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Managing the Impossible Trinity in Bangladesh: How crucial are international reserves?

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Abstract

According to the impossible trinity or trilemma hypothesis put forward by Mundell (1963), an open economy's policymakers' concurrent pursuit of mutually inconsistent goals of stable exchange rate, monetary independence and free capital flow has become a daunting task. Many emerging market countries have been seen to focus on exchange rates and macroeconomic stability while increasingly integrating into the global financial market. Bangladesh is also gradually approaching financial account liberalization. Thus, the trilemma principle comes into play in Bangladesh. Constructing three indices representing three trilemma policies, this paper examines the validity of the impossible trinity in Bangladesh. The ordinary least square estimates show that the three indices add up to the value two and hence confirm that the impossible trinity is binding in the context of Bangladesh over the period 1976-2014. The results also point to the possibility of pursuing a greater combination of the trilemma policies with the help of the foreign exchange market intervention. Further, a more nuanced approach namely seemingly unrelated regression estimates that some economic and structural fundamental factors jointly determine the optimal combination of trilemma policies. The findings highlight that the country cannot violate trilemma constraint. However, instead of adopting corner solutions, Bangladesh may occupy a middle ground positions within the impossible trinity framework with the help of higher stock of international reserves. The empirical results also suggest that a higher level of international reserves enable the country to eye further liberalization of its capital account.

1.0 Introduction

According to the impossible trinity or trilemma hypothesis put forward by Mundell (1963), an open economy's policymakers' concurrent pursuit of mutually inconsistent goals of stable exchange rate, monetary independence and free capital flow has become a daunting task. Accomplishing the aforesaid goals may allow a country to attain higher economic growth with

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stable inflation. For instance, because a stable exchange rate serves as an inflation anchor, navigating policies towards that is a stepping stone for attaining price stability. Moreover, a stable exchange rate presumably minimizes risk premium as well as currency risks thereby boosting international trade and investment. Likewise opening up its financial market allows a country to benefit from risks sharing, consumption smoothing and output volatility downsizing. Again, preserving monetary independence may also help countries stabilize their economies. In fact, all three policies jointly contribute towards stabilizing the economy but policy makers cannot achieve all policy goals to the full extent simultaneously, which is the hypothesis or essence of the impossible trinity or trilemma (Ito and Kawai 2014).

The trilemma principle comes into play in emerging market countries that have been seen to focus on exchange rates and macroeconomic stability as they increasingly integrate into the global financial market (Hutchison, Sengupta and Singh, 2012). This move towards greater financial integration is widely recognized and challenges policy makers (Lane and Milesi-Ferretti, 2005, 2007). Resultantly, many emerging market economies have taken a middle ground in the impossible trinity framework by adopting partial financial integration and managed floating exchange rate regime (Aizenman et al. 2008). The original trilemma framework, however, does not consider the role of international reserves in enabling a country to occupy a middle ground position.

Trilemma in the context of Bangladesh: Bangladesh is also gradually approaching financial account liberalization. Bangladesh has adopted a good number of initiatives in a bid to attract greater foreign currency inflows in the form of foreign direct investment and portfolio investment including lifting the ceiling for investment in almost all sectors. In addition, foreign owned/controlled companies are allowed to borrow money from local banks and likewise residents are allowed to borrow from external sources. Domestic investors are selectively allowed to invest abroad with prior approval from BB and Board of Investment. These policy measures illustrate the gradual liberalization of the financial account (Wahab and Uddin 2014). Thus according to the trilemma principle, growing financial integration must be offset by a downward revision of either monetary independence or exchange rate stability. In view of the above, it is worthwhile to examine the degree to which financial integration puts constraints on the exchange rate and interest rate policies in Bangladesh. At the same time, it would be interesting to explore the implications of international reserves on the trilemma constraint. Till today, no study testing the trilemma or assessing the role of international reserves in trilemma has been undertaken in the context of Bangladesh. This paper thus endeavors to ascertain the validity of trilemma and its flexibility in Bangladesh perspective.

1.1 Research Questions

The paper addresses the following specific research questions.

- Is the impossible trinity or trilemma constraint binding in Bangladesh?
- Do international reserves allow Bangladesh to pursue a greater combination of three trilemma policies?
- Which fundamental factors determine the optimal combinations of three policies under the Impossible Trinity Framework?

2.0 Literature Review

Empirical studies that test the trilemma are largely characterized by the examination of the negative relationship between exchange rate stability and the extent of monetary policy independence.

Shambaugh (2004) and Obstfeld et al. (2004, 2005) found that the trilemma constraint is valid in that, under pegged exchange rates, a country loses monetary autonomy that is, the interest rate of that country follows more closely the base country interest rate in compared to that of a flexible exchange rate regime. Shambaugh studied 155 countries with a period ranging from 1973 through 2000. A de facto coding of exchange rate regime depending on the volatilities of the exchange rate divides countries into two regimes namely peg and non peg. The result showed that the countries adopting pegged exchange rates tend to follow the base country interest rate. Moreover, considering the effects of capital controls on exchange rate stability and monetary independence, the paper showed that countries are more responsive to base countries interest rates under pegged exchange rate and free capital flow than under capital control. Furthermore, applying a technique developed by Pesaran, Shin, and Smith (2001), the paper empirically examined the uncovered interest rate parity theory and found that the interest rates of pegged-rate countries are cointegrated with base country interest rates in the long run. In addition, the paper also revealed that dynamic adjustment towards equilibrium in response to shocks in the foreign interest rate is relatively faster in pegged countries than in non-pegged countries.

In contrary to the findings of Shambaugh (2004) and Obstfeld et al. (2004, 2005), Frankel et al. (2004) found that regardless of the choice of exchange rate regime, in most cases the foreign interest rate determines the domestic interest rate in the long run. However, enjoying a degree of monetary autonomy, short term interest rates adjust more slowly in a floating rate era in response to shocks to the international interest rate, the result is consistent with that of Shambaugh. Frankel et al. (2004) conducted a study on 46 countries (18 industrial and 28 developing) using monthly data on local money market rates for three decades (1970s, 1980s, 1990s). The paper estimated the sensitivity of domestic interest rates with respect to international interest rates (U.S T-bill rate) for the full sample periods and three sub sample periods. The results from both pooled and single-country analysis suggest that, irrespective of the exchange

rate regime, the degree of sensitivity of domestic interest rates to international interest rate is high. Estimations of the dynamic adjustment model provide some evidences that for floating rates countries, slow adjustment in floating rate period preserve some monetary autonomy at least in the short run.

While the results of Frankel et al. (2004) neither directly support nor directly contradict the trilemma, Klein and Shambaugh (2015) found evidence of the trilemma constraint. Their results confirmed that hard corners (i.e. full capital controls and flexible exchange rate regime) allow a country to attain monetary autonomy. In contrast, round corners, resulting from intermediate exchange rate regime, enable the country to enjoy a degree of monetary independence, especially in emerging and developing countries.

A good number of literatures dealt with direct testing of the Trilemma hypothesis. Empirically testing the validity of the trilemma, Aizenman et al. (2008), Hutchison et al. (2012), Hsing (2012), Steiner (2015), and Majumder and Nag (2017) argued that the indices reflecting the attainment of the three policy objectives add up to a constant and hence validate that trilemma holds in reality, in the long run. The papers, however, differed in the way the indices are constructed. Aizenman et al. (2008) and Steiner (2015) found that the weighted sum of the three indices should be one; whereas, the sum should be equal to two according to Hsing, (2012), Hutchison (2012) and Majumder and Nag (2017). However, their empirical methodology is pretty simple and easy to understand in that they assume that the indices are linearly related although there is no underlying theory as such illustrating the existence of a linear relationship among them. Moreover, all of them relied on goodness of fit measure to confirm the validity. Their results suggested that moving towards a particular objective is compensated for by the weighted average decrease in the attainment of the other two objectives.

Aizenman et al. (2008) discussed at length the changing pattern of the trilemma configuration globally during the post Bretton Woods era. They constructed two indices for ERS and MI and used the capital account openness index, or KAOPEN, constructed by Chinn and Ito (2006, 2008)[1]. The country specific index showed that emerging market countries, with the help of a large chunk of international reserves, have approached a middle ground position in the trilemma configuration. Regressing a constant "one" on the three indices they found that the weighted linear combination of trilemma policies add upto one evidencing the existence of a trilemma constraint.

Aizenman et al. (2008), Hutchison et al. (2012), Steiner (2015) and Majumder and Nag (2017) went one step further to ascertain the possibility of trilemma relaxation. Their results were alike in that all three policy objectives are attainable in the short run. Aizenman et al. (2008) pointed out that given capital mobility international reserve accumulation provides some

[1] KAOPEN is based on the information available in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

room for the policy makers to make a trade-off between monetary independence and exchange rate stability. Note that they did not conduct any empirical examination on trilemma relaxation.

Steiner (2015) emphasized that foreign exchange intervention acts as a substitute for capital mobility allowing a country to pursue monetary independence with stable exchange rate. Augmenting the trilemma specification by another variable namely exchanges market intervention[2] they arrived at a quadrilemma equation, which presumably implies that the linear combination of the four indices would add up to a constant. A good fit with negative sign on the intervention parameter and positive signs on the indices for the three objectives is interpreted as evidence of the trilemma constraint. The results indicated that the exchange market intervention was successful in raising the weighted sum of the three policy indices thereby relaxing the trilemma. Likewise, Majumder and Nag (2017) in the Indian context, showed that active foreign exchange intervention by the Reserve Bank of India helps successfully navigate the trilemma. However, the empirical methodologies of the aforesaid studies require further elaboration. Hence, according to the above researchers' findings, a country can occupy a middle ground position within the trilemma framework using foreign exchange intervention as an accompanying policy. That is, a country can chose any two to their full extent or a combination of partial attainment of all three policy goals.

Several researchers identified that some factors are at play in determining the trilemma choices. Ito and Kawai (2014) and Majumder and Nag (2017) examined the determinants of trilemma policy configuration in the context of emerging economies and India respectively. Ito and Kawai found some of the variables (notably: relative per-capita income, trade openness, financial development) jointly determine the trilemma policy configurations. On the contrary, financial stress, financial development and foreign exchange intervention were significant determinants of trilemma policy configurations according to Majumder and Nag. Both group of researchers used seemingly unrelated regression because using the same regressors allows for joint determination of three policy objectives and correlation among error terms across the system of equations. However, using the same set of regressors in three separate equations lacks theoretical justification.

3.0 Methodology

The study deals with constructing trilemma indices, testing for the validity of the trilemma constraint in Bangladesh, examining the role of international reserves accumulation in attaining a greater combination of trilemma policies and finding the determinants of the optimal trilemma policy combination.

[2] Steiner (2015) has used two measures for exchange market intervention such as reserve changes relative to private capital flows and reserve changes relative to exchange market pressure index.

3.1 Testing the Validity of the Impossible Trinity

This sub-section delineates two separate but related empirical studies namely testing for the validity of the impossible trinity and examining the role of international reserves in the impossible trinity.

3.1.1 Data and Variables

The data spans 39 years from 1976 to 2014. The balance of payments data is available from 1976 and hence the author chose 1976 as the starting year in the sample. This study uses a number of indices which are discussed separately. The variables, data sources, frequency and period are provided in table 1.

Table-1: Summary Table of the Dataset for the Empirical Study-2

Series	Notation	Data Description	Sample	Frequency	Sources
Exchange Rate Stability Index	ERS	To be discussed in the next sub-section	1976-2014	Annually	Aizenman, et al. (2008, and updates)
Monetary Independence Index	MI	To be discussed in the next sub-section	1976-2014	Annually	Aizenman, et al. (2008, and updates)
Financial Openness Index	FO	To be discussed in the next sub-section	1976-2014	Annually	IFS, WDI
Capital Flow	BoP	Balance of Payments Components	1976-2014	Annually	IFS
Nominal International Reserves	IR	International Reserves minus gold	1976-2014	Annually	IFS
Nominal Exchange Rate (period average)	E	Nominal Exchange Rate (period average)	1976-2014	Annually	IFS
Deposit Rate	i	Domestic deposit rate	1976-2014	Annually	IFS
Fed Fund Rate	i_{us}	US Fed fund rate	1976-2014	Annually	IFS
Private net foreign assets	NFA^{p}	Foreign assets-foreign liabilities-international reserves	1976-2014	Annually	Lanes and Milesi-Ferretti (2007, and update)

3.1.2 Testing Trilemma Constraint

Constructing Trilemma Indices

The author estimates the Bangladesh's reaction to trilemma constraint following Aizenman et al. (2008, 2010). In the first place, the author constructs three indices namely monetary independence, exchange rate stability and financial openness. Then the author

estimates the trilemma constraint's existence in the context of Bangladesh by using a linear regression whereby a constant is regressed on the three indices following the methodology used by Aizenman et al (2008, 2010).

Monetary Independence Index

One of the key constructs is MI index. According to Aizenman et al. (2008), MI index can be constructed as a reciprocal of the annual correlation between monthly home country interest rate and base country interest rate. In the present study home country and base country will mean Bangladesh and United States respectively. The formula for MI index is as below.

$$\mathrm{MI} = 1 - \frac{\mathrm{corr}(\mathrm{i_i}, \mathrm{i_j}) - (-1)}{1 - (-1)}$$

where $\mathrm{i_i}\ and\ i_j$ refer to interest rates of home country and foreign country respectively. By construction, the index value lies in between 0 and 1. The higher the index the greater is monetary independence[3]. This paper follows the MI index constructed by Aizenman, Chinn and Ito in which they typically used money market rate as a proxy for policy short term rate and constructed indices for more than 170 countries.

Exchange Rate Stability Index

This study utilizes the exchange rate stability index constructed by Aizenman, Chinn and Ito. They constructed the index in the following way. Annual standard deviation of the monthly exchange rate between home country and base country is fed into the following formula to calculate the exchange rate stability index. Here, too the index is normalized between 0 and 1 as evident from the formula.

$$\mathrm{ERS} = \frac{0.01}{0.01 + \mathrm{stdev}(\Delta \log(\mathrm{exchrate}))}$$

For some instances, the formula may lead to downward bias in the index. For instance, when the exchange rate fluctuates within a certain narrow band but does not get revalued and devalued so often that may exaggerate the flexibility. In order to remove the bias they employ a threshold for the exchange rate movement. If the exchange does not break the threshold i.e. monthly +/-0.33 percent band then the exchange rate will be treated as fixed exchange rate system. The band is in line with standard +/-2 percent band annually (Shambaugh, 2004). Higher ERS index points to the more stable exchange rate against the base country currency.

Financial Openness Index

In calculating financial openness (FO) index this paper departs from the methodology applied by Aizenman, Chinn and Ito. They used "KAOPEN" constructed by Chinn and Ito (2006, 2008 and update). KAOPEN is essentially a de jure measure which uses the information

[3] 3-year moving average is taken to smooth out the index.

in IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The paper constructed a flow based FO index largely following Majumder and Nag (2017) and Hutchinson et al. (2012) in accordance with the following formula.

$$FO_t^* = \frac{|Capital\ Flow_t|}{GDP_t}$$

where, t refers to the annual data ranging between 1976 and 2014 and the capital flow is calculated as the sum of inward and outward flows of foreign direct investment, portfolio investment and other investments. Afterwards, this study normalizes this index to between 0 and 1 to make it consistent with the other indices. For normalizing the index, it is assumed that a group of developed countries particularly G-7 countries have attained financial integration to the fullest extent by 2010. Hence the author normalizes FO* of Bangladesh with respect to the average FO* of G-7 countries during 2010-2014 denoted by FO^*_{dev}. If in any case FO^*_t exceeds FO^*_{dev} then I will regard $FO^*_t = FO^*_{dev}$. That is

$$FO_t = \frac{FO_t^*}{FO_{dev}^*} \ \ where\ 0 \leq FO_t \leq 1$$

Therefore, the resultant fraction is FO index for Bangladesh and lies in between 0 and 1.

Testing Trilemma Constraint

The underlying idea of testing trilemma constraint is that if the impossible trinity holds in the context of Bangladesh then there will be trade-offs among the three policy goals. However, there remains a challenge in testing the constraint since the test of tradeoff does not necessarily imply any functional form.

Against this backdrop, this study follows Majumder and Nag (2017), Aizeman, Chinn and Ito (2008), Hutchinson et al. (2012), and Steiner (2015), who adopted the following empirical strategy. A simplest possible linear specification is used where the sum of trilemma indices add up to a constant: a constant is regressed on three indices without adding any constant on the right hand side. The model is estimated using ordinary least square method and heteroskedasticity and autocorrelation (HAC) standard error, which, essentially is robust to serial correlation as well as heteroskedasticity. Aizeman, Chinn and Ito and Steiner adopted one as constant to be regressed on the indices whereas Majumder and Nag and Hutchinson et al. regressed two on the indices. The rationale for using two is that the maximum value of each index is one and the maximum number of objectives policy makers can pursue to the indices' fullest extent is two. Hence weighted average of the three indices should add up to two. Therefore, the regression model takes the following form.

$$2 = \alpha MI_t + \beta ERS_t + \gamma \mathrm{FO_t} \ldots\ldots\ldots (1)$$

The model is estimated using annual data and sample spans from 1976 to 2014. The high value of model's goodness of fit measured by the R-squared validates the trilemma constraint in the context of Bangladesh for the sample period.

3.2 Examining the Role of Exchange Market Intervention in the Trilemma

Bangladesh's international reserves have been increasing for some time. The stock of IR to a large extent results from foreign exchange market intervention. Theoretically, changes in international reserves lead to greater exchange rate stability and higher monetary independence (Majumder and Nag 2017). When BB increases the domestic interest rate to contain inflation inconsistent with the Mundell-Fleming framework this will attract higher capital inflow thereby building up exchange rate appreciation pressure. In order to contain appreciation pressure, the central bank has to intervene in the foreign exchange (FX) market to mop up increased capital flow at the onset and thereby pacifying the exchange market pressure. However, this containment of pressure comes at the cost of a higher monetary base (i.e. money supply in the economy). Inevitably, this will lead to a change in the balance sheet of the bank and complicate the conduct of monetary policy. But central bank's subsequent sterilization helps reduce the money supply and retain monetary independence.

In view of the above, this study estimates the influence of intervention by allowing for an additional variable, namely, intervention in the right hand side of equation (1) as follows.

$$2 = \alpha MI_t + \beta ERS_t + \gamma FO_t + \delta \mathrm{INT_t} \dots \dots \dots (2)$$

The sign and significance of the intervention coefficient largely represent the role of intervention in changing the policy configuration within the trilemma framework. If the sign of the coefficient on intervention turns out to be negative and significant while the coefficients of other variables shoulder positive signs then the intervention can be interpreted to have been successful in changing the configuration of the trilemma policies. The underlying intuition is that policy makers can increase the extent of one policy objective without sacrificing the other two policy objectives if and only if intervention coefficient and other indices' coefficients bear negative and positive sign respectively. Here too, OLS method is employed to estimate the equation (2) with HAC standard error. A good fit validates the trilemma constraint and the intervention's role in managing the constraint. At this stage, thus, it is necessary to construct some measures for exchange market intervention, which will be used as intervention variables in equation (2).

Measures of Exchange Market Intervention

In this paper following Steiner (2015) and Majumder and Nag (2017) two alternative measures of exchange market intervention are used namely, (1) the changes in international reserves in relation to private capital flow, and (2) the extent of exchange market pressure offset by the changes in international reserves.

Reserve changes with respect to private capital flow

In a stable exchange rate era the reserve changes related positively to private foreign asset accumulation giving rise to private net foreign assets (Steiner 2015)[4]. Given home bias, economic agents will preferably retain their accumulated foreign assets within the national frontier in lieu of investing abroad due to the absence of volatility in the exchange rate. The monetary authority plays a central role by issuing domestic asset in exchange for private foreign asset and subsequently conducting sterilization to mop up excess liquidity[5]. The monetary authority, therefore, corrects the disequilibrium in the market for domestic and foreign assets thereby allowing the exchange rate to remain unchanged. The foregoing argument suggests that the larger the accumulation of private foreign assets the greater is the exchange market intervention thereby lowering the necessity for exchange rate adjustment. Hence one can hypothesize that the extent of trilemma flexibility is a positive function of the extent of private capital flows mopped up by the reserves changes. To this end, the first measure of exchange market intervention is formulated in the following manner.

$$INT_t^F = \frac{\Delta IR_t}{\Delta NFA_t^{pr}}$$

where, INT_t^F denotes the exchange market intervention in relation to private capital flows, ΔIR_t and ΔNFA_t^{pr} represents the changes in international reserves and private net foreign assets at time t respectively.

Private net foreign assets data is collected from Lane and Milesi-Ferretti (2007 and update). Net foreign asset is the difference between foreign assets and liabilities. Foreign assets (liabilities) comprise of foreign direct investment, portfolio equity, debt and financial derivatives. Foreign asset essentially includes the central bank's holding of international reserves.

By construction INT_t^F can take any value ranging from -∞ to +∞. However, in reality the value might not be that extreme. The different ranges of INT_t^F point to the different extent of exchange market intervention. For example, the range $0<INT_t^F<1$ signifies that the central bank partly absorbs the private capital flows. In other words, the central bank partly meets the demands for domestic assets or accommodates the missing demand for foreign assets. On the other hand, $INT_t^F<0$ suggests that the central bank leans with the wind in that instead of offsetting the demand for domestic assets due to an influx of private capital flow, the central bank, in fact, strengthens the changes in relative demand for domestic assets and foreign assets. Finally, $INT_t^F>1$ implies that the central bank leans heavily against the wind by offsetting the shortfall in demand for foreign assets more than required thereby turning the missing demand for foreign assets into actual demand.

[4] The stock of private net foreign assets is the difference between the stock of net foreign assets and stock of international reserves.

[5] Similar reasoning holds for sale of reserves at times of rising external private debt repayment.

Reserves changes relative to exchange market pressure:

The first method assumes that exchange market intervention offsets the pressure on exchange rate resulting from changes in net foreign assets reflecting the cross border wealth transfer. The second method, an alternative to the preceding method, measures an exchange market pressure index (EMPI) following Eichengreen et al. (1996) and Steiner (2015) that directly captures exchange rate pressures characterized by the excess demand or excess supply of foreign currency. Exchange market pressure resulting from excess demand of foreign currency must be met in one of three ways: the domestic currency devaluation, foreign currency sale in the exchange market and domestic interest rate increase[6]. In view of the foregoing above, EMPI is defined as the sum of exchange rate movement, changes in international reserve and interest rate changes relative to base country (USA in this case) weighted by their respective standard deviations as follows.

$$EMPI_t = \frac{1}{\sigma_{\Delta e_t}} \frac{\Delta e_t}{e_t} - \frac{1}{\sigma_{\Delta Res_t}} \frac{\Delta IR_t}{IR_t} + \frac{\Delta(i_t - i_{us,t})}{\sigma_{(i_t - i_{us,t})}}$$

where, Δe_t and ΔIR_t denote changes in exchange rate measured as units of domestic currency per unit of US Dollar and changes in international reserves. i_t and $i_{us,t}$ symbolizes the nominal domestic and US interest rate[7]. The standard deviation of variable x (x = exchange rate change, international reserve change and change in interest rate differential) are calculated separately and represented by the symbol σ. Note that annual changes in exchange rate, international reserves and interest rate may disguise interim fluctuations and hence may not result in necessary precision. Therefore, this study calculates the EMPI based on the quarterly observations of each variable.

To this end, the author constructs an index for intervention activity that measures the extent of exchange market pressure cushioned by the changes in international reserves.

$$INT_t^p = -\frac{1}{\sigma^{IR}} \frac{\Delta IR_t}{IR_t} \frac{1}{EMPI_t}$$

where, the p superscript identifies that the intervention index is measured relative to exchange market pressure index. The index value can span from -∞ to +∞. For a freely floating exchange rate INT_t^p=0. When exchange market intervention solely mitigates exchange market pressure thereby stabilizing the exchange rate, INT_t^p becomes equal to 1. On the other hand, INT_t^p value lies between 0 and 1 for all intermediate exchange rate systems.

3.3 Examining the Determinants of the Trilemma Policies

It is time to examine econometrically the determinants of triad policy combinations (i.e. exchange rate stability, monetary independences and financial openness). As earlier, the author

[6] Excess supply of foreign currency or excess demand for domestic currency needs opposite measures.

[7] Steiner (2015) retains rate effect from the EMPI definition on the grounds that interest rate changes at least partially offset the pressure on exchange rates and international reserves stemming from capital flows.

uses three trilemma indices proxying the triad policies and following the methodology of Ito and Kawai (2014).

3.3.1 Data and Variables

Following Ito and Kawai (2014) and considering the Bangladesh context, the paper chooses the following four explanatory variables: relative per capita income (as percentage of USA per capita income denoted by PCGDP), trade openness (international trade as percentage of GDP denoted by TO), international reserves (total reserves minus gold as percentage of GDP denoted by IRGDP), and gross domestic savings relative to GDP (DS). The data from the World Bank's world development indicator is collected. The sample period spans from 1976 to 2014.

Sign Expectations

The priori sign expectations for the coefficients of the explanatory variables as tabulated in table-2 are based on underlying theory and/or the findings of the previous studies. While the sign expectations of the most of the determinants for ERS and FO are unambiguous, some determinants for MI have either ambiguous sign predictions or no predictions at all. Thus far relatively fewer studies were undertaken on the determinants of MI while a large number of studies empirically examined the determinants of ERS and FO.

Table-2: Priori Sign Predictions for the Determinants of the Triad Policies

	Exchange Rate Stability (ERS)	Monetary Independence (MI)	Financial Openness (FO)
Relative per capita income	-	+	?
Trade Openness	+	-	+
International Reserves	+	+	+
Domestic Savings	+	?	-

Note: The signs are based on theoretical logic and the ? mark implies no prediction in accordance with theory.
Source: Ito and Kawai (2014)

3.3.2 Methodology

Studies ascertaining the determinants of the trilemma policies are copious. Although in the past, efforts were made to investigate the determinants of the same, this paper distinguishes itself from other studies in two ways. First, previous studies except Ito and Kawai, (2014) did not consider that the triad policies can be jointly determined. Thus this paper following Ito and Kawai, uses a set of three equations in a bid to examine the determinants of triad policies concurrently. In accordance with Ito and Kawai, seemingly uncorrelated regression (SUR) is applied to accommodate the correlation among error terms.

Second, prior studies did not impose any linear constraint on the weighted combination of the triad policies. As explained earlier, it is assumed that the weighted sum of the policy combinations would add up to constant. Since by construction each index has the maximum value of 1 and policy makers can pursue at best two policies to their full extent, this study imposes the constraint in the SUR estimation that the weighted sum of the three indices would be two[8].

Having said that the author regresses three indices namely ERS, MI and FO jointly using a system of equations on a set of exogenous variables. The system of equations is as follows.

$$ERS_t = \alpha_{ERS} + \beta_{ERS} X_t + \varepsilon_t^{ERS}$$
$$MI_t = \alpha_{MI} + \beta_{MI} X_t + \varepsilon_t^{MI}$$
$$FO_t = \alpha_{FO} + \beta_{FO} X_t + \varepsilon_t^{FO}$$

where, X denotes a vector of four exogenous variables (as explained earlier) which differ from one equation to another within the system of three equations; and β represents a vector of coefficients corresponding to the vector of exogenous variables; and by assumption $cov(\varepsilon^j, \varepsilon^k) \neq 0, for\ j\ and\ k = \{ERS, MI, FO\}$. The intuition behind this estimation is that the exogenous variables X jointly determine the triad policy choices. Note that while all the four exogenous variables are used in the equation for exchange rate stability, the gross domestic savings relative to GDP and relative per capita income are dropped from the equations for monetary independence and financial openness respectively. In order to be consistent with the assumption that is the linear constraint i.e. trilemma indices would add up to two is binding in the long run, the following two constraints are imposed.

$$\alpha_{ERS} + \alpha_{MI} + \alpha_{FO} = 2\ and\ \beta_{ERS} + \beta_{MI} + \beta_{FO} = 0$$

Putting these algebraic constraints in words, one can say that the sum of three intercepts would be 2 and the sum of the vector of coefficients would be 0 collapsing the sum of three equations to 2 plus the sum of the error terms with zero mean values. Resultantly the author ends up with the sum of three equations equal to two.

4.0 Discussion of the Results

4.1 Testing the Trilemma Constraint

In this section, this paper analyzes whether the trilemma is binding on Bangladesh (i.e. the country encountered trade-offs among the three policy goals) during the period studied. Intuition suggests that the increase in the attainment of one policy goal is offset by the weighted average decrease in the attainment of the other two policy goals. Hence, following the relevant literature, the trade-offs assuming a linear relationship among the three policy goals is examined. The examination follows a systematic procedure as described below.

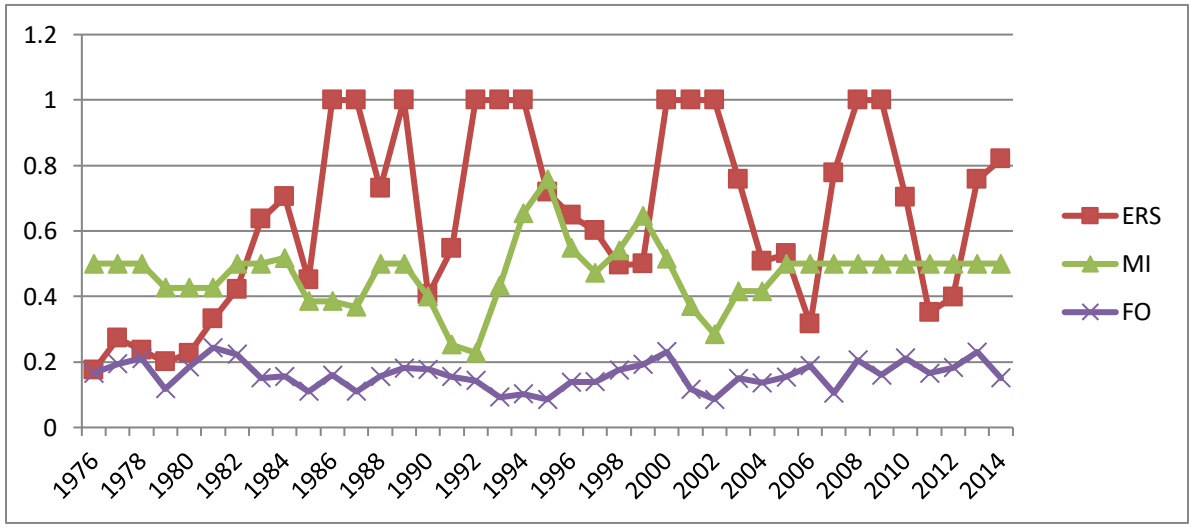
[8] The constraint is not necessarily binding in the short run meaning that short run deviations around 2 is still allowed but in the long run the constraint is binding (Aizenman, Chinn, and Ito 2008). Moreover, the error terms do not have to be 0 every year and hence deviation from 0 is permissible in the short run.

4.1.1 Evolution of the Trilemma Policies

The evolution of the three indices with each index lying between 0 and 1 is plotted in Figure-1.

The figure reveals that during the initial period of this study (1976-1979) the exchange rate stability indices have been fairly low. This is attributable to the fact that during that period BDT had been fixed with pound sterling not with the US Dollar. But the exchange rate stability index is calculated with reference to the US Dollar. Hence the index could not capture the policy maker's pursuit of exchange rate stability during that period. However, from 1980 until 2003, Bangladesh had pursued fixed exchange rate system with different arrangements notably pegged to a basket of major trading partners' currencies (1980-1999) and adjusted pegged system (2000-2003). Therefore, the relatively higher ERS indices with few instances of deviation during the fixed exchange rate regime naturally pointed to the policy makers' desire for stable exchange rates. However, after switching to a floating rate regime, the index hovered around its mean value 0.65 except some values reaching as high as 1 in some years (2008 & 2009). The evolution, therefore, broadly reflects the shift in the policy makers' focus from high exchange rate stability to moderate exchange rate stability.

Figure-1: Evolution of the Trilemma Policies



Source: Aizenman et al. (2008) and author's construction

Monetary independence index, in contrast to ERS index, remained around its mean value 0.47. However, in the initial period of interest rate liberalization subsequent upon the financial sector reform in the early nineties, MI index slipped to its lowest value ever, which subsequently reached as high as 0.76 in three years. Going further, the fluctuation in the MI index continued until 2004 reflecting the implications of market based interest rate on monetary independence. Towards the last decade of the period studied MI index remained constant at 0.5 signifying no correlation between US interest rates and local interest rates. This no correlation especially in the

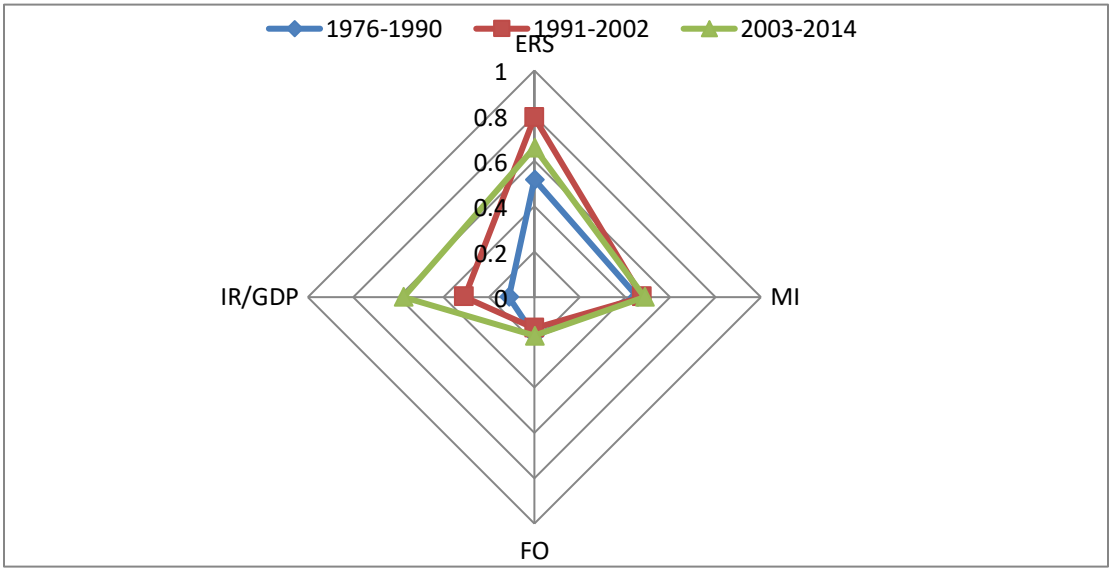
last half of the last decade may be due to the US's unconventional monetary policy arising from global financial crisis in 2008. Overall, the MI index evolution suggests that until recently Bangladesh have been successful in retaining monetary independence to a moderate level.

On the other hand, although FO index seems low in comparison with developed countries, it is still much higher than the level that would have prevailed under capital control. Because of the flow based measure, FO index seems mean reverting with fluctuations recorded in every year.

4.1.2 Changing Configuration of the Impossible Trinity Framework

For the sake of better understanding of the impossible trinity framework this study analyzes the changing configuration period-by-period. In order to do that the author breaks the entire sample period into three sub-sample periods such as 1976-1990, 1991-2002 and 2003-2014. The year 1991 marks the beginning of the financial sector reform process while 2003 is the year when Bangladesh officially moved to a flexible exchange rate era. It is assumed that these two events have implications on the changing pattern of the trilemma policies. In addition to three policies, the author also incorporates in this sub section the pattern of international reserves relative to GDP[9]. Since the latter may allow some room for policy makers to adopt a greater extent of three trilemma policy choices. In a bid to understand the pattern of evolution a graphic approach as well as a statistical test is adopted. Presented below is the diamond chart (Figure-2) illustrating the evolution of trilemma policies along with international reserves relative to GDP over three periods. The origin of such a chart implies no monetary independence, fully flexible exchange rates, no capital flow and zero international reserves.

Figure-2: Diamond chart of Trilemma policy configuration



Source: Author's computation

[9] To make the ratio comparable to three indices we normalize the same between 0 and 1 using the formulation as below: (Obs-Min(Obs)/(Max(Obs)-Min(Obs))

The figure shows that exchange rate stability has increased from the 1st period to the 2nd period. As explained earlier the relatively low exchange rate stability in the 1st period is attributable to the pegged exchange rate to pound sterling instead of US Dollar. Going forward, the ERS fell in the third period suggesting that the greater financial openness constrained policy makers to concomitantly pursue greater ERS. On the other hand, MI index appears to be roughly the same in the three periods. The FO index rises in the 3rd period after remaining roughly the same in the first two periods. Finally, the continuous rise in the IR-GDP ratio in three periods has enabled the authority to manage the dichotomy between ERS and MI for a given FO. The graphical analysis is complemented by a statistical analysis.

The author performs mean equality test for each of the two successive periods to confirm statistically the changes in three policies along with international reserves over the period. The mean equality test result is shown below (Table 3).

Table-3: Results of the Mean Equality Test: The Changing Configuration of the Trilemma Policies

		1976-1990	1991-2002	1991-2002	2003-2014
Exchange Rate Stability	Mean	0.519	0.792	0.792	0.659
	Difference		-0.273**		0.133
	t-stat		-2.59		1.411
Monetary Independence	Mean	0.456	0.475	0.475	0.486
	Difference		-0.019		-0.011
	t-stat		-0.42		-0.216
Financial Openness	Mean	0.170	0.138	0.138	0.170
	Difference		0.032*		-0.032*
	t-stat		1.935		-1.936
International Reserves over GDP	Mean	0.112	0.308	0.308	0.577
	Difference		-0.200***		-0.269***
	t-stat		-4.748		-3.356

*Notes: ***,** and * denote 1%, 5% and 10% significance level.*

Source: Author's computation

The table depicts that exchange rate stability has increased from the 1st to the 2nd period, while the difference in exchange rate stability has remained statistically same between the 2nd and the 3rd period. Monetary independence has increased in consecutive periods although insignificantly. In contrast, financial openness has declined in the 2nd period, but increased subsequently in the third period. International reserves relative to GDP kept increasing in all periods, which allow the authorities concerned to retain at least the same degree of exchange rate stability without relinquishing some extent of monetary independence.

4.2 Estimation Results

Stationarity Test: The ADF and PP test to check the stationarity of three indices are conducted and the results of such tests are produced below (Table 4).

Table-4: Unit Root Test for the Three Indices Representing Trilemma Policies

Null Hypothesis: Variable has a Unit Root					
Time Series at level					
Variables	ADF		PP		Decision
	t-stat	p-value	t-stat	p-value	
ERS	-4.25	0.0021	-3.11	0.0350	Stationary process
MI	-2.99	0.0467	-2.41	0.1471	Stationary process
FO	-4.60	0.0007	-4.64	0.0006	Stationary process

The results show that the time series of three indices are stationary at level. Therefore, one can apply simple ordinary least square method to estimate a linear relation between the constant (two in this case) and three indices. The author uses Newey-West's heteroskedasticity and autocorrelation consistent estimator to allow for the possible heteroskedasticity and autocorrelation in the residuals. The result of such estimation is discussed below (Table 5).

Table-5: Results of the Test for the Validity of Trilemma Constraint

Dependent Variable: Two		
Exchange Rate Stability	Monetary Independence	Financial Openness
0.608***	1.843***	4.382***
(0.172)	(0.434)	(0.999)

*Notes: 1/Newey-West standard errors are in parenthesis, 2/ R-squared = 0.9812, Adjusted R-squared=0.9796, 3/ *** implies significant at 1% level.*

Source: Author's computation

A high goodness of fit of the linear specification as indicated in the R-square value provides supports to the validity of the trade-off among the three policy goals. Moreover, it is clearly evident from the results that the estimated coefficients of all three indices are positive and statistically significant at any significance level. Thus the trilemma constraint holds in Bangladesh.

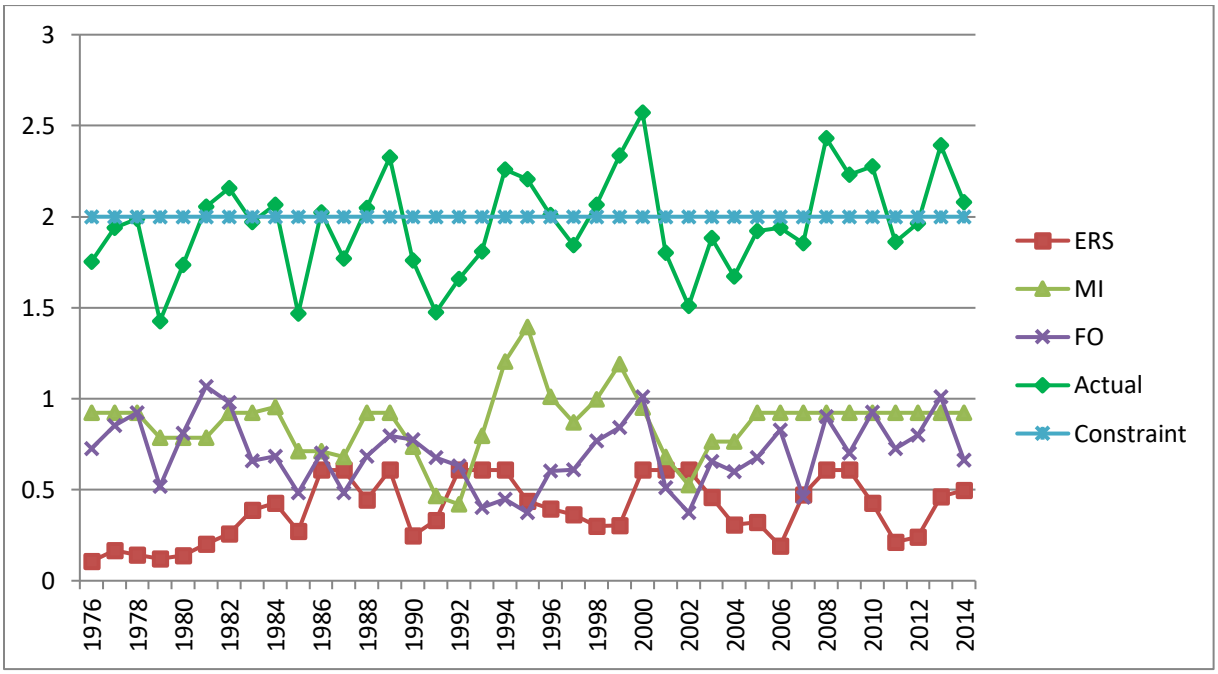
Policy Orientation under the Impossible Trinity Framework

To ascertain the extent of actual policy implementations, the paper finds the contribution of each index by multiplying the estimated coefficient and the actual value of the index. The author then plots the contribution of each index for the full sample as provided in the figure 3.

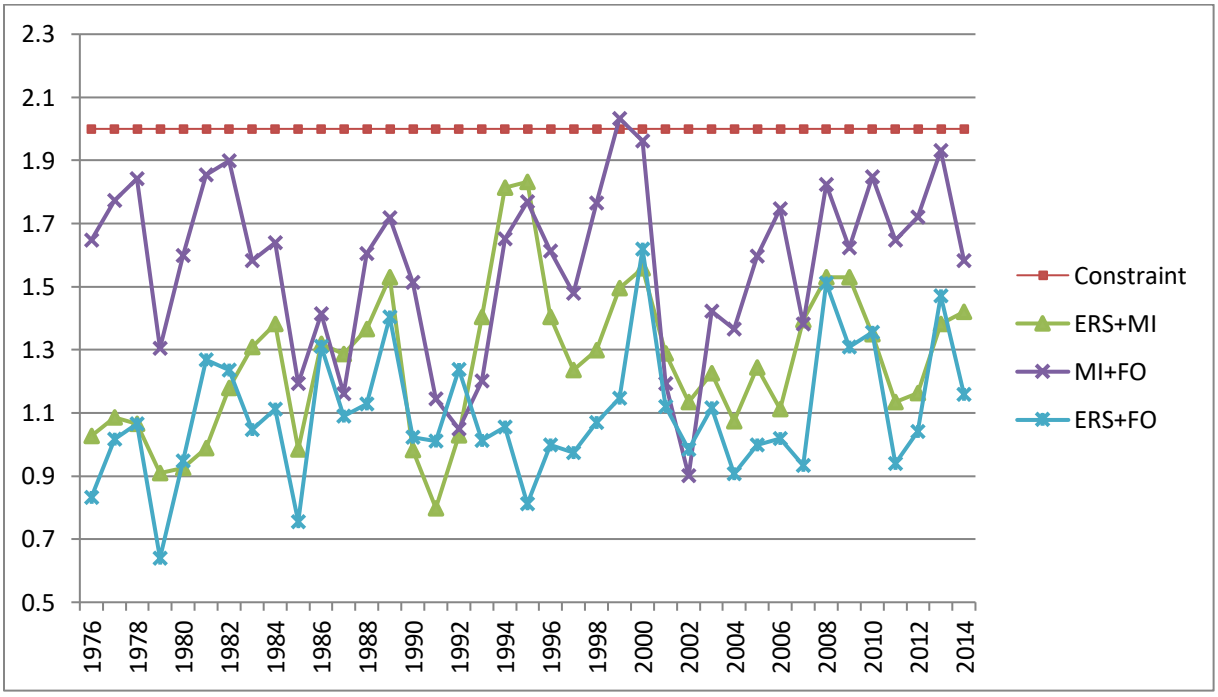
The figure shows the policy makers' preference with regard to the trilemma policies. What is clear from the upper panel is that MI has received high policy weight while the weight assigned to the financial openness remained more or less in between the weights assigned to MI and ERS in the period of investigation. Although the ERS receives the lowest weight in the

initial period on account of pegged exchange rate with pound sterling, the same has been increasing since the onset of pegged exchange rate with a basket of currencies. The blue line shows the actual attainment of three policy goals whereas the other lines show the contribution of each component to the total. Not surprisingly, the MI index has been the highest contributor throughout the period. It is also striking that when MI index goes up the subsequent slowdowns in other indices compensate for MI increase.

Figure-3: Policy Orientation under the Impossible Trinity Framework



(a)



(b)

Further, the estimated combination of trilemma policies broadly remains around its true value 2. It is clearly evident that the overall value of the three indices approaches the constant value 2 thereby bolstering the paper's argument for trilemma constraint holding in the context of Bangladesh. On the other hand, the bottom panel of the figure shows that the weighted combination of MI and FO traces the constraint closely implying that Bangladesh authorities have been committing to greater monetary independence and financial openness at the expense of exchange rate stability.

4.3Testing the Role of International Reserves in the Trilemma Framework

As argued earlier, the exchange market intervention (international reserve accumulation or decumulation) may allow a country to widen the trilemma constraint. Hence, in line with Steiner (2015), this study uses two different measures namely exchange market intervention relative to private net foreign assets (PNFA) and exchange market intervention relative to exchange market pressure index (EMPI). At the outset, the ADF and PP test to check the stationarity of the time series are conducted (Table 6).

Table-6: Unit Root Test for the Time Series: Test of Intervention Variables

Time Series at level					
Variables	ADF		PP		Decision
	t-stat	p-value	t-stat	p-value	
Intervention relative to PNFA	-4.80	0.0004	-4.99	0.0002	Stationary process
Intervention relative to EMPI	-9.01	0.0000	-8.58	0.0000	Stationary process

Hence the simple Ordinary Least Square method is applied to estimate the following equation using Newey-West's Heteroskedasticty and Autocorrelation Consistent estimator.

$$2 = \alpha MI_t + \beta ERS_t + \gamma FO_t + \delta \mathrm{INT_t}$$

The estimation results of the above equation are tabulated below.

As earlier a good fit of the above specification validates the trilemma constraint. Moreover, positive signs on the trilemma indices along with a negative sign on the intervention variable validate the importance of international reserves in the trilemma framework. The result (Table 7) shows that the adjusted coefficients of determination in both specifications are 97.99% and 97.91% respectively. This evidences the existence of a trade-off among trilemma policy choices. Further, the estimation yields positive signs on the coefficients for three indices and negative sign on the variable namely intervention relative to private net foreign assets. All the four variables in specification 1 are significant evidencing that intervention has been effective in

widening the policy space thereby allowing policy makers to pursue a greater extent of trilemma policies. Likewise, the estimation of specification 2 produces positive signs on the trielmma indices and negative signs on the intervention relative to exchange market pressure index. Although the sign on the intervention variable in specification 2 appears to be as expected, it is not statistically significant. Thus the test results provide some evidences albeit somewhat mixed on the possibility of pursuing greater combination of trilemma policies with the help of exchange market intervention.

Table-7: Test Results for the Role of Exchange Market Intervention

	Dependent Variable: Two	
	(1)	(2)
ERS	0.607*** (0.174)	0.605*** (0.174)
MI	1.877*** (0.392)	1.851*** (0.440)
FO	4.164*** (0.914)	4.356*** (1.017)
Intervention relative to PNFA	-0.054* (0.031)	-
Intervention relative to EMPI	-	-5.941 (8.703)

*Notes: 1/Newey-West standard errors are in parenthesis, 2/ R-squared = 0.9820, Adjusted R-squared=0.9799 (in specification 1), R-squared = 0.9812, Adjusted R-squared=0.9791 (in specification 2), 3/ *** and * imply significant at 1% and 10% level respectively.*

Source: Author's computation

4.4 Determinants of the Trilemma Policies

As noted earlier, this paper employs seemingly uncorrelated regression method to find the determinants of the trilemma policies represented by three indices.

Stationarity Test: As usual, this paper uses the ADF and the PP test to determine stationarity of the time series as reported in Table 8. The test results show that three variables namely gross domestic saving as a percentage of GDP, change in international reserves relative to GDP (in percentage) and trade openness are non-stationary at level. Therefore, the first difference of the series which are integrated of order one is taken before estimating seemingly unrelated regression.

Table-8: Unit Root Test for the Time Series: Determinants of Triad Policies

Null Hypothesis: Variable has a Unit Root					
Time Series at level					
Variables	ADF		PP		Decision
	t-stat	p-value	t-stat	p-value	
PCGDP	-2.27	0.1878	-2.95	0.0498	Stationary process
TO	0.62	0.9884	1.58	0.9992	Unit Root Process
IR	0.62	0.8465	1.21	0.9388	Unit Root Process
DS	-2.11	0.2407	-1.43	0.5585	Unit Root Process
Time Series at first difference					
TO	-2.81	0.0670	-2.84	0.0623	Stationary Process
IR	-1.78	0.0735	-1.88	0.0582	Stationary Process
DS	-4.46	0.0011	-4.56	0.0008	Stationary Process

Notes: Optimal lags for ADF and PP test are determined based on AIC and Newey–West bandwidth selection using Bartlett kernel respectively. Probability values for ADF and PP test correspond to MacKinnon one-sided p-values.
Source: Author's estimation

Seemingly Unrelated Regression Results

In this section, the results of joint SUR estimation of the determinants of trilemma indices are reported. As previously noted the author imposes two constraints on the SUR system to enable me ensure that the sum of trilemma indices add up to two[10]. The estimation result is tabulated in Table 9.

The results indicate that the signs of most of the estimates are consistent with this study's prior prediction. The result shows that the relative per capita GDP lowers both exchange rate stability and monetary independence although the impact on MI of the same is trivial. The impact on ERS appears to be quite consistent with the theoretical prediction, much of the previous empirical studies and the context of Bangladesh. As Bangladesh moved to a flexible exchange rate regime and its relative per capita GDP has been on the rise, it is increasingly affording greater exchange rate flexibility. As for MI, the results initially seem surprising but some studies notably Ito and Kawai (2014) have found similar results.

[10] The sum of the estimated intercepts would be two and the sum of the estimated coefficients on the exogenous regressors would be zero.

Table-9: Results of Seemingly Unrelated Regression Estimation

	Exchange Rate Stability (ERS)	Monetary Independence (MI)	Financial Openness (FO)
Relative Per Capita GDP	-0.604***	-0.077	-
	(.082)	(0.069)	
Trade Openness	0.027	0.016	0.017
	(0.041)	(0.019)	(0.014)
International Reserve accumulation	0.234***	0.068**	0.006
	(0.058)	(0.034)	(0.024)
Gross Domestic Savings	0.297	-	0.015
	(0.061)***		(0.028)
Constant	1.302***	0.554***	0.144***
	(0.097)	(0.094)	(0.026)

*Notes: Standard errors are given in parenthesis. *,** and *** refer to the significance level of 10%, 5% and 1% respectively.*
Source: Author's Computation

The ERS impact of trade openness shows that the greater trade openness leads to higher exchange rate stability although insignificantly as evidenced by the sign on trade openness in the ERS equation. Regarding FO impact, trade openness, in line with prior prediction, positively affects FO in Bangladesh.

The impact of international reserves is quite convincing as far as signs in the three equations are concerned. Significant results are found for ERS and MI, which suits the Bangladesh context fairly well. The underlying reasoning is that Bangladesh has long been accumulating international reserves in a bid to meet an emergency and to maintain stability in the exchange market so as to protect exporters and importers from volatile exchange rate repercussions. On the other hand, international reserve accumulation acting as a substitute for capital flow allows the monetary authority to retain monetary independence. Further, a higher level of international reserves on one hand builds up confidence among the foreign investors to invest in Bangladesh and on the other hand, allows policy makers to gradually open up the capital account.

In line with theoretical prediction, domestic savings enter into the ERS equation positively and significantly. Bangladesh has been running a positive savings-investment gap for a decade thereby helping to maintain current account surplus throughout the period. The surplus current account balance enables Bangladesh to maintain exchange rate stability. On the FO front, a higher domestic savings tend to affect financial openness insignificantly.

5.0 Conclusions

This paper tests for the validity of the impossible trinity in Bangladesh. The role of international reserves in the impossible trinity framework was also investigated. Finally, this paper looked for the determinants of the trilemma policies jointly. The findings of this paper are as follows.

Firstly, the empirical investigation showed that the Impossible Trinity holds in Bangladesh. To be more specific, the empirical results confirmed that an increase in the degree of financial openness results in a weighted average decrease in monetary independence and exchange rate stability. Further, the graphical analysis revealed that Bangladesh mainly adjusted ERS in the wake of growing financial openness while monetary independence underwent minimal adjustment. Subsequently, this study found evidence of the role of international reserves in widening the trilemma policy space. In other words, international reserves allow Bangladesh to pursue a greater combination of the three policies.

Secondly, a seemingly unrelated regression estimate showed how economic and structural fundamentals jointly determine the combination of the three trilemma policies. The SUR estimate reveals that the policy makers of a country with higher relative per capita GDP tend to pursue lesser degree of ERS. Trade openness bears positive relationship with ERS but insignificantly while, not surprisingly, greater trade openness increases the degree of financial openness. The higher level of international reserves enables authorities to pursue a greater degree of ERS, MI and FO although the impact on FO is insignificant. Gross domestic savings relative to GDP also favors higher ERS.

5.1 Policy Implications

The results validate the impossible trinity in Bangladesh. This paper found that Bangladesh has attached the highest policy weight on the monetary independence. As for the policy basket, Bangladesh prefers higher monetary independence along with greater financial openness. The extent of financial account liberalization adopted thus far has not seriously threatened the Bangladesh economy. Despite a calm and quiet episode of financial account liberalization, concerns remain over managing the influx of volatile hot money associated with full convertibility of the financial account. However, given upbeat macroeconomic conditions and good experience with limited openness in the financial account, Bangladesh may now eye further liberalization of the financial account.

On the other hand, Bangladesh's economic growth has largely been driven by domestic household consumption averaging a 76% contribution to the GDP growth since 1973 (ADB, 2016). Thus control over the money supply and interest rates is of paramount importance to retain and boost up household consumption as well as to attain sustainable economic growth. Moreover, with greater monetary independence BB can dictate the money supply which forms

the basis for many other policy tools and therefore attaching the highest policy priority on retaining monetary independence is very essential.

As for the exchange rate regime, a free-floating exchange rate regime becomes easier to implement under independent monetary policy. In other words, according to Mundell-Fleming Model, monetary policy is efficient under a free-floating exchange rate regime and perfect capital mobility. Nevertheless, switching to the free-float regime necessitates meeting some economic and institutional requirements. First, a competitive and deep foreign exchange market is a crucial requirement for a free-float regime. With few players, low scale of operations and lack of product diversity, Bangladesh's foreign exchange market can be classified as uncompetitive and thin. In such circumstances, moving to a free float will result in excessive volatility in the exchange rate, which, in turn, will expose the economic agents to exchange rate risk, and is likely to hamper trade and investment. Second, a well-functioning, financially sound and well-supervised banking system is another crucial requirement particularly when the trilemma constraint associated with substantial opening up of financial account compels adoption of free-float. Although Bangladesh's banking sector is now far more mature than a decade ago, free float coupled with the substantial opening up of financial account may cause the BDT to face an indefensible speculative raid leaving painful consequences for the economy. The upshot is that Bangladesh is not yet ready to float its currency fully.

Nevertheless, the economic and institutional requirements are fully met for the current system (i.e. managed float characterized by exchange rate stability). Because BB has an explicit mandate to maintain BDT's external par value, it has a greater incentive to continue with the existing system. Further, pursuit of exchange rate stability is vital in order to augment export's contribution to economic growth. In contrast, exchange rate volatility is likely to increase the uncertainty with regard to trade and investment and hence hurt economic growth. On balance, the relevant policy basket for Bangladesh would be independent monetary policy, exchange rate stability and limited financial account openness

Fourth, the empirical results suggested that international reserves may play an important role in enabling Bangladesh to attain higher level of three policies in the impossible trinity framework. In other words, the country is not constrained to take corner positions opting for two policies out of three trilemma policies rather may occupy middle ground position within the trilemma framework. Hence, Bangladesh, with increased support from international reserves, can further allow limited and cautious opening up of the financial account. In view of the foregoing discussions, this paper offers the following modified policy basket for Bangladesh economy.

- Because the monetary policy is a demand side policy and is usually used for economic stabilization in Bangladesh, retaining MI (i.e. controlling over the domestic interest rate) to the fullest extent should be the first policy priority of the country;
- Attaching the least policy weight on financial openness among the three trilemma policies, Bangladesh may cautiously open up the financial account further in some areas notably, capital inflow and outflow in short term money market instruments, selective

outbound foreign direct investment and limited outbound portfolio investment in a phased approach.

- Like many other countries, a stable exchange rate is a desired policy goal of Bangladesh and may be the second policy priority of the country under the trilemma framework. However, before liberalizing the financial account exchange rate can serve as a policy tool. Hence after liberalizing the financial account further the country may need to define an exchange rate band with a relatively larger width for a period which suits the economic needs of that time[11]. The width of the band should be adjustable accordingly in order to accommodate the growing financial integration and to fulfill the economic goals that Bangladesh wants to accomplish.

Last but not the least, in the joint determination of trilemma policies, this paper found that international reserves played a significant role in determining the three policies under the trilemma constraint. Thus the study recommends holding a level of international reserves attuned to the desired trilemma policy mix.

[11] The larger width is intended to accommodate a greater fluctuation in exchange rate associated with increasing financial account liberalization.

References

Aizenman, Joshua, Menzie D. Chinn and Hiro Ito. (2008). Assessing the emerging global financial architecture: Measuring the Trilemma's configurations over time. NBER Working Paper 14533.

Chinn, Menzie. D., and Hiro Ito. (2006). What Matters for Financial Development? Capital Controls, Institutions, and Interactions. Journal of Development Economics. 81(1): 163−192.

Chinn, Menzie. D. and Hiro. Ito. 2008 "A New Measure of Financial Openness." Journal of Comparative Policy Analysis. Volume 10, Issue 3 (September), p. 309 - 322.

Eichengreen, Barry, Andrew Rose, Charles Wyplosz. (1996). Contagious currency crises. Scandinavian Journal of Economics. 98 (4), 463–484.

Frankel, Jeffrey., Sergio L. Schmukler and Luis Servén. (2004). Global transmission of interest rates: monetary independence and currency regime. Journal of International Money and Finance. 23(5), pp.701-733.

Hsing, Yu. (2012). Test of the trilemma for five selected Asian countries and policy implications. Applied Economics Letters. 19(17), pp.1735-1739.

Hutchison, Michael, Rajeswari Sengupta, and Nirvikar Singh. (2012). India's Trilemma: Financial Liberalisation, Exchange Rates and Monetary Policy. The World Economy. 35(1), pp.3-18.

Ito, Hiro. and Masahiro Kawai (2014). Determinants of the Trilemma Policy Combination. ADBI working paper series No. 456. Tokyo: Asian Development Bank Institute.

Klein, Michael W. and Jay C. Shambaugh. (2015). Rounding the Corners of the Policy Trilemma: Sources of Monetary Policy Autonomy. American Economic Journal: Macroeconomics. 7(4), pp.33-66.

Lane, Philip R. and Giana Maria M. (2007), 'The External Wealth Of Nations Mark II: Revised And Extended Estimates Of Foreign Assets And Liabilities'. Journal of International Economics. 73, 2, 223–50

Majumder, Sayantan B. and Ranjanendra N. Nag. (2017). Policy Trilemma in India: Exchange Rate Stability, Independent Monetary Policy and Capital Account Openness. Global Economy Journal. 17(3).

Mundell, Robert A. (1963). Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates. The Canadian Journal of Economics and Political Science. 29(4), p.475.

Obstfeld, Maurice, Jay C. Shambaugh, and Alan M. Taylor. (2004). Monetary sovereignty, exchange rates, and capital controls: the trilemma in the interwar period. IMF Staff Papers, vol. 51: 75–108.

_____(2005). The trilemma in history: tradeoffs among exchange rates, monetary policies, and capital mobility. Review of Economics and Statistics. 87 (3), 423–438.

Shambaugh, Jay C., 2004. The effects of fixed exchange rates on monetary policy. Quarterly Journal of Economics. 119, 301–352.

Steiner, Andreas. (2017). Central banks and macroeconomic policy choices: Relaxing the trilemma. Journal of Banking & Finance, 77, pp.283-299.

Wahab, Md Abdul and Md. Mazbah U. (2014). External Sector Openness Management: The Bangladesh Experience. Working Paper Series: WP1405. Dhaka: Bangladesh Bank.