Impact of Foreign Exchange Reserve on Exchange Rate in Selected South Asian Economies

Muhammad Umar Hayat[1], Abdul Jabbar [2]

Abstract

The significance of exchange rate and its influence on economic stability, productiveness, and trade patterns. Our study is the first in Selected South Asian Association for Regional Corporation (SAARC) countries including Bangladesh, India, Nepal, Pakistan, and Sri Lanka. We used four methods of estimation of panel data like Generalized Method of Moment (GMM), Fixed Effect (FE), Pooled Ordinary Least Square (POLS), and Random Effect (RE). The Hausman test preferred the fixed effect instead of the random effect. This study aims to examine the effect of foreign exchange reserve on exhange rate over the period of 2000 to 2020. The concept of exchange rate is also essential to government operations. Our study also adds to previous literature by discussing and testing the impact of foreign exchange reserve on exchange rate. According to estimated results, real gross domestic product, foreign exchange reserve, and openness of trade all have a significant impact on exhange rate over the time span under consideration. Whereas money supply and terms of trade both have an insignificant impact on exchange rate. Our finding confirms that the effect of foreign exchange reserve on exchange rate has a substantial and pessimistic. The empirical findings of the paper are of great significance for macroeconomic markets. Findings are also conducive to the countries' exports and domestic resources over time, which will result in an increase in foreign exchange reserves. In the end, exchange rate is essential for understanding and implementing broader macro and financial economic policies.

[1] International Institute of Islamic Economics, International Islamic University, Islamabad, Pakistan. Email: muhammad.umar8622@gmail.com
[2] International Institute of Islamic Economics, International Islamic University, Islamabad, Pakistan. Email: jabbar@iiu.edu.pk

1   Introduction

Over the past few decades, different exchange rate systems have been. The innumerable currency rate systems have been used in the prevailing literature. Primarily, countries have worked under the Gold Standard from 1879 to 1934 rather than during World War I. The system is represented the fixed currency rate. Aftermath, the Gold Standard system collapsed in 1934 and the Bretton woods system is introduced under which a certain quantity of gold. Besides, the rest of the Worlds currencies are linked to the US$, which was used until 1971. The system was abolished from 1971 to 1973 and a floating currency rate was introduced to determine the rate of currency with respect to the supply and demand. The floating currency rate system has been prevailing with the assistance of this system government intervenes with respect to the federal bank in order to stabilize the currency prices within certain limits. It is extensively admitted that the stability of the exchange rate confirms the macroeconomic stability which formats the economic progress. Thus, the exchange rate is showing meaningful attention for broader macroeconomic and financial economic policymakers. In addition, the significance of the exchange rate has been discussed enormously in the literature on the behalf of economic prosperity and desirable acceptance (Milesi & Lane, 2002). Globally, the economic effects of COVID-19 epidemics are waning globally. The instant response of entire world governments has been to offer arbitrary fiscal measures to mitigate the macroeconomic shock.

In addition, there exists a large body of literature to identify the determinants of the currency rate. Used worldwide None of the studies has been developed among researchers to identify the impact of foreign exchange reserve on exchange rate with respect to selected SAARC countries. An exchange rate is the value of a currency that is exchanged on the behalf of another currency. Exchange rates are either floating or fixed. A floating exchange rate is a rate that can be determined by several market forces such as supply and demand. The exchange rate is defined by different economists as how can be managed if fluctuates in a currency rate. The government can be managed and control the exchange rate through central bank interventions. A study also tests the hypothesis to determine the exchange rate thru foreign

reserves. Moreover, the equilibrium exchange rate assists enterprises and other financial organizations. With the assistance of domestic and international financial organizations, we easily evaluate the performance of finance and investment. The fluctuations in the exchange rate affect the profitability of multinational companies and boost the exposure of the enterprises and financial organizations, which in term affects the growth of the economy. On the other hand, due to a disequilibrium exchange rate, it is impossible to achieve the desired outcomes in macroeconomic stability (Khan & Qayyum, 2011).

In this regard, the rate of exchange is determined by all the exogenous indicators. M2 is a factor of the currency rate, Wilson (2009) has examined the effective currency rate of the dollar on the behalf of trading partners. Johanson co-integration test has demonstrated that M2 possesses positively associated with an effective currency rate. As well as the upsurge in M2 may generate a depression in the US dollar. The same, Ahmed et al. (2012) probe the factors of the currency rate. The money supply has been achieved positively connected with the rate of exchange in the long run and vice versa. There are numerous indicators affecting an exchange rate, such as real GDP, inflation rate, interest rate, etc. Khan et al. (2012) interrogates the many determinants that have affected the nominal currency rate. The money supply and inflation rate have been positively connected with the currency rate. On the contrary, interest rates and real GDP have been negatively linked with currency rates. Similarly, the bidirectional connection of real gdp and inflation rate with reference to currency rate while unidirectional connection of money supply and interest rates with reference to exchange rate. A similar development is met (Nguyen, 2015).

Besides, the effect of foreign exchange reserve on currency rate of the five economies of South Asia between 2000 to 2020 is established in this study. The foreign exchange reserve is highly noteworthy and affects the currency rate. The foreign exchange reserve is an asset held as a reserve in the form of foreign currency by the central bank of the country. This asset serves sundry targets on the behalf of the central bank similarly foreign reserve is used as a cushion, especially for the Pakistani

economy and the rest of the world. Foreign exchange reserve is the most important indicator in the case of any country in the world, especially for SAARC countries. Enormously foreign exchange reserve has a positive and significant effect on every country in the world particularly for SAARC. Consequently, the foreign exchange reserve is the most important asset of the country held via the central government or other monetary authority. The foreign exchange reserve is a key element in this paper. The outcome of foreign reserve in a negative influence on the currency rate. In the same manner, the major object of holding the foreign exchange reserve is to enhance the volume and size of the federal bank of the country. The foreign exchange reserves are acting as a cushion for every country in the world. On the contrary, foreign reserve influences the exchange rate, consequently the factual of the research will be probed the nexus between exchange rate and foreign exchange reserve in the case of selected SAARC economies.

However, exchange rate has played an important role in a country's trade performance. Also, the significance of currency rate has been discussed extensively in the literature in terms of economic prosperity and desirable acceptance. Exchange rates have found enormous uncertainty from the culmination of the Bretton-Woods regime. Many economists have debated currency rate with reference to its worldwide worth. As well as, the currency rate has an effect on economic stability, productiveness, trade patterns and, investment, etc. That's why understanding the notion of currency rate is very essential for macroeconomic policymakers.

Therefore, the main focus of this research paper is on the exchange rate. It has limited existing literature in regard to the factors of currency rate. After scrutinizing the whole literature, few studies have been conducted with reference to currency rates for the South Asian economies. This research is most befitting for an in-depth understanding of the economies of these countries and the formulation of macro and monetary economic policies. In this frame of mind, it is necessary to judge if the economy have deteriorated due to the higher currency rate. It needs to consider why it is important to evaluate the foreign reserve on currency rate

to assist in policy making. Firstly, few studies have been conducted pertaining to assessing currency rate, and none of the studies diagnose exchange rate, hence it is essential to evaluate the theme, which is valued by policymakers. Secondly, in the present study have been overlooked the notion of foreign exchange reserve to reckon with the exchange rate such as Pakistan and other South Asian countries (Akram, 2013). Different estimation techniques are engaged in this research such as Fixed Effect, Generalized Method of Moment, Pooled Ordinary Least Square, and Random Effect (Baltagi (2005; Akram, 2013). The goal of the study is to assess the effect of foreign reserves on currency rates pertaining to selected South Asian economies. The outcome of this research shows that foreign reserves have a considerable impact on excahnge rate, according to the empirical evidence.

The remainder of this paper is designed as follows. In chapter 2 a review of the literature is presented. Chapter 3 contains a discussion on the methodology by giving some theoretical background. The empirical methodology used in this paper along with data sources, empirical model, and econometric strategy is discussed in detail in chapter 4 whereas chapter 5 covers the empirical results, and chapter 6 discussed the conclusion, policy implications, and suggestions for future research. The appendix presents the description of the variables in detail.

2   Literature Review

In history, various sorts of exchange rates, numerous aspects have been observed to play a vital role in measuring the rate of exchange. Foreign exchange reserve is that directly affects the currency rate. Krugman (1991) has presented a simple model of currency rate behavior through a target zone regime. This study has been revealed the monetary policy adjust the fluctuations of exchange rate but whenever the currency rate lies inside the zone, the zone will not defend vigorously. To check the effect of foreign exchange reserve on exchange rate with reference to five (5) selected SAARC nations. It reveals that the error correction model and co-integration procedure disclose the depreciations of exchange rate with a larger degree of openness. An increasing interest rate brings depreciation to it and the variable of terms of trade has a significant element of the currency rate (Elbadawi &

Soto, 1997). According to purchasing power parity, Rogers and Engel (2001) reported that the currency rate with inflation. The theory tells us the countries' equilibrium exchange rates have been occurred that have the same buying power. Most of the nations have a massive price level, and the countries' domestic currency is depreciated. In a study, we introduce the foreign exchange reserve as an explanatory variable. The concept of foreign exchange reserve is based on the total reserves plus gold. This section has been segmented into two subsections like empirical research and theoretical research.

2.1 Empirical Research

Numerous empirical studies have carried out to enlighten the association of exchange rates such as (Kunanopparat & Agbola, 2005; Rogoff et al., 2009; Algieri, 2013; Afshan & Raza, 2017). Most of the studies demonstrate the current experience and also reveal the previous time span. In this way, Mallick (2010) examines the rupee-dollar exchange rate under the capital mobility regime. Various factors i. e. expected exchange rate or forward exchange rates affect the behavior of the rupee-dollar exchange rate. Similarly, external institutional investment is also affecting the rupee-dollar exchange rate.

The co-integration approach is used by Mirchandani (2013) to test the exchange rate gap for India's economy. The determinants of exchange rate such as interest rate, and the inflation rate is adversely affecting the currency rate as well as GDP growth is positively related to currency rate. The currency rate and real exchange rate gap are associated with Pakistan's economy and it was calculated by Rehana et al. (1996), a study that used a two-stage least square method over the period of 1960 to 1994. In this study, the currency rate is appreciated in terms of trade and depreciated through openness. Lartey et al. (2012) appraise the currency rate using data from 1990 to 2003 with 109 developing and transition countries. In a study, the generalized method of moment procedure is used for the estimation of exchange rate.

Burange and Ranadive (2013) probe the real exchange rate using quarterly data from 1993Q1- 2011Q4. The basic elements have been contained for example productivity differences, foreign exchange reserve, government consumption, international

institutional investment, openness, interest rate, inflation rate, and terms of trade. The ARDL method has been confirmed the long-run affiliation between these indicators and the real exchange rate. The error correction model indicates a 76% conversion to the long-term equilibrium level in the next quarter. This paper established the expected theoretical correlation in the long run with the real currency rate and the above-mentioned indicators. This study evaluates the factors of foreign exchange reserve using yearly time series data. This paper used Augmented Dicky Fuller (ADF) unit root test to calculate the stationarity, Engle-Granger residual-based co-integration approach to show the co-integration relationship among the indicators, and diagnostic tests for better modeling. We got the concept of foreign exchange reserve from (Mdion et al., 2014). The concept of foreign exchange reserve is a key element in the study. In four approaches, the consequences are dissimilar.

Previously, most SAARC countries have worked exceptionally well with regard to the exchange rate. Pakistan and South Asian countries have enlarged the rate of exchange from 0.18% to 0.23%. This achievement has been completed over the period 1981 to 2018. The SAARC economies worked exceptionally in the economic literature (Murshed et al., 2020). The currency rate may guide policymakers to formulate appropriate broader macroeconomic policies in the event of an economic crisis. The government ought to be emphasized the long-term consistency in policies. Aftermath, we can easily reckon the currency gap by increasing the export side of the market. These projections have been provided to estimate the currency rate with the help of adequate government policies. (Khan et al., 2012).

2.2 Theoretical Literature

Our theoretical literature is based on various studies. Rehana et al. (1996) analysis to manage or stabilize the performance of currency rate in Pakistan spanning 1960 to 1994 with the assistance of the two-stage least square method. It demonstrates that appreciation in currency rate due to trade openness and depreciation in currency rate due to terms of trade. This paper assesses the role of the real currency rate with regard to enhancing export supply and promoting export diversification as well as this paper covering the period from 1980 to 2011. An

overvaluation and undervaluation of the real exchange rate have been harmful to exports but beneficial to export supply and export diversification (Wondemu & Potts, 2016). Emmanuel et al. (2012) have been evaluated the real exchange rate gap with the assistance of 109 developing and transition economies spanning 1990 to 2003. There are two effects used in this paper first remittances spending effects and resource movement effects with GMM estimator. The remittances spending effects have been led to real exchange rate appreciation and vice versa.

Moreover, the money supply is a factor of currency rate, Wilson (2009) has been examined the effective currency rate of the dollar on the behalf of trading partners. Johanson co-integration test has been demonstrated that M2 possesses positively associated with the effective currency rate. As a result, the upsurge in the money supply leads to the devaluation of the US dollar. Too, Khan et al. (2012) interrogates the numerous determinants have been affected the nominal currency rate. The consequences show that both the money supply and the inflation rate has been positively correlated with currency rate. Whereas interest rate and real GDP has been harmfully associated with currency rate. A structural VAR model to reckon the actual currency rate variations in China over the period of 1995Q1-2015Q4. There are five various macroeconomic shocks have used such as technology, government spending, monetary policy, foreign demand, and risk premium shocks. In which shocks, real demand shock is a key contributor to China's real currency rate fluctuations. Similarly, nominal shocks like monetary policy shocks and risk premium shocks play a vital role in the short-term horizons, but their effects decay rapidly Chen & Liu, 2017; Barbosa et al.,2018).

Muhammad et al., (2019) review the exchange rate gap by macroeconomic fundamentals of South Asian nations from 1981 to 2013. This study uses two econometric approaches with the help of five SAARC countries. Firstly, pooled sample estimated generalized least square (EGLS) and, the two-stage least square procedures have been applied. Secondly, the generalized method of moment (GMM) and ordinary least square technique have been utilized in the case of panel data analysis. The time series data are helpful but it is lack specification. For the productive visions and direction towards the South Asian policymakers, the panel data

will also provide a detailed assay of the South Asian economy. The current study contributes to the literature in terms of key determinants of rate of exchange in selected South Asian economies (Afshan and Raza, 2017). Recent paper pioneering statistical contribution of fixed effect (FE), generalized method of moment (GMM), pooled ordinary least square (OLS) and random effect (RE) and framework to evaluate the impact of foreign exchange reserve on exchange rate among the considered variables. These methodologies have several underlying benefits (Tsaurai, 2021; Akram, 2013). The economic consequences of the COVID-19 epidemic are severe globally. The government's first response is to propose prudent fiscal measures to mitigate the macroeconomic shock (Heimberger, 2020).

In the light of the above examination, the entire literature proposes different opinions on every aspect of the determinants of currency rate. Likewise, mostly the above-mentioned papers have correlated to the currency rate on the bases of South Asian economies. These studies have worthwhile to considering factors that are contributed to the South Asian rate of exchange. Our paper, therefore, speaks to the literature on the effect of foreign exchange reserve for currency rate. Most of the foreign studies have revealed positive, negative, and expected theoretical signs with regard to currency rate. But some of the studies show the mixed results and few studies show unambiguous results in all aspects. Insufficient studies have conducted at Pakistan and all of them focus on the exchange rate. Similarly, above studies in the literature have been conducted on currency rate but they do not account the effect of foreign exchange reserve. That's why, this study will outspread the consideration in the case of South Asia and serve as a guide for the estimation stage to facilitate the desired theoretical basis which will be beneficial for the policy makers.

3 Theoretical Background

Exchange rate is the monetary unit of a country that reflects the state of the economy. Exchange rate of the economy has been indicated its competitiveness in international economy and strengthens the inward stability of a country. Exchange rate is used in terms of various shapes such as rupee dollar exchange rate, rate of exchange and currency rate in the literature etc.

Fluctuations of the homebased currency which have expressed the variations of currency rate. It demonstrates the value of the national currency as compared to foreign currency. The significance of currency rate has been conversed massively in the literature due to its dominant role in prosperity and desirable acceptance from the outer world. Currency rates have found vast instability from the culmination of Bretton-Woods regime.

According to Purchasing Power Parity (PPP) theory, stated that currency rate gap amid currencies is in equilibrium when there is no change in purchasing power having both countries. It means that exchange rate amid two countries ought to be equal in terms of ratio. When the economies home currency level is enlarged it means that countries currency is changed go back to the ppp. The ppp is constructed on the behalf of "Law of one price". In the deficiency of transportation and transaction costs, competitive markets have equalized the price of an indistinguishable goods with the assist of two economies the prices have indicated the identical currency. Law of one price is based on three conditions. First, as previously mentioned, transportation costs and barriers to trade, will be significant. Second, competitive markets will be established in both countries with respect to goods and services. Lastly, the law of one price ought to be applied to tradeable goods; immobile goods such as houses, and several services that are local and not traded among the economies. According to researchers, there are two sorts of purchasing power parity like Absolute PPP and Relative PPP. Absolute ppp means equalization of price levels across the countries the relative ppp means dissimilar price levels among the countries. The conclusion is based over the countries have a higher price level; the home currencies of the countries will be facing a devaluation in currency rate. In this frame of mind, inconsistency in policies is the major drawback with regard to the weak valuation of local currency. The shifts of preferences are changes due to changes in governments thereby affecting the prior effective policies. The government ought to be emphasized long-term policies rather than short-term policies. According to the PPP approach, macroeconomic policies can and do affect the exchange rate. Several techniques are used to measure the exchange rate for various countries in numerous empirical studies with the

assistance of innumerable methodologies and tests (Akram, 2013; Kunanopparat & Agbola, 2005; Tsaurai, 2021).

3.1 Empirical Approaches to Estimating Exchange Rate

Numerous economies there is a distinction between official exchange rate. With the help of whole literature, variety of explanations have been identified there is no consensus yet with respect to the currency rate. The exchange rate is a key element to our empirical research paper. Many techniques have used to the entire literature like autoregressive distributed lag (ARDL) and interest rate parity techniques. The autoregressive distributed lag approach is based on better properties of small sample and coefficient method. This procedure estimates the exchange rate.

Likewise, interest rate parity procedure is constructed on the basis of domestic currency rather than country regulating lower rates. Countless tests have been applied in entire literature like Johanson co-integration test, Augmented Dicky Fuller (ADF) unit root test and Hausman test etc. These tests have applied basically to assess the currency rate. In a similar way, diverse procedures have used in the literature such as two stage least square, Engle Granger residual-based co-integration, recked generalized least square (EGLS) and ordinary least square procedures to assess the currency rate. In a corresponding manner, EGLS and the two-stage least square techniques have been applied. The generalized method of moment and ordinary least square approaches both have a structural relationship (Muhammad et al.,2019).

4 Data, Empirical Model, and Econometric Strategy

The balanced panel data used in this study spans 2000 to 2020. In a study, we inspect the influence of foreign exchange reserves on currency rates for the selected South Asian economies. The five South Asian countries have the largest economies than others. According to the theoretical and empirical literature, we include foreign exchange reserve as an explanatory indicator in our list of currency rate determinants (Jagessar & Conrad, 2018). Correspondingly, the data have been sourced from the International Financial Statistics (IFS) and World Development Indicators (WDI) database of the World Bank. Whereas Rogers and Engel (2001) probe the purchasing power parity (PPP)

technique, which is the most used measurement instrument. With the assistance of the PPP tool, we can easily measure the fluctuations of currency rate.

$$lnER_{it} = \beta_o + \beta_1 ER_{it-1} + \beta_2 lnGDP_{it} + \beta_3 lnFX\ Reserve_{it} + \beta_4 lnMS_{it} + \beta_5 lnTOT_{it} + \beta_6 lnTOP_{it} + \mu_i + \delta_t + \varepsilon_{it} \qquad (1)$$

A theoretical framework that supported the analysis proposed in this research is the theory of purchasing power parity. The model examined the determinants of currency rate with the assistance of purchasing power parity procedure. PPP have been regulated the currency rate by inflation. The theory tells us the economies' equilibrium currency rates have occurred that have the same buying power. Most of the countries have an immense price level, and the countries' domestic currency is depreciated. In the above equation, β_z are the constant terms, 't' is the time period, 'i' is the panel data. Whereas ε_{it} is the error term, δ_t is the time-fixed effect and μ_t is a country-specific fixed effect.

The model encompasses ER_{it-1} as a lag value of exchange rate, Real gross domestic product (RGDP) is used as a proxy of economic growth, and foreign exchange reserve (FXR) which is calculated on the bases of total reserve plus gold. Money supply (MS) is the sum of M1 plus saving deposits and terms of trade (TOT) is the level of exports over the level of imports. The Openness of trade (OT) is another important determinant of the currency rate which is accrued of imports plus exports over the gross domestic product. Appendix 1 presents the description of the variables in detail.

There are several approaches to panel data such as GMM (Generalized method of moment), FEM (Fixed Effect Model), POLS (Pooled Ordinary Least Square), and REM (Random Effect Model). In this analysis, the data have been consisted of five (5) selected SAARC economies for 21 years, where N= 105, which is greater than a year. Why do we use so many estimation techniques i. e. difference GMM, fixed effect, pooled OLS and random effect? The answer is that multiple regression model is being applied to check the effect of various aspects of foreign exchange reserve on exchange rate. The Hausman test (1978) has been used regularly either FEM is more appropriate, or REM is more

appropriate. In the same way, GMM has been used as a generic method of estimating parameters in our statistical model. A panel data estimator has been controlled for endogeneity, omitted variables, unobserved panel heterogeneity, and measurement error. The endogeneity of the lagged endogenous variable has been happened in a dynamic panel model. Whereas exogenous variables and error terms have been correlated with the model. In a parallel way, what are the reasons behind implementing the different GMM? The difference GMM specification transforms the regressors through the first difference to eliminate the fixed effects and corrects the endogeneity. Have you seen any case where a different GMM should be preferred over a system GMM and why? Yes, difference GMM is used as an instrument that is uncorrelated with the error term (with the unobserved unit-specific effects) the system GMM requires an additional assumption. In simple, difference gmm is applied when observations are greater than years and vice versa. That's why we use difference gmm instead of system gmm. In a similar character, we applied four methods of estimation for illustration fixed effect model, generalized method of moment, pooled ordinary least square and random effect model with Housman test.

Theoretically, the panel GMM estimator addresses the endogeneity, measurement error, and omitted variables bias, but the instrument is weak (Clemens & Bazzi, 2009). On the contrary, POLS is used to derive the unbiased consistent estimators to the parameters through time constant attributes. Likewise, the parameters of the fixed effect model that should be fixed are called fixed effect whereas the parameters of the random effect model that should be non-fixed are called the random effect. According to POLS, measurement errors and omitted variables are bias, as well as the heterogeneity is reduced because the measurement errors are inclined to lessen the correspondence amid regressors and the country-fixed effects. Similarly, FEM reports the issue of omitted variables bias. Though, if we compare the POLS and FEM, POLS is worse off the measurement error problem (Wacziarg & Hauk, 2009). The FEM only estimates within effect whereas REM only estimates individual effect. However, unobserved heterogeneity can be measured by the fixed effect model although heterogeneity is constant over time.

Heterogeneity can also be controlled through estimated results when we take the first difference. Unobserved heterogeneity is constant over time but is not connected with the exogeneous indicators. Consequently, unobserved heterogeneity may also be controlled thru random effect.

5   Analysis of Empirical Results

First descriptive statistics are estimated, correlation matrix, and then the whole sample is estimated under the research paper. Now, we are going to estimate the empirical results in Table form. The following regression analysis of Baltagi (2005) and Akram (2013). Summary statistics for the variables are shown in Table 1, which discloses the exchange rate, real GDP, foreign exchange reserve, money supply, terms of trade, and openness. In Table 1, EXR refers to the exchange rate, RGDP refers to real gross domestic product, FXR denotes foreign exchange reserves, MS is money supply, TOT is terms of trade and TOP refers to openness. In particular, empirically estimated values reflect the results of summary statistics such as a minimum mean value is 4.171 and a maximum mean value of 188.086, a minimum standard deviation is 6.661 and a maximum standard deviation is 317.160. The minimum value in the series is 1.350 and maximum value in the series is 1096.650.

Table 1
Descriptive statistics of exchange rate

Variables	Mean	Std. Dev	Min	Max
EXR	84.203	30.930	41.349	185.593
RGDP	4.171	6.661	1.350	2.702
FXR	188.086	317.160	2.520	1096.650
MS	59.493	16.225	30.554	116.967
TOT	83.754	20.265	46.276	122.147
TOP	43.854	13.001	25.306	88.636

Note: In Table 1, we take one dependent variable with various explanatory variables on the vertical side. Whereas we take the mean, standard deviation, minimum and maximum on the horizontal side.
Source: Author's estimation

Table 2, reveals the correlation matrix of the variables of exchange rate employed in the analysis. The correlation matrix for the variables have shown in Table 2, which unveils the exchange rate, real GDP, foreign exchange reserve, money supply, terms of

trade, and openness. Table 2, also demonstrates some fruitful information regarding the correlation matrix to the overall sample. In Table 2, EXR denotes exchange rate, MS is money supply, TOT is terms of trade and TOP is also denoting openness. The negative correlation coefficients indicate that there is an inverse linear relationship between two variables. In particular, the results of Table 2, demonstrate that the pair of money supply and the exchange rate has the smallest downbeat coefficient (0.015) and pair of foreign exchange reserves and real gross domestic product has the biggest coefficient (0.965).

Table 2
Correlation Matrix of Exchange Rate

Variables	EXR	RGDP	FXR	MS	TOT	TOP
EXR	1					
RGDP	-0.388	1				
FXR	-0.443	0.965	1			
MS	0.015	0.417	0.415	1		
TOT	0.156	0.192	0.207	-0.120	1	
TOP	0.212	-0.082	-0.062	-0.057	0.523	1

Note: We take one endogenous and five exogenous indicators in Table 2 on the vertical side. Whereas we take the mean, standard deviation, minimum and maximum on the horizontal side.
Source: Author's estimation

The findings of the estimated exercise of currency rate will be represented in Table 3. In Table 3, FEM represents the fixed effect model, and GMM represents the generalized method of moment. P OLS indicates the pooled ordinary least square and REM indicates the random effect model. The fixed effect model has been most apt as compared to the random effect because the fixed effect model is more adequate, consequently, we interpret only the fixed effect than random effect. The maximum value of the coefficients has been statistically significant and the signs have been consistent with prior results. In Table 3, shows the result of the FEM, GMM, P OLS, and REM models which include one lag value with numerous explanatory indicators. More precisely, the result of lagged exchange rate shows a highly significant effect the coefficient of the lagged exchange rate is depressing. The real gross domestic product serves as a proxy for economic growth. The fact that real GDP has been contributed in terms of trade, inflation rate, unemployment rate, and trade

openness, as a result, upsurge terms of trade, trade openness, ebb inflation rate and unemployment rate. According to the literature, real GDP level of significance at 1 percent and 10 percent but the depressed relationship with exchange rate in case of all specifications. The results of fixed effect, pooled OLS and GMM are relevant to the (Mirchandani, 2013). Likewise, when domestic production has increased, manufacturers have got expected revenues. Subsequently, the demand for domestic currency will be raised against foreign currency (Bleany, 1996). Variations in foreign exchange reserve have a negative impact on currency rate which is consistent with (Jagessar & Conrad, 2018). The consequences of foreign reserves are at 1 percent level of significance. The foreign reserves are a highly statistically significant effect on the currency rate with respect to all the specifications. The outcomes of foreign reserves are robust and an upsetting sign has divulged the depreciation of exchange rate in the South Asian economies.

When we consider developing economies, this is especially relevant to South Asian economies. As you know, as mentioned below in Table 3, the outcome of money supply has a highly significant negative association with currency rate by the specifications except pooled ordinary least square and random effect model. Thus, outcome of money supply with respect to pooled OLS and random effect have a negative insignificant effect on rate of exchange. Hence, money supply has been enlarged having the lack of availability of funds in the market. In consequence, to fulfill the excess demand of the people, producers hire extra labors cost of production will be enhanced. That's why prices go up, declines the global competitiveness of developing nations, the outcome leads to denigrating of the domestic currency (Bleeney & Fielding, 2002). Along these lines, devaluation of home currency ends up due to higher price levels (Khan et al., 2012). Our estimation findings on the subject of terms of trade have an inconsequential critical coefficient sign in all the specifications except gmm. As you see in Table 3, outcome of terms of trade is highly noteworthy with respect to gmm. Likewise, terms of trade have a contributed to the appreciation and devaluation of the South Asian economies. Our outcomes are consistent (Vieira & Macdonald,2012; Algieri, 2013).

Finally, the openness of the trade coefficient is positive and substantial with reference to all the specifications. In this manner, openness has connected with the economy's growth and currency rate. Openness has reflected the degree of trade horizons among the economies. Consequently, openness has shown pessimistic and optimism affect the currency rate. In Table 3, identical outcomes are found ((Dutta et al., 2017; Raza & Jawaid, 2015). Overall, the results of Table 3, indicates that highly statistically noteworthy impact, the value of standard error shows positive signs. Our outcomes given in Table 3, are largely consistent with Afshan and Raza (2017), in terms of both sign and statistical significance. These upshots are in accordance with theory and statistically robust. According to Table 3, we can check the goodness-of-fit with the assistance of R-square. R-square indicates the percentage of variance to an endogenous indicator that is explained by an exogenous indicator in a regression model. For example, small R2 values are not a forever problem correspondingly higher R2 values are not always necessarily good and if the R-square in the model is 0.5, it means that observed variation is approximately half which is elaborate thru model inputs. In addition, higher values of R-square are better than lower values of R-square and a higher R2 means your model fits your data. Analogously, the Arellano-Bond Test AR (2) is a second-order serial correlation. P value greater than the Arellano-Bond Test AR (2), it means that there is no second-order serial correlation (Bond & Arellano, 1991). Thus, the Hansen test (1982) is tested over-identifying restrictions in a statistical model, hence P value should be greater than Hansen test.

Table 3
Estimation Results of Exchange Rate: POLS, FEM, REM and GMM

Variables	(1) P OLS	(2) FEM	(3) REM	(4) GMM
Lag EXR_{it-1}				-0.659*** (0.055)
Ln $RGDP_{it}$	- 0.109*** (0.053)	-0.197*** (0.023)	-0.102* (0.053)	-0.184*** (0.023)
Ln FXR_{it}	-0.066*** (0.018)	-0.061*** (0.011)	-0.004 (0.042)	-0.136*** (0.084)
Ln MS_{it}	-0.072 (0.124)	-0.755*** (0.063)	-0.072 (0.124)	-0.127*** (0.033)
Ln TOT_{it}	-0.093	-0.042	-0.093	0.291***

	(0.143)	(0.101)	(0.143)	(0.070)
Ln TOP$_{it}$	0.243*	0.146**	0.162	0.168***
	(0.135)	(0.069)	(0.140)	(0.042)
R-squared	0.214	0.839		
Observation		105		
Number of Years		21		
AR (2) Test		2.34		
		(0.019)		
Hansen Test		10.71		
		(0.057)		

Notes: In Table 3, the first and second rows have been demonstrated the significance values and standard errors. Asterisks * ** and *** demonstrate the level of significance at 10, 5 and 1 percent, respectively.
Source: Author's estimation

6 Conclusion and Policy Recommendations

Exchange rate is reflecting the economic conditions of the countries. Exchange rate depends upon many structural factors. Moreover, this study used several econometric procedures such as Fixed Effect, Generalized Method of Moment, Pooled Ordinary Least Square and Random Effect Akram (2013)with the assist of Hausman test (1978). With the assistance of above estimation techniques, outcome show that the real GDP, foreign exchange reserve, money supply, terms of trade and trade openness, some variables have a significant and few variables have an insignificant impact on excahnge rate. The findingds reflect the fluctuations of exchange rate of the economies in the sample from 2000 to 2020. Furthermore, each and every economy has its own characteristics with regard to currency rate. In the light of above examination, mostly South Asian economies have not yet flourished in true sense as it is supposed to be after elapse of considerable time. Exchange rate is lie extreme positions specially in SAARC countries due to numerous factors. As well, exchange rate is not stable mostly in SAARC countries due to lack of foreign exchange reserves and artificial factors etc. At the same time, numerous countries take more debt from different domestic and international organizations, but they do not use to the particular purpose, that's why countries become poor.

Eventually, the economic situation in SAARC today is the best proof of our results. Overall findings of the paper pointed out that effect of foreign reserve on exchange rate is unfavorable. The results of the study suggest that policy makers to the countries

ought to be focused on the strategies that lead to raise the existing level of forex reserves. This finding also suggest that the countries ought to be improved their export and should be focused on intrinsic domestic resources progressively with time, consequently exchange rate may be managed. However, most effective, and appropriate policies should be formulated and implemented by the government to overcome the ever-selected SAARC problems related to decreasing the level of foreign exchange reserve and exchange rate. Therefore, the shifts of preferences are changes due to change of governments thereby to affect the prior effective policies. The government also ought to emphasize that long-term consistency in policies is required than others. Besides, this examination has considered as an attempt towards a better understanding of the effect of foreign reserve on exchange rate. The analysis also has also some limitations that we have not included some auxiliary variables in this analysis because of their high correlation with other variables within their categories. Further research will be repeated to discover the matter especially there is need to investigate the impact of international reserve and FX reserves as a percentage of GDP etc.

References

Afshan, S., & Raza, S. A. (2017). Determinants of exchange rate in Pakistan: revisited with structural break testing. *Global Business Review, 18*(4), 825-848.

Ahmad, K., & Zafar, M. (2012). Export growth and volatility of exchange rate: A panel data analysis. *Business and Social Sciences Review, 1*(4), 4-36.

Ahmed, H. (2009). Capital flows and real exchange rate overvaluation-a chronic ailment: evidence from Pakistan. *The Lahore Journal of Economics, 14*(8), 51-86.

Akram, N. (2013). Empirical examination of debt and growth nexus in South Asian countries. *Asia-Pacific Development Journal, 20*(2), 29-52.

Algieri, B. (2013). Determinants of the real effective exchange rate in the Russian Federation. *The Journal of International Trade & Economic Development, 22*(7), 1013-1037.

Baltagi, B. (2005). Econometric analysis of panel data. 3rd Edition. *John Wiley & Sons,* New York.

Barbosa, L.O.S., Jayme Jr, F. G., & Missio, F.J. (2018). Determinants of the real exchange rate in the long-run for developing and emerging countries: a theoretical and empirical approach, *International Review of Applied Economics*, *32*(1), 62-83.

Bleaney, M. F. (1996). Macroeconomic stability, investment and growth in developing countries. *Journal of development economics*, *48*(2), 461-477.

Bleaney, M., & Fielding, D. (2002). Exchange rate regimes, inflation and output volatility in developing countries. *Journal of Development Economics, 68*(1), 233-245.

Bond, S., & Arellano, M. (1991). Some tests of specification for panel data: *monte Carlo (Monte Carlo)* evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277-297.

Burange, L., & Ranadive, R. R. (2013). The Determinants of India's real exchange rate: an ARDL approach. *The Indian Economic Journal, 61*(3), 407-428.

Chen, Y., & Liu, D. (2017). Dissecting real exchange rate fluctuations in China. *Emerging Markets. Finance and Trade, 54*(2), 288-306.

Clemens, M. A., & Bazzi, S. (2009). Blunt instruments: On establishing the causes of economic growth. *Center for Global Development Working Paper* (171).

Dutta, S., Dash, A. K., & Shylajan, C. (2017). An empirical analysis of macroeconomic variables affecting the foreign exchange reserves accumulation in India. *Journal of Applied Business and Economics, 19*(5), 69-80.

Elbadawi, I. A., & Soto, R. (1997). Real exchange rates and macroeconomic adjustment in Sub-Saharan Africa and other developing countries. *Journal of African Economies, 6*(3), 74-120.

Emmanuel, K. L., Mandelman, F. S., & Acosta, P. A. (2012). Remittances, exchange rate regimes and the dutch disease: A panel data analysis. *Review of international Economics, 20*(2), 377-395.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Journal of the Econometric Society, 50*(4), 1029-1054.

Hausman, J. A. (1978). Specification tests in econometrics. *Journal of the econometric society,46* (6), 1251-1271.

Heimberger, P. (2020). Potential Output, EU Fiscal Surveillance and the COVID-19 Shock. *Intereconomics, 55*(3), 167-174.

Jagessar, J., & Conrad, D. (2018). Real exchange rate misalignment and economic growth: The case of Trinidad and Tobago. *Economies, 6*(4), 23-52.

Khan, J., Khattak, N. U. R., & Tariq, M. (2012). Factors affecting the nominal exchange rate of Pakistan: an econometric investigation (1982-2008). *Asian Economic and Financial Review, 2*(2), 421-428.

Khan, M. A., & Qayyum, A. (2011). Exchange Rate determination in Pakistan: Role of Monetary Fundamentals. *Journal of Economic Cooperation & Developmen, 32*(2), 67-96.

Khan, M. S., & Heller, H. R. (1978). The demand for international reserves under fixed and floating exchange rates. *Staff Papers*, *25*(4), 623-649.

Krugman, P. R. (1991). Target zones and exchange rate dynamics. *The Quarterly Journal of Economics,106*(3), 669-682.

Kumar, S. (2010). Determinants of real exchange rate in India: An ARDL approach. *Reserve Bank of India Occasional Papers, 31*(1), 33-64.

Kunanopparat, C., & Agbola, F. (2005). Determinants of exchange rate practices: some empirical evidence from Thailand. *Applied Economics, 37*(7), 807-816.

Lartey, E. K., Mandelman, F. S., & Acosta, P. A. (2012). Remittances, exchange rate regimes, and the *Dutch* (English). *Journal of International Economics, 79*(1), 102-116.

Vieira, F. V., & MacDonald, R. (2012). A panel data investigation of real exchange rate misalignment and growth. *Estudos Econômicos (São Paulo)*, *42*(3), 433-456.

Mallick, H. (2010). Examining the behavior of exchange rate under a partial capital mobility regime. *Forthcoming with International Economic Journal, 24*(2), 141-157.

Maricic, T., & Kruskovic, B. D. (2015). Empirical analysis of the impact of foreign exchange reserves to economic growth in emerging economics. *Applied Economics and Finance, 2*(1), 102-109.

Mdion, N. M. C., Uddin, M. J., & Islam, M. S. (2014). An econometric analysis of the determinants of foreign exchange reserves in Bangladesh. *Journal of World Economic Research, 3*(6), 72-82.

Milesi, F, G. M., & Lane, P. R. (2002). Long-run determinants of the Irish real exchange rate. *Applied Economics, 34*(5), 549-553.

Mirchandani, A. (2013). Analysis of macroeconomic determinants of exchange rate volatility in India. *International Journal of Economics and Financial Issues, 3*(1), 172-179.

Muhammad, U. D., Ahmad, F., Gupta, B., & Amin, W. (2019). Macroeconomic fundamentals and exchange rates in South Asian economies: Evidence from pooled and panel estimations. *Journal of Chinese Economic and Foreign Trade Studies, 12*(2), 104-119.

Murshed, M., & Rashid, S. (2020). An empirical investigation of real exchange rate responses to foreign currency inflows: revisiting the Dutch disease phenomenon in South Asia. *The Economics and Finance Letters*, *7*(1), 23-46.

Nguyen, B. (2015). Effects of fiscal deficit and money M2 supply on inflation: Evidence from selected economies of Asia. *Journal of Economics, Finance and Administrative Science, 20*(38), 49-53.

Raza, S. A., & Jawaid, S. T. (2015). Do terms of trade and its volatility matter? Evidence from economic escalation of China. *Journal of Transnational Management, 20*(1), 3-30.

Rehana, S., Afridi, U., Mahmood, Z., & Bhatti, R. H. (1996). Exchange rate determination in Pakistan: A simultaneous equation model. *The Pakistan Development Review, 35*(4), 683-692.

Rogers, J. H., & Engel, C. (2001). Deviations from purchasing power parity: causes and welfare costs. *Journal of International Economics, 55*(1), 29-57.

Rogoff, K., Aghion, P., Baccheta, P., & Ranciere, R. (2009). Exchange rate volatility and productivity growth: The role of financial development. *Journal of Monetary Economics, 56*(4), 494-513.

Talvi, E., Calvo, G. A., & Izquierdo, A. (2003). Sudden stopes, the real exchange rate, and fiscal sustainability: Argentina's lessons. National Bureau of Economic Research Cambridge, Mass., USA.

Tsaurai, K. (2021). Mining, Poverty, and Income Inequality in Central and Eastern European Countries: What Do the Data Tell Us?. *Comparative Economic Research. Central and Eastern Europe*, *24*(3), 7-25.

Wacziarg, R., & Hauk, W. R. (2009). A *monte Carlo* study of growth regressions. *Journal of Economic Growth, 14*(2), 103-147.

Wilson, I. (2009). The monetary approach to exchange rates: A brief review and empirical investigation of debt, deficit, and debt management: Evidence from the United States. *The Journal of Business Inquiry, 8*(1), 83-99.

Wondemu, K. A., & Potts, D. J. (2016). The Impact of the real exchange rate changes on export performance in Tanzania and Ethiopia. *African Development Bank Group Working paper series* (240).

Appendix
Table: 1
Data Description

Indicator	Explanation	Source
ER	Exchange rate is constructed as the ratio of the domestic	WDI Currency (R) and foreign currency ($)
RGDP	Real gross domestic product is used as a proxy of economic growth	World Bank
FXR	Foreign exchange reserve is computed by total reserves plus gold	IFS
MS	Money supply i.e., M2 includes M1 and saving deposits	WDI
TOT	Barter terms of trade are the ratio of export and import prices index	WDI

Note: IFS stands for International Financial Statistics