

The Determining Factors of Exchange Rate Fluctuations: A Case Study of Pakistan, Bangladesh, and India

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Abstract : *This constructive study identifies economic indicators that influence ER fluctuations in Bangladesh, India, and Pakistan from 1987 to 2018. The VECM model has been employed to identify the long-run causal movement from EXP, FDI, and FCE to RER. The Wald test is also applied as a VECM short-run representation to evaluate the model's short-run movement. This research's major determinations indicate that the long-term and short-term causal movements from FDI, EXP, and FCE to RER are momentous and significant. On top of that, the study's empirical recommend to policymakers and economy politicians that a shock to FCE, FDI, and EXP leads to fluctuations in RER. Moreover, FDI and EXP appreciate local currency against USD.*

Keywords: *VECM, FDI, Exports, Households consumptions, Wald test*

1. INTRODUCTION

The ER is one of the most crucial means of determining the relative economic health of a nation. Likewise, The ER of a country gives a window to its economic stability and prosperity. We are keeping in mind. ER fluctuations are the major concern for researchers, with this regard many pieces of literature define an absolute impact of macroeconomics aggregates on test variable (ER) (see, Aman et al., 2017; Amir Razi et al., 2012; Fatima & Fraz, 2019; Mahjoub Ebaidalla, 2014; Ramasamy & Abar, 2015; Sankarkumar et al., 2019; Sharifi-Renani & Mirfatah, 2012; Tarawalie, 2011). Following with the same tune, the ER positively incline the essential macroeconomic elements such as GDP, the balance of payment, money and near-money supplies, the annual GDP growth ratio, and the total external debt (Adusei & Gyapong, 2017). Coupled with, Mahjoub Ebaidalla (2014) examines the shock of ER flightiness on Sudan's macroeconomic performance, and the outcome of the 2SLS method revealed the induce of RER fluctuations on the economic upsurge and FDI flow in Sudan. The conclusion revealed that ER flightiness played an essential role in economic upsurge fluctuations and FDI inflows in recent decades.

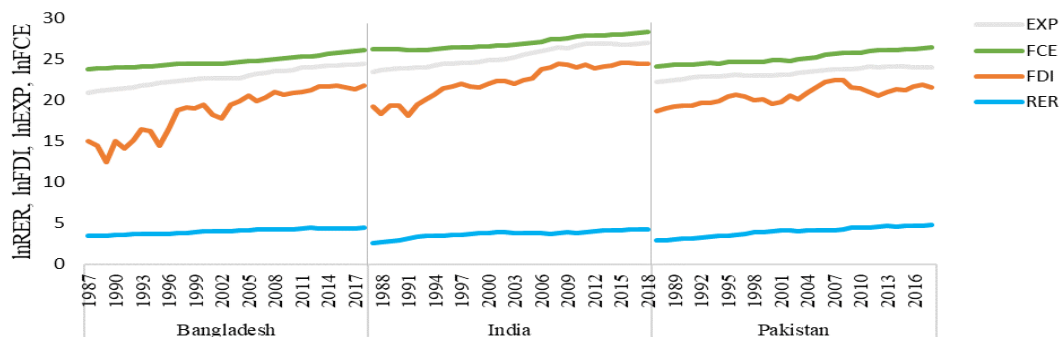
Equally important, according to Amir Razi et al. (2012) the fluctuation in the ER affected by GDP, interest rate, inflation rate, and current account, but the primary and substantial role that GDP played. In the same way, Danmola (2013) analyses the induce on macroeconomic variables of ER flightiness, and the study determination shows that ER flightiness has a substantial

favourable influence on the GDP, FDI, and trade openness, but the inverse indices of inflation. Beyond, according to Obansa et al. (2013), the ER has a greater incline than the interest rate on an economic upsurge. Notably, the induces of the interest rate were absolute but decreased as the time horizon increased. However, In the regulation period, it had a minor stroke on economic resilience than in Nigeria's deregulation era.

According to Aman et al. (2017), the correlation between ER and economic resilience in Pakistan and GDP is a dependent indicator when the main factors are exports, imports, domestic wages, demand, and FDI. Examination of the use of the 2SLS and 3SLS parallel equations. This study indicates that ER has been favourable in connecting economic resilience through export incentive networks, increasing investment levels, increasing FDI inflows, and promoting the import replacement industries. Similarly, Sankarkumar et al. (2019) explained Indian growth by considering variables such as the nominal ER, the price index, the balance of payments, exports, reserves of foreign currencies, the GDP, imports, inflation, international reserves, and financial provision. The study reveals that the real ER did not establish a linear affiliation with all the variables apart from the balance of payments and inflation. The real ER and economic resilience have a long-run affiliation.

Despite Ramasamy and Abar (2015) findings, except for employment and the budget deficit, macroeconomic factors significantly affected ER. In the study, most macroeconomic variables display opposite signs of anticipation, and in determining the exchange rate variations, they find that psychological factors such as investors trust have more influence on ER than the economic determinants. Equally important, Fatima and Fraz (2019) discover the impact on exchange rates of GDP, inflation and interest rate in developing and developed nations, the findings have an

Figure 1: Country data of RER, FDI, FCE, EXP



important and heavy effect on the exchange rate of all macroeconomic variables. On balance, Akhtar and Faruqui (2015) observed the impact of macroeconomic aggregates on the exchange rate regime in Bangladesh and compared with South Asia nations. Henceforth, the study output replicated that macroeconomic essentials have significant causation to ER fluctuations. In this empirical research study, we focus on observing the behaviour of key macroeconomics indicators namely FDI, Exports, and FCE, see Table.1, that attempt to explain vitality in RER in the case of Pakistan, Bangladesh, and India. Furthermore, this research understands the causal long-run movement and the speed of adjustment from short-form fluctuations to long-term equilibrium and help and mine the path for further study in the same field to overcome the causes of currency appreciation and devaluation in assign nations.

In-fact, particularly the data comprising 31 years for each county, namely Pakistan, Bangladesh, and India, see Figure 1. The natural log of the variables is taken to make data normal, reduce fluctuations in the data and make the data linear. Four key macroeconomic variables can be seen in the figure namely Real exchange rate (RER), Foreign direct investment (FDI), Exports (EXP)

and Final Consumption Expenditure (FCE), which are mentioned in the vertical axis of the figure, and periods are mentioned on horizontal axis separately for Bangladesh, India, and Pakistan. One can sum-up that RER is gradually increasing across all three countries, which means the local currency Real ER is depreciating against USD in all three countries. Similarly, there is an increasing trend in EXP and FDI as well. Particularly, in India's case, the growth rate of the assigned macroeconomic indicators is high compared to Pakistan. However, the overall trend is absolute.

2. LITERATURE REVIEW

Foreign direct investment and exchange rate

The role of FDI in financial growth, economic rise, living standards, and the GDP is extremely important. Considering these substantial FDI roles in developing economies, several kinds of research have been conducted to evaluate the factors that have an immense induce on FDI inflows. ER and their uncertainty are one of those variables that have been a source of debate. The affiliation between currency flightiness and FDI inflow is essential. According to earlier literature, the strike of RER on FDI is different. The consequence of a different set of researchers supports an inverse connection between ER and FDI (see, for example, Aizenman, 1992; Kyereboah-Coleman & Agyire-Tettey, 2008; Nazima Ellahi, 2011; Omorokunwa & Ikponmwoosa, 2014; Yassin Sheikh Ali et al., 2017). The others consider an absolute correlation between the ER and FDI (see, Aman et al., 2017; Emmanue & Luther, 2014; Lily et al., 2014; Osinubi & Amaghionyeodiwe, 2009). Different from Yassin Sheikh Ali et al. (2017) examine the ER incite on Somali FDI. The ER and FDI are related inverse and substantially, while the inflation and domestic investment of FDI are affirmative and significant.

Similarly, based on Nazima Ellahi (2011) findings, the long-period favourable ER instability has adverse induces on FDI inflows in the case of Pakistan. Continuing with the same fashion, massive inflows of the workforce's FDI and movement have considerably enhanced Pakistan's real equilibrium ER (Hafeez-ur-Rehman et al., 2010). Stimulating the point that the higher ER enhances FDI injection into the world, while also a strong FDI inflow enhances currency stability in the region (Emmanue & Luther, 2014). Similarly, in the case of Iran: the ER, GDP, and trade openness have an affirmative strike on FDI. However, world crude oil prices and ER impulsiveness have an inverse relation to foreign direct investment (Sharifi-Renani & Mirfatah, 2012).

Exports and exchange rate fluctuations

Exports from any country play a major role in the country's growth and are the principal indicators of that country's economic health. Since the late 1970s, when the ER moved from flexible to fixed ER after the 1972–73 agreement of Bretton Wood, the affiliation between ER fluctuations and exports has become a major concern. Simultaneously, the main criticism of the flexible ER is the increase of uncertainty in the flexible currency and the decrease of the global trade. However, the dynamic of exports and ER fluctuations urged researchers and political leaders to investigate how currency fluctuations collision trade volume. In the literature, contradictory results are observed about the collision on global trade of ER variability. Studies supporting the assumption that ER flightiness reduces trade volume are (for example, Akhtar & Hilton, 1984; Arize, 1995; Baak et al., 2007; Bailey et al., 1987; Grauwe, 1988). However, Gotur (1985) and Hooper & Kohlhagen (1978) suggested that there was not any cause and induce a correlation between ER inconsistency and exports. Trade and price levels depreciate actual ER, Although trade restrictions and workers' remittances have adverse induces or a long-period appreciation of Pakistan's RER (Bashir & Luqman, 2014).

Similarly, ER affects Pakistan's exports adversely but is insignificant, whereas world income has a favourable and considerable induce on exports (Ahmed et al., 2017). notwithstanding, Hooper and Kohlhagen (1978) examine the collision of uncertainty in the ER on trade were studied during the years 1965 to 1975, they examined bilateral and multilateral trade between developed countries. By the default of nominal currency instabilities, they calculated ER risk. The ER fluctuations could not have a considerable effect on the volume of trade. They measured the instability of the ER risk as to the default of the nominal ER function. Moreover, Mustafa and Nishat (2004) explore Pakistan's connection with currency instability, and export production, the outcomes of the research concluded that in the case of the UK and the United States, the association is inverse, whereas, in Pakistan and India, the association is not short-term but is observed for a long time.

Besides, the ER's instability has an adverse and necessary induce in the case of Bangladesh trade with major partners such as Western European and North America, in the short term and long-period (Ahmed, 2009; Hassan & Tufta, 1998). Besides, Arize et al. (2003) have studied the ER uncertainty to suppress export flows. Exports are used as the dependent variable; the model findings show that the rise in ER variations has a considerable inverse induce both on short-and long-run export demand. In like manner, Baak et al. (2007) Investigate exports in eastern Asian countries (Hong Kong, South Korea, Singapore, and Thailand) for the collision of ER flightiness. Their results showed an adverse influence on exports in the short-term and long-time periods of the ER flightiness. On another note, Doğanlar (2002) elaborated on the collision on exports in five Asian countries of ER impulsiveness. The results show that the flightiness of ERs reduced these countries' real exports. This could lead to a risk reduction for producers in such countries. If the ER explosiveness rises, producers will choose to sell on national rather than foreign markets. Kumar and Dhawan (1991) estimate the collision of ER uncertainties on exports from Pakistan and identify strong evidence indicating that the increased variability in its bilateral ER had an inverse impression on exports. Nonetheless, Altıntaş et al. (2011) describe the long-term ties between Turkish exports, variability in ERs, international wages, and relative prices have been identified. The long-time estimates suggest that the ER collision on Turkish exports are favourable and statistically substantial, while relative prices have an unfavourable and considerable induce on Turkish exports.

Consumption and exchange rate vitality

Consumption influences business cycles, which shape short-term decision-making in monetary policy; Consequently, it appeals to policymakers to understand consumption factors. The research shows that ER uncertainty inhibits long-time consumption. The induces are nevertheless irrelevant in the short term (Iyke, 2017). likewise, Consumption and save options have several key influences in short-term and long-term economic analysis. The first thing that influences short-term monetary policy decisions is that consumption affects business cycles. In the second place, saving decisions affect capital stock levels, remuneration, interest rate changes, long-duration living standards, and collision fiscal and monetary policy (Carroll, 2006). Despite that, Njindan Iyke and Ho (2018) explained the induces of ER instability on consumption in Ghana, which has frequently experienced currency fluctuation. The research revealed that the foreign ER's fluctuation has an inverse, long-duration induces on domestic consumption. Despite, Edeme et al. (2017) describe the induce on household welfare of ER fluctuations and the causal association between ER variations and household goods in Nigeria. The conclusions showed that household welfare responded to fluctuations in the ER is affirmative and considerable. Impulsiveness in ER had a direct inverse collision on demand. Similarly, the instability in the currency exchange has short-term consequences for domestic consumption in virtually every region, but in only half of these countries, the short-term induce remains for long-duration. Also,

in the emerging economies, the findings have important effects on business cycles and growth and quantitative models of consumer behaviour (Bahmani-Oskooee & Kutan, 2015).

3. METHODOLOGY

Data and variables description

As it is mentioned that to study the long-run causative association and the flow of causality from the independent variable such as FDI, EXP and FCE toward real ER as a reliant variable. The statistics are drawn from the 2020 World Bank predictor for growth. From 1987 to 2018, which consist of 31-year data. The variables descriptions are listed in Table 1.

Table 1: Variables description (RER, FDI, EXP, FCE)

| Variable | Description | Sources |
|----------|--|--|
| RER | Official exchange rate (LCU per US\$, period average) | IMF & IFS |
| FDI | Foreign direct investment, net inflows (BoP, current US\$) | IMF, BoP database, supplemented by data from the United Nations Conference on Trade and Development and official national sources. |
| EXP | Exports of goods and services (BoP, current US\$) | IMF, BoP Statistics Yearbook, and data files. |
| FCE | Final consumption expenditure (current US\$) | WB national accounts data, and OECD National Accounts data files. |

- RER is described as the exchange rate set by national authorities or the rate developed on the legally approved exchange markets.
- FDI applies to transfers of money directly into the reporting economy. It refers to the capital stock, revenue reinvestment and other money.
- EXP include all sales, from citizens of a nation to non-residents of general goods in the rest of the world, with a change in ownership. Note: The statistics were based on the IMF's Balance of Payment Manual (BPM6) in its sixth edition and will not be accessible until 2005.
- FCE spending budget is the amount of total household consumption and government expenditure.

Data analysis

The purpose of this analysis is to investigate whether a causative association exists in the model. Perhaps, we are entitled to elaborate the casual affiliation as in equation keeping RER as the dependent variable, whereas the rest of variables are independent variables. Based on theoretical background and literature different methods have been used to undermine the study includes OLS (De Vita & Kyaw, 2011; Edeme et al., 2017; Kumar & Dhawan, 1991; Osinubi & Amaghionyeodiwe, 2009), ECM and VAR (Altıntaş et al., 2011; Islam & Hossain, 2018; Jin, 2013; Kim & Roubini, 2000), GMM and 2SLS, (Akpan & Atan, 2011; Latief & Lefen, 2018; Mahjoub Ebaidalla, 2014), Flexible Dynamic Panel Data (Iyke, 2017; Jinzhao, 2012), Panel Granger Causality and ARDL (Korkmaz, 2016; Lily et al., 2014; Nazima Ellahi, 2011). This trial aims to use the VECM Panel to check the causality of the variables. This is shown because the VECM Panel can distinguish short and long-term affiliations and provide more accurate estimates than regular VAR. Besides, the ECT, a cointegration term built into VECM, allows being corrected with a phased speed of short-term change by deviating from long-run equilibrium.

Model Specification

Literature review and research methodologies are useful for selecting an appropriate model for a study that best fits the data types. Similarly, perhaps, many researchers have preferred VECM to test the long-run and near-term causal affiliation between macroeconomics essentials (Aggregates) and real ER. We follow (Arize et al., 2003; Bashir & Luqman, 2014; Mustafa & Nishat, 2004). To have the best model fit, the variables should be stationary at the first difference. Hence, the Unit Root test is initially required to check data stationery then followed by the Johansen Panel Co-integration test. Finally, the VECM near term representation Wald test is used. Apart from this, the VECM model's dynamics and the deviation from a long-lasting balance are also typical. The ECT, however, characterizes the equilibrium of the long run. The question is how dynamic behaviour can be modelled. (Engle & Granger, 1987) suggested a two-step estimation technique applied in this paper to model the dynamic behaviour of co-integrated I (1) variables. In the first step, this model is developed.

$$\ln RER_{it} = \alpha_i + \beta_{1i} \ln FDI_{it} + \beta_{2i} \ln EXP_{it} + \beta_{3i} \ln FCE_{it} + e_{it} \dots (1)$$

$$\dot{e}_{it} = \ln RER_{it} - \dot{\alpha}_i - \dot{\beta}_{1i} \ln FDI_{it} - \dot{\beta}_{2i} \ln EXP_{it} - \dot{\beta}_{3i} \ln FCE_{it} \dots (2)$$

Where:

I is 1,2,3,....., N in equation 1 is the number of the cross-section in our panel model is the number of countries, t=1,2,3,...., T is the period, lnRER is the natural log of the real ER, lnFDI is the natural log FDI, lnEXP is the natural log of exports and lnFCE is the natural log of Final Consumption Expenditure, α and β are correspondent coefficient, e is residuals. To get residuals, we bring other variables to the right side of equation 1. Equation 2 describes the lag residuals ($e_{i,t-1}$), which explained the independent variable's long-run causal affiliation to the dependent variable (RER). That is denoted by ECT ($ECT_{i,t-1}$). The next step is to introduce the system of equations where the ECT is incorporated with short-run relation dynamics.

$$\Delta \ln RER_{it} = \alpha_{1i} + \sum_{k=1}^m \beta_{11ik} \Delta \ln RER_{it-k} + \sum_{k=1}^m \beta_{12ik} \Delta \ln FDI_{it-k} + \sum_{k=1}^m \beta_{13ik} \Delta \ln EXP_{it-k} + \sum_{k=1}^m \beta_{14ik} \Delta \ln FCE_{it-k} + \lambda_{1i} ECT_{it-1} + \mu_{1it} \dots (3)$$

$$\Delta \ln FDI_{it} = \alpha_{2i} + \sum_{k=1}^m \beta_{21ik} \Delta \ln FDI_{it-k} + \sum_{k=1}^m \beta_{22ik} \Delta \ln RER_{it-k} + \sum_{k=1}^m \beta_{23ik} \Delta \ln EXP_{it-k} + \sum_{k=1}^m \beta_{24ik} \Delta \ln FCE_{it-k} + \lambda_{2i} ECT_{it-1} + \mu_{2it} \dots (4)$$

$$\Delta \ln EXP_{it} = \alpha_{3i} + \sum_{k=1}^m \beta_{31ik} \Delta \ln EXP_{it-k} + \sum_{k=1}^m \beta_{32ik} \Delta \ln FDI_{it-k} + \sum_{k=1}^m \beta_{33ik} \Delta \ln RER_{it-k} + \sum_{k=1}^m \beta_{34ik} \Delta \ln FCE_{it-k} + \lambda_{3i} ECT_{it-1} + \mu_{3it} \dots (5)$$

$$\Delta \ln FCE_{it} = \alpha_{4i} + \sum_{k=1}^m \beta_{41ik} \Delta \ln FCE_{it-k} + \sum_{k=1}^m \beta_{42ik} \Delta \ln FDI_{it-k} + \sum_{k=1}^m \beta_{43ik} \Delta \ln EXP_{it-k} + \sum_{k=1}^m \beta_{44ik} \Delta \ln RER_{it-k} + \lambda_{4i} ECT_{it-1} + \mu_{4it} \dots (6)$$

Where Δ is the first difference of variables, k is optimal leg length our case it is one, β , λ , and α are slope coefficient of the equations and μ is the residuals.

Unit Root Test

The macroeconomic time-series, most of which is not stationary, may never be successfully

explained by macroeconomic trends that concentrate on economic disruptions as a strictly transitional source of fluctuations and that stochastic variations due to fundamental factors are an essential component of any model of macroeconomic fluctuation (Nelson & Plosser, 1982). In other words, data has Unit Root, before going for cointegration. Unit Root Test is a convenient tool to look for data stationery. We follow LLC (Levin & Lin, 2002), IPS (Im et al., 2003), and ADF Augmented Dickey-Fuller (ADF) tests. The following are major and useful Unit Root Panel analysis method for explaining data stationarity at level or differences.

Cointegration Test

A set of statistical convenience methods are applied to test the Unit root of assign variables in our case (RER, FDI, EXP, and FCE), the second step is to check for the long-run affiliations among variables. Johansen Panel Co-integration test is used for the long-duration association. At the back of Maddala and Wu (1999) approach, judge the number of Cointegration relations among four variables. Whereas, Maddala and Wu (1999) preferred and relied on (Johansen, 1988), and concluded the suggestion of Fisher (1932) by combining trace testing with Max-Eigen statistics for full panel cointegration testing through the combination of individual cointegration cross-sections. Johansen Fisher Panel Cointegration adds the p-values of Johansen's individual cointegration test statistics. Engle and Granger (1987) described that if all variables are cointegrated, the VECM representation must be checked for error correction representations. We are using the Johansen parameter for cointegration. Besides, proper lag selection criteria information is a graphic element in VECM estimates. Based on Lütkepohl's (2006) findings, the lag length criteria are equally important for cointegration see (Johansen, 1988). We use the unrestricted Vector Autoregressive (VAR) model to determine the appropriate lag order to test the lag frequency.

4. EMPIRICAL RESULTS

The unrestricted VAR model is used to select appropriate lag length information criteria for panel Johansen cointegration (see, Engle & Granger, 1987). Liew's (2006) findings describe optimal lag length criteria, according to him the Akaike's Information Criterion (AIC) and Final Prediction Error (FPE) criteria for lag length selection are stronger than other criteria for autoregression time series in the case of fewer observations. Thus, Table 2 refers to the lag length selection criterion; based on the above discussion, the lower value of AIC and FPE preferred lag (1) as optimal lag length criteria.

Table 2: Lag length selection information criteria based on unrestricted VAR estimates.

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|--|----------|----------|-----------|-----------|-----------|-----------|
| 1 | 265.8984 | NA | 1.94e-08* | 6.407652* | 5.924225* | 6.214127* |
| 2 | 279.9944 | 25.30041 | 2.04e-08 | -6.358830 | -5.391975 | -5.971780 |
| 3 | 288.8386 | 14.96720 | 2.47e-08 | -6.175350 | -4.725067 | -5.594775 |
| 4 | 298.4298 | 15.24751 | 2.95e-08 | -6.011021 | -4.077311 | -5.236921 |
| 5 | 310.0923 | 17.34420 | 3.37e-08 | -5.899802 | -3.482665 | -4.932178 |
| 6 | 322.6810 | 17.43050 | 3.82e-08 | -5.812333 | -2.911768 | -4.651184 |
| - indicates lag order selected by the criterion, LR: sequentially modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion. | | | | | | |

For VECM implication, at the first difference, we presume that all variables should be stationary.

Three methods have been replicated to test data Unit Root, see Table 3. LLC (Levin, Lin & Chut), IPS (In, Pesaran and Shin W-stat), and ADF Augmented Dickey-Fuller (Fisher Chi-square) tests. All three methods were used to test whether variables are stationary at the level or first difference. In the case of FCE, at level, the LLC method's statistics are 3.46658 with 0.997 correspondent probability, which was higher than the 5% confidence interval.

Similarly, the same variable is tested with the IPS method, whereas the correspondent probability was one, which accounts for more than 0.05. Likewise, we conclude that the FCE is Unit Root at I (0). The LLC, IPS, and ADF results are considerable at I (1) with subsequent probabilities are 0.0005, 0.0010 and 0.0022, respectively, which is less than 0.05 in all three tests. As a result, we conclude that the FCE is stationary at first difference. However, EXP and RER are not considerable at I (0); the reported probabilities are higher than 0.05 interval. We cannot reject the Null hypothesis; instead, we accept the Null hypothesis that there is Unit Root in the data at I (0). However, at I (1), the probabilities are less than 5% considerable for all three tests. Furthermore, the results of IPS and ADF are not considerable at I (0) for FDI, whereas the induce of LLC is considerable at I (0), concluding that the results of two tests are inconsiderable; thus, we consider FDI Unit root at I (0). The conclusions of all the tests are considerable at I (1) for FDI.

Table 3: LLC, IPS and ADF Panel Unit Root Tests (FCE, EXP, FDI, RER)

| Table 3: LLC, IPS and ADF Panel Unit Root Tests (FCE, EXP, FDI, RER) | | | | | | | |
|---|------------|--------------|------------|--------------|------------|--------------|------------|
| At level | | | | | | | |
| Variable | LLC | | IPS | | ADF | | Conclusion |
| | Statistics | Probability* | Statistics | Probability* | Statistics | Probability* | |
| FCE | 3.46658 | 0.9997 | 5.35591 | 1.0000 | 0.03399 | 1.0000 | I (0) |
| EXP | -1.35549 | 0.0876 | 0.82409 | 0.7951 | 2.25464 | 0.8949 | I (0) |
| FDI | -1.65903 | 0.0486 | -0.10882 | 0.4567 | 4.57742 | 0.5990 | I (0) |
| RER | -2.87266 | 0.0020 | -1.01578 | 0.1549 | 9.25346 | 0.1598 | I (0) |
| At First Difference | | | | | | | |
| FCE | -3.28897 | 0.0005** | -3.08696 | 0.0010** | 20.5486 | 0.0022** | I (1) |
| EXP | -1.59320 | 0.0556 | -3.22292 | 0.0006** | 21.3037 | 0.0016** | I (1) |
| FDI | -3.25426 | 0.0006** | -5.97172 | 0.0000** | 42.9222 | 0.0000** | I (1) |
| RER | -3.87930 | 0.0001** | -3.59521 | 0.0002** | 24.2631 | 0.0005** | I (1) |
| - Methods statistics are significant at **1% and *5%. | | | | | | | |
| - LLC: Levin, Lin & Chu t*, IPS: Im, Pesaran and Shin W-stat, ADF: Augmented Dickey-Fuller-Fisher Chi-square. | | | | | | | |

To order for our variables to check long-lasting cointegration, we have adopted the Johansen panel cointegration test based on the Fisher system. The use of cointegration tests of the Johansen panel type Fisher is based on the reasons stated above. Table 4 reveals that there are at the most

one at the most two and at the most three cointegration equations between RER, FCE, EXP & FDI in the related percentages of trace stat and Max Eigen checks. This is valid since we cannot consider the null hypothesis that no correlation exists between them. Rather we accept the alternate hypothesis that many cointegration equations with a p -value of 0.0001 from the Fisher trace test and p -value 0.0100 from the max-eigen test. Hence, we support the evidence that at most, one equation is considerable at 0.0196 probability from the trace test.

Table 4: Johansen Fisher Panel Cointegration Test (RER, FDI, EXP, and FCE)

| Hypothesized No. of CE(s) | Fisher Stat.* (from trace test) | Probability | Fisher Stat.* (from the max-eigen test) | Probability |
|---------------------------|---------------------------------|-------------|---|-------------|
| None | 29.18 | 0.0001 | 16.81 | 0.0100** |
| At most 1 | 15.08 | 0.0196 | 10.98 | 0.0889 |
| At most 2 | 7.885 | 0.2467 | 9.185 | 0.1634 |
| At most 3 | 2.630 | 0.8536 | 2.630 | 0.8536 |

- Probabilities are computed using asymptotic Chi-square distribution, and Model statistics are significant at** 1% and* 5% level.
- Lag length criteria are selected based on minimum AIC and SIC, the linear trend is determined in the data- no trend in VAR

The long-run VECM representative (see Table5) is the ECT (Error Correction Term). That could show a sustainable causality, and the other would mean the speed of adjustment to a sustainable balance. The guideline for a sustainable causality movement is from the independent variables to the dependent variable. However, the speed of adjustment for sustainable stability is considered when the coefficient is less than zero and significant. Our model's empirical examination concluded similar findings to the mentioned criteria: the cointegration equation's coefficient is negative and considerable, with a reported p -value of 0.0000 and a coefficient of negative - 0.055244. This implies that the long-term causality running from independent variables such as FCE, FDI, and EXP to the dependency variable RER.

Moreover, ECT is implying an adjustment speed of 5.52 per cent per year. Therefore, we can say that at a rate of 5.52 per cent annually, the entire system returns to its sustainable balance. This meant that in the past, some imbalance had been repaired at the speed of adjustment specified.

Table 5: Panel VECM Long-run representation: RER as a dependent variable

| | Coefficient | Std. Error | t-Statistic | Probability |
|-----|-------------|------------|-------------|-------------|
| ECT | -0.055244 | 0.011676 | -4.731585 | 0.0000 |

- Coefficient is significant at** 1% and *5% level, the linear trend is determined in the data- no trend in VAR.
- Long-term coefficients are - 0.172765232008, - 0.851920790435, 0.981448398643 for FDI, FCE and EXP, respectively.
- R-squared is 0.341276, and Adjusted R-squared is 0.302067, DW statistics is 2.041936.

Besides, a short-term causality check with the Wald test, as illustrated in Table 6 below, is conducted. The two models' test results show that there is a short-term causality from the independent variables to the dependent variables. To sum up. Model one shows momentous short-term causation running from FDI, EXP, and FCE to RER at p -value 0.0181.

| Table 6: Panel VECM short-run representation, multivariate analysis: Wald test | | | | |
|---|----------------|----------|----|-------------|
| Variable | Test Statistic | Value | df | Probability |
| RER | Chi-square | 11.90599 | 4 | 0.0181 |
| FDI | Chi-square | 1.784490 | 4 | 0.7753 |
| EXP | Chi-square | 10.91798 | 4 | 0.0275* |
| FCE | Chi-square | 8.111878 | 4 | 0.0876 |
| <p>- Significant at the *1% level. Restrictions are linear in coefficients. RER: Real exchange rate, FDI: Foreign direct investment inflow, EXP: Exports of goods and services, FCE: Final Consumption Expenditure.</p> <p>- Short-run coefficients for model.1 are 0.306080, -0.014799, 0.195237, and -0.047032 for RER, FDI, FCE and EXP, respectively.</p> | | | | |

Model fit tests are the primary pre-requisites of using every statistical model. In our study, Table 7 describes the model fit diagnostics. The Jarque-Bera test is used for data normality, and the LM test is applied for autocorrelation. The Jarque-Bera test statistics are taken from descriptive statistics table, which verified that except FDI, the rest of the variables are normally distributed with p-values of 0.083239, 0.11900 and 0.0659 RER, EXP and FCE, respectively. Besides, the LM test result accepts the null hypothesis that there is no serial correlation in the model residuals with a *p*-value of 0.7838. likewise, the heteroskedasticity test rejects the alternate hypothesis, concluding that there is homoskedasticity in the residuals of the model with a *p*-value of 0.5566.

| Table 7: Model diagnostics | | | |
|--|--------------------|------------|-------------|
| Description | Statistics | Chi-square | Probability |
| Heteroskedasticity | | 97.34163 | 0.5566 |
| Serial Correlation LM Tests | 11.40548 | | 0.7838 |
| Normality test | Jarque-Bera | | |
| RER | 4.972080 | | 0.0832 |
| FDI | 13.41454 | | 0.0012** |
| EXP | 4.257252 | | 0.1190 |
| FCE | 5.438249 | | 0.0659 |
| - Test statistics are significant at **1% and *5% level. | | | |

Sims (1980) developed an orthogonalized procedure to demonstrate impulse responses in assigned variables to the model, especially in the case of VAR estimations. In comparison, innovation to a series can cause impulses in themselves as well as in other regressors. In our study, we are entitled to examine the responses of RER while adding some additional shock to other regressors and observe the behaviour of the target series in the model. Indeed, this model's general representation is widely available in the literature (see Bernanke, 1986; Sims, 1980,

1986). To summarize the model's impact, see figure 2, where one standard deviation shock is provided to regressors such as FDI, EXP, and FCE, the response of RER is observed for ten years in each case. The response of RER to one standard deviation innovation to FDI is initially observed to be negative in the short-term after that it has a permanent effect for a long time. However, ultimately the response can be negative to meet its equilibrium level at the rate of 0.05 each year. In the same way, initially, in the case of EXP, the response of RER can be noted as negative in the short-term and holds permanent impact for the long-term.

Nonetheless, the response of RER to one standard deviation shock to FCE is positive. Besides, variance decomposition, taking RER as dependent series, is performed in Table 8. Perhaps, for a short period, major fluctuations in RER is observed by its shock, which is called endogenous impulse—in other words, taking period three into account. Its shock observes 93.64 percent of the variance in RER. However, in the same period, 0.12, 1.79, and 4.43 per cent fluctuation in RER is influenced by FDI, EXP, and FCE, respectively. In contrast, in the long period, particularly in period ten, 69.95 per cent fluctuation is observed in RER as its innovations. Whereas 7.59, 10.95, and 11.4 per cent independent series is observed by FDI, EXP, and FCE simultaneously.

Table 8: Variance decomposition, RER as a dependent variable

| Period | S.E. | RER | FDI | EXP | FCE |
|--------|----------|----------|----------|----------|----------|
| 1 | 0.049206 | 100.0000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.077209 | 96.77084 | 0.145584 | 0.590647 | 2.492933 |
| 3 | 0.097961 | 93.64130 | 0.125906 | 1.798410 | 4.434390 |
| 4 | 0.115091 | 90.36346 | 0.491723 | 3.175031 | 5.969786 |
| 5 | 0.130189 | 86.90165 | 1.244256 | 4.596100 | 7.257990 |
| 6 | 0.144051 | 83.34082 | 2.288941 | 6.006738 | 8.363503 |
| 7 | 0.157107 | 79.78921 | 3.523102 | 7.368221 | 9.319464 |
| 8 | 0.169596 | 76.33706 | 4.859911 | 8.655303 | 10.14772 |
| 9 | 0.181653 | 73.04695 | 6.233525 | 9.853902 | 10.86562 |
| 10 | 0.193354 | 69.95616 | 7.597365 | 10.95831 | 11.48817 |

Figure 2: IR function (d.f. adjusted) impuls, bivariat model

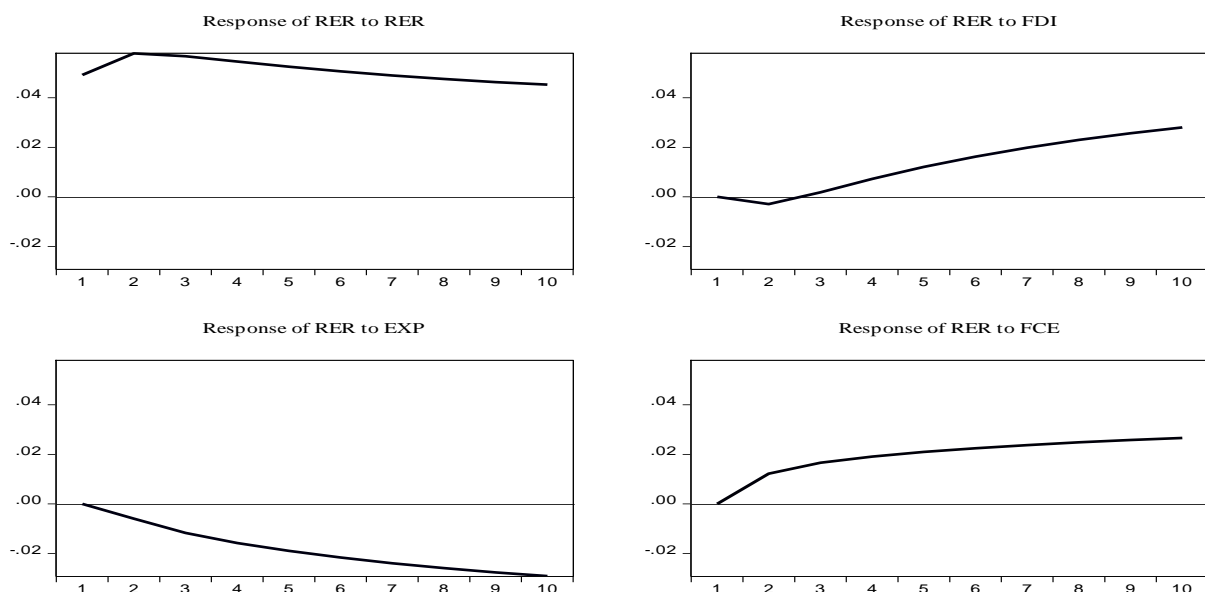
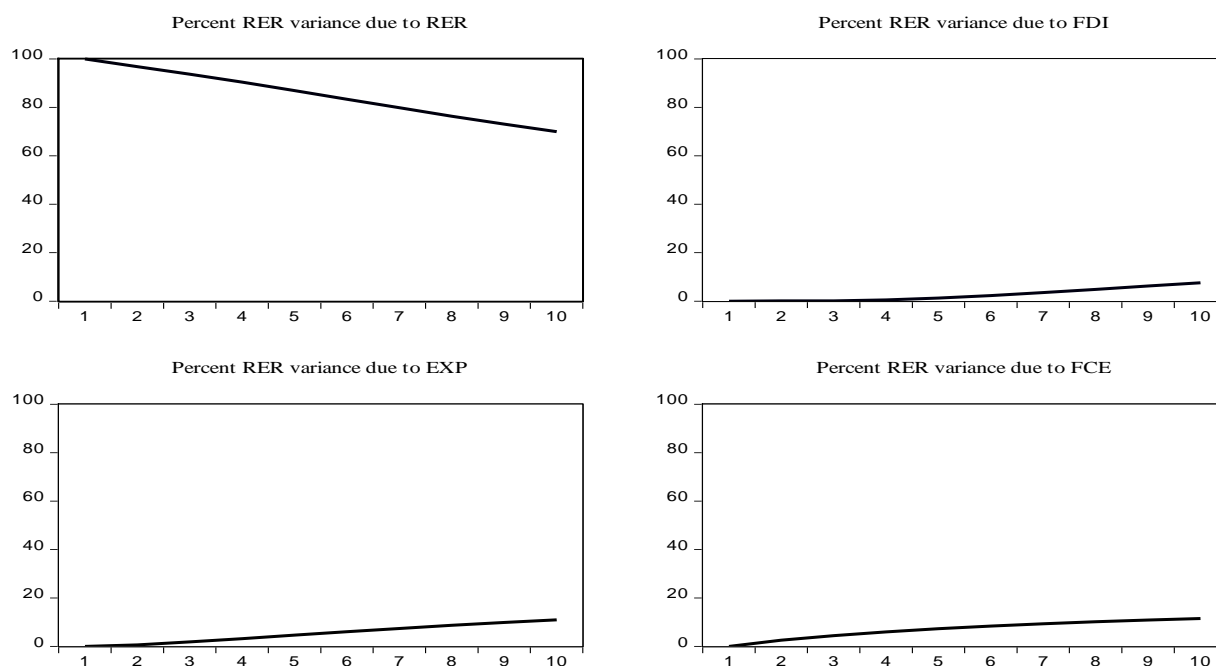


Figure 3: Variance decomposition



5. CONCLUSION

This study explored the causative consequences of key macroeconomics indicators that have a long-lasting collision on RER fluctuations in South Asian countries, namely Pakistan, Bangladesh, and India. The data is constructed for the time of 1987 to 2018. using a cointegration and Vector Error Correction Model (VECM) approach. To disclose the model's finest significance, we conclude the most important economic indicators, such as FDI, Exports, Final Consumption Expenditure (FCE), and Real exchange rate (RER). Lag (1) optimal lag length criteria have selected based on the unrestricted VAR model lag. Besides, the work develops a long-term association between variables after measuring the Johansen cointegration study. The study also states a long-lasting affiliation flowing from FDI, EXP, and FCE to RER, despite the introduction of the VECM. Moreover, the short-run test Wald findings show that FDI, EXP, and FCE have a short-run causal connection to RER. The study also suggests that direct foreign investments and exports are the sole cause of Pakistan, Bangladesh, and India's economic rise. This study highly suggests that except FCE shock to exports and FDI inflow in the short-term appreciate local currency against USD; with the coefficient of -0.045, and -0.014 respectively. While in the long-term except EXP other impulses to FDI and FCE evaluate the local currency exchange rate, with coefficients of -0.172, and -0.851. On the other hand, increasing Final Consumption Expenditure have significantly positive causal Short-term affiliation with the ER. In other words, increase FCE devalue the real ER against USD. Beyond, the findings also included that in the long-run Exports has momentous positive causal consequences on RER. Means, increasing Exports in short-term appreciates local currency and effect can be permanent. While in a long time, the impact of impulses in RER due to Export shock can be positive to meet its equilibrium in the long-term.

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