The Effect of Remittances and Interest Rate on Exchange Rate Volatility in Pakistan:

By

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Abstract:

Exchange rate is considered as one of the most significant factor of a country's economic growth and its volatility can significantly impact the international trade. The topic of exchange rate volatility is an increasing concern of not only the researchers but the policy makers around the world over the years. This study intends to investigate the impacts of the remittances and interest rate on exchange rate volatility in Pakistan as Pakistan receives a considerable amount of foreign exchange in terms of worker's remittances. To estimate the relationship among the variables, the monthly time series data for the period of 2006-2018 has been analyzed by using Generalized Method of Moments (GMM) and Augmented Dicky-Fuller (ADF) has been applied for confirming the stationary of the series. The results reveal that the remittances affect the exchange rate volatility as described by GMM. Afterward the exchange rate volatility is also influenced by interest rate as revealed by GMM. Taking to account the remittances and interest rate have negative impacts on exchange rate volatility in Pakistan. The ramification of the study is that growing in remittances and interest rate can be effective in curbing the exchange rate volatility.

Keywords: Remittances, Interest Rate, Exchange Rate Volatility, Generalized Method of Moments, Etc.

Introduction:

The fluctuations in exchange rate of an economy play a significant role in its macroeconomic stability which is prime objective of economic

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policy makers as exchange rate fluctuations have real economic costs. The macroeconomic variables such as inflation, employment level, interest rate, capital inflow/outflow, foreign direct investment, terms of trade and foreign exchange reserves are important to determine the fluctuations in exchange rate and are also affected by the fluctuations in exchange rate volatility itself. A moderate level of volatility in exchange rate is crucial for economic stability of an economy.

Exchange rate is the value at which one currency is changed over to another currency and how rapidly the exchange rate fluctuates is its volatility. The comparative price of two national currencies is called exchange rate (Frenkel & Johnson, 2013). It has been defined more specifically by (Mundell, 1961) as "the ratio between a unit of one currency and the amount of another currency for which that unit can be exchanged at a particular time". The comparative price of a currency is determined mainly by the external cash inflow and outflow of that currency. Remittances remain as a main part of external cash flows; hence, they play a significant role in the exchange rate volatility (see for instance, Makhlouf & Mughal, (2011)). Remittances are transfer of funds mostly from the labor force (which belongs to developing economies) working in developed economies to their countries of origin. Theoretically, the increased volume of remittances increases the disposable income of households which in turn exerts an upward pressure on the demand of local currency for spending. This causes the Dutch disease phenomenon for the host country as the increase in income of households increases the prices in non- tradable sector which motivates the labor in tradable sector to move to the non-tradable sector (Amuedo-Dorantes & Pozo, 2004) that rises the wages in the tradable sector. Consequently, the production cost and prices increase in tradable sector of the economy which negatively affects its competitiveness in the global market, putting a downward pressure on the exports of the host country (Acosta et al., 2009).

The influence of remittances on exchange rate is straightforward theoretically. However, the magnitude of this impact is an empirical question and is determined by the size of remittances, output and trade sector of the economy. An important feature of Pakistan's economy is the contribution of employee's remittances in its GDP. It is amongst the countries in south Asian where remittances significantly contribute in GDP (see Figure 1). Figure 1 shows that in 2017, remittances contributed around 7 percent in its GDP. This shows that remittances might have been playing an important role in exchange rate volatility in Pakistan. to

estimate the magnitude of the effect of remittances on exchange rate volatility as

Figure 1: Remittances as % of GDP in South Asian Countries in 2017
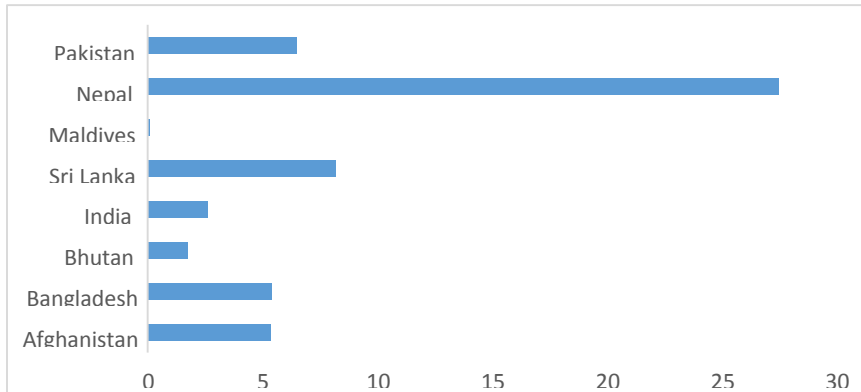
Note: Data source is World Bank, World Development Indicators.

For the first time the inflow of remittances was recorded officially in the 1970's when the construction sector of the Gulf States was boomed by employing of millions of Pakistani employees. The contribution of remittances in GDP of Pakistan rises to 10 percent in 1982/83 (as shown in Figure 2). The fluctuation in the remittances received by Pakistan over the time period 1981-2019 are shown in Figure 2. A sharp increase in remittances is observed in 2001 which is attributed to 9/11 in 2001 (Zaidi, 2015). During this time period The United States became the main foreign country from where these remittances were received. This may be attributed to the fear Pakistani workers might have been facing after 9/11 in the United States regarding their savings in the U.S. banks.

Figure 2: Worker's Remittances received by Pakistan as % of GDP
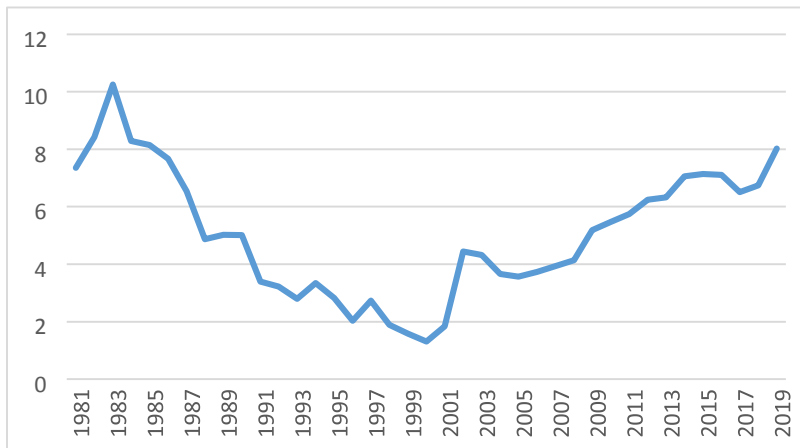
Note: Data source is World Bank, World Development Indicators.

The annualized charge of debit or credit-capital calculated as the percentage ratio of interest to the principle is called interest rate. Every bank has their own criteria for determining the interest on loans but, in fact local interest rates are approximately the equal for every bank and commonly interest rates are increased in the times of tight money supply, inflation, higher demand of credit, or owing to greater reserve demand of banks. Decreasing in business and stock market activities is associated with increasing in interest rate because credit come to be more valuable and buying shares will be the best option of earning more for the investors than buying bank deposits or newly issued bonds (Okoth, 2013).

Interest rate is also an important variable which affects macroeconomic variables including exchange rate. Theoretical influence of interest rate on exchange rate is firstly investigated by an American economist (Irving fisher) who claims that the differentials of interest rate are tended to reflect the fluctuations of the exchange rate which is also famous as International Fisher Effect (IFE). A number of researchers used the (IFE) theory for investigating the influence of interest rate on the exchange rate volatility and concludes that high interest rate can be an influential instrument for curbing the exchange rate volatility (Benita & Lauterbach, 2007; Asari et al., 2011).

This paper aims to investigate how remittances and interest rate affect the exchange rate fluctuations in Pakistan as Remittances contributes

substantially in the balance of payments of Pakistan which ultimately lead to exchange rate movements.

Secondly, this study examines the effect of interest rate on the exchange rate volatility as Pakistan is considered as a small open economy where the macrocosmic variables are influenced by international factors also. However, to account for international factors is beyond the scope of this paper, we attempt for investigating the relationship of interest rate and remittances by controlling terms of trade.

This paper is organized as follows; section two reviews the literature briefly, section three lays out the Methodology section four reports and discusses the results and section five concludes the study.

Brief Review of the Literature:

A significant amount of work has been done to examine and identify the relationship between the remittances and exchange rate. Remittances has positive significant influence on exchange rate if used for saving means remittances appreciate the volatility of the exchange rate and can negatively influence the exports if it is resorted for consumption. For instance, (Khurshid et. al., 2017) inspect the influences of remittances on exchange rate using the GMM approach on annual data series. In addition, the casual relationship between the exchange rate and worker's remittances is tested using the Garner test of causality. (Pozo & Amuedo-Dorantes, 2004) report that remittances have the potential to push up the exchange rate in 13 Caribbean and Latin American countries over a sample period of 1979-1998.

Indeed, recently, most of the researchers devoted their attention to explore and determine the relevance between the remittances and exchange rate. While remittances are known as the most significant determinant of exchange rate and are a greater source of foreign cash flows (Makhlouf & Mughal, 2013). While in making the economic policy for the country, both variables are crucial and playing a vital role in it. The consistency in macroeconomic indicators such as unemployment, interest rate, prices, exports and wages cause to reduce the risk for both households and investors while, they could be influenced by the volatility in remittances and exchange rate (Khurshid et al., 2017). A study conducted by (Bussolo & Medvedev, 2007) stated that exchange rate of a developed economy can be appreciated by the remittances and the concept is termed as Dutch disease. When the inflow of the remittances of a country increases it push-ups the demand of the local currency, increase the spending, and also due

to decline in the labor supply puts extra pressure on competitiveness and real rate of exchange on the country the findings are further accepted by the study of (Khurshid et al., 2017).

Interest rate is main intervention instrument for determining the exchange rate volatility. A theory which has been developed by Irving Fisher, an American economist, connecting the exchange rates to interest rates and states that the exchange rate expectations can be reflected by the differentials of interest rate which is also famous as Fisher Effect (Demirag, & Goddard, 1994). The international Fisher Effect (IFE) has been explained by (Madura, 2020) as external interest rate and fluctuation in the price of the foreign currency is dependent on the inference of relationship of the real profit.

The International Fisher Effect has been examined and interpreted by substantial number of studies to the earlier studies (Sundqvist, 2002; Benita & Lauterbach, 2007) for curbing and controlling the exchange rate volatility, the interest rate is the most popular and effective instrument they conducted the study of exchange rate volatility between the U.S. dollar and 43 other currencies. In the panel results they reported positive relationship between the exchange rate volatility and interest rate and stated that the countries with higher exchange rate volatility mostly pay higher interest rate and further the study reported the results of examining the specific country that interest rate negatively affects the exchange rate volatility and claimed that rise in interest rate can be effective in curbing the exchange rate volatility. The study of (Andries et al., 2017) also documented both negative and positive association between interest rate and exchange rate and argued that the relationship is positive in the long term and negative in the short term. The study of (Asari et al., 2011) argued that higher interest rate offers higher return to lenders compare to other countries in an economy. Therefore, higher interest rate can attract the foreign capital flows and cause the exchange rate to increase and concludes that higher interest rate can play a crucial role in curbing exchange rate volatility and these findings are further confirmed by (Tariq et al., 2015).

Hence, the hypotheses of the study are developed as follows; First, there is a connection between interest rate and exchange rate volatility and second, there is a relationship between remittances and exchange rate volatility.

Research Methodology:

This study intends to investigate the influence of remittances and interest rate on exchange rate volatility in Pakistan. To empirically estimate the effect, following model is specified.

Model Specification:

The study utilizes the system of GMM method firstly recommended by the (Arellano & Bover, 1995). Selecting system GMM estimator as the main estimator for the model described in equation (1) is due to the preferred characteristics of GMM: first, it excludes the bias and yields a proficient and reliable parameter estimation, in which the independent variables are not perfectly exogenous. Second, overcomes the issue of fixed impacts and endogeneity of the independent variables, eliminating the dynamic panel bias (Reaz et al., 2017) so that, we estimated the following regression to deliver an investigation on the influence of the interest rate and remittances on the volatility of exchange rate.

$$EXRV_t = \beta_0 + \beta_1 REM_t + \beta_2 IR_t + \beta_3 ToT_t + \varepsilon_t \tag{1}$$

Where EXRV represents exchange rate volatility, REM_t is the lag value of remittances, IR symbolizes the interest rate rate, β_0 indicates intercept, β_1 is the coefficient of REM, β_2 is the coefficient of IR, and ε represents the error term.

Measuring Volatility:

In recent economic literature measuring the exchange rate volatility is a debated topic and due to the lack of an exclusive method of measuring volatility the outcomes of exchange rate volatility are unclear (Siregar & Rajan, 2004). Standard deviations have been used by some authors for measuring volatility where the degree to which the exchange rate fluctuations in contact to its mean overtime is (Carrera & Vuletin, 2002; Schnabl, 2009; Gadanecz & Mehrortra, 2013). Where utilizing this method have also challenges. Firstly, due to, it accepts the normal empirical distribution of the exchange rate. Secondly, it can not to catch the past information of exchange rate because it is failed to reveal the distribution between a random factors of the process of exchange rate (Alagidede & Ibrahim, 2017). Moreover, the standard deviation method is well-known for underestimating the impact of volatility on judgments due to this approach is random in selecting the instruction of the moving average (Pagan and Ullah, 1988).

To capture the dynamic aspects of the volatility of exchange rate and to dominate the methodological insufficiencies of standard deviation method the study is used the exponentially weighted moving average model (EWMA) interpreted by Roberts in (1959) (Hnter, 1986).

$$\sigma = \sqrt{(1-\lambda)\sum_{t=1}^{T}\lambda^{t-1}(r_t - \bar{r})^2} \qquad (2)$$

Where $0 < \lambda < 1$. λ is the decay lower factor, λ, the lower the effect of farther EXR values (Moosa & Bollen, 2002) as the monthly data is used by study. Thus, the study assumes that $\lambda=0.97$ (Morgan, 1996).

The terms of trade (TOT) which is control variable of the study is calculated according the following formula used by (Lee & Kim, 2011).

$$\text{Terms of Trade} = \frac{export\ unit\ value\ index}{import\ unit\ value\ index} \times 100$$

Data Collection & Variables of Study:

This study intends to investigate the effect of interest rate and remittances on the volatility of exchange rate where the study selected the Lending Weighted Average rate (LWAR) from the set of interest rate's types which is the accumulated rate of interest paid on total debt and using this formula LWAR=$\sum$(rate × amount)÷ $\sum$ (amount) the LWAR has been calculated (Hanif, 2019).monthly time series data is utilized for the period of 2006 to 20018 and selecting this period as our sample size is due to sample size will not be enough if we will use annual data for estimation the proposed model using GMM. Hence monthly data will provide us with sufficient no of observations. and the data of remittance is converted to log form for the purpose of decreasing the variance. The state Bank of Pakistan (SBP) website is utilized for obtaining the data for remittances (RIM), Interest Rate (IR), and exchange rate volatility (ERV) where the study used Real Effective Exchange Rate which is the nominal effective rate of exchange (a degree of the value of one currency compared to the weighted average of some other currencies) divided by index of costs Mundi Index or a price deflator. Moreover, remittances and interest rate is adopted as explanatory and exchange rate volatility is used as explained variable and the study also contains term of trade (TOT) which is a country's export prices index and it is import prices index ratio as a control variable.

Empirical Results:

Table1: Summary Statistics:

Variables	Mean	Std. Deviation	Minimum	Maximum
Exchange Rate Volatility	69.306	75.887	0	307.74
Remittances	8.086	3.64	1.527	16.94
Interest Rate	11.375	1.971	7.80	14.66
Terms of Trade	0.597	0.089	0.37	0.88

For certifying the time series stationary of the selected period (2006-2018) of monthly data the study utilized the unit root tests of Augmented Dicky-Fuller (1979). The table 4.2 describes the results of unit root (ADF) test and shows that EXR and TOT are stationary at level 1(0) while the REMIT and LWAR are stationary at first difference 1(1).

Unit Root Test (ADF)

Variables	Level 1(0)		First difference	
	Intercept	Intercept & trend	Intercept	Intercept & trend
Exchange Rate Volatility	-13.316***	-7.605***	-5.272***	-6.556***
Remittances	-1.847	-4.503***	-16.548***	-16.500***
Interest Rate	-0.777	-2.270	-3.470***	-3.886***
Terms of Trade	-3.023***	-4.023***	-11.934***	-11.893***

Table 1: Unit Root Test (ADF)

Notes:

***, **, and * denote the level of significance at 1, 5 and 10% correspondingly and optimum lag length selected based on AIC is used for ADF test.

ADF statistic is calculated as $\Delta x_t = a_0 + b_0 x_{t-1} + \sum_{i=1}^{k} c_0 \Delta x_{t-1} + w_t$ where Δ is the difference operator, a_0, b_0 and c_0 are the estimated coefficients, the variable whose time series properties are inspected denoted by x and white-noise error term is denoted by w.

Table4: Estimation of the model $EXRV_t = \beta_0 + \beta_1 REM_{i,} + \beta_2 LWAR_t + \varepsilon$ using system GMM:

Variable	Coefficient	t-Statistic	Prob.
Constant	290.5870	9.008433	0.0000
Remittances	-19.72959	-17.22423	0.0000
Interest Rate	-12.18163	-5.471117	0.0000
Terms of Trade	1.236855	2.833519	0.0053
R-squared = 0.813042 Adjusted R-squared = 0.808917 0.309720		J-statistic = 1 Prob(J-statistic) =	

Table 4 describes the empirical results between remittances, interest rate and exchange rate volatility. Where the findings describe those

remittances have a significant negative impact on the exchange rate volatility in order to increasing in remittances can decrease and curb the exchange rate volatility and in the same time, it shows that our results support the perspectives of (Khurshid et al., 2017) who claims that remittances can restraining the exchange rate volatility if used for consumption. In addition to this, on the basis of empirical evidence of table 1 the interest rate has also negative effect on exchange rate volatility means restrains the exchange rate volatility and these findings Support the outlooks of (Asari et al., 2011) who argued that interest rate is effective in curbing exchange rate volatility and also confirm the evidence of (Tariq et al., 2015) who claim that interest rate is one of the most efficient factor in curbing exchange rate volatility and negatively affects the exchange rate volatility.

Conclusion and Recommendations:

The broad scope of this study was intended to investigate the effects of remittances and interest rate on exchange rate volatility in Pakistan. The study utilized the ADF Dicky and Fuller (1979) test for confirmation the stationary of the variables and found that all variables are stationary in their level except the interest rate which was stationary in first difference. On the basis of the results of GMM the study found that remittances have negative relationship with exchange rate volatility it means that increase in remittances can moderate the exchange rate volatility and it has also been found that the interest rate has also negative effect on exchange rate volatility means depreciate the exchange rate volatility. Therefore, through enhancement in the size of remittances and increase in the interest rate the government can control the highly volatile exchange rate of the country and provide better opportunities for the investors especially for the foreign investors. The government may provide the opportunities to switch the remittances to be invested in the place of saving. Further researchers should attempt to take longer study duration of above 15 years by using other variables.

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