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RESEARCH ARTICLE

Financial Integration in Money Markets: Evidence from SAARC Region

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Abstract: The primary purpose of the study was to investigate the extent of financial integration between the four major money markets (Pakistan, India, Sri Lanka, and Bangladesh) in the SAARC region. To determine the association between these money markets, this study deployed variety of robust time series techniques such as JJ Co-integration Test, Granger Causality Test, Impulse Response Functions (IRF), and Variance Decomposition Analysis (VDC). Monthly data for the period 2007–2015 was utilized for the data analysis whereas Call Money rates and Interbank rates were used as proxies of money markets. The empirical findings confirmed the presence of long term relationship between the nominal interest rates in SAARC region. Additionally, the results also unveiled the existence of bi-directional causal relationship between the money markets of Pakistan, India, and Sri Lanka. It was also found that Bangladesh's money market is most rigid and unresponsive to other markets in the region. This study also confirmed the existence of robust ingredients for formulation of a monetary union in the SAARC region.

Keywords: Interest rates, SAARC, Money Markets, Monetary Union, Co-integration, IRF, VDC

JEL Classifications: C21, E43, E44, E51, F15, O42

Augmented mobility of capital flows contribute to higher economic growth and prosperity around the globe. Over the last few decades, regional and global financial integration have taken essential spot as a policy tool to (1) accelerate trade, (2) aim higher economic growth, (3) boost capital flows, (4) yield higher returns on investments, and (5) diversify portfolio risks. The trend of regional financial integration has reinforced smooth national consumption and investment levels regardless of short-term volatility in national income levels.

The principal of regional integration gets its support from standard trade theory which recognizes free trade as a most proficient trade approach. Contemporary financial literature links openness and economic growth (Grossman & Helpman, 1992; Edwards, 1993; Sachs & Warner, 1995). In last the three decades, countries around the globe have undertaken Regional Trade Agreements (RTA) to liberalize trade and investment arrangements. The statistics of World Trade Organization (WTO) exhibits the exponential growth of RTAs. In early 1990s, the numbers of operational RTAs were 40, which increased to 380 in 2007, 206 of those were operational. In April 2015, WTO received notification of 612 accords around the world and of those accords, 406 were operational. Theoretical economic and financial literature identifies three major streams through which RTAs influence the economic growth: (1) Accelerated Foreign Direct Investment (FDI) in free trade regions, (2) preferential trade and investment configurations, and (3) additional forms of integration such as facilitating mobility of information and statistics in the region, movement of people in free trade region, and cross-border transfer of funds (Borenzstein, De Gregorio, & Lee, 1998; Blomström & Kokko, 1997; Dunning, 1979). Most of the studies have shown that economic integration can lead to higher economic growth but few studies have also highlighted contrary evidence (Brada & Mendez, 1988; De Melo, Panagariya, & Rodrik, 1993). The possible explanation advocated was that RTAs are not solely based on economic motives. Regional politics, international diplomacy, internal security, and politics significantly influence development of RTAs. Winters (1997) asserted that the aspiration for integrated Europe originated from strong political paradigm.

Trade integration can lead to extension in financial and monetary collaboration among countries. Few studies have advocated even stronger relationship, for example, monetary unions can multiply trade opportunities (Glick & Rose, 2001; Persson, 2001). In perfectly integrated economies, identical assets sell at the same price resulting in normal gains from the trade, which is known as "Law of One Price (LOOP)." Financial market integration is an extension of theory of price equalization. Additionally, the financial integration approach gets its reinforcement from the theory of "Interest Rate Parity (IRP)" which holds under the assumption of perfect capital mobility in the region. The previous evidence shows that global and regional financial integration have uplifted capital flows between developed and developing economies and accelerated economic growth and prosperity. Regional financial integration mitigates country specific income, consumption, and investment volatility risks through regional monetary risk sharing. Regional financial integration promotes financial stability in the region by supporting the regional financial service industry. Furthermore, the regional financial integration can assist and boost the role of financial intermediation through synchronized and efficient allocation of the capital. Financial openness created from financial integration serves the purpose of expanding investment opportunities for investors, diversifying portfolio risks, and yielding higher risk adjusted returns. Although substantial amount of literature links regional financial integration with higher economic growth, few studies have also documented collapsing growth rates associated with regional financial integration in few developing economies.

South Asian Association of Regional Corporation (SAARC) is a regional union of eight south Asian countries established in 1985. Initially, SAARC constituted of seven member states which included Pakistan, Bhutan, Bangladesh, Nepal, Maldives, India, and Sri Lanka. In 2007 Afghanistan also became the member of SAARC union. Currently, SAARC is functional in multiple areas of co-operation which include agriculture and rural development, biotechnology, culture, economic and trade, education, energy, environment, finance, funding mechanism, information, communication and media, people-to-people contacts, poverty alleviation, science and technology, security aspects, social development, and tourism. SAARC represents a contiguous region with diverse ethnic, social, political, and economic dynamics. But the member states of SAARC also share cultural, religious, societal, and linguistic similarities which play crucial role in providing basis for natural integration among countries in the region. Historically, the region enjoyed overwhelming intra-regional trade and it was estimated up to 19% in 1948 (Kumar & Singh, 2009). After independence from British rule, the intra-regional trade gradually declined due to territorial disputes among the South Asian states. The volume of intra-regional trade contracted in 1968 was merely 2% and 4.1% in 1995 which reflected imperative need of trade liberalization and preferential trade arrangements in the region. In 1995, to boost intra-regional trade, SAARC member states signed the South Asian Preferential Trade Agreement (SAPTA). Despite the effort to liberalize trade and eliminate natural trade barriers, SAPTA only managed to moderately increase intra-regional trade levels. In 2006, another agreement called South Asian Free Trade Area agreement (SAFTA) came into force which aimed at higher trade liberalization through reduction in tariffs.

Despite the fact that South Asian region is enriched with extraordinary and diverse natural resources, the economic growth in the region has been sluggish. The South Asian region consists of around fifth of the world population and two fifths of the total poor population of the world. The region only contributes 3% to the global GDP and merely 2% to total world exports. The statistics of SAARC Secretariat reveal that the intra-SAARC trade is very low as compared to the intra-regional trade of other prominent regional alliances. In European Union (EU), North American Free Trade Agreement (NAFTA), Asia-Pacific, Association of South East Asian Nations (ASEAN), the intra-regional trade level is estimated up to 66%, 53%, 32%, and 25% respectively. The intra-regional trade between SAARC only accounts for 1.4% of the total exports of the world and 1.3% of the total imports of the world. The primary reason for low-level of trade between SAARC countries is attributed to the political instability in the region and disputes among two larger nations, Pakistan and India. The size of SAARC economy is strictly dependent on these two larger countries. In 2013, the Indian economy accounted for 79% of the total output in SAARC region followed by Pakistan with 10%. The central reasons for low-level of regional integration are trust deficit, institutional deficit, and trade deficit (Desai, 2010). Besides the fact that the intra-regional trade in SAARC region has been very low as compared to other regional bodies, the overall output of the SAARC region has expanded. In 2003, the total output of the SAARC region was estimated at USD 793.9 billion which increased to USD 2.4 trillion in 2013. The future outlook for higher regional integration and trade is strictly dependent on trade trust between two larger member states, Pakistan and India (Jayaraman & Choong, 2012).

Objective of the Study

Numerous studies have been carried out to investigate the merits of financial integration in different regions around the globe. Predominantly, previous studies have focused on regional financial integration in European Union (EU), Chinese Economic Area (CEA), Pacific Basin, Middle East & North Africa (MENA), and East Asia. However, there is dearth of evidence on financial integration in the South Asian region. The primary purpose of the study was to investigate the extent of financial integration between the four major money markets (Pakistan, India, Sri Lanka, and Bangladesh) in the SAARC region. In order to determine the association between these money markets, this study deployed a variety of robust time series techniques such as JJ Co-integration Test, Granger Causality Test, Impulse Response Functions (IRF), and Variance Decomposition Analysis (VDC).

Literature Review

Theoretical reinforcement of this study is rooted in the literature that linked financial development and economic output. The genesis of empirical link between financial development and economic output could be traced back to 19th century. Schumpeter (1934) identified the role of financial intermediation in accelerating economic growth. McKinnon (1973) advocated positive relationship between financial development and economic output. The study also concluded that trade barriers, capital restrictions, and inefficient credit allocation had an adverse impact on the economic output. Levine (1997) found that financial development was a strong predictor of economic growth. Another line of literature explored the link between financial development and economic output volatility (Aghion, Banerjee, & Piketty, 1999; Caballero & Krishnamurthy, 2001). Furthermore, a review of the literature on financial integration and volatility of economic output depicts divergent results. Baxter and Crucini (1995) linked higher financial integration with decreased volatility in consumption levels but higher volatility with economic output. On the contrary, Mendoza (1994) associated higher financial integration with lower economic output volatility.

Furthermore, our study also got theoretical support from literature that investigated the existence of financial integration between money markets around the globe. The earlier studies on the underlying topic particularly focused on evaluating relationship between domestic markets yields and US money market yields (Giddy, Dufey, & Min, 1979; Kaen & Hachey, 1983; Swanson, 1987). More specifically, our study endorsed the literature on international transmission of interest rates and integrated capital markets. The earlier studies have categorized capital market structure into three forms: integrated, segmented, and weakly segmented. The pioneer study of Agmon (1972) identified globally integrated markets. The study depicted high correlation between different market. Chinn and Frankel (1995) examined the corresponding impact of US and Japanese interest rates on interest rates in Pacific region. De Brouwer (2009) explored the role of global interest rates on volatility of interest rates in East Asia. Bremnes, Gjerde, and Sattem (2001) investigated international transmission of interest rates by deploying time series techniques such as Variance Decomposition analysis (VDC), Impulse Response Function (IRF), and co-integration test. The results exhibited significant contribution of US interest rate in explaining interest rates of German and Norwegian markets. Further, Nieh and Yau (2004) deployed the same time series methodologies to find the relationship between interest rates in Chinese Economic Area. Neaime (2005) examined the extent of financial integration in MENA region and its impact on macroeconomic volatility. In a similar study, Kleimeier and Sander (2000) used co-integration analysis to compare the extent of regional financial integration and global financial integration in EU region. Aforementioned studies have established compelling evidence of regional financial integration in different regions around the world. A series of studies had documented the pattern of intra-regional trade and economic integration in SAARC region (Panagariya, 2003; Pitigala, 2005; Baysan, Panagariya, & Pitigala, 2006; Bhuyan, 2008; Jain & Singh, 2009; Raghuramapatruni, 2011; Jha, 2013). However, relatively less concentration was assigned to financial integration in the region. Saxena (2005) investigated the possibility of common currency in the SAARC region and showed lack of robust ingredients to facilitate such configurations.

This study is in line with these earlier studies and attempts to apply the similar methodologies to investigate the relationship in the SAARC region and also seeks to add conclusive evidence to the literature regarding existence of financial integration and prospects of future currency union in SAARC region.

Theoretical Framework

Law of One Price (LOOP)

One of the broader ways to measure financial integration is utilizing price-based measures. Previous studies on price-based measures of financial integration can be bisected into two major categories. The first line of studies measure financial integration through estimating correlation of returns across markets. The approach was very effective for the purpose of international risk diversification. Price indexes were used to measure financial integration but subject to aggregation bias. The second line of studies measured financial integration through testing Law of One Price (LOOP) in integrated markets. Theoretically, perfectly integrated markets are assumed to follow LOOP. The law dictates that two markets are presumed to be perfectly integrated when identical assets sell at the same price across borders. LOOP stipulates that two assets with similar risk should have equal expected return irrespective of the habitation of issuer and holder of the asset. In perfectly integrated markets, identical assets are sold at the same price that results in normal gain from the trade. One of the potential pay-off of financial integration is higher industrial output at lower prices due to allocative efficiency. Additionally, financial integration can stimulate Competative pressure in the region by advocating economies of scope and scale. Broadly, two markets are integrated under the LOOP when the discount rate at which cash flows are discounted is equal across two markets. Return on two similar assets in two different markets can differ due to the exchange rate risk. The previous studies have also documented other factors that impede equalization of discount rates in international invesment settings. These barriers include tax rate differentials, accounting standards, statutory restrictions, corporate governance practices, and cultural and linguistic differences across markets. The central banks around the globe strive to sustain reasonable interest rates, low inflation rates, and stable exchange rates. This critical balancing act has significant bearing on the economic benefits of financial integration.

This study seeks to link the financial sector and real sector within each economy and subsequently across four economies. Consequently, LOOP forms a crucial part of theoretical framework of our study.

Interest Rate Parity

In perfectly integrated markets, shocks get transmitted smoothly across the markets. The unification between markets is attained by removing controls on international trade. The integration process is not merely restricted to surge in capital flows but it extends to price and returns equalization of assets across integrated markets. Interest rate parity is among most widely used approaches to estimate financial integration. Previous studies have used various parity conditions to analyze financial integration between capital markets. The first parity condition is Covered Interest Rate Parity (CIP) which stipulates that differential between interest rates is neutralized by the exchange rate forward premiums and arbitrage activities are fully covered. According to CIP, the impediments to free capital flows between markets include capital controls and other institutional barriers. The second parity condition is termed Uncovered Interest Rate Parity (UIP) which depicts that under perfect capital mobility in the region, investors would be indifferent between holding portfolios comprised of domestic or foreign assets. Additionally, if the assumptions of perfect capital mobility, zero transaction cost and negligible capital control are satisfied, the appreciation or deprecation in exchange rate is neutralized by interest rate differential. The aforementioned relationship could be written in equation form in the following way:

$$I_t - I\,\hat{}\,_t = \Delta S^e{}_{t+1} + \theta_t \quad (1)$$

Where I_t is domestic interest rate, $I\hat{}_t$ is foreign interest rate, $\Delta S^e{}_{t+1}$ is expected rate of change of spot exchange rate, and θ_t is the risk premium. This equation shows that existence of risk premium is divergence from UIP. Nevertheless, there will exist long-term relationship between the rates, if the expected rate of change in exchange rate ($\Delta S^e{}_{t+1}$ ~ 0) and risk premium (θ_t ~ 0) are stationary. Domestic rate (I_t ~ I (1)), foreign rate (I^t ~ I (1)), and the linear combination of both rates are non-stationary. To measure the long-term relationship between the rates, equation 1 is rewritten as follows:

$$I_t = A + BI\,\hat{}\,_t + u_t \quad (2)$$

Where $A,B = (0,1)^4$, and $u_t = \Delta S^e{}_{t+1} + \theta_t$ I(0).

Equation 2 stipulates that domestic and foreign interest rates do not drift too far in the long run, at the same time allowing short-term deviations.

The abovementioned theoretical framework is deployed in this study to estimate the long-term relationship (integration) between the interest rates in the SAARC region.

Hypothesis Development

Earlier studies have shown that under perfect capital mobility in the long run, interest rates in the region converge. Furthermore, recent deregulation and globalization of markets has translated into increased co-movement between nominal interest rates. This study investigated if interest rates in the SAARC region are influenced by common stochastic trends and shocks. This study also intended to explore the short-term and long-term relationship between the interest rates in the SAARC region and to find whether approximated relationship is consistent with UIP. The central alternative hypothesis is as follows:

H_1: Is there a long-term relationship between interest rates of four large economies (India, Pakistan, Sri Lanka and Bangladesh) in the SAARC region?

Data Description and Research Methodology

The study sample is constituted of four large economies (India, Pakistan, Sri Lanka, and Bangladesh) of the SAARC region. These four countries represent around 95% of the total output in the region. Interbank rate and call money rate for the period 2007–2015 are used as proxies to estimate financial integration in the region (Nieh &Yau, 2004). These rates are appropriate proxies because of significant impact on the financial configurations of money markets in the region. All rates are obtained from Statistical Bulletins of respective central banks.

Unit Root Test

The primary assumption to be satisfied for time series analysis is to check the stationarity of variables. The non-stationary time series could result in factious results. The results of spurious regression can predict statistically significant relationship between variables. On the contrary, if estimated accurately, the relationship between variables might not exist. To test the stationarity of variables in our model, Dickey and Fuller's (1981) test is applied which is commonly known as ADF-statistic.

Co-integration Test

Two variables are said to be co-integrated if the series of respective variables have long-term association, irrespective of the fact that individual time series may be non-stationary. Although, the ADF-statistic ensures the stationarity of the time series, yet the stationary series can still predict invalid results. Co-integration implies if the residual of the model is stationary then the variables in the model tend to have co-moment which indicates long term equilibrium between variables in the model. This study used multivariate co-integration test (Johansen & Juselius, 1990) which permits the test of multiple co-integrating vectors in the model, hence multiple associations between variables can be explored. The test has been widely used by previous studies to estimate regional financial integration in different regions around the globe.

VAR Model

The conventional multivariate VAR model setup for this study is as follows:

$$X_1 = (INCR, PKIR, BGCR, SRCR) \quad (3)$$

INCR, BGCR, and SRCR are call money rates of India, Bangladesh, and Sri Lanka respectively. PKIR represents interbank rate of Pakistan in the Model. The selection of appropiate lag for the model is based on Akaike information criterion (AIC) and Schwarz criterion (SC).

Granger Causality Test

Granger (1969) stated that if variable (A1) is a cause of Variable (B1), then past time series values of variable (A1) contain significant information to predict the values of (B2) over and above the information contained in time series of (B2). To test the casual relationship between interest rates in four money markets in the SAARC region, this approach is very effective. Identification of relationships will signal strong or weak form of financial integration in the region.

Impulse Response Function (IRF)

Under given period of time, IRF depicts the time profile effect of shocks in given time period on variables in the model. It is also useful in evaluating the relative magnitude of each shock and relative influence on the variables of interest. In this study, the impact of economic shocks is estimated in particular interest rate and its relative strength and influence on other rates in the region.

Variance Decomposition Analysis (VDC)

VDC analysis explains forecast error variance in an objective variable caused by the shocks in other variables. VDC provides dissection of variation in the objective variables. Furthermore, it also explains the change in a particular variable at given period of time arising from the change in the same variable and change in other variables in the model. In context of this study the analysis will assist in estimating the short-term and long-term variation explained in an individual rate by other rates in the SAARC region.

Results

Table 1 reports the descriptive statistics of money markets in the SAARC region for the period 2007–2015.

Table 1. *Descriptive Statistics of Interest Rates in Four Markets*

	Mean	Std. Deviation
Pakistan	10.946670	1.757102
India	6.948917	2.118621
Sri Lanka	10.161270	3.548571
Bangladesh	8.486070	4.086633

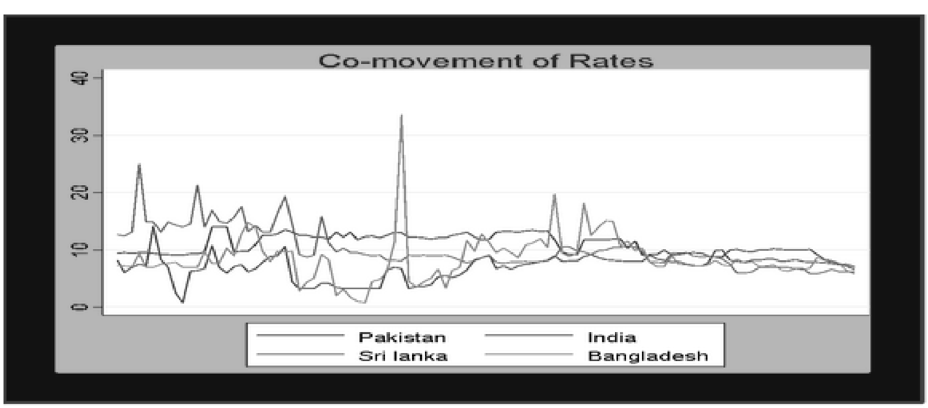

Figure 1. Co-movement between rates.

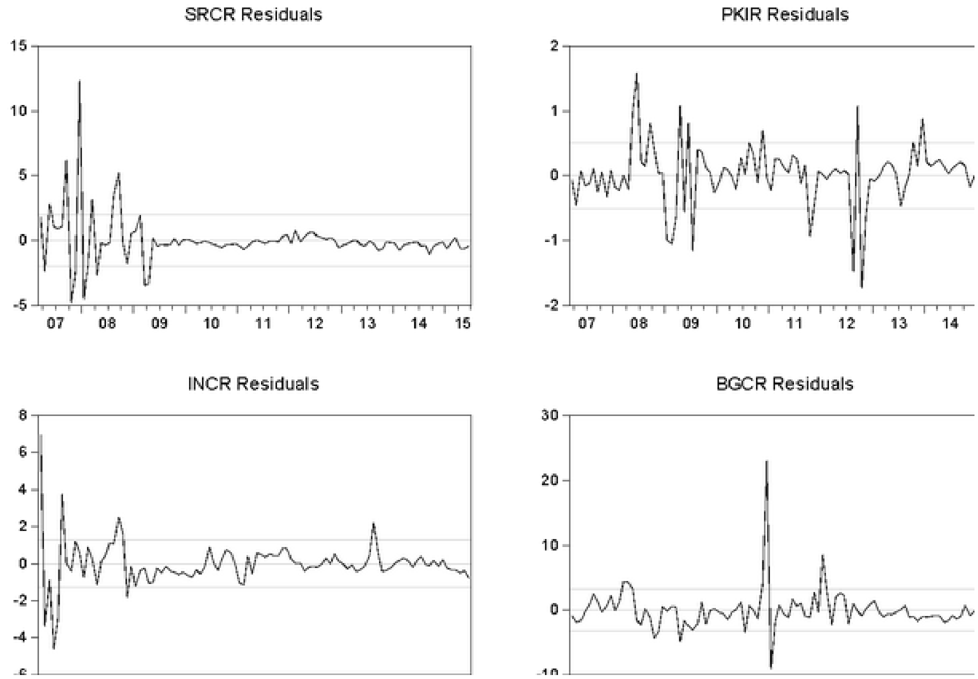

Figure 2. Graphs of residuals.

The statistics show different level of interest rates prevailing in the SAARC region. The highest and lowest average nominal interest rate is reported in Pakistan and India respectively. Highest degree of volatility in rates is found in the money markets of Bangladesh money market. Additionally, call money rate of Bangladesh depicted less co-movement with other rates in the region.

Unit Root Test Results

The results of unit root test show that variables were non-stationary in their original form. Under Dickey and Fuller test, the stationarity assumption was tested using three different models (Constant, Linear trend and None).

In each model, all of the four rates (INCR, PKIR, SRCR, and BGCR) were integrated at first order difference (Appendix A–L).

JJ Co-Integration Test Result

The optimal lag length for the co-integration test was derived from optimal lag length selection criteria. The standard indicators for optimal lag length, such as Sequential Modified LR Test Statistic, Final Prediction Error (FPR), and Akaike Information Criterion (AIC), proposed 3 as optimal lag length for co-integration test (Appendix M). The results of JJ co-integration test

Table 2. *Stationarity Assumption Using Dickey and Fuller Test*

Variables	Constant Model		Linear Trend Model		None Model	
	Critical value	t-statistic	Critical value	t-statistic	Critical value	t-statistic
SRCR	(3.503049)	(3.615243)***	(3.459397)	(3.603236)**	(2.590340)	(3.404271)***
PKIR	(3.497727)	(5.513900)***	(4.052411)	(11.51210)***	(2.588530)	(5.512513)***
INCR	(3.497029)	(11.42222)***	(4.052411)	(11.36313)***	(2.588292)	(11.48045)***
BGCR	(3.497727)	(10.56206)***	(4.053392)	(10.51740)***	(2.588530)	(10.61683)***

**** Significant at 1% level, ** Significant at 5% level.*

confirmed that variables under study link to form long term equilibrium. At 5% level of significance, the trace statistic was greater than critical value (49.48234> 47.85613). Under the Max Eigen value criteria, at 5% significance level, Max-Eigen Statistic was greater than the critical value (31.91860>27.58434). The results also indicated presence of one co-integrating equation for our model (Appendix N). For the sake of brevity it may be concluded that the results of co-integration test confirmed our alternative hypothesis. There is a long-term relationship between the variables in our model which implies the convergence of the nominal interest rates of four markets in the long run. Alternatively, we may conclude that the results showed the integration of four major money markets in SAARC region in the long run. The evidence of financial integration holds strong implication for economic and trade integration in the region.

Further, to ensure the robustness of results, alternative methodology of Engle and Granger (1987) test is used to estimate the co-integration between the rates. Earlier studies have documented the superiority of JJ co-integration approach over Engle and Granger approach, yet Engle and Granger test is considered more appropriate for low number of data observations. The results from the bi-variant Engle and Granger test also reinforce the results from JJ co-integration test (Appendix O–R) and confirm the presence of long-term relationship between rates in the SAARC region.

Granger Causality Test Results

The results of co-integration test revealed the long-term convergence between the money market rates in the SAARC region. Granger causality test is also applied to estimate the causal relationship between the nominal interest rates. Further, the approach assists in evaluating the link between and across the four money markets in the region. The results of Granger causality test show bi-directional causal relationship between three major money markets of India, Pakistan, and Sri Lanka. The results have strong implications for possible monetary union in the SAARC region, most likely to be patterned after EU model. The central bank of India (largest economy in the region) may serve as benchmark for the creation of Central Bank of SAARC union like Bundesbank of Germany was used as a benchmark and eventually served as the model for the creation of the European Central Bank (ECB).

Additionally, the results also depicted that money market of Bangladesh is not causally linked with any other money market in the region. The probable reasons of such deviation may include higher volatility of rates in the money market and policy interventions by the central bank of Bangladesh.

IRF Results

Results of IRF showed the existence of self-response for all the four rates in the model.

Table 3. *Pairwise Granger Casuality Tests*

Null Hypothesis	F-statistic	P-value
PKIR does not Granger Cause SRCR	2.18665	0.0021*
PKIR does not Granger Cause INCR	2.00691	0.0311*
PKIR does not Granger Cause BGCR	0.30973	0.9924
INCR does not Granger Cause SRCR	3.11212	0.0010*
INCR does not Granger Cause PKIR	3.05572	0.0012*
INCR does not Granger Cause BGCR	1.47149	0.1481
SRCR does not Granger Cause PKIR	1.85970	0.0484*
SRCR does not Granger Cause INCR	4.29881	0.00005*
SRCR does not Granger Cause BGCR	0.76879	0.7048
BGCR does not Granger Cause SRCR	0.65310	0.8173
BGCR does not Granger Cause PKIR	0.53159	0.9116
BGCR does not Granger Cause INCR	0.44797	0.9560

**Significant at 5% level and the null hypothesis is rejected.*

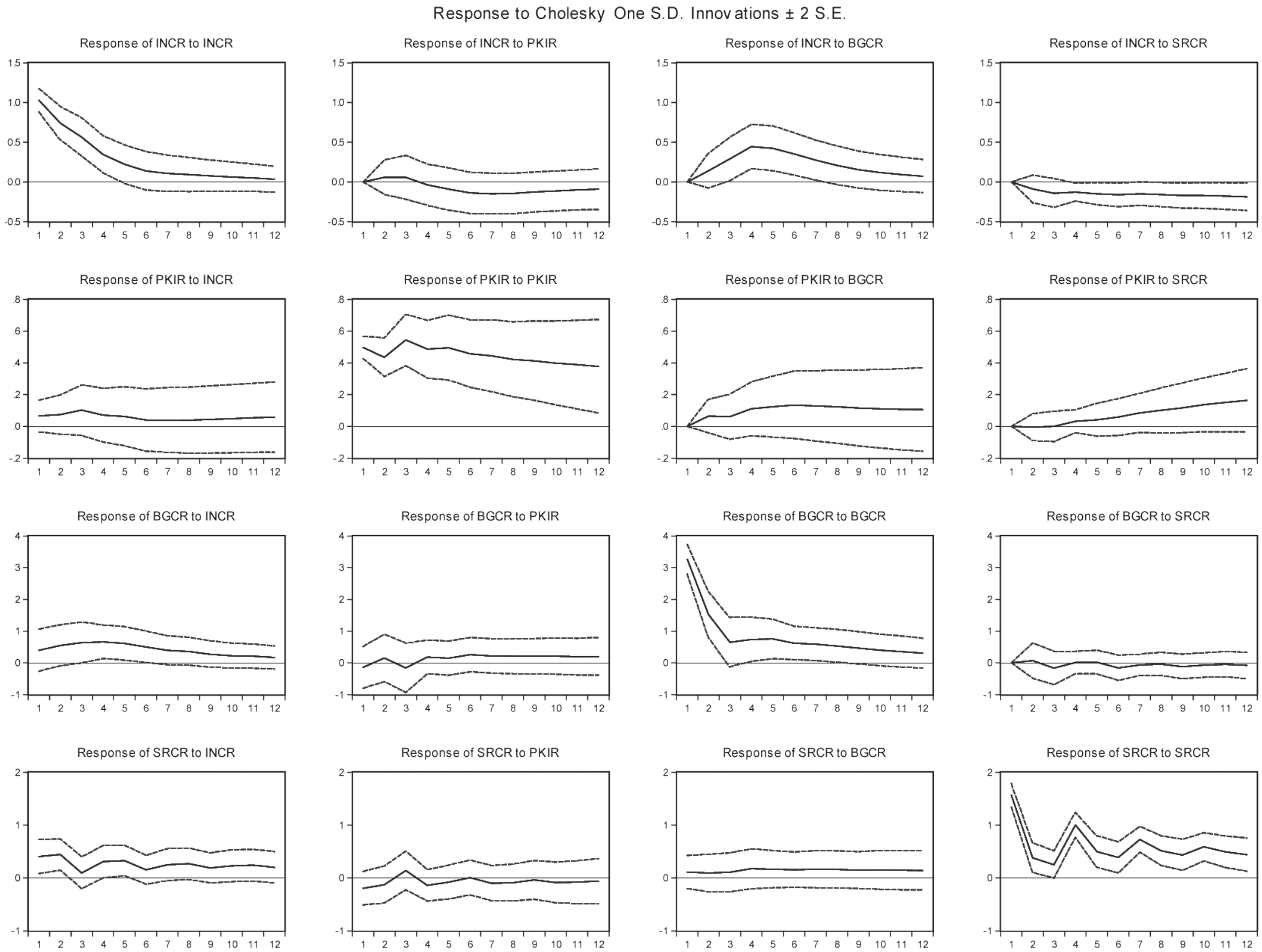

Figure 3. IRF results.

The results also illustrated the positive response of nominal interest rates of Pakistan, Sri Lanka, and Bangladesh (PKIR, SRCR, and BGCR) to one standard deviation shock to the Indian rate (INCR). Thus, IRF results reinforced our proposition that central bank of India may be served as the benchmark for the creation of central bank of SAARC. The analysis also revealed a positive response of Bangladesh rate to one standard deviation shock to other rates in the region. This further validated the argument of possible monetary union in the region. The interest rates in Bangladesh are significantly influenced by other regional rates. Additionally, the nominal interest rates of Pakistan and Sri Lanka also depicted positive shock to one standard deviation shock in other money market rates in the SAARC region. Alternatively, the results of IRF showed that the rates in the SAARC region are mutually dependent to some extent. Further, to a certain level the markets depicted the trend of self-reliance, yet the monetary shocks are transmitted across the region.

VDC Results

The results of the generalized-forecast error variance decomposition are presented in the Tables 4–7. Each number in the tables represents percentage value. The values of error forecast variance decomposition show the explanatory percentage of the change in each of the four interest rates.

As depicted by VDC analysis, in the short-run, none of the rates significantly explained the changes in each other. The results are comprehensible as the monetary rate of each country in short run is strictly dependent on necessities, constraints, and monetary policy considerations of domestic economy. The results showed that in the long run the Indian rate (INCR) explained around 12% percent of the variation in Bangladesh Rate (BGCR) and Sri Lankan

Table 4. *Variance Decomposition of INCR*

Period	S.E	INCR	PKIR	BGCR	SRCR
1	1.028753	100.0000	0.000000	0.000000	0.000000
2	1.280257	98.09280	0.207285	1.216578	0.483337
3	1.437433	93.28635	0.320922	5.048278	1.344450
4	1.549674	85.25391	0.326737	12.57971	1.839641
5	1.631010	78.83367	0.600683	18.07972	2.485926
6	1.687911	74.28159	1.239014	21.23250	3.246888
7	1.726365	71.40526	1.930202	22.81209	3.852442
8	1.754659	69.39930	2.566894	23.48480	4.549004
9	1.776101	67.92531	3.018263	23.67963	5.376804
10	1.793106	66.77414	3.370703	23.67320	6.181952
11	1.807924	65.76478	3.633146	23.55342	7.048649
12	1.821568	64.81673	3.831304	23.36686	7.985099

** Cholesky Ordering: INCR PKIR BGCR SRCR*

Table 5. *Variance Decomposition of PKIR*

Period	S.E	INCR	PKIR	BGCR	SRCR
1	0.501001	1.708615	98.29139	0.000000	0.000000
2	0.670653	2.162044	96.92334	0.907730	0.006891
3	0.871286	2.647277	96.33386	1.014657	0.004202
4	1.006427	2.470566	95.47035	1.958998	0.100090
5	1.130833	2.266128	94.78229	2.740920	0.210666
6	1.229377	2.020137	94.04712	3.527576	0.405162
7	1.316863	1.851052	93.36383	4.024052	0.761068
8	1.392501	1.731451	92.68418	4.384567	1.199805
9	1.462214	1.654910	92.02890	4.596356	1.719836
10	1.526347	1.615888	91.27093	4.744281	2.368901
11	1.586724	1.610260	90.45682	4.845960	3.086960
12	1.643694	1.624598	89.57388	4.930448	3.871075

** Cholesky Ordering: INCR PKIR BGCR SRCR*

Rates (SRCR). Additionally, in the long run BGCR significantly described around 24% change in the Indian rate (INCR). Moreover the results of VDC analysis also confirmed evidence obtained from the previous tests. These results also reinforced our recommendations proposed earlier.

Concluding Remarks

The primary objective of the study was to estimate financial integration between four major money markets in SAARC region. Additionally, the study also evaluated the possibility of monetary union in the SAARC region based on the extent of financial integration between money markets.

The results of various robust time series techniques confirmed the presence of co-movement between the money market rates in the SAARC region. The results of the co-integration test demonstrated the long-term relationship between the nominal interest rates. Thus, on the basis of evidence our study also supported the argument of financial integration in the SAARC region. Our study also explored the causal links between and

Table 6. *Variance Decomposition of BGCR*

Period	S.E.	INCR	PKIR	BGCR	SRCR
1	3.292739	1.444234	0.195012	98.36075	0.000000
2	3.671739	3.389552	0.326915	96.24926	0.034268
3	3.789391	6.004478	0.493586	93.27362	0.228312
4	3.920379	8.448446	0.678775	90.65908	0.213695
5	4.040616	10.22946	0.764486	88.80273	0.203327
6	4.129567	11.26206	1.111772	87.27689	0.349278
7	4.194809	11.78810	1.337636	86.51089	0.363369
8	4.248469	12.20743	1.534785	85.89503	0.362757
9	4.289507	12.38307	1.741207	85.44514	0.430585
10	4.319847	12.47936	1.946691	85.12011	0.453836
11	4.343347	12.56524	2.115999	84.85594	0.462818
12	4.362488	12.60353	2.310830	84.59042	0.495215

** Cholesky Ordering: INCR PKIR BGCR SRCR*

Table 7. *Variance Decomposition of SRCR*

Period	S.E	INCR	PKIR	BGCR	SRCR
1	1.629942	6.237385	1.441529	0.471352	91.84973
2	1.738688	11.95010	1.800988	0.685682	85.56323
3	1.768007	11.83549	2.365941	1.021041	84.77753
4	2.067927	10.86566	2.194940	1.444754	85.49465
5	2.159814	12.27158	2.145412	1.902608	83.68040
6	2.204939	12.25780	2.059524	2.314285	83.36839
7	2.344397	11.99232	2.007141	2.539893	83.46064
8	2.422321	12.46691	2.016946	2.808245	82.70790
9	2.473289	12.55606	1.958030	3.045591	82.44032
10	2.558208	12.53523	1.945213	3.192289	82.32726
11	2.621587	12.77256	1.951861	3.353160	81.92242
12	2.670084	12.87513	1.930099	3.510764	81.68400

** Cholesky Ordering: INCR PKIR BGCR SRCR*

across the interest rates in SAARC region and unveiled bi-directional casual relationship between the three major money markets of India, Pakistan, and Sri Lanka. Additionally, results also unfolded that Bangladesh's money market is more rigid and unresponsive to other money markets in the region. The results obtained from IRF analysis showed positive shock in interest rates due to monetary shocks in the SAARC area. The results of VDC analysis further validated the argument of financial integration in the SAARC region.

The study served the purpose of pioneer evidence to evaluate the possibility of monetary union in the SAARC region. From the perspective of policy making, this study contained functional information for predicting money market rates in the SAARC region and encompassed useful insights about the relationship between the money market rates in SAARC union.

Based on the empirical evidence presented, we support the possible formulation of the SAARC monetary union and propose that such configurations can be sustained in the region. Robust ingredients are identified to facilitate such configurations in the region. It is also proposed that the central bank of India may serve as a benchmark for the creation of Central Bank of SAARC.

Although constitution of monetary union encompasses considerable potential benefits for trade in the region, substantial amount of fiscal coordination between member countries is also pivotal for fruitful monetary alliance. The success of a possible monetary union is strictly dependent on the fiscal coordination between member countries. Higher level of monetary coordination is recommended that can facilitate free flow of capital in the region for trade expansion.

We are of the view that in the long run, the rationale for such regional monetary arrangements shall not be merely restricted to economic and financial cognition. Other factors like trade, regional politics, peace, security, and global economy shall also assert substantial influence.

For future studies, a subsequent study is recommended on co-integration of inflation rates in the SAARC region because the co-integrated nominal interest rates may be a result of co-integrated inflation rates. If the inflation rates of SAARC tend to move together, then less may be expected of capital flows which are another crucial ingredient for monetary integration process.

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APPENDIX A. *Unit root test for SRCR with constant model*

Null Hypothesis: D(SRCR) has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.615243	0.0072
Test critical values:	1% level	-3.503049	
	5% level	-2.893230	
	10% level	-2.583740	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SRCR,2)
Method: Least Squares
Date: 12/29/15 Time: 23:54
Sample (adjusted): 2007M11 2015M06
Included observations: 92 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SRCR(-1))	-1.793447	0.496079	-3.615243	0.0005
D(SRCR(-1),2)	0.479218	0.450971	1.062637	0.2911
D(SRCR(-2),2)	0.017762	0.411489	0.043166	0.9657
D(SRCR(-3),2)	0.353454	0.366663	0.963975	0.3379
D(SRCR(-4),2)	0.187963	0.334365	0.562150	0.5755
D(SRCR(-5),2)	0.403566	0.286541	1.408408	0.1628
D(SRCR(-6),2)	0.094200	0.241019	0.390842	0.6969
D(SRCR(-7),2)	0.058258	0.157801	0.369188	0.7129
D(SRCR(-8),2)	-0.162004	0.086234	-1.878657	0.0638
C	-0.165441	0.138580	-1.193829	0.2360

R-squared	0.882221	Mean dependent var	0.095761
Adjusted R-squared	0.869294	S.D. dependent var	3.445363
S.E. of regression	1.245611	Akaike info criterion	3.379452
Sum squared resid	127.2269	Schwarz criterion	3.653559
Log likelihood	-145.4548	Hannan-Quinn criter.	3.490084
F-statistic	68.24663	Durbin-Watson stat	1.835991
Prob(F-statistic)	0.000000		

APPENDIX B. *Unit root test for SRCR with constant, linear trend model*

Null Hypothesis: D(SRCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 8 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.603236	0.0350
Test critical values:	1% level	-4.060874	
	5% level	-3.459397	
	10% level	-3.155786	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SRCR,2)
Method: Least Squares
Date: 12/29/15 Time: 23:57
Sample (adjusted): 2007M11 2015M06
Included observations: 92 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SRCR(-1))	-1.800332	0.499643	-3.603236	0.0005
D(SRCR(-1),2)	0.483184	0.453822	1.064700	0.2902
D(SRCR(-2),2)	0.019752	0.413923	0.047718	0.9621
D(SRCR(-3),2)	0.353283	0.368769	0.958004	0.3409
D(SRCR(-4),2)	0.187964	0.336285	0.558945	0.5777
D(SRCR(-5),2)	0.403277	0.288188	1.399354	0.1655
D(SRCR(-6),2)	0.094688	0.242410	0.390611	0.6971
D(SRCR(-7),2)	0.058568	0.158712	0.369022	0.7131
D(SRCR(-8),2)	-0.161642	0.086741	-1.863506	0.0660
C	-0.237092	0.311114	-0.762074	0.4482
@TREND(“2007M01”)	0.001276	0.004954	0.257600	0.7974

R-squared	0.882317	Mean dependent var	0.095761
Adjusted R-squared	0.867789	S.D. dependent var	3.445363
S.E. of regression	1.252764	Akaike info criterion	3.400372
Sum squared resid	127.1227	Schwarz criterion	3.701890
Log likelihood	-145.4171	Hannan-Quinn criter.	3.522067
F-statistic	60.72926	Durbin-Watson stat	1.832363
Prob(F-statistic)	0.000000		

APPENDIX C. *Unit root test for SRCR with None model*

Null Hypothesis: D(SRCR) has a unit root
Exogenous: None
Lag Length: 8 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.404271	0.0009
Test critical values:	1% level	-2.590340	
	5% level	-1.944364	
	10% level	-1.614441	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SRCR,2)
Method: Least Squares
Date: 12/29/15 Time: 23:58
Sample (adjusted): 2007M11 2015M06
Included observations: 92 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SRCR(-1))	-1.588559	0.466637	-3.404271	0.0010
D(SRCR(-1),2)	0.300723	0.426553	0.705007	0.4828
D(SRCR(-2),2)	-0.136493	0.391675	-0.348484	0.7284
D(SRCR(-3),2)	0.230549	0.352814	0.653458	0.5153
D(SRCR(-4),2)	0.081084	0.322981	0.251048	0.8024
D(SRCR(-5),2)	0.320663	0.278710	1.150526	0.2532
D(SRCR(-6),2)	0.027608	0.235075	0.117441	0.9068
D(SRCR(-7),2)	0.019809	0.154875	0.127903	0.8985
D(SRCR(-8),2)	-0.180116	0.085106	-2.116370	0.0373

R-squared	0.880174	Mean dependent var	0.095761
Adjusted R-squared	0.868624	S.D. dependent var	3.445363
S.E. of regression	1.248798	Akaike info criterion	3.374944
Sum squared resid	129.4382	Schwarz criterion	3.621641
Log likelihood	-146.2474	Hannan-Quinn criter.	3.474513
Durbin-Watson stat	1.848595		

APPENDIX D. *Unit root test for PKIR with constant model*

Null Hypothesis: D(PKIR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.513900	0.0000
Test critical values:	1% level	-3.497727	
	5% level	-2.890926	
	10% level	-2.582514	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PKIR,2)
Method: Least Squares
Date: 12/29/15 Time: 23:59
Sample (adjusted): 2007M04 2015M06
Included observations: 99 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PKIR(-1))	-0.823203	0.149296	-5.513900	0.0000
D(PKIR(-1),2)	-0.257608	0.099844	-2.580114	0.0114
C	-0.026058	0.049675	-0.524569	0.6011

R-squared	0.582433	Mean dependent var	-0.005253
Adjusted R-squared	0.573733	S.D. dependent var	0.755542
S.E. of regression	0.493286	Akaike info criterion	1.454381
Sum squared resid	23.35983	Schwarz criterion	1.533021
Log likelihood	-68.99186	Hannan-Quinn criter.	1.486199
F-statistic	66.95155	Durbin-Watson stat	2.026045
Prob(F-statistic)	0.000000		

APPENDIX E. *Unit root test for PKIR with constant, linear trend model*

Null Hypothesis: D(PKIR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.51210	0.0000
Test critical values:	1% level	-4.052411	
	5% level	-3.455376	
	10% level	-3.153438	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PKIR,2)
Method: Least Squares
Date: 12/30/15 Time: 00:00
Sample (adjusted): 2007M03 2015M06
Included observations: 100 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PKIR(-1))	-1.157132	0.100514	-11.51210	0.0000
C	0.177870	0.102039	1.743165	0.0845
@TREND(“2007M01”)	-0.004083	0.001742	-2.343880	0.0211

R-squared	0.577442	Mean dependent var	-0.005900
Adjusted R-squared	0.568729	S.D. dependent var	0.751744
S.E. of regression	0.493679	Akaike info criterion	1.455680
Sum squared resid	23.64078	Schwarz criterion	1.533835
Log likelihood	-69.78400	Hannan-Quinn criter.	1.487311
F-statistic	66.27714	Durbin-Watson stat	1.925828
Prob(F-statistic)	0.000000		

APPENDIX F. *Unit root test for PKIR with None model*

Null Hypothesis: D(PKIR) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.512513	0.0000
Test critical values:	1% level	-2.588530	
	5% level	-1.944105	
	10% level	-1.614596	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(PKIR,2)
Method: Least Squares
Date: 12/30/15 Time: 00:00
Sample (adjusted): 2007M04 2015M06
Included observations: 99 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PKIR(-1))	-0.818320	0.148448	-5.512513	0.0000
D(PKIR(-1),2)	-0.259805	0.099383	-2.614191	0.0104

R-squared	0.581236	Mean dependent var	-0.005253
Adjusted R-squared	0.576919	S.D. dependent var	0.755542
S.E. of regression	0.491440	Akaike info criterion	1.437041
Sum squared resid	23.42678	Schwarz criterion	1.489468
Log likelihood	-69.13354	Hannan-Quinn criter.	1.458253
Durbin-Watson stat	2.025928		

APPENDIX G. *Unit root test for INCR with constant model*

Null Hypothesis: D(INCR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.42222	0.0000
Test critical values:	1% level	-3.497029	
	5% level	-2.890623	
	10% level	-2.582353	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INCR,2)
Method: Least Squares
Date: 12/30/15 Time: 00:01
Sample (adjusted): 2007M03 2015M06
Included observations: 100 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INCR(-1))	-1.139561	0.099767	-11.42222	0.0000
C	-0.001491	0.133159	-0.011196	0.9911

R-squared	0.571054	Mean dependent var	0.006600
Adjusted R-squared	0.566677	S.D. dependent var	2.022834
S.E. of regression	1.331576	Akaike info criterion	3.430401
Sum squared resid	173.7632	Schwarz criterion	3.482504
Log likelihood	-169.5200	Hannan-Quinn criter.	3.451488
F-statistic	130.4672	Durbin-Watson stat	1.670030
Prob(F-statistic)	0.000000		

APPENDIX H. *Unit root test for INCR with constant, linear trend model*

Null Hypothesis: D(INCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.36313	0.0000
Test critical values:	1% level	-4.052411	
	5% level	-3.455376	
	10% level	-3.153438	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INCR,2)
Method: Least Squares
Date: 12/30/15 Time: 00:02
Sample (adjusted): 2007M03 2015M06
Included observations: 100 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INCR(-1))	-1.139754	0.100303	-11.36313	0.0000
C	-0.021526	0.273800	-0.078619	0.9375
@TREND("2007M01")	0.000389	0.004638	0.083878	0.9333

R-squared	0.571085	Mean dependent var	0.006600
Adjusted R-squared	0.562242	S.D. dependent var	2.022834
S.E. of regression	1.338374	Akaike info criterion	3.450328
Sum squared resid	173.7506	Schwarz criterion	3.528483
Log likelihood	-169.5164	Hannan-Quinn criter.	3.481959
F-statistic	64.57614	Durbin-Watson stat	1.669830
Prob(F-statistic)	0.000000		

APPENDIX I. *Unit root test for INCR with None model*

Null Hypothesis: D(INCR) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.48045	0.0000
Test critical values:	1% level	-2.588292	
	5% level	-1.944072	
	10% level	-1.614616	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INCR,2)
Method: Least Squares
Date: 12/30/15 Time: 00:02
Sample (adjusted): 2007M03 2015M06
Included observations: 100 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INCR(-1))	-1.139555	0.099260	-11.48045	0.0000

R-squared	0.571054	Mean dependent var	0.006600
Adjusted R-squared	0.571054	S.D. dependent var	2.022834
S.E. of regression	1.324834	Akaike info criterion	3.410402
Sum squared resid	173.7635	Schwarz criterion	3.436454
Log likelihood	-169.5201	Hannan-Quinn criter.	3.420945
Durbin-Watson stat	1.670038		

APPENDIX J. *Unit root test for BGCR with constant model*

Null Hypothesis: D(BGCR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.56206	0.0000
Test critical values:	1% level	-3.497727	
	5% level	-2.890926	
	10% level	-2.582514	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BGCR,2)
Method: Least Squares
Date: 12/30/15 Time: 15:56
Sample (adjusted): 2007M04 2015M06
Included observations: 99 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BGCR(-1))	-1.656977	0.156880	-10.56206	0.0000
D(BGCR(-1),2)	0.288312	0.097816	2.947490	0.0040
C	-0.013038	0.342267	-0.038092	0.9697

R-squared	0.672582	Mean dependent var	-0.006970
Adjusted R-squared	0.665760	S.D. dependent var	5.890521
S.E. of regression	3.405514	Akaike info criterion	5.318503
Sum squared resid	1113.362	Schwarz criterion	5.397143
Log likelihood	-260.2659	Hannan-Quinn criter.	5.350321
F-statistic	98.60145	Durbin-Watson stat	2.060621
Prob(F-statistic)	0.000000		

APPENDIX K. *Unit root test for BGCR with constant, linear trend model*

Null Hypothesis: D(BGCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.51740	0.0000
Test critical values:	1% level	-4.053392	
	5% level	-3.455842	
	10% level	-3.153710	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BGCR,2)
Method: Least Squares
Date: 12/30/15 Time: 15:56
Sample (adjusted): 2007M04 2015M06
Included observations: 99 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BGCR(-1))	-1.658207	0.157663	-10.51740	0.0000
D(BGCR(-1),2)	0.288839	0.098289	2.938670	0.0041
C	0.189037	0.714149	0.264702	0.7918
@TREND("2007M01")	-0.003886	0.012037	-0.322851	0.7475

R-squared	0.672941	Mean dependent var	-0.006970
Adjusted R-squared	0.662612	S.D. dependent var	5.890521
S.E. of regression	3.421514	Akaike info criterion	5.337608
Sum squared resid	1112.142	Schwarz criterion	5.442462
Log likelihood	-260.2116	Hannan-Quinn criter.	5.380032
F-statistic	65.15568	Durbin-Watson stat	2.061581
Prob(F-statistic)	0.000000		

APPENDIX L. *Unit root test for BGCR with None model*

Null Hypothesis: D(BGCR) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.61683	0.0000
Test critical values:	1% level	-2.588530	
	5% level	-1.944105	
	10% level	-1.614596	

**MacKinnon (1996) one-sided p-values.*

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BGCR,2)
Method: Least Squares
Date: 12/30/15 Time: 15:58
Sample (adjusted): 2007M04 2015M06
Included observations: 99 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BGCR(-1))	-1.656974	0.156070	-10.61683	0.0000
D(BGCR(-1),2)	0.288313	0.097311	2.962796	0.0038

R-squared	0.672577	Mean dependent var	-0.006970
Adjusted R-squared	0.669201	S.D. dependent var	5.890521
S.E. of regression	3.387940	Akaike info criterion	5.298316
Sum squared resid	1113.379	Schwarz criterion	5.350743
Log likelihood	-260.2666	Hannan-Quinn criter.	5.319528
Durbin-Watson stat	2.060599		

APPENDIX M. *A13: VAR Lag Order Selection Criteria*

VAR Lag Order Selection Criteria
Endogenous variables: INCR PKIR BGCR SRCR
Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-925.2685	NA	2024.662	18.96466	19.07017	19.00734
1	-662.3978	498.9179	13.13568	13.92649	14.45403*	14.13987*
2	-645.4937	30.70330	12.91776	13.90804	14.85762	14.29212
3	-613.9800	54.66674*	9.451857*	13.59143*	14.96304	14.14622
4	-600.9290	21.57404	10.11765	13.65161	15.44526	14.37711

** indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

APPENDIX N. *JJ co-integration Results*

Trend assumption: Linear deterministic trend
Series: INCR PKIR BGCR SRCR
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.277978	49.48234	47.85613	0.0349
At most 1	0.083817	17.56374	29.79707	0.5984
At most 2	0.070123	8.984874	15.49471	0.3668
At most 3	0.018800	1.859985	3.841466	0.1726

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.277978	31.91860	27.58434	0.0130
At most 1	0.083817	8.578863	21.13162	0.8648
At most 2	0.070123	7.124889	14.26460	0.4745
At most 3	0.018800	1.859985	3.841466	0.1726

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

INCR	PKIR	BGCR	SRCR
0.765946	0.442998	-0.355997	0.140622
-0.222605	0.066005	-0.215464	-0.024834
-0.146255	-0.163671	0.044411	0.304835
-0.072369	0.564572	0.072052	0.037062

Unrestricted Adjustment Coefficients (alpha):

D(INCR)	-0.413791	0.117559	-0.050066	-0.031964
D(PKIR)	-0.053575	0.000162	0.110049	-0.028691
D(BGCR)	0.927069	0.697047	-0.132909	-0.177961
D(SRCR)	0.037070	-0.174078	-0.194427	-0.145223

1 Cointegrating Equation(s): Log likelihood -609.7109

Normalized cointegrating coefficients (standard error in parentheses)

INCR	PKIR	BGCR	SRCR
1.000000	0.578367	-0.464780	0.183592
	(0.14580)	(0.07113)	(0.07549)

Adjustment coefficients (standard error in parentheses)

D(INCR)	-0.316942
	(0.06991)
D(PKIR)	-0.041035
	(0.03955)
D(BGCR)	0.710085
	(0.26382)
D(SRCR)	0.028394
	(0.11895)

APPENDIX O. *Engle and Granger Bivariate Test of Co-integration for India*

Dependent Variable (INCR)	N	Model	Asymptomatic Critical Values of co-integration			
Independent Variable		**Constant**	**1 %**	**5%**	**10 %**	**Test Statistic**
PKIR	2	Constant	-3.90	-3.34	-3.04	-3.13*
BGCR	2	Constant	-3.90	-3.34	-3.04	-4.23***
SRCR	2	Constant	-3.90	-3.34	-3.04	-3.25*

Significant at 10 % level, ** Significant at 5 % level, * Significant at 1 % level*

APPENDIX P. *Engle and Granger Bivariate Test of Co-integration for Pakistan*

Dependent Variable (PKIR)	N	Model	Asymptomatic Critical Values of co-integration			
Independent Variable		**Constant**	**1 %**	**5%**	**10 %**	**Test Statistic**
INCR	2	Constant	-3.90	-3.34	-3.04	-5.96***
BGCR	2	Constant	-3.90	-3.34	-3.04	-1.52
SRCR	2	Constant	-3.90	-3.34	-3.04	-5.64***

Significant at 10 % level, ** Significant at 5 % level, * Significant at 1 % level*

APPENDIX Q. *Engle and Granger Bivariate Test of Co-integration for Bangladesh*

Dependent Variable (BGCR)	N	Model	Asymptomatic Critical Values of co-integration			
Independent Variable		**Constant**	**1 %**	**5%**	**10 %**	**Test Statistic**
INCR	2	Constant	-3.90	-3.34	-3.04	-5.73***
PKIR	2	Constant	-3.90	-3.34	-3.04	-4.99***
SRCR	2	Constant	-3.90	-3.34	-3.04	-4.90***

Significant at 10 % level, ** Significant at 5 % level, * Significant at 1 % level*

APPENDIX R. *Engle and Granger Bivariate Test of Co-integration for Sri Lanka*

Dependent Variable (BGCR)	N	Model	Asymptomatic Critical Values of co-integration			
Independent Variable		**Constant**	**1 %**	**5%**	**10 %**	**Test Statistic**
INCR	2	Constant	-3.90	-3.34	-3.04	-3.61**
PKIR	2	Constant	-3.90	-3.34	-3.04	-4.64***
SRCR	2	Constant	-3.90	-3.34	-3.04	-1.72

Significant at 10 % level, ** Significant at 5 % level, * Significant at 1 % level*