

The impact of exchange rate volatility on BRICS Trade and the Possible use of CBDCs to Overcome Exchange Rate Volatility

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INTRODUCTION

- BRICS economies have been practising export-led growth strategies over a period of time and have opened their economies more than any other emerging economies.
- BRICS members are all developing or newly industrialised countries but possess distinct large, fast-growing economies and strongly influence regional and global affairs (Santiago, 2020).
- The World Trade Organization (WTO) points out that five BRICS countries represent almost three billion people, which is about 43% of the world population.
- They have a combined nominal GDP of US\$14.9 trillion, which is about 25% of the world's GDP and an estimated US\$4 trillion in consolidated foreign reserves.

Why a concern about currency issues in BRICS?

According to Wilson & Purushothaman (2003), BRICS economies may become world economic powers in the next 50 years.

It is believed that BRICS economies will be larger than the elite group of the world's wealthiest nations (G7) economies in US dollar terms in the next 40 years and that by 2025 it will nearly be half of the G7 countries' size.

However, this imposes on producers the challenge of dealing with a source of foreign competitiveness that is additional to the productive conditions within each country in the BRICS.

Some of the BRICS countries have higher trade openness than the other BRICS countries making access to their markets difficult.

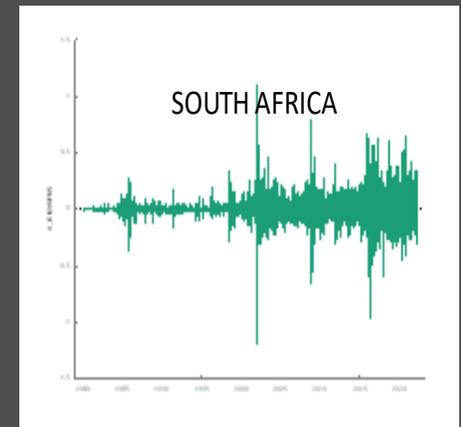
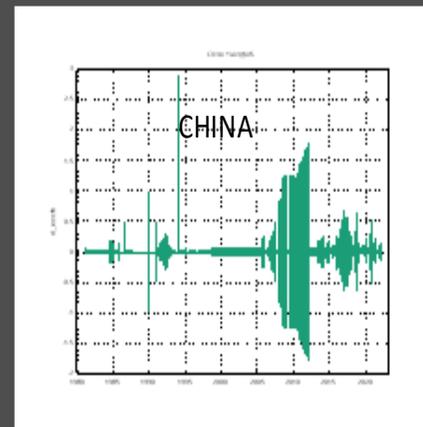
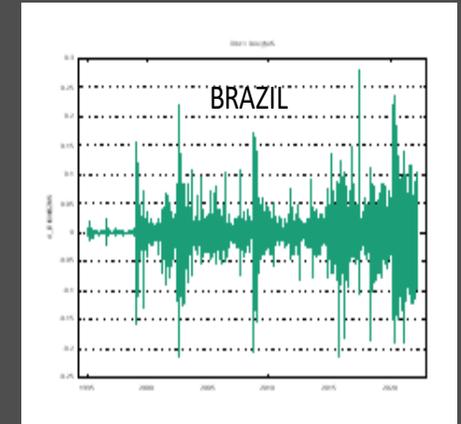
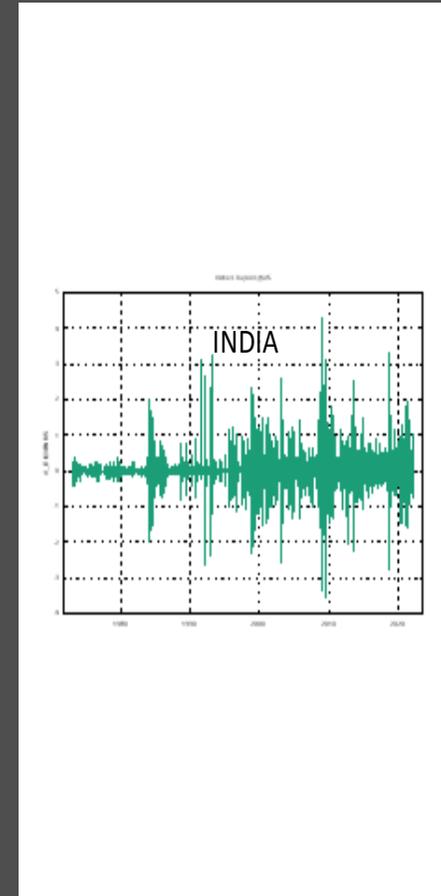
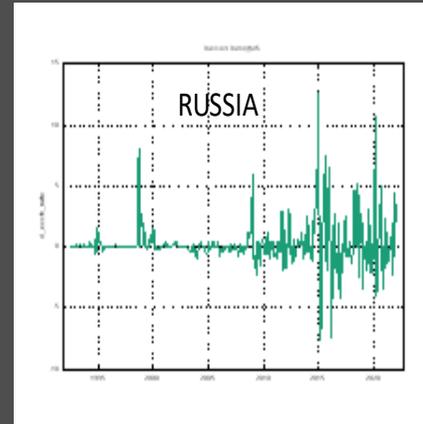
Volatility of BRICS national currencies

Risk-averse traders may choose to trade less to avoid any price uncertainty associated with exchange rate changes.

This means that currency volatility may impede the flow of trade in BRICS countries.

Currency volatility may lead to suboptimal economic benefits accruing to BRICS countries.

BRICS CURRENCIES PER US\$ DAILY EXCHANGE RATES



Source: Author's own computation using FRED (2022) data

Specific objectives, assumptions and methodology

- a. To examine the exchange rate volatility on BRICS Export volumes
- b. To examine the exchange rate volatility on BRICS import volumes

Control Variables are as follows:

- a. To examine the relationship between BRICS export volumes and inflation
- b. To examine the relationship between BRICS import volumes and inflation
- c. To examine the relationship between BRICS export volumes and import tariffs
- d. To examine the relationship between BRICS import volumes and import tariffs

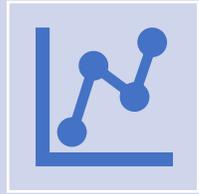
Assumptions

Variable		Relationship with Export Volumes	Relationship with Import Volumes
Exchange Rate	Volatility	Negative (-)	Negative (-)
Inflation		Negative (-)	Positive (+)
Import Tariffs		Negative (-)	Negative (-)

Hypotheses

- H_{01} : There is no relationship between exchange rate volatility and export/import volumes
- H_{A1} : There is a relationship between exchange rate volatility and export/import volumes
- H_{02} : There is no relationship between Inflation and export/import volumes
- H_{A2} : There is a relationship between Inflation and export/import volumes
- H_{03} : There is no relationship between import tariffs and export/import volumes
- H_{A3} : There is a relationship between import tariffs and export/import volumes

Specific Research Methodology



This study is based on a quantitative research methodology. The econometric models used to analyse the data are two-pronged: GARCH and ARDL.



The GARCH model was used to test for exchange rate volatility, while the ARDL model was used to examine the impact of exchange rate volatility on export and import volumes.

GARCH Model

Although ε_t is serially uncorrelated, its conditional variance σ_t^2 may change over time

Engel (1982) defined the terms of the ARMA mean equation as an autoregressive conditional heteroskedastic (ARCH) process where all are of the form:

- $\varepsilon_t = z_t(t) \sigma_t$

and

$$\sigma_t^2 = \omega + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2$$

Where $z_t(t)$ as an independent and identically distributed (i.i.d) variable has a distribution with a zero mean and a unit variance

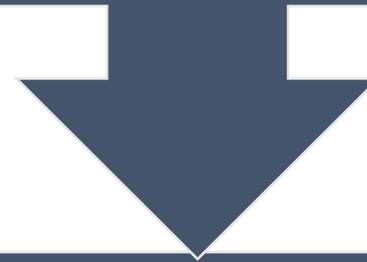
ARCH AND GARCH MODEL ESTIMATIONS

- However, the ARCH model has two shortcomings.
- Firstly, the ARCH (p) model is regarded as a short memory process because only recent p residuals have an effect on the current variance.
- Secondly, it is important to note that the ARCH specification, according to Engel (1995), looked more like a moving average specification than an autoregression.
- The GARCH lets the conditional variance be a function of the squares of previous observations and past variances.
- It improves the autoregressive structure on conditional variance, allowing shocks to persist over time. A GARCH (p,q) model, therefore, models the variance equation as follows:

$$\sigma_t^2 = \omega + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^q \beta_j \sigma_{t-j}^2$$

ARCH AND GARCH MODEL ESTIMATIONS (cont)

In this way, the error term has a conditional variance that is a function of the magnitudes of past errors.



The p, q in the GARCH (p, q) indicates that the conditional variance depends on the p 's most recent squared residuals and the q 's most recent conditional variances.

ARDL BOUNDS TO COINTEGRATION EQUATION

- $\ln\Delta Y_t = \beta_0 + \beta_1 T_t + \sum_{i=1}^n \beta_{2i} \Delta \ln Y_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta \text{Exp Volatility}_{B_{t-i}} + \sum_{i=0}^n \beta_{4i} \Delta \text{Imp Tariffs}_{R_{t-i}} + \sum_{i=1}^n \beta_{5i} \Delta \text{Inflation}_{I_{t-i}} + \alpha_1 \ln Y_{t-1} + \alpha_2 \text{Exp Volatility}_{B_{t-1}} + \alpha_3 \text{Import Tariffs}_{R_{t-1}} + \alpha_4 \text{Inflation}_{I_{t-1}} + \varepsilon_t$
- The parameters β_2, \dots, β_5 are the short-run multipliers (elasticities) and $\alpha_1, \dots, \alpha_4$ are the long-run multipliers (elasticities).
- Δ is defined as the first difference operator, T is the time trend, $\ln Y_t$ is the natural logarithm of export and import volumes. The white noise residual term is denoted by ε_t .

Presentation of empirical findings

- all the GARCH terms are positive and significant. The time-varying volatility includes a constant term plus its past errors.]
- This means that the past values significantly predict the current values in all the above models.
- The sum of the coefficients of ARCH and GARCH terms is close to 1 in all five cases suggesting a persistent volatility shock.
- The volatility shocks are transmitted to the next period.

	Model 1: Brazil	Model 2: Russia	Model 3: India	Model 4: China	Model 5: South Africa
Variables					
const	-0.00536246	0.0310372*	-0.00361559	0.00305289**	0.00318815
Daily exchange rates/US\$(-1)	1.00718***	0.996466***	1.00013***	0.999695***	0.999786***
Variance Equations					
c	0.0308929***	0.0249229***	0.00330862***	7.28272***	4.55399e-05***
Resid(-1)^2	0.328960***	1.00378***	0.0880998***	0.0332466***	0.0739302***
GARCH(-1)	0.296056***	0.444317***	0.884822***	0.960860***	0.925495***

IMPACT OF CURRENCY VOLATILITY ON BRICS TRADE

- Given the above evidence of the existence of the volatility shocks, it is important to ascertain the impact of such volatility shocks on the BRICS trade.
- To test this hypothesis, we use the GARCH series in a multivariate context on quarterly data covering a period of 1995 – 2020.
- We apply these series in ARDL econometric technique with exports and imports as dependent variables and exchange rate volatility, inflation, and import tariffs as exogenous variables.
- The ARDL results are reported in the next subsection.

STATIONARITY TEST RESULTS

- Both ADF and Phillips Perron Results show at least one variable, exchange rate volatility, is stationary at levels whilst all the other variables became stationary after the first difference.

Impact of exchange rate volatility on export volumes

Country	Long run (-/+)	Short run (-/+)	Number of lags (short-run)
Brazil	- (sig)	No short run	n/a
Russia	+ (sig)	No short run	n/a
India	-	+ (sig)	0
China	+	- (sig)	0,1 & 4 lags
South Africa	+	- (sig)	1

Implications

The preceding ARDL results show that the exchange rate volatility has mixed effects on export volumes in BRICS countries. In some instances, it is negative in the short run, positive in the long run, and vice versa.

This suggests that the unpredictability of the BRICS exchange rates is also transmitted on the export volumes as denoted by the coefficients' mixed signs.

Clearly, exchange rate volatility heightens the level of uncertainty in the economy, particularly in export-sector businesses.

Impact of exchange rate volatility on imports in BRICS countries

Country	Long run (-/+)	Short run (-/+)	Number of lags (short-run)
Brazil	- sig	None	n/a
Russia	- sig	None	n/a
India	+ sig	-	1, 2 & 3
China	-(insig)	(insig)	n/a
South Africa	+(insig)	-(sig)	1

Implications

The preceding ARDL results show that the exchange rate volatility has mixed effects on import volumes in BRICS countries.

This suggests that the unpredictability of the exchange rates in BRICS countries is also transmitted on the import volumes as denoted by mixed signs of the coefficients.

Clearly, exchange rate volatility heightens the level of uncertainty in the economy particularly in businesses that are in the import sector.

Conclusions

The results align with our a priori expectations in the case of Brazil, Russia and China in the long run but only in the short run in the case of India and South Africa.

The results further suggest that the null hypothesis of no relationship between import volumes and exchange rate volatility is rejected in favour of the alternative hypothesis in the cases of Brazil, Russia and India in the long run and South Africa in the short run.

We fail to reject the null hypothesis in the case of China in the long and in the short run and South Africa in the long run only.

Conclusions

The econometric results indicate that in most instances, the exchange rate volatility has a negative relationship with export volumes in BRICS.

Similarly, there is strong evidence of a negative relationship between exchange rate volatility and import volumes in BRICS countries.

It can be safely concluded that the exchange rate uncertainty impacts negatively on BRICS trade.

This threatens the consolidation and enhancement of cooperation amongst BRICS countries through trade.

Recommendations

We thus recommend alternative and more stable forms of international finance to facilitate trade.

The use of digital currencies will go a long way in addressing the shortcomings posed to BRICS countries by the use of the conventional exchange rate system.