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Trade Balance and its Determinants in South Asian Countries: A Panel Data Analysis

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Abstract

Persistent deficit in trade balance is a common characteristic of developing countries in which low value agricultural exports may not offset the high value industrial imports. This article intends to explore the effect of inflation, exchange rate, GDP, FDI and GCE on trade balance of South Asian countries: Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. Data were obtained from World Development Indicators from 2001 to 2019 published by World Bank. Initially, the trend of all variables was monitored using graphs. Then, fixed effect model was applied as suggested by Hausman test in which only exchage rate was found significantly negatively related with trade balance. Due to serial correlation problem with fixed effect mode, data were further analysed through panel ARDL/ PMG and found the evidences of long-run relationship among the variables. It was also found that inflation, exchange rate, and GDP had significant positive relationship with trade balance in long-run whereas GCE had significant negative impact on it. Interestingly, FDI did not have significant contribution on trade balance in long-run. None of variables were found to be significant in short run. However, all selected variables affected signifcantly to trade balance in short-run while testing cross-section wise. Finding of this research has an important implication to South Asian countries for making concensus in desiging common currency to fight against the growing concern of trade deficit in the region.

Keyywords: *Fixed effect model, Panel ARDL, Trade balance*

JEL Classifications: *C33, F14, F19*

Introduction

Due to geographical variation, socio-economic and cultural difference, some of goods and services produced by South Asian countries are heterogeneous.

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They import some other goods from foreign countries which cannot be produced in their areas. Exports and imports help to run the economic activities of the countries but a country suffers from negative trade balance or trade deficit when its total import value exceeds total export value. A trade deficit in some cases may specify that the nation's people are feeling confident and rich enough to buy more than the country produces. A country cannot have a trade deficit unless other countries are eager to lend it the funds needed to finance the purchases of imports (Sharif & Ali, 2016). South Asian countries are advised to focus on investment in infrastructure in order to boost exports and tackle the continuing trade deficit (ADB, 2017).

Economic growth and development of a country are fostered by trade and also stated that trade plays a vital role in economic growth (Sharifi-Renani & Mirfatah, 2012). When there will be the growth of exports, it promotes in specialization of the export products. It increases the productivity and enhances the skills for rise of export sector. Economic growth rate of the country is promoted with increase in the capacity to export the goods and services (Uddin et al., 2010). Trade surplus of the country is taken as favorable situation for the economy while trade deficit indicates the weak economy. It is essential to understand the international trade position of a country in order to take advantages from it (Akoto & Sakyi, 2019). The questions like what is the position of trade balance and why it is fluctuated in short and long run, should be addressed by every country. This is particularly important for developing countries where large trade deficit is observed.

Trade deficit of a country can minimize the risk of inflation by quoting products at lower price. If a country is able to control inflation, the tendency of trade deficit would be gradually reversed, and economy reached in steady consumption growth and local productivity can be improved. Privatization and deregulation can play crucial role in this regards. The aim of trade policies should be driving domestic output, taking care of domestic industries, protecting consumers and promoting export (Sarbapiya, 2012). Many analysts believed that trade policy openness and higher ratios of trade volumes were positively correlated with economic growth. After Rodriguez and Rodrik (2000) questioned this conclusion, a new understanding policy surfaced. They demanded people attention to protectionist policies with other poorly executed policies in developing countries.

Exchange rate might play crucial role in trade balance. When a country devaluates its currency, import items become cheaper while the export items become more costly, resulting in increment in imports and decline in exports. Hence, the trade imbalance among the countries can be rectified by using exchange rate adjustment tool (Shao, 2008). Appreciated exchange rate mostly reduces trade deficit whereas depreciated exchange rate can promote trade surplus. As per Marshall-Lerner condition, the real currency depreciation improves a country's trade balance in the long run if the volume of exports and import are

elastic enough in accordance with the real exchange rate. If the coefficient of real exchange rate is found to be positive in long run then only the Marshall-Lerner condition is satisfied as per econometric analysis (Gocer & Elmas, 2013). A successful trade policy demands an understanding the relationship between the terms of exchange rates and the trade balance (Bahmani-Oskooee & Ratha, 2004). Thus, this study tries to analyze the relationship between exchange rate and trade balance.

For last two decades, imports of some South Asian countries is much higher than their exports as a result they have been facing trade deficit. Therefore, it is important to find the root cause of deficit. Monetary policy and economic strategies adopted by these countries might be the primary reasons. Given the difference in the trade balance across countries and time, it is necessary to investigate whether the main factors like exchange rate, gross domestic product (GDP) growth, inflow of foreign direct investment (FDI), government consumption expenditure (GCE), and inflation influence their trade balance.

Most of the studies in determinants of trade balance were conducted either in single country or in global context. However, using explanatory variables of trade balance like exchange rate, GDP, FDI, GCE, and inflation is rarely found in the context of South Asia. Therefore, this study might give new insights into the increasing concern of South Asian countries facing situation of trade deficit. Confirming the Marshal-Lerner proposition of exchange rate and trade balance, it provides important policy feedback for developing regional level collaboration among South Asian countries in common currency.

The remainder of the paper has been organized as follows: Section 2 describes the literature review and theoretical framework; Section 3 presents the methodology and econometric model used for estimation; Fourth section present the findings of data analysis and their discussion; and last section draws the conclusion and implications.

Review of Literature

In regards to the determinants of trade balance, three prominent approaches are discussed in the literature like conventional, monetary, and absorption. Conventional approach of elasticity claims that trade balance is affected by exchange rate (Himarios, 1989) whereas national income and expenditures are major determinants of trade balance in conventional approach. Monetary variables like interest rate and inflation are included in monetary approach of trade balance (Alexander, 1959; Mundell, 1971; Duasa, 2007).

Several research works have been carried out regarding the determinants of trade balance. The study made by Liew (2003) on the ASEAN (Association of South East Asian Nations) showed that balance of trade affected in those nations who change real effective exchange rate not in nominal effective exchange rate.

Duasa (2007) checked the short run and long-run relationships between trade balance, real exchange rate (RERs), income, and money supply in the case of Malaysia. Using the ARDL (Autoregressive Distributed Lag) co-integration approach, the study observed a positive but statistically insignificant relationship between the trade balance and exchange rate. Further, the money supply and domestic income had a strong negative and positive impact on the trade balance. Ng et al. (2008) investigated the real exchange rate and trade balance relationship in Malaysia for the period from1955 to 2006. According to their findings, trade balance and exchange rate are interrelated in long-run.

Shao (2008) investigated on the association between exchange rate changes and balance of trade in the context of Japan by considering 26 years of annual data and concluded the long-run relationships among five macro-economic variables. These variables are trade balance, domestic income, foreign income, net-foreign assets, and real exchange rate. On the other hand, final effects of the exchange rate changes on trade balance is undetermined. Moreover, the reduction in trade surplus can be made in the short run by appreciating the exchange rate. However, in the longer period, relationship did not persist. The positive sign of the relation is not guaranteed in this case, and appreciation is not surely able to correct the trade imbalance between countries.

Yazici (2008) studied the impact of exchange rate changes on Turkish trade balances from time periods 1986 to 1998. His study found that after depreciating the domestic currency, the trade balance initially improved, then deteriorated, and finally improved. Irhan et al. (2011) examined the determinants of the Turkish trade balance and clarified that real exchange rate depreciations improved the trade balance. Gocer and Elmas (2013) investigated the relationship between the trade balance and the exchange rate with the panel co-integration with multiple structural breaks under cross-sectional dependence method by using the 1980-2011 period data of Bulgaria, Hungary, Poland, and Romania. Their study established that Marshall-Lerner condition fits well for Bulgaria, Hungary, and whole panel as well.

Iyke and Ho (2017) examined the impact of exchange rate changes on trade balance in the context of Ghana using quarterly data between 1986Q1 and 2016Q3 with linear and non-linear specifications of analysis. Their results found the evidence of an asymmetric effect of the exchange rate on trade balance. Moreover, they concluded a positive relationship of domestic income and foreign income with trade-balance of Ghana. By using time series data of 1970-2003, Aqeel et al. (2004) assessed the relationship between economic growth of a country and foreign trade in Pakistan. They used variables like trade, fiscal, economic liberalization, and FDI, and the results of co-integration and error-connection showed significant relationship among these variables. Likewise, Pacheco-Lopez (2005) found that an increase in FDI possibly increase imports

more than exports which creates trade deficits more than trade surpluses. In addition, large FDI inflows might create negative consequences for exports and it also becomes a threat to exchange rate stability.

Sarbapiya (2012) also took up various econometric techniques including Augmented Dickey-Fuller (ADF), Johansen co-integration, vector error correction models (VECM), and OLS to examine the long- and short-run trade behavior for India over the period of 1973 to 2011. The results depicted a long run and short-run causality among inflation, exchange rate, FDI, household consumption, and foreign income. Foreign income and FDI have a significant positive impact on trade balance while household consumption, inflation, and exchange rate exert negative effects on trade balance in the long-run. Similar findings were observed for the short-run.

Mbayani (2006) examined the major determinants of trade balance in Tanzania. The author focused on trade in goods and used real exchange rate, foreign income, FDI, household consumption, government expenditure, and Trade liberalization. The study found out that government spending, household consumption and trade liberalization are the principal determinants of Tanzanian trade balance. Falk (2008) found impacts of effective exchange rate index, real foreign, and GDP per capita and the government finances stability on the trade balance after examining the determinants of the trade balance empirically by using fixed-effects models and linear-mixed models. The impact of GDP per capita was negative where others were positive.

Muhammad (2010) examined the short and long run determinants of trade deficit in Pakistan by using annual data from 1975 to 2008. Foreign income, domestic consumption, real effective exchange rate, and FDI are tested through Johansen co-integration technique and vector error correction model (VECM) for long run and short run analysis respectively. All the variables have a significant impact on the trade deficit in Pakistan.

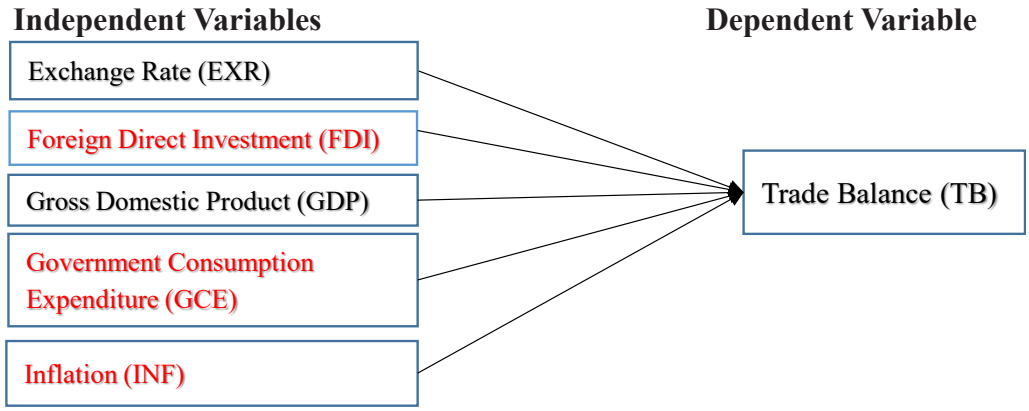
Jayachandran (2013) analyzed the impact of exchange rates on trade and GDP. Using data from 1970 to 2011 and variables as exports, imports, exchange rate, and foreign investment. The result showed that the exchange rates have significant negative impacts on real exports and imports, mean that higher exchange rates rise and fall have a tendency to cut real exports in India.

Awan (2015) investigated the effect of financial development on trade balance. The aim of the study was to find the relationship between financial development, trade balance, exchange rate, and inflation. Analyzing annual data from 1972-2014 through ARDL, the researcher observed that financial development and inflation have positive significant impact on trade balance and exchange rate has negative significant impact on trade balance.

Conceptual Framework

Based on the above discussed studies and theoretical underpin of the trade balance, a conceptual model showing the independent variables and dependent variables has been prepared for this study as shown in given figure 1.

Figure 1: Conceptual Framework of the Study



Trade Balance: Trade balance is defined as the ratio of total exports to total imports of the country. This makes the trade balance insensitive to units of measurement.

Exchange Rate: Nominal exchange rate of respective countries against US dollar.

Gross Domestic Product: Real GDP at constant price of 2010.

Foreign Direct Investment: Net foreign direct investment inflow as percentage of gross domestic product.

Government Consumption Expenditure: Aggregate transaction value on a country's national income accounts representing government's expenditure on goods and services.

Inflation: Change in annual consumer price index

Materials and Methods

This study is based on secondary data and all required time series data and information were obtained from World Development Indicators - 2020 (World Bank, 2020) for the period 2001 to 2019. Because of unavailability of data, Afghanistan and Maldives are not included in this study. Hence, out of eight South Asian countries, only six countries (Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka) are taken for the research. According to Human

Development Report 2019, except Sri Lanka all the selected countries for this study lie in medium tier while Sri Lanka falls in high tier. As far as GDP per capita is concerned, Sri Lanka has the highest as $ 3,947 and Nepal has lowest as $ 1,048 (IMF, 2019). In case of exchange rate against U.S. $, Indian currency is the strongest whereas Sri Lankan currency is the weakest. Data shows that there is high inter-dependency among South Asian countries in international trade. Nepal and Bangladesh are major exporting partners of India among South Asian countries where as Bangladesh, Bhutan, Nepal and Sri Lanka are mainly dependent on India for their imports.

Model Specification

This study used trade balance as a dependent variable whereas average exchange rate with respect to U.S. $, GDP growth, government consumption expenditure growth in percent, inflation, inflow of FDI in percent of GDP and t are independent variables. Normally, trade balance is the difference between total export value and total import value. However, following Haynes and Stone (1982); Bahmani-Oskooee and Alse (1994); Sharif and Sheikh Ali (2016), trade balance is defined as the ratio of total export value to total import value. The study used three models under the functional form of dependent and independent variables as shown below:

$$TB = f(EXR, FDI, GDP, GCE, INF)$$

Fixed Effect Model

In this model, all parameters are considered as non-random quantities. The assumption of fixed model effect is that the individual-specific effects are correlated with the independent variables (Wooldridge, 2010). This model is estimated by 'Least Square Dummy Variable Regression'. The model for N countries and T time periods can be expressed as

$$TB_{it} = (\alpha + \tau_i) + \beta_1 EXR_{it} + \beta_2 FDI_{it} + \beta_3 GDP_{it} + \beta_4 GCE_{it} + \beta_5 INF_{it} + \epsilon_{it}$$

Where:

TB_{it} = Trade balance of country i at time period t
TB = Trade balance
EXR = Average exchange rate to U.S.$
FDI = FDI inflow percent of GDP
GDP = GDP growth
GCE = Government consumption expenditure growth
INF = Inflation
α = Unobserved time-invariant individual effect which cannot be directly measured

β_1, β_2, β_3, β_4 and β_5 = Parameters
i = 1, 2……. n
t = 1, 2…….t
ϵ_{it} = Error term
τ_i = Fixed effect specific to country

Random Effect Model

The random effects assumption is that the individual unobserved heterogeneity is uncorrelated with the independent variables (Wooldridge, 2010). This model is estimated by 'Generalized Least Square'. The major difference between fixed and random effect models are like - in case of fixed effect, τ_i is the part of intercept which is correlated with other regressors whereas in case of random effect, τ_i is an individual specific random heterogeneity or a component of the composite error term which is not correlated with any regressors. The model can be stated as

$$TB_{it} = \alpha + \beta_1 EXR_{it} + \beta_2 FDI_{it} + \beta_3 GDP_{it} + \beta_4 GCE_{it} + \beta_5 INF_{it} + (\tau_i + \epsilon_{it})$$

Where:

τ_i = Random effect specific to country,
i = 1,2,…….n
t = 1,2…….t

Hausman (1978) test was used to make choice between fixed effect model and random effect model. Static models have some limitations like occurrence of very high elasticity estimates (Oxera, 2010) and suffer from serial correlation most of the time. In order to address these limitations, dynamic model has also been considered. A Panel ARDL (Autoregressive Distributive Lags) / PMG (Pooled Mean Group) was used as a dynamic model to check long-run and short-run relationship between variables.

Panel ARDL Model

Panel ARDL regression in addition to 'Error Correction Model' (Engle & Granger, 1987) is required to measure long-run as well as short-run relationship between variables. It can be applied when there is only one-way interdependence between dependent and explanatory variables at the level of cross-sections in panel. ARDLs are standard least square regressions which include lags of both the dependent variable and explanatory variables as regressors (Greene, 2008). Panel ARDL model is similar to the Peseran et al. (1999) model. Panel ARDL model can be written as:

$$TB_{it} = \varphi_i + \sum_{k=1}^{p} \beta_{ik} TB_{i,t-k} + \sum_{k=0}^{q} \alpha_{1k} EXR_{i,t-k} + \sum_{k=0}^{q} \alpha_{2k} FDI_{i,t-k} + \sum_{k=0}^{q} \alpha_{3k} GDP_{i,t-k} + \sum_{k=0}^{q} \alpha_{4k} GCE_{i,t-k} + \sum_{k=0}^{q} \alpha_{5k} INF_{i,t-k} + \varepsilon_{it}$$

ECM of the Study is:

$$\Delta TB_{it} = \varphi_i + \sum_{k=1}^{p} \beta_{ik} \Delta TB_{i,t-k} + \sum_{k=0}^{q} \alpha_{1k} \Delta EXR_{i,t-k} + \sum_{k=0}^{q} \alpha_{2k} \Delta FDI_{i,t-k} + \sum_{k=0}^{q} \alpha_{3k} \Delta GDP_{i,t-k} + \sum_{k=0}^{q} \alpha_{4k} \Delta GCE_{i,t-k} + \sum_{k=0}^{q} \alpha_{5k} \Delta INF_{i,t-k} + \lambda ECT + \varepsilon_{it}$$

Where,

ECT = Error correction term,
i = 1,2……N are cross-sectional units,
t = 1,2……T are time periods,
φ_i = Group specific intercept,
α_{ik} and β_{ik} = Co-integrated coefficients,
ε_{it} = Error term,
λ = Speed of adjustment,
p and q = Number of lags of dependent and independent variables.

Results and Discussion

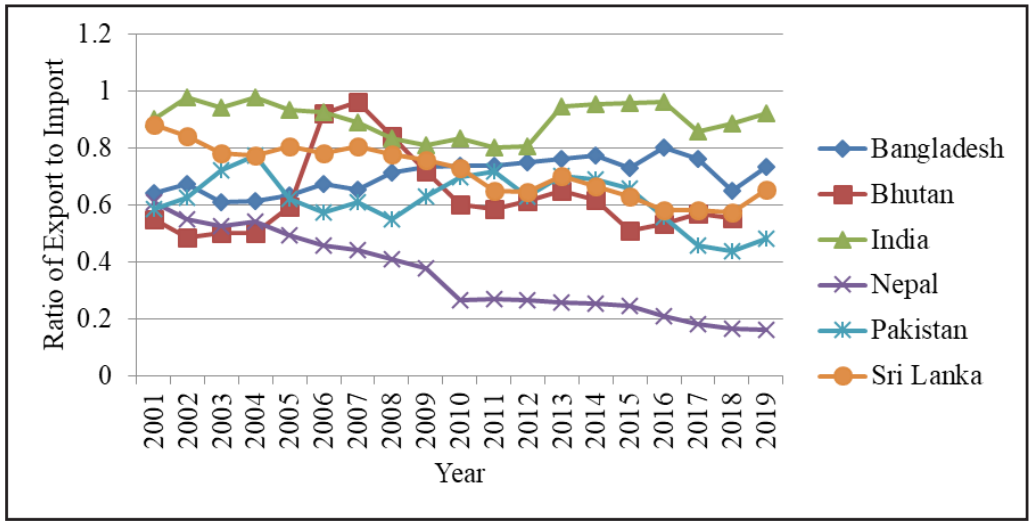
Data obtained from the source were organized and analyzed using Eviews and Microsoft Excel. Trend of each variable was observed through various graphs then descriptive statistics were computed.

Trend Analysis

In time series and panel data analysis, trend analysis is essential to observe the pattern of variables over past time periods. It helps economists, policy makers, etc. to explore something regarding forecasting.

Figure 2 shows the trend of trade balance of six South Asian countries between 2001 and 2019. There are ups and downs in trend of all countries except Nepal whose trend is continuously decreasing since 2001. However, less than one export-import ratio indicates that all South Asian countries are running in trade deficit. Trade balance of India was found relative high and consistent, while Nepal had lowest and declining trade balance over last two decades. Bhutan's trade balance was found highly volatile during the study period. Bangladesh has progressed in reducing trade deficit as its trend of trade balance was found increasing.

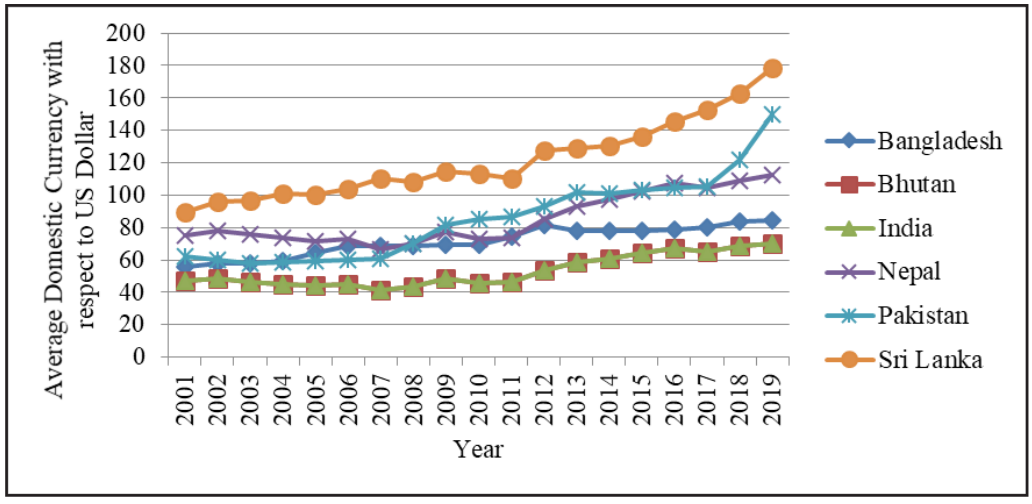
Figure 2: Trend of Trade Balance of South Asian Countries



Source: World Development Indicators 2020.

Trend of average exchange rate is presented in Figure 3. From 2001 to 2008, Indian currency with respect to US dollar is almost stable and after 2013, it started to depreciate. Sri Lankan currency is devaluated almost at linear trend. After 2017, the trend of Pakistani currency changes drastically.

Figure 3: Average Exchange Rate

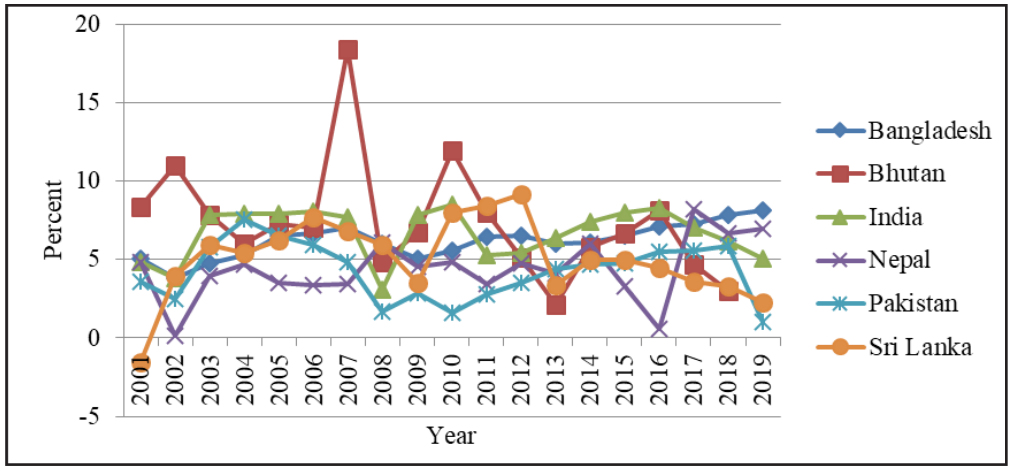


Source: World Development Indicators 2020.

Figure 4 depicts that trend of FDI of Bhutan is different from other countries where the flow is even negative in 2017. In case of Nepal, it is horizontal straight line lying almost at zero till 2008. Apart from these two countries the trend is

sometimes at increasing form while sometimes at decreasing form.

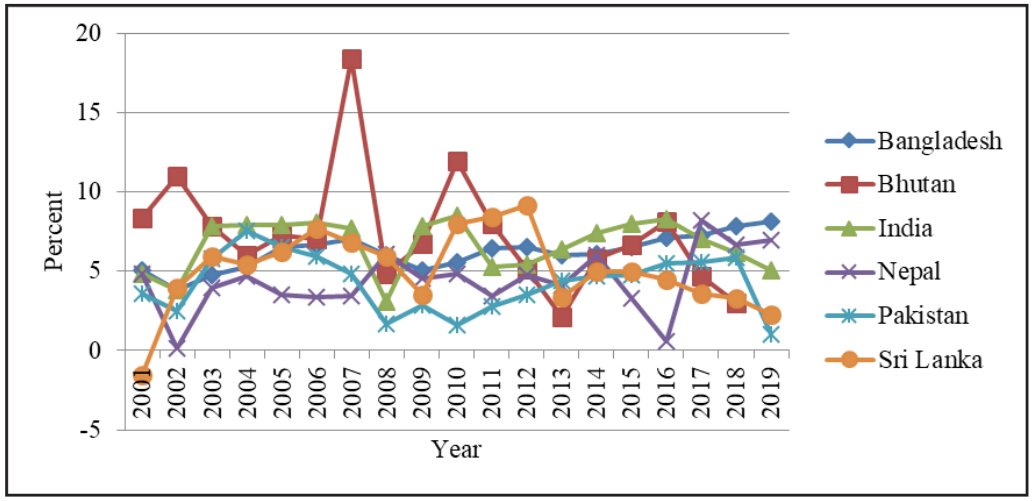
Figure 4: FDI Inflow Percent of GDP



Source: World Development Indicators 2020.

Figure 5 shows that trend of GDP growth of Bhutan is different than others. Sometimes it has gone up like high jump while sometimes it has fallen down. In recent years, trends of Bangladesh and Nepal are increasing whereas trends of other countries are decreasing.

Figure 5: GDP Growth

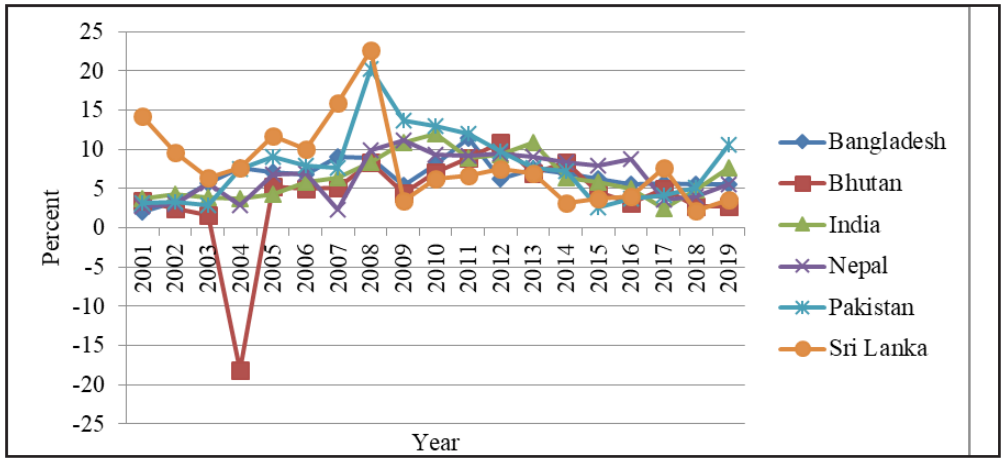


Source: World Development Indicators 2020.

Figure 6 shows the trend of government consumption expenditure growth where trend of Pakistan and Sri Lanka are different as compared to others. In case of Sri Lanka, there are four times where growth is negative. In case of

Pakistan, the growth is very high in 2005 while in 2019 it falls down to negative. In case of other countries, there is swing between 0 to 10 most of the time.

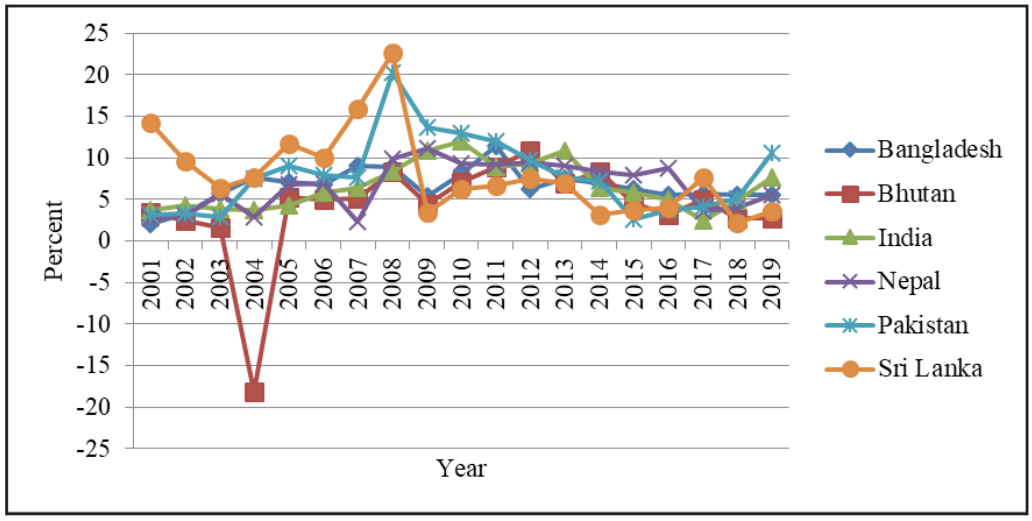
Figure 6: Government Consumption Expenditure Growth



Source: World Development Indicators 2020.

According to Figure 7, till 2009, there are ups and downs of inflation with greater margin in trend of Bhutan, Pakistan and Sri Lanka. Around 2012, all of them are clustered around same point. After 2017, inflation of most of the countries is going up.

Figure 7: Inflation



Source: World Development Indicators 2020.

Descriptive Statistics

Bhutan has average trade deficit of $ 334 Million which is the least among six countries whereas India has the highest average deficit of $ 44.6 Billion. Similar result was observed while measuring trade balance with respect to the size of economy. During 19 years of sample period, trade deficit is most consistent in Bangladesh and greater variability in India. Trade balance is negatively distributed in all countries except Bhutan where the distribution is positive. Indian currency is found to be strongest having mean value of 53.21 and the corresponding value for Sri Lanka is 121.42, found to be weakest. The least and most uniformity is seen in Pakistan and Bangladesh. On an average, prices are least inflated in Bhutan whereas most inflated in Sri Lanka. Like in previous variables, Inflation is also consistent in Bangladesh but inflation of Bhutan is highly fluctuated. Bhutan has the highest average GDP growth of 7.37 percent with greater variation whereas least growth of 4.24 percent is seen in Pakistan. FDI inflow percent of GDP is higher in India and lower in Nepal. As far as most and least consistencies are concerned, they are respectively observed in India and Bhutan. Bangladesh's average government consumption expenditure growth of 7.53 percent is superior to others and Sri Lanka has the lowest of 4.07 percent. The growth is most steady in Bangladesh and least uniform in Pakistan.

Multicolinearity Test

In case of multiple independent variables, it is always advisable to check whether there exists high degree of correlation between them. The correlation coefficients between independent variables are presented in Table 1. The moduli of the coefficients are below 0.8 in all cases which indicates that there is no evidence of severe multi-co-linearity (Studenmund, 2001).

Table 1: Correlation Coefficients

Variables	EXR	FDI	GDP	GCE	INF
EXR	1	0.1773	-0.3012	-0.1333	0.1298
FDI	-	1	0.4497	0.0908	0.1982
GDP	-	-	1	0.2111	-0.1674
GCE	-	-	-	1	-0.1016
INF	--	-	-	-	1

Source: Author's Calculation.

Unit Root Test

Stationary is the necessary condition for each time series and panel data analysis. Stationary can be checked in panel data through various tests like in Levin et al. (2002); Im et al. (20023), W-stat, ADF - Fisher Chi-square (Fisher, 1932;

Dickey & Fuller, 1979) and PP - Fisher Chi-square (Fisher, 1932; Phillips & Perron, 1979). Levin et al. (2002) 't' assumes common unit root process as a null hypothesis whereas others assume individual unit root process as a null hypothesis (Choi, 2001; Im et al., 2003).

Table 2: Results of Unit Root Test

Method		TB	EXR	FDI	GDP	GCE	INF
Levin, Lin and Chu t	Level	- 0.99	- 1.03	- 0.78	- 2.84*	- 4.29*	- 1.66**
	First Difference	- 4.59*	- 2.98*	- 3.26*	NA	NA	- 6.55*
Im, Pesaran and Shin W-stat	Level	- 0.28	1.27	- 0.47	- 2.78*	- 3.06*	- 0.17
	First Difference	- 2.90*	- 2.80*	- 3.78*	NA	NA	- 5.41*
ADF - Fisher Chi-square	Level	11.60	8.27	13.09	27.70*	31.25*	11.14
	First Difference	28.60*	27.63*	35.53*	NA	NA	48.50*
PP - Fisher Chi-square	Level	8.47	3.19	16.08	43.09*	60.23*	20.56
	First Difference	40.34*	42.32*	63.84*	NA	NA	100.64*

Note: *Significant at 1percent, **Significant at 5 percent.

Table 2 shows that all above tests are found to significant at level at 1percent level of significance in case of GDP and GCE whereas all other variables are significant at first difference at 1 percent level of significance. Hence, GDP and GCE are stationary at level but TB, EXR, FDI and INF are stationary at first difference.

Hausman Test

In order to check whether 'Fixed Effect Model' or 'Random Effect Model' was more applicable, Hausman test of efficiency of model was run and the results are presented in Table 3.Table provides the summary of cross-section random effect and Hausman test is found to be significant at 1 percent of significance which means Fixed effect model is better than Random effect model. Moreover, there is significant difference in all independent variables except inflation between fixed and random effects while applying cross-section random effects test comparisons.

Table 3: Result of Hausman Test

Test Summary		Chi-square Statistic	Degree of Freedom	Prob.
Cross-section random		261.481*7	5	0.00001
Cross-section random effects test comparisons:				
Variables	**Fixed**	**Random**	**Var (Diff.)**	**Prob.**
EXR	-0.0027	-0.0018	0.0000**	0.0316
FDI	-0.0001	0.0614	0.00003*	0.0000
GDP	0.0027	0.0071	0.000003*	0.0073
GCE	-0.0013	-0.0033	0.0000*	0.0000
INF	0.0022	0.0020	0.0000	0.7124

Source: Author's Calculation.

Note: *Significant at 1percent, **Significant at 5 percent.

Table 3 depicts summary of cross-section random effect and Hausman test is found to be significant at 1 percent of significance which means Fixed Effect Model is preferable over Random Effect Model. Moreover, there is significant difference in all independent variables except inflation between fixed and random effects while applying cross-section random effects test comparisons.

Fixed Effect Model

As suggested by Hauman test, the fixed effect model was fitted to find out the relationship between independent and dependent variables.

Table 4: Results of Panel Least Square

Variables	Coefficients	Std. Error	t-Statistic	Prob.
EXR	-0.0027	0.0006	-4.8317*	0.0000
FDI	-0.0002	0.0119	-0.0129	0.9897
GDP	0.0027	0.0046	0.5868	0.5587
GCE	-0.0013	0.0014	-0.9096	0.3653
INF	0.0022	0.0023	0.9759	0.3315
C	0.8474	0.0563	15.0310	0.0000
F-statistic = 37.2797*		R-square = 0.7918		
Prob (F-statistic) = 0.0000		Adjusted R-square = 0.7706		
Durbin-Watson stat = 0.5613				

Source: Author's Calculation

Note: *Significant at 1percent

It was found that 79.18 percent of variation in trade balance is explained by EXR, FDI, GDP, GCE, and INF and when adjusted by degree of freedom the percent variation explained decreased to 77.06. In addition, the model is found to be significant at 1 percent level of significance. Even though there is high value of R-square and the model is significant, only one independent variable

average exchange rate is found to be significant. There is evidence of negative and significant relationship between average exchange rate and trade balance. Moreover, when average exchange rate increases by 1 unit and eliminating the effect of other independent variables then ratio of export to import is expected to decrease by 0.0027. Durbin-Watson statistic is less than lower limit (d_L) of critical values indicating that there is evidence of serial correlation among residuals. This is further supported by residual cross-section dependence test as shown in Table 5.

Table 5: Residual Cross-Section Dependence Test

Test	Statistic	Degree of Freedom	Prob.
Breusch-Pagan LM	39.8738*	15	0.0005
Pesaran scaled LM	4.5413*	15	0.0000
Bias-corrected scaled LM	4.3747*	15	0.0000
Pesaran CD	-1.0177	15	0.3088

Source: Author's Calculation.

Note: *Significant at 1 percent.

According to Breusch-Pagan LM, Pesaran scaled LM and Bias-corrected scaled tests; there is evidence of cross-section dependency among residuals however Pesaran CD test does not support it. Thus, Fixed Effect Model used in this analysis is not sufficient to explain the causal relationship between trade balance and its explanatory variables.

Panel ARDL Model

The major problem of static models is that they normally suffer from serial correlation. In this case also same problem occurred. Even Redundant Fixed Effects-Likelihood Ratio cannot overcome it. So, the analyses were continued with dynamic model. Because of small groups and time periods, panel ARDL model was used which helps to find long-run as well as short-run relationship between variables. Coefficients of long-run relationship are presented in the Table 6.

Table 6: Results of Long-run Coefficients with Co-integrated Term

Variables	Coefficients	Standard Error	t-Statistic	Prob.
EXR	0.0240	0.0040	5.9427*	0.0000
FDI	- 0.0207	0.0186	- 1.1166	0.2702
GDP	0.0356	0.0059	5.9577*	0.0000
GCE	- 0.0058	0.0026	- 2.2384**	0.0303
INF	0.0304	0.0060	5.0267*	0.0000
COINTEQ01	- 0.3484	0.1504	- 2.3169**	0.0252
Log likelihood= 216.83				

Source: Author's Calculation

Note: *Significant at 1 % , **Significant at 5 %.

The model in this analysis was selected according to Akaike Info Criterion (AIC). The value of Log likelihood is 216.83 indicating that the model is significant at 1percent level of significance. Co-integrated term or Error correction term is found to be significant at 5 percent level of significance which means there is presence of long-run relationship among variables. Moreover, the corresponding value is - 0.3483 which means that EXR, FDI, GDP, GCE and INF returns to long-run equilibrium by 34.83 percent speed of adjustment through trade balance. Long-run coefficients of EXR, GDP and INV are significant at 1 percent level of significance and GCE is significant at 5 percent level of significance but FDI is found to be insignificant. In addition, when EXR increases by 1 unit and eliminating the effect of all other independent variables then ratio of export to import (Trade balance) is expected to increase by 0.024 in long-run. Likewise, 1 percent increase in GDP and 1percent increase in Inflation improve trade balance by 0.035 and 0.030 respectively in long-run. On the other hand, increase 1percent in GCE impairs trade balance by 0.0057.

Table 7 shows the coefficients of short-run relationship between variables of interest. The result depicts that none of short-run coefficients are significant. This confirms the notion that there is no evidence of short-run relationship of EXR, FDI, GDP, GCE and INF with trade balance.

Table 7: Results of Short-run Coefficients

Variables	Coefficients	Standard Error	t-Statistic	Prob.
D (EXR)	- 0.0046	0.0029	- 1.5879	0.1195
D (FDI)	- 0.0060	0.0198	- 0.3031	0.7632
D (GDP)	- 0.0125	0.0076	- 1.6396	0.1082
D (GCE)	0.0015	0.0019	0.7741	0.4430
D (INF)	- 0.0023	0.0019	- 1.1951	0.2385

Source: Author's Calculation.

Cross-section short-run coefficients are also computed and presented in Appendix II. Since Co-integrated-terms are significant in all countries except Bangladesh, long-run relationship of trade balance with its explanatory variables was found in Bhutan, India, Nepal, Pakistan and Sri Lanka. Short-run coefficients of all independent variables are significant at 1percent level of significance in all countries but the direction of the relationship is not same. Negative short-run relationship between average exchange rate and trade balance are observed in Bangladesh, Bhutan, India and Pakistan while positive relationship is noticed in Nepal and Sri Lanka. There is positive and significant short-run relationship between FDI inflow and trade balance in case of Bhutan and India whereas in other countries the relationship is negative. Positive significant short-run relationship of GDP growth with trade balance was found only in Pakistan. Similarly, short-run relationship between Government consumption expenditure

growth and trade balance is negative in case of Bangladesh and Sri Lanka while in other countries the relation is positive. Likewise, short-run relationship between inflation and trade balance was found positive and significant in case of India and Sri Lanka.

Diagnostic Test

Diagnostic test of residuals is not compulsory in case of Panel ARDL. Only normality can be checked in panel ARDL. Jarque-Bera test statistic is 4.80 which is not significant at 5 percent level of significance hence residuals are approximately normally distributed. Serial correlation can be checked only by cross-section but not directly by panel ARDL. Cross-section serial correlation was tested through Breusch-Godfrey Serial Correlation LM Test and presented in Appendix-III. Both F-statistic and Chi-square statistic are not significant in all countries indicating that residuals are not suffering from serial correlation.

Discussion

The results of fixed effect model supports Khan and Hossain (2010) in the context of Bangladesh, where they examined the relationship between trade balance and its determinants, and found that exchange rate was significantly negatively related to trade balance. In consistent to their study, the present study also found fixed effect model better than random effect model. However, it is opposite to the findings of another study in Bangladesh (Kundu, 2015), in which trade balance was positively affected by exchange rate.

In contrast to the findings of Phan and Jeong (2015) in Vietnam, while applying ARDL in the determinants of trade balance, this study shows the positive effect of exchange rate, GDP, GCE and inflation but no significant effect of FDI on trade balance in long run. Moreover, in their study, exchange rate is not significant in short run but in this case significant negative relationship was observed when analyzing cross-section short-run coefficients. Significant but opposite sign is observed in case of FDI while comparing the results of both studies. In south Asian context, Hassan et al. (2017) examined the factors affecting trade deficit in Pakistan, India and Bangladesh, and concluded that trade balance can be improved by devaluating real exchange rate and expanding GDP growth while analyzing through ARDL. In dynamic panel, this study found that there exists significant long-run relationship GDP and exchange rate with trade balance, which is similar to the findings of Khan and Hossain (2012) in Bangladesh. Thus, Marshall-Lerner condition is valid in long-run.

In the line with Sarbapiya (2012) in India, this study found significant error correction term with negative sign along with positive impact of FDI and negative imact of exchnage rate on trade balance. This indicates that there is not fundamnetal change observed even after 2012 in the short term external sector

determinants (FDI and exchnage rate) of trade balance in the context of India. Neverthless, effect of exchnage rate and inflation was found positive on trade balance also shown by Ousseini and Aboubacar (2017) in eight West African countries through Panel VAR approach.

Regarding government expenditure, our study supports the findings of Shawa and Shen (2013), in which they found that government expenditure and inflation were negatively related to trade balance, whereas FDI affected trade balance positively. Somalia et al. (2016) did not observe impact of inflation and FDI and found positive impact of exchange rate on trade balance. While investigating the dynamics of inflation, exchange rates and the trade balance in a small economy by taking the case of Uganda, Yiheyis and Musila (2018) found that exchange rate and inflation had no significant relationship in long-run with trade balance. But our study found positive relationship of these two variables (exchange are and inflation) with trade balance. Finally, this study observed cross-section dependency with long-run relationship among the trade balance and its determinants as depicted by Sezer (2017) using panel data analysis in fourteen transition economies and Turkey.

Conclusion

This paper examined the determinants of trade balance of six South Asian countries: Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka through panel data analysis between 2001 and 2019. Findings of static model reflected the significant negative relationship between exchange rate and trade balance, leading to the conclusion that appreciating the currency contributes improvement in trade balance. Because of serial correlation faced by the static model, it was further investigated through panel ARDL model (PMG). In long run, trade balance was found positively affected by GDP, exchange rate and inflation while negatively related with GCE. These findings have important insights for policy makers by indicating the importance of internal and external sector growth in trade balance. South Asian countries can improve their trade balance by increasing GDP, devaluating their currencies and increasing general price level. Governments of South Asian countries emphasize in increasing the FDI, surprisingly our findings suggested no enhancement in the trade balance due to FDI inflow. Furthermore, in order to improve trade balance, governments of South Asian countries should reduce the consumption expenditure which was found one of the obstructing factors in long-run advance of trade balance.

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Appendix I: Descriptive Statistics

Countries		N	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis	C.V.
Bangladesh	INF	19	2.0071737	11.3951652	6.5603763	2.0756634	0.1	1.323	31.639396
	GDP	19	3.8331239	8.15268495	6.2007309	1.0978816	-0.261	-0.088	17.705681
	FDI	19	0.0955794	1.73541854	0.9265864	0.4455183	-0.179	-0.393	48.081685
	TB	19	-1.62E+10	-2.257E+09	-7.66E+09	3.253E+09	-0.567	1.769	-42.46123
	GCE	19	3.057604	15.4126931	7.5356713	2.8810329	0.643	2.168	38.231934
	EXR	19	55.806667	84.4535225	71.43745	9.1680501	-0.306	-1.12	12.833675
Bhutan	INF	19	-18.10863	10.9196569	4.092809	5.9305253	-3.078	11.891	144.9011
	GDP	18	2.1199726	18.3608541	7.3756133	3.661463	1.6	4.049	49.642827
	FDI	17	-0.675563	6.32159817	1.3263501	1.7315548	2.113	4.459	130.55036
	TB	18	-6.25E+08	-30098070	-3.34E+08	177920685	0.163	-1.028	-53.24475
	GCE	18	-10.10901	20.852107	5.5584065	6.3913852	0.029	2.564	114.98593
	EXR	19	41.348533	70.4203405	53.215892	9.8316125	0.601	-1.327	18.474956
India	INF	19	2.490887	11.9893899	6.5548786	2.8000209	0.565	-0.796	42.716594
	GDP	19	3.0866981	8.4975847	6.6545415	1.6374467	-0.836	-0.458	24.606454
	FDI	19	0.6058893	3.6205219	1.6742995	0.7101887	0.961	1.95	42.417065
	TB	19	-1.11E+11	-3.148E+09	-4.46E+10	3.54E+10	-0.62	-0.954	-79.391
	GCE	19	-0.185249	14.1903855	6.4475702	4.1521435	0.018	-0.902	64.398578
	EXR	19	41.348533	70.4203405	53.215892	9.8316125	0.601	-1.327	18.474956
Nepal	INF	19	2.2692192	11.0948237	6.6646826	2.860531	-0.242	-1.42	42.920739
	GDP	19	0.1201432	8.22349948	4.3897547	1.9828532	-0.335	0.702	45.170022
	FDI	18	-0.098375	0.7794303	0.2566825	0.2455473	0.34	-0.553	95.661874
	TB	19	-1.2E+10	-1.317E+09	-4.52E+09	3.343E+09	-1.063	0.185	-74.03115
	GCE	18	-6.742375	15.931179	6.7578652	5.7688039	-0.659	0.206	85.364293
	EXR	19	66.415028	112.609483	85.236946	15.504432	0.615	-1.301	18.189803
Pakistan	INF	19	2.5293282	20.2861211	7.9352164	4.5803934	1.057	1.424	57.72235
	GDP	19	0.9888294	7.54686002	4.249526	1.8278995	-0.179	-0.845	43.014197
	FDI	19	0.3828265	3.66832282	1.2387641	0.9952807	1.631	1.483	80.344649
	TB	19	-3.11E+10	-5.232E+09	-1.43E+10	7.287E+09	-1.333	1.05	-51.00195
	GCE	19	-6.714831	46.4818833	6.5395167	11.161462	2.7	9.431	170.67717
	EXR	19	57.751997	150.036254	85.411648	25.838976	0.808	0.408	30.252285
Srilanka	INF	19	2.1350377	22.5644955	8.0416368	5.1263028	1.454	2.388	63.747007
	GDP	19	-1.545408	9.14457225	5.0833969	2.5029539	-0.706	1.463	49.237821
	FDI	18	0.8418734	1.86397332	1.3048148	0.3334858	0.494	-0.915	25.558091
	TB	19	-1.13E+10	-1.109E+09	-5.38E+09	3.255E+09	-0.558	-1.016	-60.46153
	GCE	19	-9.982925	15.9999768	4.0714738	7.0512086	-0.404	-0.688	173.18566
	EXR	19	89.383013	178.744925	121.42296	24.592772	0.885	0.108	20.253806

#C.V= Coefficient of variation

Appendix II: Results of Cross-section Short-run Coefficients with Co-integrated Term

Countries	Variables	Coefficient	Std. Error	t-Statistic	Prob.
Bangladesh	D(EXR)	- 0.0041	2.53E-05	-164.627*	0.0000
	D(FDI)	- 0.032g	0.000480	-67.9353*	0.0000
	D(GDP)	- 0.0203	0.000399	-50.9467*	0.0000
	D(GCE)	- 0.0045	1.23E-05	-367.506*	0.0000
	D(INF)	- 0.0021	3.22E-05	-65.4993*	0.0000
	COINTEQ01	- 0.0383	0.015576	-2.457746	0.0910
Bhutan	D(EXR)	-0.0158	5.19E-05	-304.720*	0.0000
	D(FDI)	0.0735	0.000493	149.013*	0.0000
	D(GDP)	-0.0436	0.000171	-254.840*	0.0000
	D(GCE)	0.0081	1.17E-05	690.138*	0.0000
	D(INF)	-0.0067	9.34E-06	-715.756*	0.0000
	COINTEQ01	-0.8986	0.034567	-25.9969*	0.0001
India	D(EXR)	-0.0039	4.40E-06	-905.312*	0.0000
	D(FDI)	0.0256	0.000151	169.909*	0.0000
	D(GDP)	-0.0151	3.06E-05	-493.597*	0.0000
	D(GCE)	0.0059	2.22E-06	2663.35*	0.0000
	D(INF)	0.0043	1.61E-05	265.798*	0.0000
	COINTEQ01	-0.6442	0.011227	-57.3798*	0.0000
Nepal	D(EXR)	0.0027	4.17E-06	641.556*	0.0000
	D(FDI)	-0.0512	0.000767	-66.7333*	0.0000
	D(GDP)	-7.34E-0	7.13E-06	-10.2856*	0.0020
	D(GCE)	0.0008	5.20E-07	1509.31*	0.0000
	D(INF)	-0.0034	5.09E-06	-671.699*	0.0000
	COINTEQ01	-0.0469	0.006854	-6.83828*	0.0064
Pakistan	D(EXR)	-0.0093	3.27E-05	-284.526*	0.0000
	D(FDI)	-0.0039	0.000387	-10.1456*	0.0020
	D(GDP)	0.0101	0.000101	100.110*	0.0000
	D(GCE)	0.0001	1.39E-06	86.7408*	0.0000
	D(INF)	-0.0074	1.20E-05	-618.396*	0.0000
	COINTEQ01	-0.4229	0.024695	-17.1270*	0.0004
Sri Lanka	D(EXR)	0.0028	4.54E-06	609.759*	0.0000
	D(FDI)	-0.0475	0.000368	-128.951*	0.0000
	D(GDP)	-0.0061	7.41E-06	-817.196*	0.0000
	D(GCE)	-0.0014	1.22E-06	-1185.09*	0.0000
	D(INF)	0.0018	2.55E-06	703.590*	0.0000
	COINTEQ01	-0.0394	0.002636	-14.9540*	0.0006

*Significant at 1percent

Appendix III: Breusch-Godfrey Serial Correlation LM Test

Countries	F-Statistic	Prob.	Obs*R-squared	Prob (Chi-square)
Bangladesh	1.46307	0.261	2.782951	0.0953
Bhutan	2.745563	0.1285	3.662025	0.0557
India	2.374808	0.1577	3.758002	0.0526
Nepal	1.671387	0.2283	2.662595	0.1027
Pakistan	0.11328	0.7451	0.25132	0.6161
Sri Lanka	0.181583	0.6828	0.429837	0.5121