significance for the coefficients of the long-term equations is based on chi-square values obtained by imposing cointegrating restrictions on coefficients (Chi- square critical values: at 1 per cent = 6.63; at 5 per cent = 3.84; at 10 per cent = 2.70), whereas significance for the coefficients of short-term factors is based on *t*-values.

X. POLICY RECOMMENDATIONS

It seems that currently exchange rates are managed on an ad-hoc basis without having clear targets or objectives. However, this management can be rated as good as the exchange rate remains very close to its equilibrium as warranted by economic fundamentals. Certainly, there is scope to improve exchange rate management under a managed floating regime.

There are at least three channels identified in this paper by which exchange rate instability can be transmitted to the domestic economy.

(i) Pass-through (inflation) effect: A high pass-through coefficient is estimated for Bangladesh Taka. A one per cent change in international prices translates almost 100 per cent of that change into domestic prices. Since Bangladesh's trade is dominated by imports, a depreciation of taka can easily translates inflation into the domestic economy. This high exchange rate pass-through is also likely to increase external debt burden.

(ii) Competitiveness effect: Although Bangladesh achieved average competitiveness during the period 2000-2008 through REER depreciation, it was not stable. Competitiveness in the European markets suffers from this instability since the overall REER moves in tandem with the real Euro. Hence, it is very likely that it may destabilise trade relations with other countries. It is found that an increase in net foreign assets leads to REER appreciation, that is, the loss of international price competitiveness. An improvement of terms of trade works in favour of REER depreciation because of the substitution effect due to increase in import prices.

(iii) Domestic credit effect: This is an indirect channel through which exchange rate is affected in Bangladesh. An increase in domestic credit causes the exchange rate to depreciate or the foreign reserves to deplete or some combination of the two, leading to exchange market pressure. It is observed that sterilised intervention creates extra pressure in the foreign exchange market.

Note that there is no simple formula for exchange rate management to achieve two important goals of exchange rate management, such as *competitiveness* and *price stability*, simultaneously (Ohno 1999). In the absence of a solid consensus on the proper target of exchange rate management, we propose to adopt the following pragmatic policies.

Stabilisation of REER: In normal times the exchange rate should be managed so as to stabilise overall competitiveness. For this purpose, the REER index should be constantly monitored. The real exchange rate of Euro needs to be stabilised in order to stabilise the REER. For this purpose, adjustments must be made against movements of other currencies as well as of inflation differentials. *This can be accomplished either by a prescribed formula or more informally through timely corrections.*

REER Basket: Currently there are eight currencies in the REER basket. Since Bangladesh's commodity trade is dollar-denominated, *we propose to create a REER basket of four major currencies including the US dollar, the euro, the UK pound sterling and the Japanese yen with proper weights.* This kind of basket would be easier to manage and monitor. Although trade with Japan is not significant, Japanese yen should be included because it matters for debt burden, official development assistance (ODA) and grants.

Crisis Management: Bangladesh has not yet faced any currency crisis, and thus the capacity of exchange rate management has not been tested yet. With gradual economic development, shocks such as sudden shifts in FDI, export demand or the terms of trade, large business swings, significant resource discovery (or loss), major natural disasters etc, may occur. In that *case a trigger mechanism needs to be adopted for additional adjustments.* On the other hand, in the face of a currency attack or other severe financial turmoil in the region or in the global economy, REER stabilisation policy may be suspended temporarily to minimise contagion, credit crunch, reversal of capital flows, etc. However, *during a crisis or global economic meltdown, it is better to stabilise the NEER instead of the REER when other trading partner currencies are fluctuating against each other.*

Accumulation of Reserves: To maintain managed floats, Bangladesh needs to accumulate a sufficiently large stock of reserves. Has reserve accumulation already proceeded beyond the optimal point? The stock of international reserves stood at 10 billion US dollar in 2009, which can afford hardly 4 to 5 months' import payments. Since the standard practice is to maintain international reserve for 3-months import payments, current reserve position has met the necessary condition, but it is still not sufficient to tackle any crisis. For maintaining stability in the foreign exchange market, it is necessary to accumulate additional reserves. In this context, the management of capital inflows is very important for avoiding any crisis. Since maintenance of large stocks of reserves is a costly activity, *exchange rate stabilisation policies should be based on frequent and small adjustments rather than large and rare ones.*

Institutional Development: The foreign exchange market of Bangladesh is in an embryonic stage and thin in terms of daily transactions, which is US$ 20 million on average. Currency forward market and other derivatives are absent. Bangladesh Bank still controls the market by controlling net open dollar position of commercial banks. However, if the economy embarks on a middle-income growth path, the market will need to expand and forward transactions will need to be entertained. Therefore, to reap the maximum benefits of the managed floating regime, there is no alternative other than building institutions and bringing efficiency and depth to the foreign exchange market. In particular, it is necessary to develop inter-bank bond markets as well as capital markets with further financial liberalisation.

XI. CONCLUDING REMARKS

This paper analyses exchange rate policies of Bangladesh under a floating rate regime in a comprehensive manner. It analyses both the behaviour of the nominal exchange rate and the real exchange rate. Although Bangladesh was committed to maintaining a freely floating regime, our findings suggest that its exchange rate policies were not consistent with the characteristics of freely floating regime. Generally speaking, Bangladesh pursues a managed floating rate regime. Given the *thin* foreign exchange market and high exchange rate pass-through, it appears to be difficult for Bangladesh to maintain a freely floating regime.

We find that the REER depreciated around 20 per cent from the year 2000 in an unstable fashion. One of the sources of REER instability is the real euro, which has served to destabilise trade relations with other major partners. The analysis suggests that the real exchange rate of euro must be stabilised. The estimated export demand functions reveal a positive and negligible but significant effect of REER volatility on exports, indicating that more positive impact of the REER on exports would have been achieved with a stable REER. The REER appears to have been slightly overvalued (on average 3 per cent in each quarter) after 2004:Q2, which suggests that there was scope for depreciation if needed to boost the export sector.

Given the vulnerable financial system, we suggest that it is better for Bangladesh to continue a managed floating regime with frequent and small interventions. Simultaneously, Bangladesh Bank needs to work on developing mechanisms for inflation targeting policies, ensuring efficiency in the financial system, and building necessary institutions in order to manage exchange rates efficiently. To conclude, maintaining short-term stability and medium-to-long

term flexibility should be the general objective of exchange rate management policies in Bangladesh.

REFERENCES

ADB.2002. *Quarterly Economic Update (March)*. Asian Development Bank, Dhaka, Bangladesh Resident Office.

Baffes, J., I. Elbadawi, and S. O'Connell.1999. "Single-Equation Estimation of the Equilibrium Real Exchange Rate." In L. Hinkle and P. Montiel *(eds.) Exchange Rate Misalignment: Concepts and Measurement for Developing Countries*. New York: Oxford University Press.

Bahmani-Oskooee Mohsen, Miquel-Angel Galindo Martin, and Farhang Niroomand.1998. "Exchange Rate Sensitivity of the Demand for Money in Spain." *Applied Economics*, Taylor and Francis Journals, 30(5): 607-12.

Baxter, M. and Alan Stockman. 1989. "Business Cycles and the Exchange-Rate Regime: Some International Evidence." *Journal of Monetary Economics*, 23 (May): 377-400.

Bayoumi, T. and Barry Eichengreen.1994. "One Money or Many? Analyzing the Prospects for Monetary Unification in Various Parts of the World." *Studies in International Finance*, 76.

Bubula, Andrea and Inci Ötker-Robe. 2002. "The Evolution of Exchange Rate Regimes since 1990: Evidence from *De Facto Policies*." IMF Working Paper 02/155, IMF, Washington, D.C.

Chowdhury, Mainul I. and S. F. Siddique. 2006. "Exchange Rate Pass-Through in Bangladesh." Working Paper No. 0607, Policy Analysis Unit, Research Department, Bangladesh Bank.

Clark, P. and R. MacDonald.1998."Exchange Rates and Economic Fundamentals: A Methodological Comparison of BEERs and FEERs." IMF Working Paper WP98/67, IMF, Washington.

De Brouwer, Gordon and Neil Ericsson. 1995. "Modelling Inflation in Australia." Reserve Bank of Australia Research Discussion Paper 9510.

Dornbusch, R.1988. *Exchange Rates and Inflation*. Cambridge: MIT Press.

Eichengreen, B., A. Rose, and C. Wyplosz. 1996. "Contagious Currency Crises." NBER working paper, no. w5681.

Garcés Diáz, Daniel .1999. "Determinación del Nivel de Precios y la Dinámica Inflacionaria en Mexico." Banco de México, Documento de Investigación Económica.

Girton, Lance and Don Roper. 1977. "A Monetary Model of Exchange Market Pressure Applied to the Postwar Canadian Experience." *American Economic Review*, 67 (4): pp.537-48.

Grenville, S. and D. Gruen. 1999. "Capital Flows and Exchange Rates." In D. Gruen and L. Gower (eds.), *Capital Flows and the International Financial System.* Sydney: Reserve Bank of Australia.

Hausmann, Ricardo, Ugo Panizza, and Ernesto Stein.2001. "Why do Countries Float the Way They Float?" *Journal of Development Economics*, 66: 387-414.

Hernandez, Leonardo and Peter Montiel.2003. "Post-Crisis Exchange Rate Policy in Five Asian Countries: Filling in the "Hollow Middle?" *Journal of the Japanese and International Economies*, 17 (3): 336-69.

Hooper, P. and J. Marquez. 1993. "Exchange Rates, Prices and External Adjustments in the United States and Japan." International Finance Discussion Paper, No. 456, Board of Governors of the Federal Reserve System.

Hossain, Akhter. 1997. "The Real Exchange Rate, Production Structure, and Trade balance: The Case of Bangladesh." *Indian Economic Review*, 32(2):155-77.

_____ . 2002. "Exchange Rate Responses to Inflation in Bangladesh." IMF Working Paper WP02/20, IMF, Washington.

Hossain, Monzur. 2009. "Institutional Development and the Choice of Exchange Rate Regime: A Cross-country Analysis." *The Journal of the Japanese and International Economies* 23(1): 56-70.

Islam, Mirza Azizul. 2003. "Exchange Rate Policy of Bangladesh: Not Floating Does Not Mean Sinking." CPD Occasional Paper series, No.20, Dhaka.

Joahnsen, S. 1988. "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control*, 12(3): 231-54.

Johansen, S. and K. Juselius. 1992. "Testing Structural Hypothesis in a Multivariate Cointegration Analysis of the PPP and the UIP for UK." *Journal of Econometrics*, 53: 211-44.

Johansen, S. 1995. "*Likelihood-based Inference in Cointegarted Vector Autoregressive Models.*" Oxford, UK: Oxford University Press.

Juhn, Grace S. and Paolo Mauro. 2002. "Long-Run Determinants of Exchange Rate Regimes: A Simple Sensitivity Analysis." *IMF Working Paper 02/104.*

Kaminsky, G.L and C. Reinhart. 1999. "The Twin Crises: The Causes of Banking and Balance of Payments Problems." *The American Economic Review*, 89(3): 473-500

Levy, Yeyati Eduardo and Federico Sturzenegger. 2002. "Classifying Exchange Rate Regimes: Deeds Versus Words." *Universidad Torcuato di Tella.* Available at: www.utdt.edu/~fsturzen.

Montiel, P.J. 1997. "Exchange Rate Policy and Macroeconomic Management in ASEAN Countries." In J. Hicklin et al. (eds.) *Macroeconomic Issues Facing ASEAN Countries.* Washington, D.C.: IMF.

Mundell, R. 1961. "A Theory of Optimal Currency Areas." *American Economic Review*, 51: 657-65.

Ohno, Kenichi. 1999. "Exchange Rate Management in Developing Asia: Reassessment of the Precrisis Soft Dollar Zone." ADBI Working Paper 1, Asian Development Bank Institute.

Poirson, H. 2001. "How Do Countries Choose their Exchange Rate Regime?" IMF Working Paper, Wp/01/46.

Rahman, Md. Habibur and S. Barua. 2006. "Recent Experiences in the Foreign Exchange and Money Markets." Policy Note 0703, published in the *Bangladesh Bank Quarterly*, III (4).

Rahman, AKM Atiqur and Syed Abul Basher. 2001. "Real Exchange Rate Behaviour and Exchange Rate Misalignments in Bangladesh: A Single Equation Approach." *Bangladesh Development Studies*, 27 (2).

Reinhart, Carmen M. and Kenneth Rogoff .2004. "The Modern History of Exchange Rate Arrangements: A Reinterpretation." *Quarterly Journal of Economics*, 119 (1).

Taslim, Mohammad Ali. 2003. "A Monetary Approach to Exchange Market Disequilibrium in Australia: 1975-97." *Australian Economic Papers*, 42: (2).

Von, Hagen J. and J. Zhou. 2005. "The Choice of Exchange Rate Regime: An Empirical Analysis for Transition Economies." *Economics of Transition*, 13 (4): 679-703.

Younus, Sayera. 2009. "Impact of Monetary Policy Changes in a Semi Global Economy: Evidence from Bangladesh." Working Paper Series: WP 0902, Bangladesh Bank.

Younus, Sayera and Mainul Islam Chowdhury.2006. "An Analysis of Bangladesh's Transition to Flexible Exchange Rate Regime." Working Paper Series: WP 0706, Bangladesh Bank.