Journal of Positive School Psychology
2023, Vol. 7, Issue 1
Pp 65-85

Monetary Transmission and Current-Account Dynamics in South Asian Countries.

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Abstract
With the emergence of global imbalances over the past few decades and is reflected through the large current-account deficit of USA with rest of the world. These global imbalances draw the attention of the policy makers and economists and a continuous debate about the sources and the implications it could have on future economic behavior. Furthermore, the developing and emerging economies are at a higher risk due to their weaker macro-economic framework and lesser capacity to bear the shocks. The present study observes the impact of global and, domestic monetary-policy shocks upon current account by using the PSVAR model and attempts to explore that how change in global monetary condition can influence the current account developments and provide an insight that how domestic monetary policy can be used to attain sustainable current account balances in South-Asia using a panel of four countries from 1984-2018. The study is further extended by including the country-specific effects as well. The results indicate that both global and domestic monetary policy shocks influence the current account balances in South-Asia, a rise in global interest rate leads to worsening of current account if the domestic interest rate is unable to counter this effect by a larger magnitude.

Keywords: current-account deficit, US monetary policy, PSVAR, impulse response

JEL Classifications: F32, F4, C32, C51

Article History:
Received: 17th Jan. 2023
Accepted: 27th Feb. 2023
Published: 28th Feb. 2023

1. Introduction

One of the main features of global economy is the emergence of global imbalances over the past few decades and is reflected through the large current-account deficit of USA with rest of the world. These global imbalances draw the attention of the policy makers and economists and a continuous debate about the sources and the implications it could have on future economic behavior (Ferrero et al., 2008). Furthermore, changes in global monetary policy specifically normalization of US monetary policy following the global financial crisis of 2008 has questioned the macro-economic stability of developing countries and their capability to adjust with macroeconomic shocks (Schuler & Sun 2022; Miranda-Agrippino and Ray 2020; Kalemli-Ozcan 2019; Rey 2013). However, this issue is of more concern among those countries which face persistent deficits in current account, as these economies are more inclined to uncertainty in financial and economic sectors. This issue arises due to fluctuation in capital-flows which ultimately is used to finance the deficits in current-account (Claessens & Ghosh, 2013). However, a consistent rise in global interest-rate constitutes a possibility of decrease in capital-flows to emerging market economies (EMEs) which would put these countries at a higher risk of reversal in current account deficits resulting in adverse outcome on growth. However, in case of EMEs due to increase volatility of exchange rate and capital-flows there is a higher risk, meanwhile, the countries which allow the appreciation of their currencies and widening of current account deficits are ones

which experience the greatest impact (Eichengreen & Gupta, 2015). The changing international monetary situation has revived the interest of researchers that if the deficits in current account balances among EMEs are consistent and arises the question that how current account deficits can be influenced by international monetary conditions. Furthermore, in order to determine that how monetary policy of a country can be employed to confine the external shocks, and, attain sustainable adjustment in current account balances.

There has been a long discussion that either the monetary policy expansion improves or deteriorate the trade-balance or current-account of a country but there is no general consensus either theoretically or empirically to this question (Kim2001b; Irvandi &Yildirim 2013; Zorzi et al.,2020). According to the Mundell-Fleming-Dornbusch model, an expansionary monetary policy leads to real exchange-rate depreciation resulting in an improved trade-balance. Conversely, a rise in domestic income because of expansion in monetary policy leads to a higher demand for domestic products resulting in worsening of trade balance. Nevertheless, the intertemporal approach focuses on forward-looking decisions of economic agents. An expansion in monetary policy results in transitory increase in income which may lead to an improved current account due to consumption smoothing. But if there is a decrease in real interest rate resulting in higher investment and it may lead to deterioration of current account (Kim 2001 b; Betts & Devereux 2000 a).

There are various existing studies which observe the relation between monetary policy variables (like interest rate and exchange rate) and current account (Schuler & Sun 2022; Londono, & Sapriza, 2015; Bauer & Neely, 2014; Lo Duca, & Straub, 2016; Scotti, & Wright, 2014; Lau et al., 2006 and Lee & Chinn ,2006) but these studies normally focused on developed countries. Yet in some cases the objective is to determine that if the monetary policy intervention can result in sustainable current account (Lu ,2012 and Lu 2009) or to determine the best monetary policy rule which smooth the current account balances (Di Giorgio &Nistico,2013 and Ferrero et al., 2008). Despite the fact that optimal monetary policy is necessary for stability in current account balances but these studies ignore the need to narrow down the monetary variables that can explain the behavior of current-account. Though there are few studies which tried to cover the gap, by observing effects of monetary policy shocks on current-account balance (Kim, 2001a and Lane,2001) but yet again these studies focused at developed economies and, do not have any significance for developing economies as the behavior of current account is different in low-income countries.

Therefore, in order to recognize that in what way current-account can be affected by monetary policy conditions as well as the minimal understanding of monetary variables that can influence the current account in South-Asian countries is the motivation to investigate the monetary policy role in current account stabilization.

The present study tries to observe the impact of monetary-policy shocks upon current-account balances, employing the panel structural var model (PSVAR) while considering the selected South-Asian Countries namely: Bangladesh, India, Pakistan and Sri Lanka for the time period of 1984-2018. Then for robustness, country-specific results are observed as well. This study has not taken into consideration the remaining South Asian countries on the pretext that, of the total GDP for the region, these countries merely contribute percent . To determine the effect of foreign interest rate shocks on current account. Furthermore, the study infers the mechanism that how changes in domestic monetary policy can influence the current accounts in developing countries.

The remaining of the paper is as follows; the literature is reviewed in section II, in section III methodology and data are discussed, section IV includes results and lastly section V includes the conclusion and policy implications.

2. Literature Review

The monetary approach to the balance of payments is used to describe the relation among current-account, and the monetary policy (Johnson, 1972; Frenkel & Johnson, 2013). According to this approach, any variation in the external position of a country is due to the change in domestic currency demand and supply which affects the domestic credit creation and finally resulting in a real income change. During the fixed exchange-rate, the monetary approach assumes that the surplus or deficit in balance of payment is due to the gap between demand for money and, supply of money. But main objection of monetary theory is that it assumes fixed exchange-rate from which most of the countries have departed. Therefore, it suggests that disequilibrium in balance of payment is due to the capital flows, as the monetary approach is unable to address the issue of assets demand which are determined not only in different currencies but also influenced by the fluctuations in exchange rate (Rabin & Yeager, 1982).

In order to deal with such issues, current account approaches have been evolved over the time. These

approaches, assume that balance of payment involves trading of goods &services as well as assets in international market that ultimately influence not only movement of money but the behavior of consumption and income as well. This concept is incorporated in Intertemporal approach to current account by Obstfeld & Rogoff (I995) who points out that any change in real economy could be responsible for the disequilibrium in balance-of-payment, therefore, balance-of-payment accounts of trading in goods & services among the nations. According to intertemporal-approach of current account, borrowing or lending in international market enables the countries to smooth consumption, therefore, the current-account is influenced by both internal and external interest rate during the process of borrowing and lending. This implies that monetary phenomenon of current account can be delineated by interest-rate, and, exchange-rate; hence suggesting that the monetary-policy can influence the current account.

Most of the empirical studies investigate the relation among monetary policy and, trade-balance and tried to analyze the occurrence of J-curve theory in case of industrial countries i.e., the exchange rate depreciation leads to worsening of trade balance during short-run but will improve in long-run. In that context Recently Iqbal et al., (2021) investigated the asymmetric J-curve for a panel data and identified evidence of J-curve in China, Malaysia and USA. Irvendi & Guloglu (2010) observed the relation among monetary policy, trade balance, and, exchange-rate for Canada, UK, Australia, New Zealand, and, Sweden. The results indicate that the strict monetary policy resulting in improved trade balance except for UK indicating no effect of J-curve in any of the above-mentioned countries. These findings are consistent with the study of Prasad & Gable (1998) which specify significance of interest-rate, and, monetary policy in determining current-account of any country. However, it is realized over the time that analysis on the impact of monetary variables can be further extended to the current account analysis as well i.e., to observe the effects of monetary policy shock on current-account balances. Lee & Chinn (2006) tested the structural VAR for G-7 countries with minimal assumptions. The results indicate that the permanent monetary shocks have larger effects on real exchange rater but insignificant and smaller effects on current account. Another recent study by Ferrero et al., (2008) investigate the current-account adjustment for monetary policy. Extending the Obstfeld &Rogoff (2005) model of exchange-rate and observed the impact of different monetary regimes for G-7 countries, considering USA as a home country and the rest as foreign country respectively. The results indicate that the monetary policy has deeper impact on inflation and output compared to on current account and exchange-rate.

Despite the fact that some of the studies disapprove the J-curve hypothesis, there are many studies which identify the validity of J-curve. The J-curve hypothesis suggest that as the domestic currency depreciates which reduces the prices of domestic products resulting in higher exports and lowering down the imports of a country. According to J-curve hypothesis the adjustment in trade balance is not immediate as the quantity of exports and import do not adjust, however, as the value of imports increase, causing a deficit in trade-balance. It means that in short-run the trade balance deterioration is due to the domestic currency depreciation. So, the impact of an expansion in monetary policy initially results in a budget deficit and then gradually turned into a trade surplus resulting in a J-curve. For example, Koray & McMillin (1999) examined the effect of trade-balance on monetary policy for the US economy and resulting in the contractionary policy shock results in transitory appreciation of nominal and real exchange rate leading to a short-term improvement in trade balance and then worsening of trade balance which support the J-curve hypothesis. Lane (2001) employed the VAR technique to observe that how monetary-policy can influence US current-account and, the findings are in line with J-curve theory i.e., current-account fluctuations are because of monetary-policy shock. In the same manner, Nadenichek (2006) also examined the response of trade-balance to the movements in exchange-rate for G-7 countries. The results indicate that the J-curve exist in five countries. Another recent study by Ezzat (2018) investigate the J-curve in Egypt along with eight countries. The results indicate that J-curve do not hold in long-term and the results are consistent with previous studies for same hypothesis in developing economies. Bhat & Bhat (2018) identified non-existence of J-curve in India, the results indicate that in worsening of trade balance due to appreciation in currency in short-run and the same result hold for long-run.

According to the Mundell-Fleming-Dornbusch (MFD) theory a financial expansion leads to depreciation in nominal exchange-rate and deteriorating terms of trade. The adjustment ultimately results in an improved in trade-balance is regarded as expenditure-switching effect. In contrast, when the same policy encourages domestic demand via increased imports resulting in worsening of trade balance is considered as income-absorption effect. Even though these two effects take the trade-balance in an opposite direction, movement in trade balance is determined by the dominant effect (Ncube & Ndou,2013; Kim,2001a).

The issue that how monetary policy shocks can be identified is investigated by Kim (2001 a) and Kim (2001b) reasoned that in open economy monetary shocks are identified much better as if it has the capacity to distinguish among money demand shocks, and, money supply respectively, which requires imposition contemporaneous identifying restrictions. These above-mentioned studies explore the effect of monetary policy on current account, trade balance and macroeconomic variables and results indicate that the expansion

in monetary policy deteriorate the trade balance of US economy and then improves gradually after a year. However, (Kim 2001b) used the VAR model to emphasize the impact of monetary shocks on small European countries which include Italy, France and UK. These findings identify the significance of global interest-rate in determining the trade-balance, and explains the mechanism that how monetary-policy shocks can be transmitted to an economy. Both Kim (2001a) and Kim (2001b) stressed the importance of foreign monetary policy and impact it can have on the current-account balances in case of developing economies. Even though the developing and emerging countries face greater level of risk whenever there is a change in global monetary policy, most of the studies observed are in context of developed countries (Dunne & Makanza 2016).

One of the recent researches considering the developing economies conducted by Ncube &Ndou (2013), examined link among monetary policy, trade-balance, and, exchange-rate for South Africa. This study explores that an expansion in monetary policy can influence the trade-balance either due to the income-absorption effect or because of expenditure-switching effect. Income-absorption effect is that the strict monetary policy decreases real GDP leading to a decrease in imports and thereby improved trade-balance. It also suggests that the interest rate shocks affect the trade balance as there is a change in rate of consumption. While the expenditure-switching effect exist when the contraction in monetary policy leading to a higher interest rate which results in greater capital-inflows, and, appreciation of exchange-rate. It indicates that exports are becoming expensive but imports are relatively cheaper resulting in higher demand of imports and thereby reduced demand for exports causing worsening of trade balance.

Yet another study in this context is done by Dunne & Makanza (2016) who extended the work of Ncube & Nadou (2013) and observed the channels that how monetary-policy shocks can influence current-account balances of South-Africa using SVAR technique. The results indicate that global monetary shocks influence the current account balances i.e., the rise in foreign interest-rate is followed by decrease in current-account deficit. Similarly, Gergiadis (2016) investigates the significant impact of U.S. monetary policy shocks on rest of the world depending on the exchange-rate regime, trade openness and financial integration. Adler and Buitron (2020) observed the effect of US monetary policy on trade balances and spillover effects on trade to the rest of world, results indicate that monetary expansion leads to improved trade balance. Zorzi et al., (2020) observed the spillover effects of U.S. monetary policy shocks and result indicate Fed monetary policy has larger impact on financial markets of emerging economies as well as on economic activity. Schuler & Sun (2022) examined the drivers current-account balances and interest-rate for Germany, Italy and Spain by employing structural VAR indicating that investment shocks lead to improved current account and interest rates. The results also specifies that US monetary shocks have significant impact on euro economy.

In order to observe the underlying relation between current account balances and macroeconomic variables, the NOEM models investigate the relation between exchange-rate, and current-account. For example, Lane & Milesi-Ferretti (2002) and Bergin (2006) explain the relation between current-account, and, exchange-rate by developing different macroeconomic models and the results indicate that a shift in current-account is mainly due to the divergence from uncovered interest parity, or in other words in some cases it affects the current account more strongly rather than the exchange rate.

This study intends to follow the structural VAR to observe the effect of monetary-policy shocks upon current-account in South-Asian countries. SVARs are considered as an appropriate technique for this study, due to its ability to integrate the assumptions that possibly be used to identify the model. Many of the studies has used the SVAR model to observe the dynamics of current account (Kano, 2008; Lee & Chinn, 2006; Corestti & Muller, 2006).

3. Methodology & Data

The study follows the structural vector autoregressive (SVAR) to identify that in what manner monetary policy shocks can be observed on current-account. According to Kim &Roubini (2008) vector autoregressive (VAR), models are more effective to control the endogeneity element of shocks. The study considers the following ordering of variables for SVAR;

Xt= [USRATE, RGDP, CAD, RIR, REER]

is a five by one column vector. USRATE is the foreign interest-rate which indicates the US interest-rate, and can be used as a proxy to global monetary shocks, RGDP is the real gross domestic product which shows the general economic performance, CAD is the current-account deficit calculated as a ratio of GDP, RIR is the domestic interest-rate, and REER, is the real effective exchange-rate.

The simple vector autoregressive model for each cross- sectional unit ‘i’ can be written in functional form as:

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$$usrate_{i\,t} = f\,(rgdp_{i\,t},\ cad_{i\,t},\ rir_{i\,t},\ reer_{i\,t},\ usrate_{i\,t-l},\ rgdp_{i\,t-l},\ cad_{i\,t-l},\ rir_{it-l},\ reer_{i\,t-l}) + e^{usrate}{}_{i\,t}$$

$$rgdp_{i\,t} = f\,(usrate_{i\,t},\ cad_{i\,t},\ rir_{i\,t},\ reer_{i\,t},\ gdp_{i\,t-l},\ usrate_{i\,t-l},\ cad_{i\,t-l}\ rir_{it-l},\ reer_{i\,t-l}) + er^{gdp}{}_{i\,t}$$

$$cad_{i\,t} = f\,(usrate_{i\,t},\ rgdp_{i\,t},\ rir_{i\,t},\ reer_{i\,t},\ cad_{i\,t-l},\ usrate_{i\,t-l},\ rgdp_{i\,t-l},\ rir_{i\,t-l},\ reer_{i\,t-l}) + e^{cad}{}_{i\,t}$$

$$rir_{i\,t} = f\,(usrate_{i\,t},\ rgdp_{i\,t},\ cad_{it},\ reer_{i\,t},\ rir_{i\,t-l},\ usrate_{i\,t-l},\ r\,gdp_{i\,t-l},\ cad_{i\,t-l},\ reer_{i\,t-l}) + e^{rir}{}_{i\,t}$$

$$reer_{it} = f\,(usrate_{i\,t},\ rgdp_{i\,t},\ cad_{i\,t},\ rir_{i\,t},\ reer_{i\,t-l},\ usrate_{i\,t-l},\ rgdp_{i\,t-l},\ cad_{it-l},\ rir_{i\,t-l}) + e^{reer}{}_{i\,t}$$

where i = 1, 2……4, as four cross-sectional units are included in our model l represents the number of lags to be included in model. The difference between the simple VAR, and, the SVAR model is that the in simple VAR model contemporaneous relation does not exist among the variables but in case of SVAR model there exists a contemporaneous relation among the variables which is illustrated by matrix A in which there are coefficients for the variables with the current time period t. in vector form the SVAR panel model is represented as:

$AX_{i\,t} = BX_{t\,t-1} + \varepsilon_{i\,t}$ $\qquad \varepsilon_{i\,t} \sim iid(0, \sum\varepsilon)$ for each 'i'

$$\text{With } A = \begin{bmatrix} 1 & \alpha_{usrate,rgdp} & \alpha_{usrate,cad} & \alpha_{usrate,rir} & \alpha_{usrate.reer} \\ \alpha_{rgdp,usrate} & 1 & \alpha_{rgdp,cad}, & \alpha_{rgdp,rir} & \alpha_{rgdp,reer} \\ \alpha_{cad,usrate} & \alpha_{cad,rgdp} & 1 & \alpha_{cad,rir} & \alpha_{cad,reer} \\ \alpha_{rir,usrate} & \alpha_{rir,rgdp} & \alpha_{rir,cad} & 1 & \alpha_{rir,reer} \\ \alpha_{reer,usrate} & \alpha_{reer,rgdp} & \alpha_{reer,cad} & \alpha_{reer,rir} & 1 \end{bmatrix}$$

Here Xit = (USRATEit, RGDPit, CADit, RIRit, REERit) is the vector of endogenous variables i.e. foreign interest rate, gross domestic output, current account deficit, domestic interest-rate, and, real effective exchange-rate for each cross-sectional unit 'i'. Matrix A with 1 diagonal and non-zero elements otherwise show the contemporaneous relationship between the variables. Then at the later stage, during the process of identification restrictions can be imposed depending on the economic theory. Lastly, Xit represents the vector Xt with lth number of lags, B implies the respective coefficients matrix, and εit is the vector of error-terms with zero mean and constant variance and uncorrelated with each other for each unit of the cross section. These error terms are actually the structural shocks for their respective variables.

To implement the identification scheme, the study followed the Kim & Roubini (2008) model, but restrict it to focus only to the effect of monetary-policy shocks upon current-account. The basic identification scheme using a recursive-model where the ordering of variables mentioned as {USRATE, RGDP, CAD, RIR, REER} where USRATE is foreign interest rate considered as exogenous variable which indicate the effect of change in foreign monetary policy, and its effect on current-account. RGDP indicates real gross domestic product, assuming that output do not respond to other variables contemporaneously (Kim & Roubini ,2000 a). The ordering of current-account deficit on third number, is affected by the foreign interest rate and output contemporaneously but do not respond to exchange-rate. Afterwards, real interest- rate is ordered fourth, an indication of domestic monetary-policy, and its influence upon current-account. As one of the basic goals of monetary policy is to keep inflation under certain control, it is assumed that interest-rate cannot be influenced with rest of the variables in given model contemporaneously Gajic, R. (2012). However, real effective exchange-rate is ordered last after the real interest-rate representing the financial market equilibrium. It is assumed that all the variables can affect o real exchange-rate contemporaneously (Kim & Roubini ,2008 and Kim & Roubini, 2000 a).

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The restrictions for the specification are mentioned as:

$$\begin{bmatrix} \Delta USRATE_t \\ \Delta RGDP_t \\ \Delta CAD_t \\ \Delta RIR_t \\ \Delta REER_t \end{bmatrix} = \begin{bmatrix} B_{11}(L) & 0 & 0 & 0 & 0 \\ B_{21}(L) & B_{22}(L) & 0 & 0 & 0 \\ B_{31}(L) & B_{32}(L) & B_{33}(L) & 0 & 0 \\ B_{41}(L) & B_{42}(L) & B_{43}(L) & B_{44}(L) & 0 \\ B_{51}(L) & B_{52}(L) & B_{53}(L) & B_{54}(L) & B_{55}(L) \end{bmatrix} \begin{bmatrix} U_{USRATE,t} \\ U_{RGDP,t} \\ U_{CAD,t} \\ U_{RIR,t} \\ U_{REER,t} \end{bmatrix}$$

In order to identify the structural parameters from this given system, where $\varepsilon_{USRATEt}$, ε_{RGDPt}, $\varepsilon_{CADt}, \varepsilon_{RIRt}$ and ε_{REERt} indicate structural disturbances. The below mentioned lower-triangular system formulate the base to identify restrictions.

$$\begin{bmatrix} U_{USRATE,t} \\ U_{RGDP,t} \\ U_{CAD,t} \\ U_{RIR,t} \\ U_{REERt} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ G_{21}(L) & 1 & 0 & 0 & 0 \\ G_{31}(L) & G_{32}(L) & 1 & 0 & 0 \\ G_{41}(L) & G_{42}(L) & G_{43}(L) & 1 & 0 \\ G_{51}(L) & G_{52}(L) & G_{53}(L) & G_{54}(L) & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{USRATE,t} \\ \varepsilon_{RGDP,t} \\ \varepsilon_{CAD,t} \\ \varepsilon_{RIR,t} \\ \varepsilon_{REER,t} \end{bmatrix}$$

The present study uses the annual data to observe effect of monetary, and macroeconomic variables upon the current-account deficit for the four selected South-Asian countries namely: Bangladesh, India, Pakistan and Sri Lanka from 1984 to 2018. This study has not taken into consideration the remaining South Asian countries on the pretext that, of the total GDP for the region, these countries merely contribute 2 percent .To identify the effect of foreign monetary policy, US interest rate is foreign interest rate considered as exogenous variable which indicate the effect of change in foreign monetary policy, and its effect on current-account., measured in log terms and taken from international financial statistics (IFS). Real gross domestic product (RGDP) assuming that output do not respond to other variables contemporaneously (Kim & Roubini ,2000) and is being estimated at constant prices of 2010 and measured in logs. The ordering of current-account deficit on third number, is affected by the foreign interest rate and output contemporaneously but do not respond to exchange-rate. The current-account deficit (CAD), variable is being estimated as the ratio of the current-account balance to gross domestic product (GDP) in per centage terms. To show the effects of domestic monetary policy, the real interest-rate (RIR), is used which indicates the lending interest-rate adjusted for inflation and measured in log terms. The effective exchange rate (REER) is a weighted average of currency relative to an index (or group of other major currencies) adjusted for inflation. Using the real interest-rate (RIR), and, real effective exchange-rate to indicate the impact of monetary-policy shocks on current account is used by some of the studies (Dunne & Makanza ,2016; Lu ,2009 and Kim & Roubini, 2008).

4. Results:

The objective of present study is to observe the association among current account deficit, and monetary policy as well as to analyze that how a change in global monetary-policy shocks, and, domestic monetary-policy shocks can influence current-account balances in case of selected South-Asian Countries. The table 1. mentions the descriptive statistics for the baseline model.

Table 1. Descriptive statistics for Selected South-Asian Countries.

Variables	MEAN	STD.DEV	MIN	MAX
USRATE	4.2312	2.0772	1.1613	8.2031
RGDP	5.2459	3.1238	-1.5454	9.6277
CAD	-2.0901	2.5094	-9.5431	5.3300
RIR	5.3035	2.9382	0.3128	14.8214
REER	2.0405	0.0818	1.8978	2.3027

The table indicate that maximum current-account deficit is -2.09 per cent of GDP, maximum real interest-rate is 14 per cent, however, the maximum real effective exchange rate is 2.3 per cent respectively. The standard deviation indicates that the maximum fluctuation is in current-account deficit, and, then in real interest-rate i.e., 2.5 per cent, and 2.9 per cent respectively, which can be because of using interest-rate as a policy variable to control inflation. The present study proceeds by using the stationary data with the objective to attain unbiased estimates. The results from the panel-unit root test are mentioned in table 2 which indicate that all variables are stationary at 5 percent significance level.

Table 2. Panel-unit root test: Levin, Lin & Chu test.

Variables	Level	1st-difference
USRATE	-1.5001	-5.3096
RGDP	-2.8149	-7.5007
CAD	-1.2386	-6.4428
RIR	-3.7814	-8.2543
REER	-1.0827	-2.8764

Since all the variables are stationary at 1st-difference I (1), panel cointegration test is observed which indicate that there is no long-run relation among the variables1. While estimating the VAR models, one of the important criterions is to select the appropriate lag length selection. To find the appropriate lag length all the five tests are being observed which are; Likelihood Ratio (LR) test, the Final Prediction Error (FPE) test, Akaike Information Criterion (AIC) test and Hannan-Quinn Information Criterion (HQ) test.

Table 3: Lag-length Selection

Lag length	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	NA	$1.03e-^{13}$	-15.7174	-15.6037	-15.6712
1	132.3904	$5.01e-^{14}$	-16.4361	-15.7538	-16.1590*
2	52.0369	$-4.74e-^{14}$	-16.4934	-15.2425	-15.9853
3	44.7317*	$4.71e-^{14}$*	16.5044*	-14.6848*	-15.7652

*indicates the optimal lag-length chosen by criterion.

The results are reported in the above-mentioned table-3, which indicates that the appropriate lag-length for the baseline differenced model is 3 that can be applied to observe the effects of monetary-policy shocks upon current-account deficits of South-Asian Countries. To check the stability of model, three diagnostic tests are observed and mentioned below in table-4 and results indicate that model discussed is not serially correlated and multivariate normal.

Table-4 Diagnostic Test

	White Test (cross)	**Normality Test**	**LM Test**
Model	0.1414	0.1921	0..4169
White test;	H_0: no heteroscedasticity exists.		
Normality test;	H_0: residuals are multivariate normal		
LM test;	H_0: no serial autocorrelation		

To observe the impact of monetary policy shocks on current-account in South-Asian Countries by using the impulse response, which indicates the impact of shock of an endogenous variable in system on rest of the variables. The figure-1, illustrates the impact of monetary shocks on current-account in case of South-Asian Countries2.

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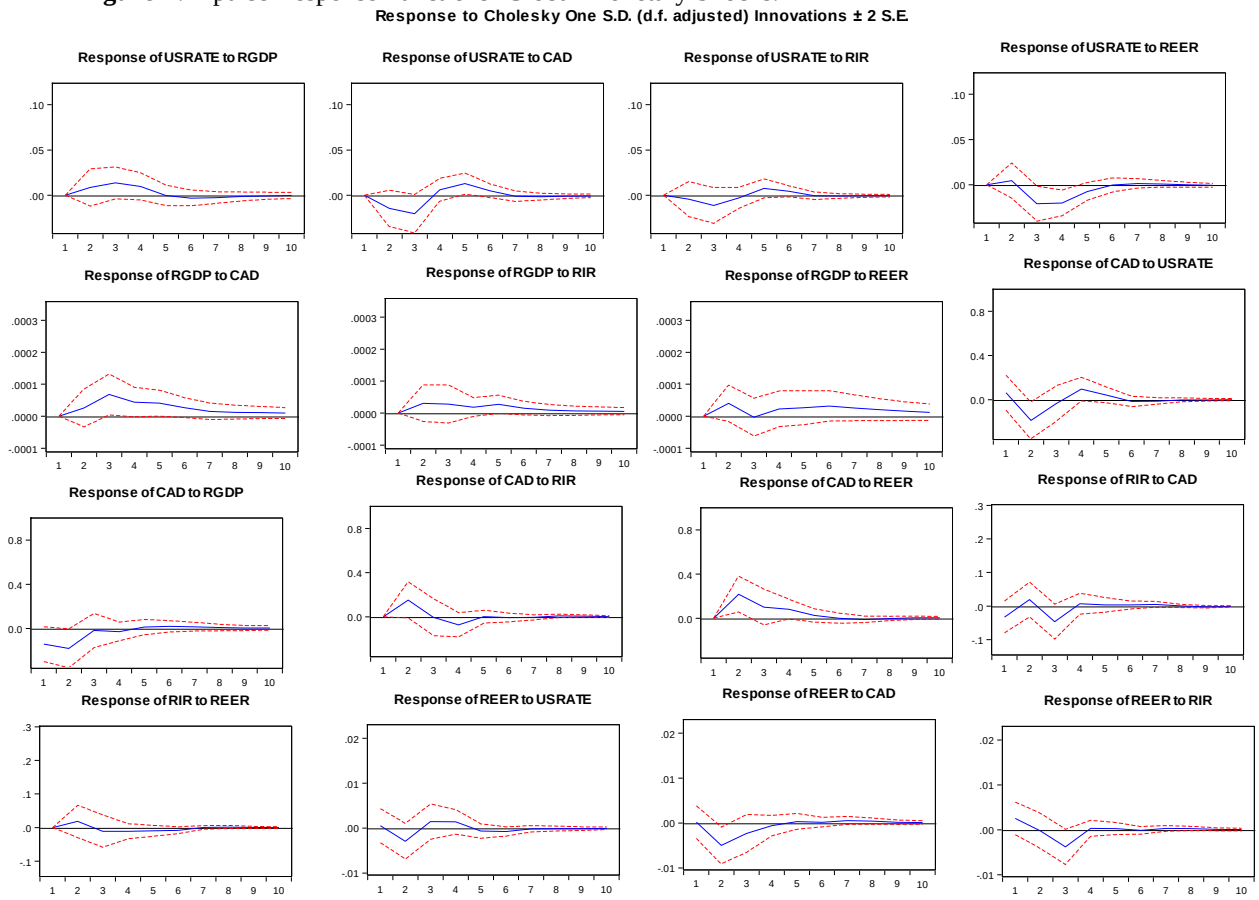
Figure-1.Impulse Response Functions- Global Monetary Shocks.



The figure-1, analyze the effect of positive USA interest-rate, and it is used as an alternate to indicate the global monetary-shocks that leads to an expansion in real GDP in column 1 of row 1. The results indicate that one SD shock in global monetary interest rate has smaller but significant impact on RGDP or domestic output for the first three years and then later on becomes insignificant in the considered time period. In the same manner, influence of expansionary global-monetary shocks upon current-account deficit is insignificant initially, however, at later stages it becomes significant i.e., in year 5 and year 6 reaches to the peak and then becomes insignificant for the considered time period, which ultimately leads to depreciation of real effective exchange-rate. These results are consistent with Mundell-Fleming Dornbusch (MFD) model which specifies that a monetary expansion leads to a higher domestic demand for imports due to higher output or income in short-run resulting in deterioration of current account deficit (Kim ,2000 a; Belts & Devereux ,2000 a).

To observe the impact of output shocks on current-account, it demonstrates that a positive shock to output there is a worsening of current-account deficit during first three years and then it becomes insignificant for the considered time period. However, with the positive output shocks, the real exchange-rate appreciates, and a rise in real interest-rate shown in row 2 and column 2 and 3 respectively. These results are consistent with economic theory of current account which suggests that a positive productivity shock can raise the investment, and resulting in worsening of current-account. These effects have a counter-cyclical effect on the current-account as suggested by (Mendoza ,1991; Backus et al., 1994). Similarly, King & Rabelo (1999) suggested that a rise in the real interest-rate may result in a positive and persistent productivity shock. To observe the effect of current account on the domestic monetary policy which is proxy as, real interest-rate mentioned in row 2, of column 4 which indicate worsening of current-account due to strict monetary policy. However, due to the depreciation in real effective exchange rate shown in row 3, column 1 indicate that the current account slightly improves before worsening by 0.10 pp which shows the J-curve effect. These results are consistent with Kim & Roubini (2008) argued while observing the case of USA specify that exchange-rate depreciation results in an improved current-account position, however, in the present study depreciation in real effective exchange-rate leads to worsening of current-account by 0.10 percentage point.

The impulse response functions results discussed earlier specify the total effects of the shocks. In order to know the contribution made by each variable in SVAR, variance decomposition is used which results are mentioned in table-6 given below.

Table-5 Structural Variance Decomposition-Global Monetary Policy

Period	USRATE	RGDP	CAD	RIR	REER
1	0.4742	2.5268	96.9989	0.0000	0.0000
3	4.1890	5.5113	82.0525	1.5997	6.6472
6	5.1767	5.4860	78.0571	4.2505	7.0294
9	5.5920	5.5060	76.0035	5.2580	7.0397

The results indicate that the current-account is substantially influenced due its own shocks that has a contribution about 96.6 percent in period 1 but this contribution continue to reduce at the longer horizon to 76 percent in period 9. However, the contribution of foreign interest-rate (US-RATE), and, real effective exchange-rate (REER) increases with time. The contribution of foreign interest rate shock to explain variation in current account 4.1 percent in period 3 which increases to 5.5 percent period 9 respectively. In the same manner, the contribution of real effective exchange-rate shock to explain variation in current-account is 7 percent in period 9 respectively. Similarly, the output shocks explain about 6 percent variation and the real interest rate shocks explain 5.2 percent variations in current account shocks. This shows that in case of South-Asia, current-account is influenced by domestic as well as foreign monetary policy. These results indicate that due to the contractionary foreign monetary policy, domestic interest-rate raises resulting in worsening of current-account. Meanwhile, exchange-rate depreciation and contractionary domestic monetary-policy also deteriorates current-account. Though, foreign monetary-policy and real effective exchange rate have relatively large effects on current-account deficit relative to domestic monetary-policy. The results are consistent with the findings of (Dunne & Makanza ,2016; Bergin ,2006) argued that the emerging and developing economies are more influenced by the exogenous shocks like foreign monetary policy as compared to the developed countries.

While using the VAR models, one of the issues that can influence the results depend on the choice of variables and choice of restrictions. In order to check the robustness of this model, the present study tried to observe the effect of nominal interest-rate (NIR) substituting it with real interest rate (RIR), as well as the impact of nominal effective exchange-rate (NEER) instead of real effective exchange-rate (REER). This exercise is being observed to examine, if current-account behavior can be changed when nominal variables are used rather than real monetary variables. Therefore, to compare the estimates of the model using nominal variables with the initial model which is using real variables, the results are stated in figure-2.

Using the nominal monetary variables indicate the same results as in the case of real variables. It indicates that influence of expansionary global-monetary shocks upon current-account deficit are significant but smaller initially, and then becomes insignificant for the considered time period, shown in row 1 column 2. While observing the effect of current-account on the domestic monetary-policy in column 4 of row 2, indicate the deterioration of current account, because of contractionary monetary policy by a maximum of 0.36 percentage point. However, due to the depreciation in nominal effective exchange rate shown in row 3, column 1 indicate that the current account slightly improves before worsening by 0.16 pp. Even though the results of impulse response functions with nominal variables have the similar magnitude as in case of model with real variables. Yet, the main difference is the effect of domestic monetary-policy shock upon current-account is relatively smaller in case of nominal variables model shown in figure-2, which suggest that compared to nominal variables, real variables have more significant and strong effect on current-account.

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Figure-2. Impulse Response Functions- Nominal Domestic Monetary Shocks

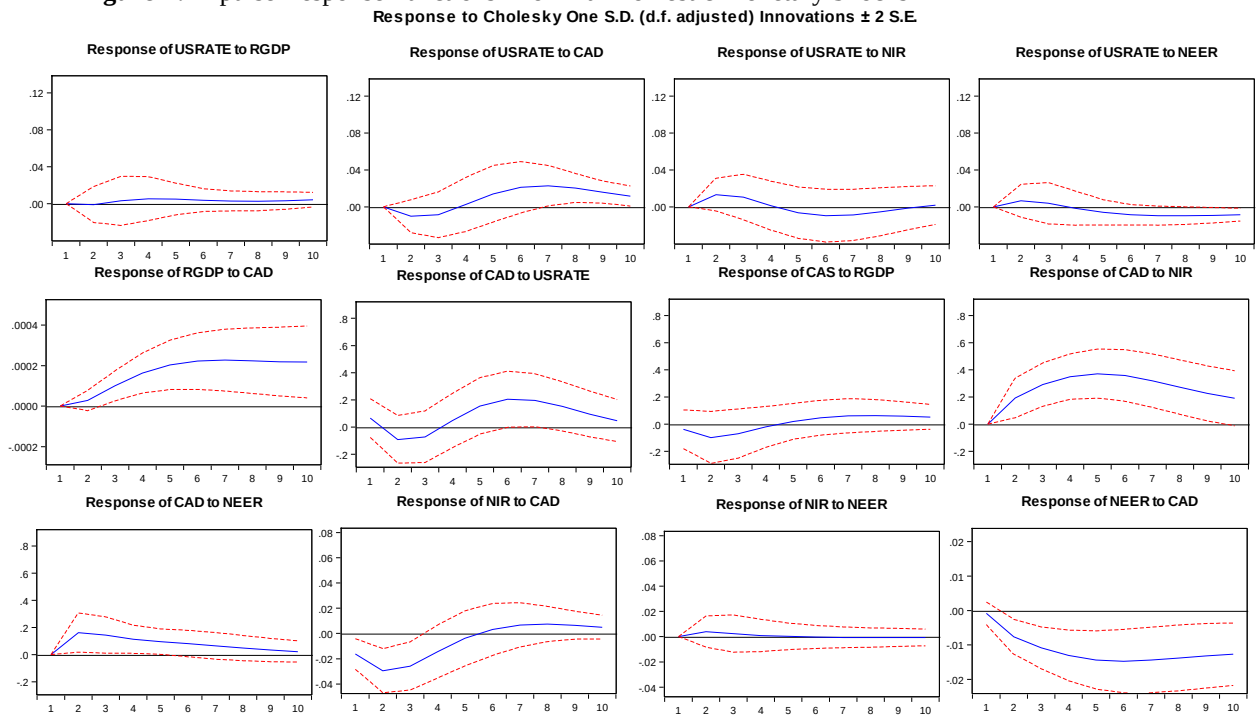


Table-6 Structural Variance Decomposition-Nominal Domestic Interest Rate

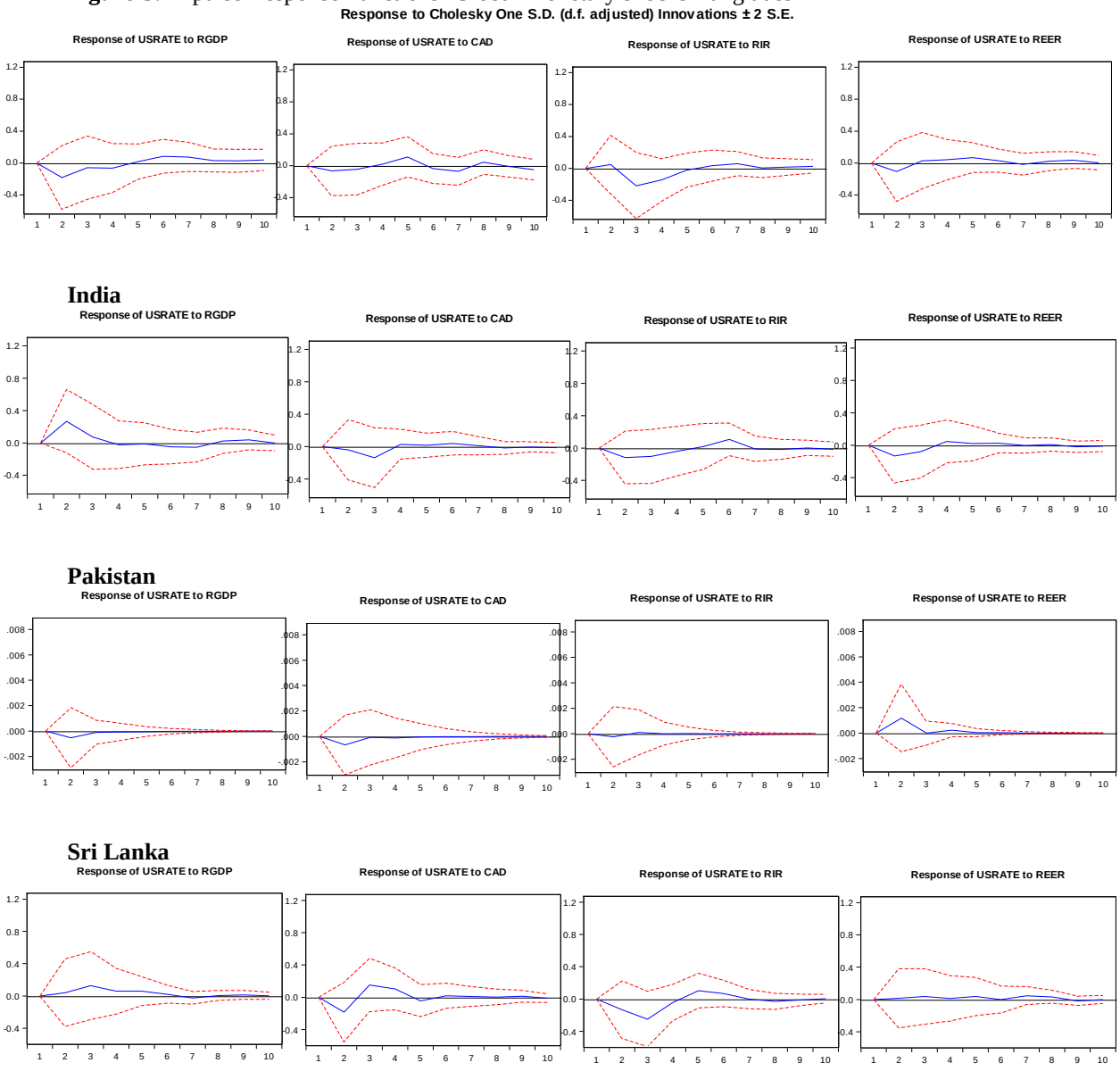
Period	USRATE	RGDP	CAD	NIR	NEER
1	0..3818	1.2489	98.3691	0.0000	0.0000
3	4.7155	4.2211	82.2731	3.2374	5.5527
6	5.6393	4.1776	80.8866	3.2913	6.0050
9	5.6590	4.1871	77.8369	4.3066	6.0102

The variance decomposition results are shown in table-6, which shows that the contribution of foreign interest rate to explain variation in current account is 5.6 percent which is similar to the initial model when the real variables are used i.e., 5.5 percent. The nominal exchange rate contribution to the current account is 6 percent which lower relative to real effective exchange-rate i.e., 7 percent. Likewise, contribution of the nominal interest rate which indicate the domestic monetary policy is 4.3 percent to explain variation in current account which is relatively smaller in volume, as compared to the impact of domestic monetary-policy discussed in earlier model where real variables are observed i.e., 5.2 percent which indicate that the domestic monetary policy has a smaller role to manage the current account balances.

Country-Specific Shocks

The study begins with the panel-analysis of impact of USA interest-rate shocks, that are used as an alternate to indicate the global monetary- policy shocks upon current-account in South-Asian countries. In order to do a comprehensive analysis, the country-specific effect of US interest rate shocks is also observed.

Figure-3. Impulse Response Functions- Global Monetary shocks Bangladesh



The diagram-3 displays, impulse-response functions to a shock in Bangladesh, India, Pakistan, and, Sri Lanka respectively. The results specify that one SD shock in global interest rate has smaller but insignificant effect on real GDP in case of Bangladesh and Pakistan. However, in case of India, and, Sri Lanka it is significant for the first three years and then gradually become insignificant over the subsequent time period. In the same manner, while observing the effects of global monetary shocks on current account deficit is insignificant in case of India and Pakistan but very small and significant for Sri Lanka and Bangladesh.

Considering the global interest rate shock on real interest rate reveals that impact of global interest rate is insignificant in case of Pakistan, and, Sri Lanka, however, considering Bangladesh, and, India the impact is very small and then it gradually become insignificant over the considered time period. Yet, the impact of global interest rate is significant on real effective exchange-rate in case of Pakistan, and India, even though the impact is quite smaller. These results are in line with the results of Caglayan et al., (2016) who argued that a rise in foreign interest rate will result in depreciation of real effective exchange-rate which ultimately results in higher domestic interest rate.

Therefore, while observing the cross-country effects the results the magnitude of the impact of global interest rate is similar to the one which are observed in panel estimation.

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Variance Decomposition Country-Specific Effects.

In order to know the contribution made by each variable, structural variance decomposition is used. The table.7 indicates the variance decomposition analysis of foreign interest rate shocks in case of each selected country under consideration.

Table-7-Structural Variance Decomposition- Country-Specific Effects.

Bangladesh

Period	USRATE	RGDP	CAD	RIR	REER
1	0.1393	5.8245	94.0361	0.0000	0.0000
3	21.9143	5.1295	57.1401	8.6874	7.1286
6	25.1155	6.2606	52.9647	9.0909	6.5680
9	25.7372	6.4632	52.1087	9.1799	6.5108

India

Period	USRATE	RGDP	CAD	RIR	REER
1	0.2986	9.1576	95.5936	0.0000	0.0000
3	3.0427	14.7526	67.3693	14.1356	0.6996
6	9.6693	14.8984	51.8090	20.1763	3.4466
9	11.2430	14.8415	50.2876	20.1693	3.4592

Pakistan

Period	USRATE	RGDP	CAD	RIR	REER
1	1.5381	13.8762	84.5856	0.0000	0.0000
3	4.0813	28.7762	61.3862	4.3437	1.4122
6	35.9668	16.9326	38.6532	6.4197	2.0274
9	36.2966	10.6795	37.6922	8.1949	3.1366

Sri Lanka

Period	USRATE	RGDP	CAD	RIR	REER
1	2.4001	21.8267	75.7731	0.0000	0.0000
3	2.5651	14.9738	61.0115	0.7415	20.7078
6	7.6127	13.7278	54.5804	5.4620	18.6169
9	7.6493	13.6786	54.5063	7.6760	16.4895

The results specify that current-account is influenced with its own shocks, and its share is about 94 percent in case of Bangladesh, 95 percent in India, in Pakistan 84 percent and 75 percent in case of Sri Lanka respectively. But this contribution continues to reduce in longer horizons in case of all economy's under-consideration.

Furthermore, the contribution foreign interest rate shock which is indicated through US interest-rate, and, real effective exchange-rate continue to increase over time. The contribution of foreign interest rate shock to explain variation in current account is 25 percent in period 9 in Bangladesh, 11 percent in India, 36 percent in Pakistan and around 8 percent in Sri Lanka in period 9 respectively. In the same manner, the contribution of real effective exchange-rate shock to explain variation in current-account continue to increase in longer horizon. Similarly, the real interest rate shocks explain about 6.5 percent variation in Bangladesh, 20 percent in India, 8 percent in Pakistan and 7 percent variations in current account shocks in Sri Lanka respectively. This describe that in South-Asia, current-account is influenced not only by domestic but with foreign monetary policy as well. These results are in line with the findings of Khan & Ahmed (2016) identifies that in US monetary policy has a sound impact on monetary policy of South-Asian countries, that it not only results in deprecation of real effective exchange-rate but also influences domestic real interest -rate.

To summarize this discussion, the purpose is to observe the effect of monetary shocks upon current-account in selected South-Asian Countries and for that both panel and country-specific results are presented.

The present study applies a structural VAR technique and impact of both real and nominal variables is observed. The key findings suggest, that current account is influenced by the monetary variables i.e., exchange-rate and interest-rate.

5. Conclusion

The emergence of global imbalances over the past few decades which is reflected through the large current-account deficit of USA with rest of the world. Specifically, the normalization of US monetary policy after the financial crisis of 2008 raised many questions while considering the financial and economic soundness of emerging, and, developing countries and their capacity to adjust with economic shocks. Yet, these practices are common in economies which suffer more due to persistent deficits in current-account and are usually financed by foreign capital. The developing and emerging countries usually fall in this category as these countries have been characterized by higher interest-rate relative to the rest of the world. The question arises that if the deficit in current account balances in emerging economies are consistent, then how current account can be influenced by the monetary conditions in global market, and to what magnitude monetary policy domestically can be applied to confine external shocks and attain sustainability in current-account balances. Therefore, in order to analyze the link between monetary policy, and current-account in low-income countries motivates the present study to examine the contribution of monetary policy to stabilize external balance.

The present study employs the panel structural model (PSVAR) to determine the effects of foreign monetary policy shocks along with domestic monetary shocks on current-account balances in case of selected South-Asian Countries. For robustness, country-specific effects are observed as well and the results are similar to panel.

The novelty of this study that how change in foreign monetary policy can influence current-account by considering South-Asian Countries as a case-study, considered as an emerging market with developing country characteristics, and wide current account deficits which extremely affected by the global monetary conditions.

The results indicate that the monetary policy shocks are important to determine current-account as well as if domestic interest rate do not change in response to change in foreign interest rate, it is possible that a reversal in current-account i.e., narrowing of deficit. Furthermore, the real effective exchange rate appears to be an important variable that dominates the monetary policy. The results specify that a strict foreign monetary policy leads to a rise in interest-rate domestically that ultimately increase public savings. These results are consistent with the findings of (Khan & Ahmed ,2016), observed the monetary policy behavior in South-Asian Countries suggesting that monetary policy in these countries is influenced by foreign interest-rate, and movement in exchange-rate.

The findings from this study specifies that foreign monetary policy influences the current account behavior in South-Asian countries, therefore it is suggested to include the foreign interest rate in monetary policy reaction function to absorb the external shocks, as the inclusion of related monetary policy variables helps to control the external shocks and minimize the biases. As the real effective exchange-rate influences the monetary policy, it is suggested to target the exchange rate along with the domestic interest rate to control output and inflation in an economy. And lastly, to protect the domestic economies from the global shocks, the monetary authorities are required to improve the efficiency and competitiveness of domestic financial markets by introducing more regulations.

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Appendix

Descriptive Statistics

Variables	Bangladesh	India	Pakistan	Sri Lanka
US RATE				
Mean	4.2908	4.2908	4.2908	4.2908
Mini	1.1613	1.1613	1.1613	1.1613
Maxi	8.2031	8.2031	8.2031	8.2031
Std. Dev	2.1014	2.1014	2.1014	2.1014
RGDP				
Mean	5.2537	6.2767	4.5617	4.9559
Mini	2.4162	1.0568	1.0143	-1.5454
Maxi	7.8637	9.6277	7.7058	9.1445
Std. Dev	1.3277	1.9182	1.8727	2.0800
CAD				
Mean	-0.1885	-1.4064	-2.5739	-4.0117
Mini	-3.8203	-5.0048	-9.2043	-9.5431
Maxi	3.4701	1.4435	5.3300	0.0145
Std. Dev	1.6408	1.2553	2.8880	2.2890
RIR				
Mean	6.9442	6.2010	2.5259	5.5499
Mini	3.0686	1.0853	0.5500	0.3128
Maxi	17.8214	9.1912	7.9500	12.7417
Std. Dev	2.7322	2.1180	1.6855	3.1226
REER				
Mean	2.0795	2.0179	2.0618	1.9978
Mini	1.9927	1.8985	1.8985	1.8978
Maxi	2.2097	2.2283	2.3027	2.1367
Std. Dev	0.0564	0.0899	1.3938	0.0761

Panel Co-integration Test

Pedroni Residual Cointegration Test
Series: USRATE RGDP CAD RIR REER

Sample: 1984 2018
Included observations: 140
Cross-sections included: 4
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	0.012673	0.4949	-0.207777	0.5823
Panel rho-Statistic	0.457777	0.6764	0.541711	0.7060
Panel PP-Statistic	-0.274512	0.3918	-0.112879	0.4551
Panel ADF-Statistic	-2.414631	0.0079	-2.480633	0.0066

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	1.301725	0.9035
Group PP-Statistic	0.252645	0.5997
Group ADF-Statistic	-2.529336	0.0057

Lag-length Selection

Lags	**Bangladesh**		**India**		**Pakistan**		**Sri Lanka**	
	SC	**HQ**	**SC**	**HQ**	**SC**	**HQ**	**SC**	**HQ**
0	7.6452	7.4948	8.1794	8.0289	8.8386	8.6882	3.9360	2.7829
1	-2.1093*	-3.0120*	-1.2216*	-2.1243*	-0.4819	-1.3846*	2.5554*	1.6368*
2	-1.2179	-2.8729	-0.5149	-2.1699	0.6391	0.6391	3.7123	2.0281

**indicates the optimal lag-length using the criterion.*

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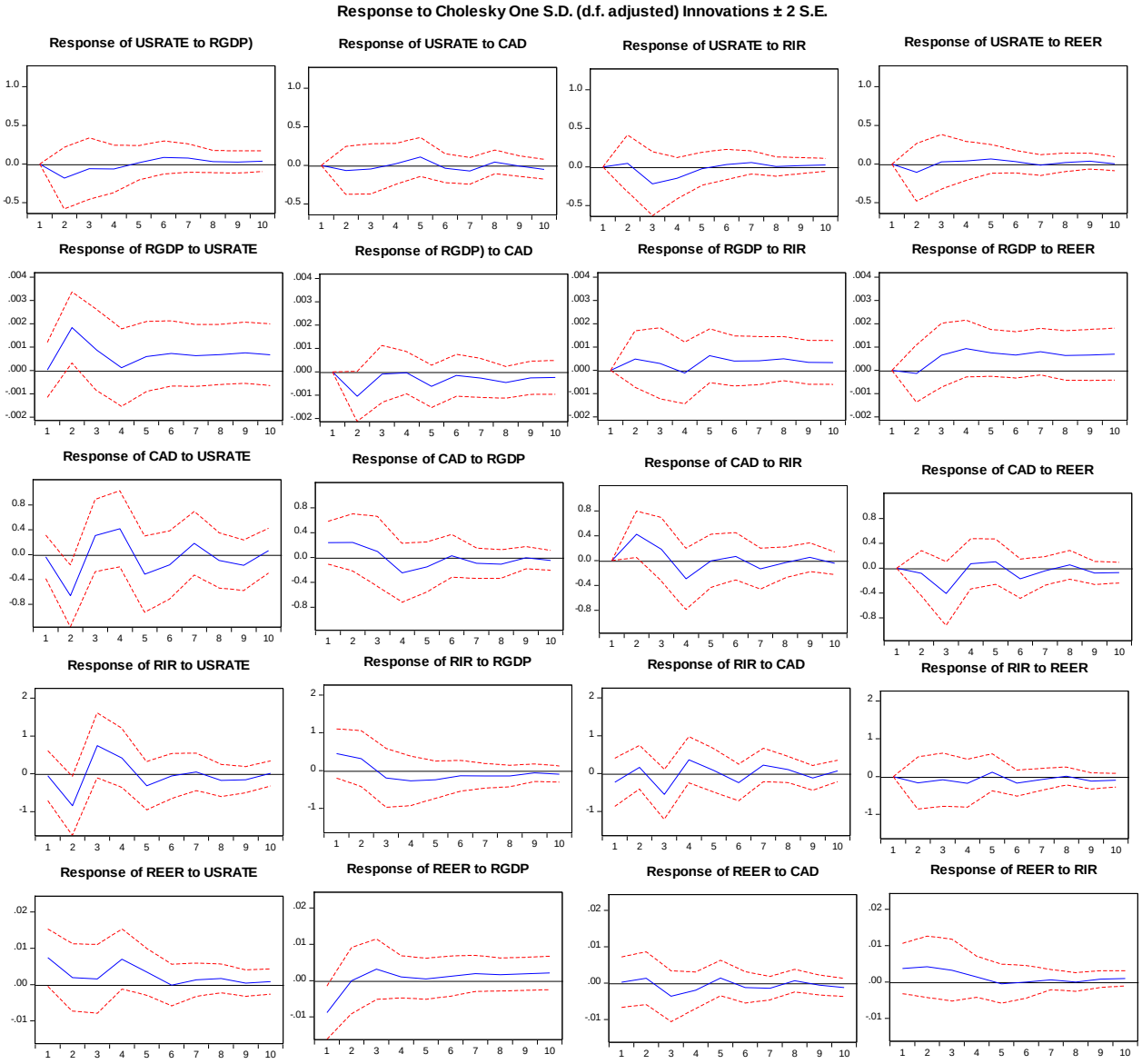
Impulse response functions-Country-Specific Monetary Shocks

Bangladesh



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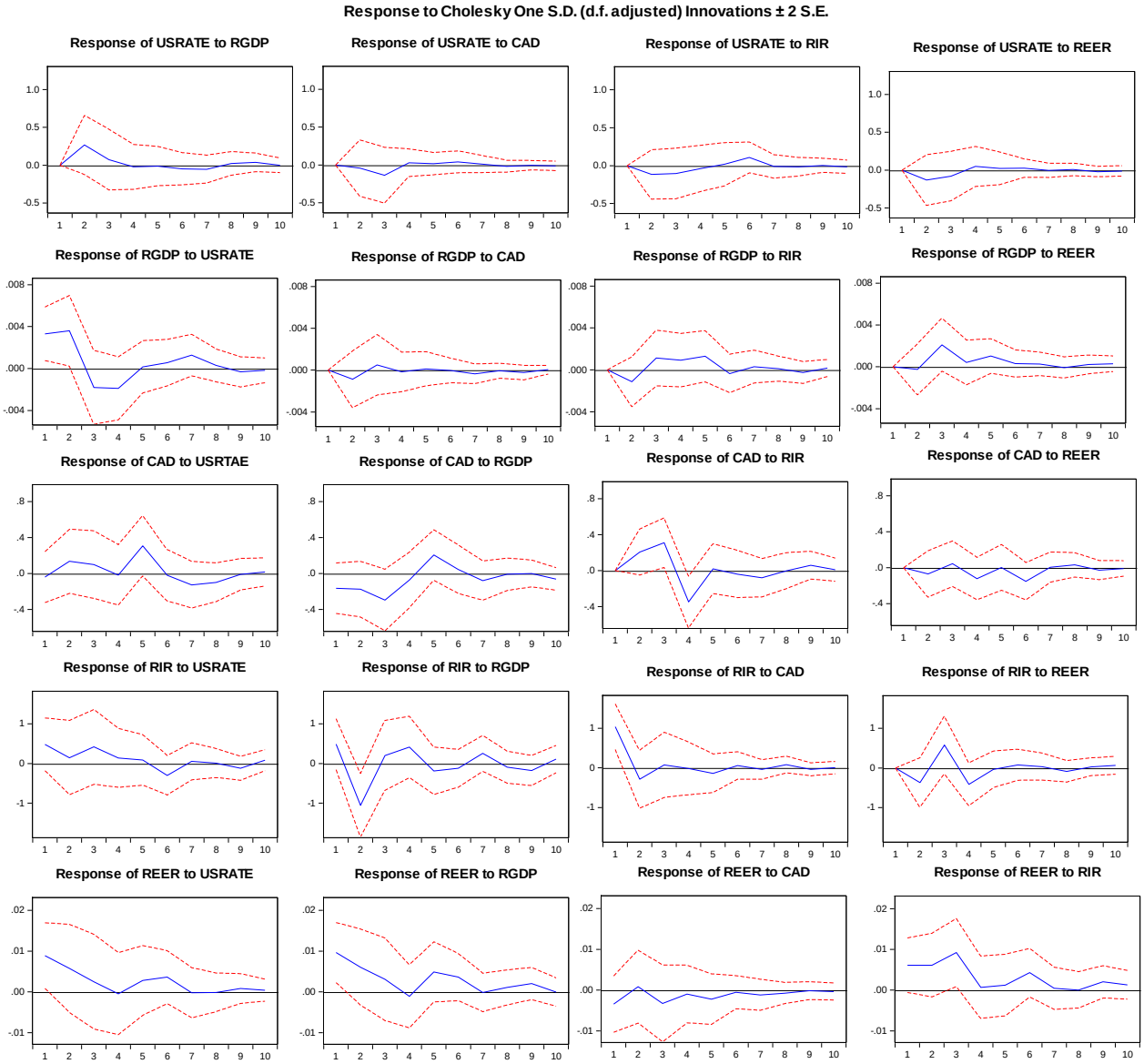
India



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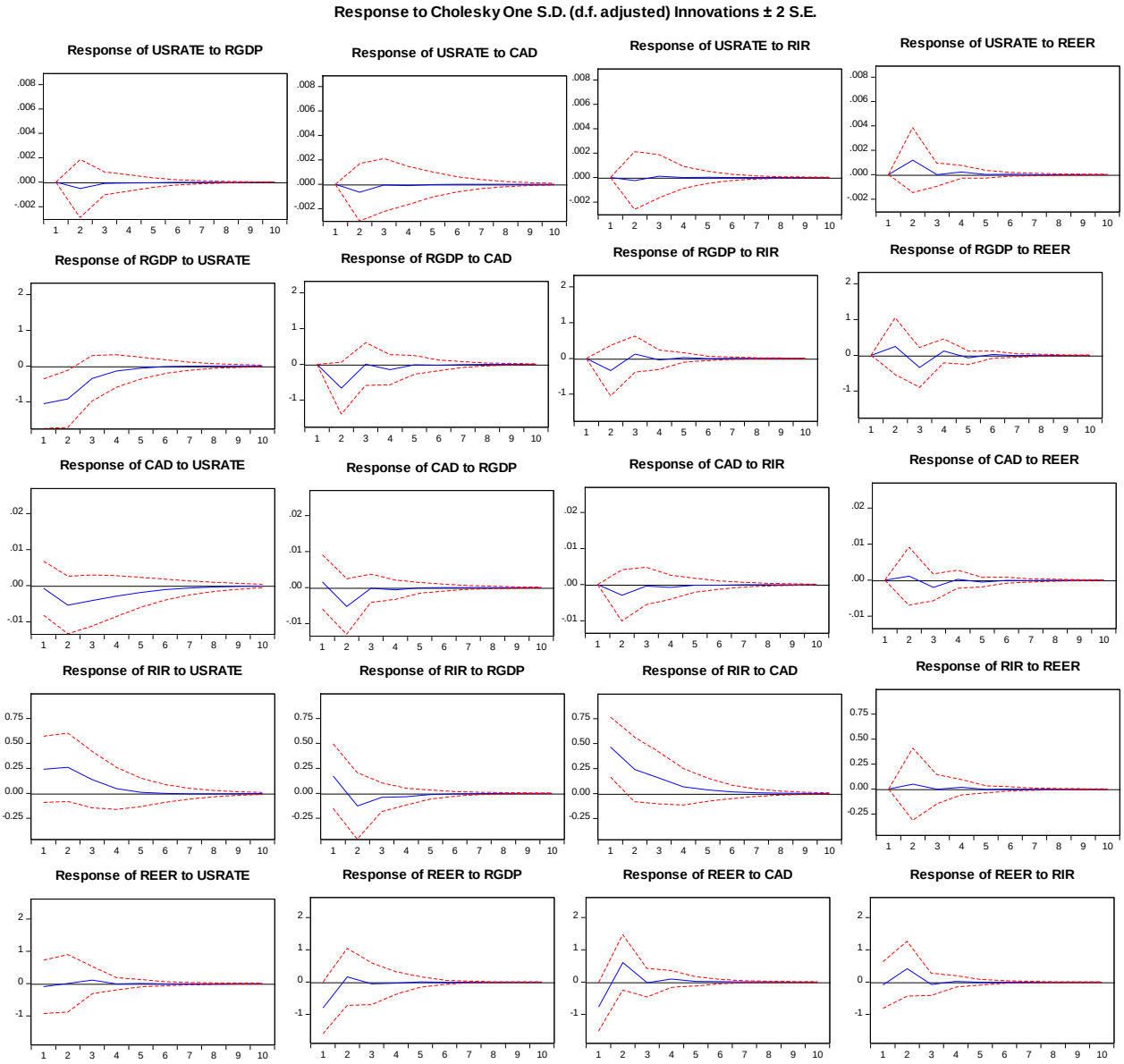
Pakistan



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Sri Lanka