Exchange Rate Volatility and Foreign Remittances in SAARC Countries

Sidra Ilyas[1], Touseef Ahmad[2], Kashif Saeed[3], Sabira Dilawar[4]
and Muhammad Ramzan Sheikh[5]

Abstract

This study explores the relationship between exchange rate volatility and foreign remittances on the economies of SAARC countries over the period 2000 to 2023. With the ongoing debate among policymakers and researchers on this subject, the study employs the Cross-Sectional Autoregressive Distributed Lag (CS-ARDL) model to analyze data from eight SAARC nations. The variables considered include remittances, foreign reserves, trade, foreign direct investment (FDI), political stability, and GDP growth, sourced from the World Development Indicators (WDI), while exchange rate volatility is calculated using the GARCH method. The analysis involves two models. In the first model, remittances serve as the dependent variable, with exchangerate volatility, GDP growth, trade, inflation, and political stability as independent variables. In the second model, exchange rate volatility is the dependent variable, with remittances, GDP growth, trade, inflation, foreign reserves, and FDI as the independent variables. The results indicate both long-run and short-run relationships between exchange rate volatility and foreign remittances in SAARC countries. The findings show that remittances are positively associated with GDP growthand inflation, while exchange rate volatility, trade, and political stability have negative relationships with remittances. Additionally, exchange rate volatility has a positive association with inflation, while GDP growth, remittances, trade, FDI, and foreign reserves exhibit negative associations with exchange rate volatility. Granger causality tests reveal complex bidirectional andunidirectional causal relationships among the variables. These insights offer valuable implicationsfor policymakers aiming to manage exchange rate volatility and enhance remittance inflows in theSAARC region.

Keywords: Exchange Rate Volatility, Foreign Remittances, Exchange Rate, Foreign Exchange, Granger Causality.

Introduction

The exchange rate represents the value of one currency relative to another, serving as a national currency's quote in comparison to international currencies. Depending on the conversion mechanism, the exchange rate may function as a conversion factor, multiplier, or ratio. When exchange rates are allowed to fluctuate freely, they are considered the most rapidly changing pricesin the global economy,

[1]*Assistant Professor, School of Economics, Bahauddin Zakariya University Multan, Pakistan.*
Email: *sidrailyas@bzu.edu.pk*
[2]*MPhil Student, School of Economics, Bahauddin Zakariya University Multan, Pakistan. Email:* *atouseef917@gmail.com*
[3]*Assistant Professor, Department of Accounting and Finance, The Islamia University ofBahawalpur, Pakistan.*
Email: *kashif.saeed@iub.edu.pk*
[4]*Lecturer, Department of Economics, The Women University Multan, Pakistan. Email:* *sabira.6113@wum.edu.pk*
[5]*Professor of Economics, School of Economics, Bahauddin Zakariya University, Multan.*
Email: *ramzahsheikh@bzu.edu.pk*

influencing international goods markets and financial transactions (Azid et al., 2005).

Volatility, often described as turbulence, fickleness, or uncertainty, plays a significant role in financial markets, impacting asset prices, options pricing, portfolio optimization, and risk management. This inherent volatility provides a critical foundation for economic decision-making (Azid et al., 2005). Exchange rates, when allowed to fluctuate freely, are seen as the most volatile prices in the economy, reflecting unpredictability in international trade and financial securities. These rates are modeled as forward-looking relative asset prices, accommodating unforeseen shifts in the comparative demand and supply of domestic and foreign currencies. As a result, market expectations about changes in the monetary supply, interest rates, and income levels are reflected in exchange rate volatility. This topic has been the focus of extensive discussion in the economic literature (Jamil, 2012).

Volatility serves as an indicator of how an asset's value changes over time, with higher volatility inherently linked to greater risk and potential for significant losses. Financial markets have developed sophisticated tools, such as implied volatility metrics, to manage and price these risks. In an ideal, efficient market, actual volatility would align with implied volatility, meaning that the hedging cost would be an unbiased prediction of an asset's future volatility (Silva, 2017).

Foreign remittances are a crucial source of income for many countries, particularly in the SAARC region. These remittances help recipient households to increase their income, boost consumption, and manage socioeconomic shocks. However, the impact of remittances on household welfare and poverty, as well as their effect on inequality, remains an area of ongoing research with mixed findings (Taylor, 1992).

In SAARC countries, foreign remittances play a vital economic role, contributing significantly to household consumption, savings, and investment. Estimating the magnitude of foreign remittances involves collecting data from central banks, national statistical agencies, and international financial institutions like the World Bank and the IMF. These measurements capture both formal and informal remittance channels, offering a comprehensive view of their scale and impact on national economies.

Research Questions of the Study

The research questions are given below:
- What is the impact of exchange rate volatility on foreign remittances?
- Do remittances influence the exchange rate volatility?
- Is there any causality between exchange rate volatility and foreign remittances?

Objectives of the Study

The general objective of the research is to look at the link between the exchange rate volatility and foreign remittances in SAARC countries. The specific objectives of the research are as follows:
- To examine the impact of exchange rate volatility on remittance.
- To evaluate the influence of remittance on exchange rate volatility.
- To explore the causality between exchange rate volatility and foreign remittances.

This study offers fresh perspectives on the relationship between exchange rate volatility and foreign remittances, an area that has received less attention compared to the extensive literature on exchange rates and trade. In the context of SAARC countries, research on this topic is particularly limited. While previous studies have primarily focused on methodologies such as GMM, GARCH, and ARCH, this study employs the more advanced Cross-Sectional Autoregressive Distributed Lag (CS-ARDL) approach. This cutting-edge econometric technique addresses many of the issues that earlier methods could not effectively resolve.

The study is structured as follows: section 2 reviews the relevant literature, providing context forthe research. Section 3 outlines the study's model, data, and sources. Section 4 presents a detailedanalysis of the results. Finally, section 5 concludes the study, discussing the implications of the findings.

Literature Review

This section presents the literature reviews of the previous studies.

Table 1 provides a comprehensive overview of studies analyzing the relationship between remittances and exchange rates across different regions, with a particular focus on developing countries.

Table 1: Studies on Remittances and Exchange Rate

Authors	Country	Time	Methodology	Main Results
Ceesay & Limbe, (2024)	Gambia	2009-2019	ARDL	+ve
Annisa & Jayadi (2024)	Indonesia	1990-2019	VAR Model	-ve
Ali and Ismail (2024)	Pakistan	1976-2022	ARDL	+ve
Adibi, (2023)	Nigeria	1980-2021	DOLS	-ve
McFarlane et al. (2022)	1977 to 2019	Jamaica	Granger Causality Analysis	+vee
Saadat & Naderi (2020)	1980-2017	Developing countries	VAR	+ve
Azizi (2021)	01 Developing Countries	1990-2015	₋S and FixedEffect	-ve
Kim (2019)	14 Developing Countries	1970-2013	Pooled OLS, AH-IVGMM	-ve
Anosik (2 0 2 3)	WAMZ	1960-2022	Panel RLS	-ve
Adeniyi et al. (2019)	1996–2012	Developing Countries	Systematic GMM	+ve
Opperman & Adjasi (2019)	2002-2014	Sub-Saharan African countries.	GMM	+ve
Senadza & Diaba (2017)	1993 to 2014	Sub Saharan Africa	PMGE	+ve
Khurshid et al. (2017)	1992 to 2015	Pakistan	GMM	+ve
Khan et al. (2016)	1980 to 2014	Pakistan	ARDL	+ve
Barrett (2014)	1995-2010	Jamaica	OLS	+ve
Lartey et al. (2012)	1990–2003.	09 developing countries	GMM	+ve
Broda and Romalis (2011)	1970-1997	Chicago	OLS and GMM	+ve
Aggrawal et al. (2011)	1975–2007	Developing countries	GMM	+ve

The findings are mixed, with some studies indicating a positive impact of remittances on exchange rates, while others show a negative effect. The most frequently employed methodologies include the Generalized Method of Moments (GMM) and the Autoregressive Distributed Lag (ARDL) model, highlighting their effectiveness in addressing econometric challenges in these analyses. Overall, the results underscore the complexity of this relationship, which is influenced by country-specific factors and the chosen analytical approach.

Model Specification, Data and Methodology
This study investigates the relationship between exchange rate volatility and foreign remittancesin SAARC countries, using two specified models to conduct the analysis.

Model 1: Impact of Exchange Rate Volatility on Foreign Remittances
The following is the model's functional form:

REM = f (GDPG, ERV, TRADE, INF, PS)   **(1)**

The model's econometric form is as follows:

$$REM_{it} = \eta_0 + \eta_1 GDPG_{it} + \eta_2 ERV_{it} + \eta_3 TRADE_{it} + \eta_4 INF_{it} + \eta_5 PS_{it} + \mu_{it}$$ **(2)**

Model Impact of Foreign Remittances on Exchange Rate Volatility
The following is the model's functional form:

ERV = f (GDPG, TRADE, INF, FDI, REM, FR)   **(3)**

The model's econometric form is as follows:

$$ERV_{it} = \eta_0 + \eta_1 GDPG_{it} + \eta_2 FDI_{it} + \eta_3 TRADE_{it} + \eta_4 INF_{it} + \eta_5 REM_{it} + \eta_6 FR_{it} + \mu_{it}$$ **(4)**

Data for the variables has been collected from the World Development Indicators (WDI) for eight SAARC countries, covering the period from 2000 to 2023. Exchange rate volatility is calculated using the GARCH model. Table 2 provides a description of the variables, their units of measurement, and the sources of data collection.

Table 2: Description of the Variables

Variables	Description	Measurement Units	Sources
ERV	Exchange rate Volatility	LCU Per US$ through GARCH	
REM	Personal Remittances		
FR	Foreign Reserve	% of GDP	
TRADE	Trade		
FDI	Foreign Direct Investment		WDI
GDPG	Gross domestic product growth	Annual %	
INF	Inflation		
PS	Political Stability	Index	

Results and Discussions
Summary Statistics and Correlation Analysis
The summary statistics in table 3 reveal key insights into the distribution and behavior of all the variables in the study. On average, personal remittances represent a moderate percentage of GDP across the SAARC countries, though there is significant variation, as indicated by the high standard deviation. The distribution of remittances is positively skewed, with a few countries receiving much higher remittances than others, and the kurtosis indicates the presence of extreme values. The Jarque-Bera test confirms that the distribution is not normal. Exchange rate volatility exhibitssubstantial fluctuations, with a high standard deviation reflecting periods of both stability and instability across the region. The distribution is positively skewed, with occasional extreme spikesin volatility, and the kurtosis suggests a leptokurtic distribution, meaning that extreme values are more frequent than in a normal distribution. The Jarque-Bera test strongly rejects the hypothesis of normality.
GDP growth shows positive average growth across the SAARC countries, but the high standard deviation indicates considerable variation, with some countries experiencing significant economic booms and others facing downturns.

The kurtosis value suggests a leptokurtic distribution, with more frequent extreme trade values. The Jarque-Bera testfurther supports the non-normality of trade data.

Table 3: Summary Statistics

	REM	ERV	GDPG	TRADE	INF	PS	FR	FDI
Mean	5.930	70.471	5.181	50.444	7.511	-0.960	0.207	1.938
Median	3.767	67.866	5.613	44.702	5.880	-1.079	0.148	0.923
Maximum	27.626	204.867	37.687	116.550	68.010	1.284	0.748	16.783
Minimum	0.000	11.770	-32.909	21.460	-3.365	-2.810	0.021	-0.639
Std. Dev.	6.502	37.756	6.024	23.677	7.899	1.155	0.173	2.929
Skewness	1.786	0.915	-1.001	1.264	4.512	0.280	1.435	2.785
Kurtosis	5.673	4.411	17.834	3.787	29.681	2.064	4.151	10.880
Jarque-Bera	142.675	40.256	1671.165	39.168	5916.941	8.725	68.502	690.695
Probability	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000

Inflation rates across the region show a pattern of moderate averages but significant variability, with periods of very high inflation in certain countries. The distribution is highly positively skewed, indicating that most countries have relatively low inflation but with occasional extreme spikes. The very high kurtosis confirms the presence of frequent extreme values, and the Jarque-Bera test strongly rejects normality for inflation data. Political stability in the SAARC region shows low average values, with moderate variation across countries. The distribution is only slightly positively skewed, with relatively less frequent extreme values compared to other variables. However, the Jarque-Bera test still indicates non-normality, suggesting that even political stability data has irregularities in its distribution.

Foreign reserves as a percentage of GDP show low average levels, with moderate variation among countries. The data is positively skewed, indicating that a few countries hold relatively larger reserves, and the kurtosis suggests occasional extreme values. The Jarque-Bera test rejects normality for foreign reserves as well. Foreign direct investment inflows vary widely, with the data distribution highly positively skewed, indicating that while most countries receive moderate FDI, a few attract disproportionately high levels. The kurtosis value reflects a leptokurtic distribution, with frequent outliers, and the Jarque-Bera test confirms that the distribution is not normal.

Correlation Analysis
Table 4 presents the correlation analysis. the variables ERV and INF have a weak positive correlation with REM. GDPG, TRADE, PS, FR, and FDI have a weak negative correlation with REM. The variables GDPG, TRADE, FDI, PS, and FR have a weak negative correlation with ERV. The variable INF has a weak positive correlation with ERV.

Table 4: Correlation Analysis

	REM	ERV	GDPG	TRADE	INF	PS	FR	FDI
REM	1.000							
ERV	0.174	1.000						
GDPG	-0.162	-0.062	1.000					
TRADE	-0.263	-0.098	0.220	1.000				
INF	0.155	0.181	-0.011	-0.038	1.000			
PS	-0.184	-0.315	0.101	0.755	-0.252	1.000		
FR	-0.114	-0.385	0.063	0.822	-0.140	0.742	1.000	
FDI	-0.385	-0.040	0.417	0.263	0.006	0.062	0.088	1.000

Unit Root Analysis

Table 5 presents the results of the Second-generation Im-Pesaran-Shin (CSDIPS) Unit Root Test. The variables REM, ERV, GDPG, INF, FR, and FDI are found to be stationary at lag 0, both with and without a trend. In contrast, the variables PS and TRADE are stationary at lag 1, regardless of the trend.

Table 5: Unit Root Test

Second Generation Panel Unit Root Test

Cross-Section-Dependence based Im-Pesaran-Shin (CSDIPS) Unit Root Test

Variables	Without Trend			With Trend		
	Lags	Zt Statistics	P-Value	Lags	Zt Statistics	P-Value
REM	0	0.802	0.789	0	1.598	0.945
ERV	0	-1.144	0.126	0	-0.833	0.202
GDPG	0	-3.527	0.000	0	-3.708	0.000
TRADE	1	-1.198	0.115	1	0.805	0.790
INF	0	-5.938	0.000	0	-5.292	0.000
PS	1	0.278	0.610	1	-1.372	0.0085
FR	0	-1.274	0.101	0	0.093	0.537
FDI	0	-2.570	0.005	0	-3.242	0.001

Cross-Sectional Dependence Test

In this section, the results of the cross-section dependence test are explained. Table 6 shows the results of the cross-sectional dependence test among the variables. The CD test for all variables is statistically significant, so a cross-sectional dependence exists among all variables.

Table 6: Pesaran's Cross-Sectional Dependence (CD)Test

Variable	CD-test	P-Value
REM	1.365	0.072
ERV	22.423	0.000
GDPG	7.960	0.000
TRADE	3.225	0.001
INF	2.461	0.014
PS	4.821	0.000
FR	1.100	0.072
FDI	1.678	0.093

Slope Homogeneity Test

This section explains the results of slope homogeneity. Table 7 illustrates the results of the slope homogeneity test. In both Models, the Delta test and HAC Robust Adjusted test are statistically significant, which means the slope of the independent variables is the same across all cross-sectional units. So, there exists slope homogeneity.

Table 7: Slope Homogeneity Test

Model 1: REM/GDPG, ERV, TRADE, INF, PS			
Delta Test			
Un-Adjusted	**P-value**	**Adjusted**	**P-value**
-5.125	0.000	-3.433	0.000
HAC Robust Adjusted Delta Test			
Un-Adjusted	**P-value**	**Adjusted**	**P-value**
2.876	0.000	-2.642	0.000
Model 2: ERV/ GDPG, TRADE, INF, FDI, REM, FR			
Delta Test			
Un-Adjusted	**P-value**	**Adjusted**	**P-value**
-4.965	0.000	-3.755	0.000
HAC Robust Adjusted Delta Test			
Un-Adjusted	**P-value**	**Adjusted**	**P-value**
2.852	0.000	-2.543	0.000

Results and Discussion

This section presents the study's findings and discussions, focusing on both long-run and short-run results. Table 8 displays the long-run estimates based on the CS-ARDL model for remittances and exchange rate volatility. In the first model, personal remittances (REM) serve as the dependent variable, while the independent variables include exchange rate volatility (EVR), annual GDP growth (GDPG), trade openness (TRADE), inflation (INF), and political stability (PS).

The first independent variable, GDPG, shows a statistically significant positive relationship with remittances. Economic growth indicates resilience and stability, which can give migrants hope for their home country's future. With greater confidence, migrants are more likely to send money home to support their families and invest in the economy (Freund & Spatafora, 2008). These findings align with studies by Meyer & Shera (2017), Mundell (1961), Adewuyi & Akpokodje (2013), Aggarwal (2011), Adams (2009), Giuliano & Ruiz-Arranz (2009), Edwards & Levy-Yeyati (2005), and Fayissa & Nsiah (2010).

There is a statistically significant negative relationship between exchange rate volatility and remittances. Exchange rate volatility introduces uncertainty regarding the value of remittances in the home country's economy (Amuedo-Dorantes & Pozo, 2006). This result is consistent with findings by Buch et al. (2002) and Aghion et al. (2009).

Trade is negatively associated with REM and is highly statistically significant. Increased trade often leads to the growth of local industries and economic diversification. As the regional economy strengthens and becomes more diverse, remittances as a source of income may become less essential (Aggarwal, 2011). Higher export revenue in foreign currency reduces the reliance on remittances for foreign exchange (Freund & Spatafora, 2008). Additionally, increased trade may

generate more job opportunities domestically, reducing the need for financial support from abroad (Barajas, 2009). This finding is consistent with studies by Janjua (2007), Acosta & Fajnzylber (2007), Hyder & Mahboob (2006), and Ahmed (2009).

There is a statistically significant positive relationship between INF and REM. High inflation erodes the purchasing power of families in their home country, prompting migrant workers to send additional remittances to help their families maintain their standard of living (Bouhga-Hagbe, 2004). Remittances can also serve as a form of protection for households facing economic instability due to inflation, helping them cushion against financial pressure and uncertainty (Rapoport & Docquier, 2006). This result is consistent with studies by Deluna (2014), Roy & Rahman (2014), Khan & Islam (2013), Bourdet & Falck (2006), Amuedo-Dorantes & Pozo (2004), Bayangos (2012), and Narayan et al. (2011).

Political stability (PS) has a statistically significant negative relationship with REM. Politically stable countries often experience improved economic conditions, higher employment rates, and increased income levels, leading to a reduced reliance on remittances for financial support (Ziesemer, 2010).

Political stability also decreases perceived risks to the economy and society, leading to reduced financial support from migrants as their need to provide for their loved ones decreases (Czaika & Spray, 2013). This finding aligns with studies by Chami et al. (2003), Fosu (2004), and El-Sakka et al. (1999). In the second model, the dependent variable is exchange rate volatility (ERV), while the independent variables include personal remittances (REM), GDP growth (GDPG), trade openness (TRADE), inflation (INF), foreign reserves (FR), and net foreign direct investment inflows (FDI).ERV is negatively associated with GDPG and is statistically significant. Sustained GDP growth often reflects a stable macroeconomic environment, reducing speculation and uncertainty in thecurrency market, which in turn decreases exchange rate volatility (Ghosh et al., 1997). Economic growth boosts investor confidence, encouraging more foreign direct investment and portfolioinflows. Stable capital inflows help stabilize the currency and reduce exchange rate volatility(Frankel & Rose, 1996). This result is consistent with findings by Doganlar (2002), Vieira et al.(2013), Dollar (1992), Serven (2003), Demir (2010), Belke & Gros (2001), and Schnabl (2009). Trade has a negative and statistically significant relationship with exchange rate volatility (ERV).Increased exports and higher trade volumes lead to greater foreign exchange earnings. Acontinuous inflow of foreign currency through exports helps stabilize the exchange rate byensuring a steady supply of foreign exchange (Ghosh et al., 2016). Investors generally perceiveeconomies with robust trade activity as more stable, which boosts confidence and reduces currencyspeculation. This increased trust can lead to lower exchange rate volatility (Wei, 1996).Conversely, the risks associated with exchange rate volatility may discourage economic agentsfrom engaging in trade, as it increases the cost for risk-averse participants and subsequentlyreduces trade activity (Clark, 1973). These findings align with the results of Hooper & Kohlhagen(1978), Cushman (1983, 1988), Kroner & Lastrapes (1993), Caporale & Doroodian (1994), Hassan& Tufte (1998), Rahmatsyah et al. (2002), Clark (1973), Baron (1976), Hooper & Kohlhagen(1978), Pino et al. (2016), Arize et al. (2003), and Siregar & Rajan (2004).

Inflation shows a positive and highly statistically significant relationship with ERV. Inflation-induced economic instability can fuel currency speculation, as investors may engage in activities that increase exchange rate volatility, anticipating further depreciation of the currency (Frankel & Rose, 1996). These findings are consistent with studies by Musa (2021), Dornbusch (1976), Mulwa (2013), Timothy et al. (2016), and Shaari et al. (2012).

Foreign direct investment (FDI) has a negative and highly significant relationship with ERV. FDI

represents long-term investments in a country's manufacturing, infrastructure, and technological sectors. These steady and continuous investments generate sustained demand for the domestic currency, which contributes to exchange rate stability (Blonigen, 2005). These findings are in line with those of Cushman (1985), Esquivel & Larraín (2002), Asante & Gyasi (2000), and Kyereboah-Coleman & Agyire-Tettey (2008).

Remittances (REM) are negatively related to ERV and are statistically significant. Remittances provide a reliable and consistent supply of foreign exchange, which helps balance the supply and demand for foreign currency, thereby reducing exchange rate volatility (Ratha, 2005). These results are consistent with studies by Singer (2010), Collins (1996), Broz (2002), Aizenman (1992), Frieden & Stein (2001), and Simmons (1994).

Table 8: Long Run Estimates of CS-ARDL

Variables	REM	ERV
	Long Run Results	
GDPG	0.420**	-1.885***
	(0.190)	(0.0658)
ERV	-0.0338***	
	(0.00622)	
TRADE	-0.0183***	-0.0522*
	(0.00383)	(0.0288)
INF	0.0250***	1.412***
	(0.00438)	(0.378)
PS	-1.844***	
	(0.104)	
FDI		-1.157***
		(0.330)
REM		-3.417**
		(1.385)
FR		-3.237***
		(0.896)
R-squared	0.390	0.370
Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$		

Table 9 provides the short-run results of CS-ARDL. The value of the error correction term is negative and highly statistically significant. It means moving towards long-run equilibrium takes about 9 months in the remittances model and 8 months in the exchange rate volatility model.

Table 9: Short Run Estimates of CS-ARDL

Variables	REM	ERV
	Short Run Results	
Δ GDPG	-0.0611***	-0.287
	(0.00954)	(0.530)
Δ ERV	0.00960	
	(0.0255)	
Δ TRADE	-0.00148	-0.250
	(0.0448)	(0.358)
Δ INF	-0.00379	-0.119
	(0.0276)	(0.222)
Δ PS	0.0187	
	(0.483)	
Δ FDI		-2.863*
		(1.488)
Δ REM		-0.0843
		(0.296)
Δ FR		0.0422
		(0.0282)
ECT	-0.906***	-0.885***
	(0.0453)	(0.0658)

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Causality Analysis
This section describes the results of the causality analysis.

Result of Lag Order
Table 10 shows that the optimal lag length for the VAR model is 2, as indicated by the lowest values in FPE, AIC, SC, and HQ. This suggests that a VAR model with 2 lags best fits among the considered options.

Table 10: Lag Order Selection Criteria for a Vector Autoregression (VAR) Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3799.881	NA	9.40e+30	94.02175	94.25823	94.11663
1	-3039.076	74.04806	1.62e+24	78.39693	82.41724	80.00993
2	-3085.934	1269.238	1.02e+24*	77.97368*	80.10208*	78.82762*
3	-2962.888	105.3456*	1.35e+24	78.09600	84.00822	80.46806
4	-2912.678	59.50853	2.39e+24	78.43649	86.24062	81.56761
5	-2859.695	52.32854	4.79e+24	78.70852	88.40456	82.59870

While lag 3 has the lowest LR value, it is not optimal in other criteria. Therefore, lag 2 is the preferred choice for this VAR model.

Granger Causality Analysis

This section presents the results of Granger Causality analysis. The results in table 11 indicate bidirectional causality between the following pairs: EXRV and REM, GDPG and REM, TRADE and REM, INF and REM, FDI and REM, INF and EXRV, and FR and EXRV. There is unidirectional causality where PS causes REM, REM causes FR, EXRV causes GDPG, TRADE causes EXRV, and EXRV causes FDI. Additionally, GDPG causes TRADE, INF causes GDPG, PS causes GDPG, FR causes GDPG, FDI causes GDPG, INF causes TRADE, PS causes TRADE, FR causes TRADE, and TRADE causes FDI, all showing unidirectional causality. There is no causality between PS and EXRV, PS and INF, FR and INF, and FDI and INF.

Table 11: Results of Paired Granger Causality Test

H_0	Lag	F-Statistics	P-value
EXRV➡REM	2	2.29623	0.0072
REM➡EXRV	2	4.60083	0.0115
GDPG➡REM	2	2.35567	0.0013
REM➡GDPG	2	13.6457	0.0005
TRADE➡REM	2	3.30276	0.0403
REM➡TRADE	2	4.47565	0.0007
INF➡REM	2	2.79854	0.0089
REM➡INF	2	2.92297	0.0567
PS➡REM	2	2.89420	0.0012
REM➡PS	2	1.47234	0.2329
FR➡REM	2	0.22645	0.7976
REM➡FR	2	4.22181	0.0013
FDI➡REM	2	4.81813	0.0032
REM➡FDI	2	3.21530	0.0065
GDPG➡EXRV	2	0.34342	0.7099
EXRV➡GDPG	2	3.07995	0.0486
TRADE➡EXRV	2	2.03557	0.1352
EXRV➡TARDE	2	3.93354	0.0222
INF➡EXRV	2	3.47589	0.0222
EXRV➡INF	2	4.19908	0.0167
PS➡EXRV	2	0.27110	0.7629
EXRV➡PS	2	0.58743	0.5571
FR➡EXRV	2	3.43618	0.0073
EXRV➡FR	2	4.80967	0.0069
FDI➡EXRV	2	1.83559	0.1629
EXRV➡FDI	2	2.98163	0.0536
TARDE➡GDPG	2	0.82021	0.4428
GDPG➡TARDE	2	7.60416	0.0008

INF➡GDPG	2	3.85139	0.0087
GDPG➡INF	2	0.21837	0.8041
PS➡GDPG	2	3.13173	0.0466
GDPG➡PS	2	0.83377	0.4365
FR➡GDPG	2	3.83801	0.0045
GDPG➡FR	2	1.02817	0.3601
FDI➡GDPG	2	7.98604	0.0005
GDPG➡FDI	2	0.72032	0.4882
INF➡TRADE	2	2.27367	0.0074
TRADE➡INF	2	1.05088	0.3528
PS➡TRADE	2	3.19974	0.0449
TRADE➡PS	2	0.17515	0.8396
FR➡TRADE	2	4.80212	0.0099
TRADE➡FR	2	0.27333	0.7613
FDI➡TRADE	2	0.93460	0.3958
TRADE➡FDI	2	3.26929	0.0417
PS➡INF	2	0.74591	0.4761
INF➡PS	2	1.05005	0.3525
FR➡INF	2	0.87177	0.4202
INF➡FR	2	0.33502	0.7158
FDI➡INF	2	0.73520	0.4810
INF➡FDI	2	0.49799	0.6087
FR➡PS	2	0.16757	0.8459
PS➡FR	2	0.01919	0.9810
FDI➡PS	2	0.55564	0.5749
PS➡FDI	2	1.67697	0.1905
FDI➡FR	2	0.62763	0.5353
FR➡FDI	2	0.28940	0.7491

Conclusion and Policy Recommendations

This study seeks to assess the impact of exchange rate volatility and foreign remittances on SAARC countries from 2000 to 2023. The analysis employs the Cross-Sectional Autoregressive Distributed Lag (CS-ARDL) model for eight SAARC countries. Data for variables such as remittances, foreign reserves, trade, foreign direct investment (FDI), political stability, and GDP growth were sourced from the World Development Indicators (WDI) for the period 2000 to 2023. Data on exchange rate volatility were obtained using the GARCH model. The CS-ARDL technique is applied in this study, and two models are estimated. In the first model, remittances are the dependent variable, while exchange rate volatility, GDP growth, trade, inflation, and political stability serve as independent variables. In the second model, exchange rate volatility is the dependent variable, with remittances, GDP growth, trade, inflation, foreign reserves, and FDI net inflows as independent variables. The results demonstrate both long-run and short-run

relationships between exchange rate volatility and foreign remittances in SAARC countries. In the first model, GDP growth and inflation positively correlate with remittances, while exchange rate volatility, trade, and political stability show negative relationships. In the second model, inflation is positively associated with exchange rate volatility, whereas GDP growth, remittances, trade, FDI, and foreign reserves exhibit negative relationships with exchange rate volatility. The results of Granger Causality indicate bidirectional causality between the following pairs: EXRV and REM, GDPG and REM, TRADE and REM, INF and REM, FDI and REM, INF and EXRV, and FR and EXRV. There is unidirectional causality where PS causes REM, REM causes FR, EXRV causes GDPG, TRADE causes EXRV, and EXRV causes FDI. Additionally, GDPG causes TRADE, INF causes GDPG, PS causes GDPG, FR causes GDPG, FDI causes GDPG, INF causes TRADE, PS causes TRADE, FR causes TRADE, and TRADE causes FDI, all showing unidirectional causality. There is no causality between PS and EXRV, PS and INF, FR and INF, and FDI and INF.

The right balance between exchange rate volatility and remittances should be found in the policy recommendations. Based on the results policies are given below:

- The findings of the study show that an increase in the gross domestic product growth increases the remittances of SAARC countries. So, it is recommended that policymakers should create opportunities for the migrants so that they can participate in economic activities which in turn increase the economic performance of the SAARC countries.
- The results of the study indicate that the exchange rate volatility is negatively affected by the remittances in SAARC countries. So, it is suggested that the government should implement such policies that enhance the exchange rate volatility which further improves the remittances of the SAARC countries.
- The outcomes illustrate that trade has a negative impact on remittances. So, it is recommended that the government should promote trade in order to improve and increase the remittances in the SAARC countries.
- The results indicated that inflation has a positive effect on remittances. So, it is suggested that policymakers should make such policies that enhance the inflation so which in turn increases the remittances.
- There is a negative relation between the remittances and political stability. So, it is recommended that policymakers stabilize the political performance in the countries which in turn increases the remittances in the SAARC countries.
- The findings of the study show that a decrease in the gross domestic product growth increases the exchange rate volatility of SAARC countries. So, it is recommended that policymakers should create opportunities for the migrants so that they can participate in economic activities which in turn increase the economic performance of the SAARC countries.
- The results of the study indicate that remittances are negatively affected by the exchange rate volatility in SAARC countries. So, it is suggested that the government should implement such policies that enhance the remittances which further improves the exchange rate volatility of the SAARC countries.
- The outcomes illustrate that trade has a negative impact on exchange rate volatility. So, it is recommended that the government should promote trade in order to improve and increase the exchange rate volatility in the SAARC countries.
- The results indicated that inflation has a positive effect on exchange rate volatility. So, it is suggested that policymakers should make such policies that enhance the inflation so which in turn raises the exchange rate volatility.

- The findings of the study show that a decrease in foreign direct investment increases the exchange rate volatility of SAARC countries. So, it is recommended that policymakers should create opportunities for the people so that they can participate in FDI activities which in turn increase the exchange rate volatility of the SAARC countries.
- The results indicated that foreign reserve is negatively related to the exchange rate volatility. So, it is suggested that policymakers should make such policies that enhance the exchange rate volatility which in turn raises the foreign reserve.

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