# The impact of exchange rate volatility on BRICS Trade

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# Acknowledgement


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# Introduction

- The breakdown of the Bretton-Woods agreement signalled the dawn of a new era for the global economy in which many of the worlds major trading nations would embrace a regime of floating exchange rate determination (McKenzie & Melbourne, 1999)
- Thus the currencies are traded on the basis of the forces of demand and supply
- Consequences are that risk averse traders would cut back on out put in fear of exchange rate volatility
- Exchange rate volatility poses a potential to reduce trade flows
- **Consequences** of **exchange rate volatility** on **trade** have long been at the centre of the debate on the optimality of alternative **exchange rate(see** Côté, A., 1994. *Exchange rate volatility and trade: A survey* (No. 1994-5). Bank of Canada.)

- The **exchange rate volatility** has a significant negative **impact due to exchange rate** uncertainty *(see Chowdhury AR. Does exchange rate volatility depress trade flows? Evidence from error-correction models. The review of economics and statistics. 1993 Nov 1:700-6.)*
- Khan AJ, Azim P, Syed SH(2014) use GARCH based **exchange rate volatilities** measure the **volatility impact** on trade (see *The impact of exchange rate volatility on trade: a panel study on Pakistan's trading partners. The lahore journal of economics. 2014 Jul 1;19(1):31.*

# Aim of the Study & Methodology

- The aim of this study is to assess the impact of exchange rate volatility on BRICS trade flows.
- Following the work of Khan AJ, Azim P, Syed SH(2014) we make use of GARCH Model to test for volatility in the BRICS Currencies
- We make use of a non-linear quintile regression to detect the impact on trade flows
- We incorporate ARDL Model to substantiate Quintile Regression Results and also to capture the long run and short run effects

# DATA SOURCES

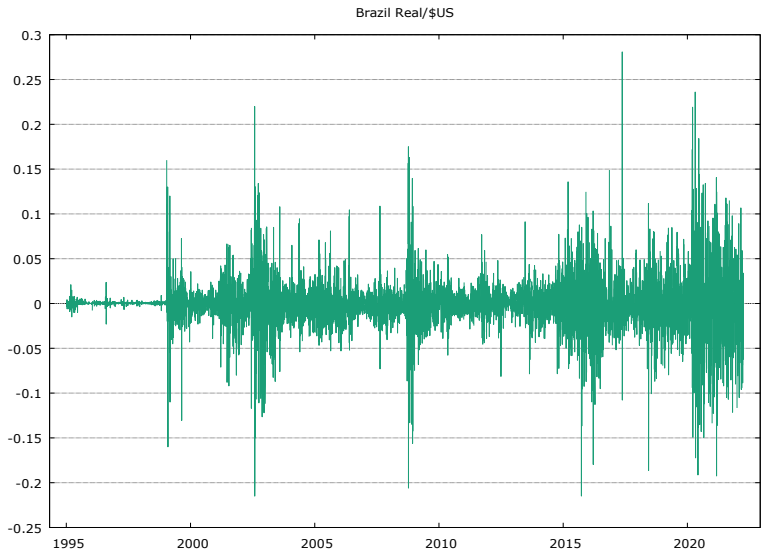
- **Federal Reserve Economic Data daily exchange rates**
- **UNICTAD**
- **WORLD BANK**
- **IMF**

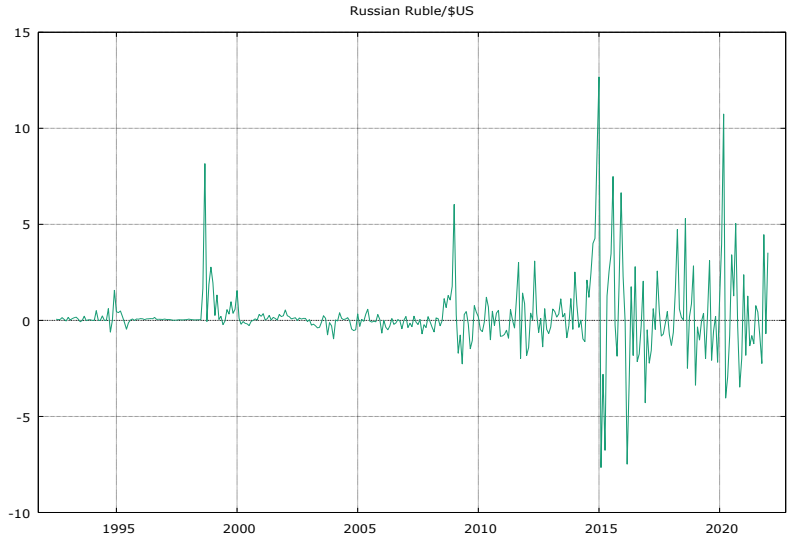
# ECONOMETRIC MODELS USED IN ANALYSIS

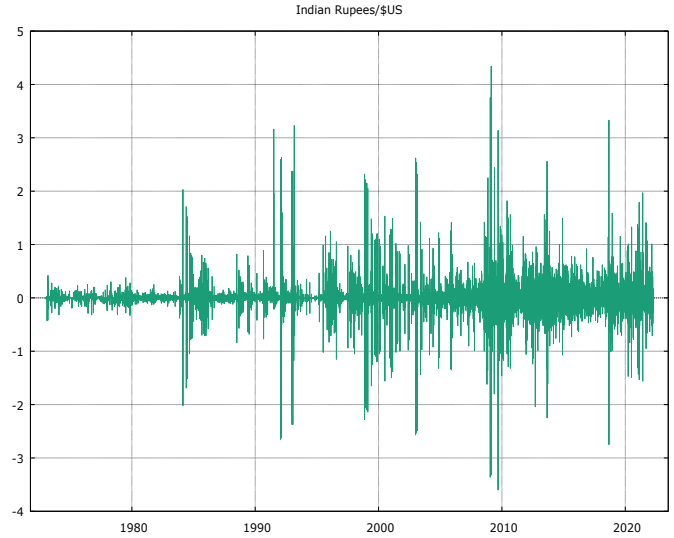
- GARCH is a statistical model that can be used to **analyze a number of different types of financial data**, for instance, macroeconomic data. Financial institutions typically use this model to estimate the volatility of returns for stocks, bonds, and market indices.
- We make use of GARCH (1,1) Model

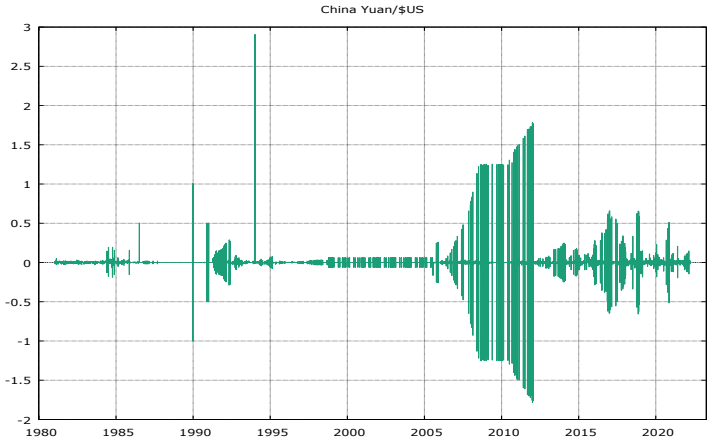
- Quantile regression is **an extension of Standard linear regression, which estimates the conditional median of the outcome variable and can be used when assumptions of linear regression do not meet**.

# Volatile BRICS currencies data series

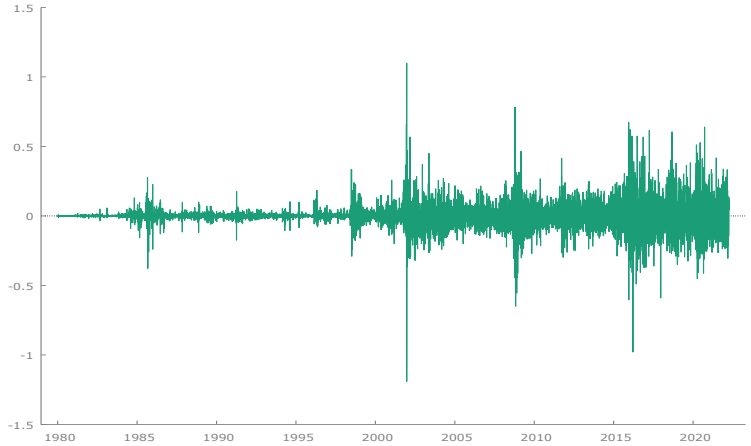



Source: FRED Economic Data, 2022

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# Model 1:BRAZIL : GARCH, using observations 1995-01-03:2022-04-01 (T = 7109)

## Dependent variable: Brazillian Real/$US Daily Rates

## Standard errors based on Hessian

| | Coefficient | Std. Error | z | p-value | |
|---|---|---|---|---|---|
| const | −0.00536246 | 0.00540902 | −0.9914 | 0.3215 | |
| Real/$US_1 | 1.00718 | 0.00212579 | 473.8 | <0.0001 | *** |
| | | | | | |
| C | 0.0308929 | 0.00120931 | 25.55 | <0.0001 | *** |
| Resid(-1)^2 | 0.328960 | 0.0269205 | 12.22 | <0.0001 | *** |
| GARCH(-1) | 0.296056 | 0.0221624 | 13.36 | <0.0001 | *** |

Null hypothesis: no ARCH effect is present

Test statistic: LM = 6192.95 with p-value = P(Chi-square(5) > 6192.95) = 0.0001

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## Model 2:RUSSIA:GARCH(1,1) [Bollerslev] (Normal)*
## Dependent variable: Ruble/$US daily rates
## Reduced Sample: 1992:07 -- 2022:01 (T = 355), VCV method: Hessian

Conditional mean equation

| | coefficient | std. error | z | p-value | |
|---|---|---|---|---|---|
| const | 0.131041 | 0.0310372 | 4.222 | 2.42e-05 | *** |
| exch_rate_1 | 0.996466 | 0.00145706 | 683.9 | 0.0000 | *** |

Conditional variance equation

| | coefficient | std. error | z | p-value | |
|---|---|---|---|---|---|
| C | 0.0249229 | 0.00616399 | 4.043 | 5.27e-05 | *** |
| Resid(-1)^2 | 1.00378 | 0.141258 | 7.106 | 1.19e-012 | *** |
| GARCH(-1) | 0.444317 | 0.0366779 | 12.11 | 8.90e-034 | *** |

Null hypothesis: no ARCH effect is present Test statistic: LM = 330.827 with p-value = P(Chi-square(12) > 330.827) = 1.54401e-63

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**Model 3:INDIA: GARCH, using observations 2000-01-03:2022-04-01**
**(T = 5805) – Reduced Sample**
**Dependent variable: Rupee/$US daily rates**
**Standard errors based on Hessian**

| | Coefficient | Std. Error | z | p-value | |
|---|---|---|---|---|---|
| const | −0.00361559 | 0.0154862 | −0.2335 | 0.8154 | |
| Rupee/$US (-1) | 1.00013 | 0.000285783 | 3500. | <0.0001 | *** |
| | | | | | |
| C | 0.00330862 | 0.000299280 | 11.06 | <0.0001 | *** |
| Resid(-1)^2 | 0.0880998 | 0.00695548 | 12.67 | <0.0001 | *** |
| GARCH(-1) | 0.884822 | 0.00765742 | 115.6 | <0.0001 | *** |

Null hypothesis: no ARCH effect is present
Test statistic: LM = 5776.69 with p-value = 0.0001

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# Model 4: CHINA: GARCH(1,1) [Bollerslev] (Normal)*

## Dependent variable: Yuan/$US

## Sample: 1981-01-05 -- 2022-04-01 (T = 10760), VCV method: Hessian

| | coefficient | std. error | z | p-value | |
|---|---|---|---|---|---|
| const | 0.00305289 | 0.00119207 | 2.561 | 0.0104 | ** |
| exch_1 | 0.999695 | 0.000171319 | 5835 | 0.0000 | *** |

Conditional variance equation

| | coefficient | std. error | z | p-value | |
|---|---|---|---|---|---|
| C | 7.28272e-05 | 2.00477e-06 | 36.33 | 6.06e-289 | *** |
| Resid(-1)^2 | 0.0332466 | 0.00130827 | 25.41 | 1.83e-142 | *** |
| GARCH(-1) | 0.960860 | 0.000835552 | 1150 | 0.0000 | *** |

Null hypothesis: no ARCH effect is present

Test statistic: LM = 10730.8

with p-value = P(Chi-square(5) > 10730.8) = 0.0001

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**Model 5: SOUTH AFRICA: GARCH, using observations 2000-01-03:2022-04-01 (T = 5805): Reduced Sample**

**Dependent variable: Rand/$US**

**Standard errors based on Hessian**

| | Coefficient | Std. Error | z | p-value | |
|---|---|---|---|---|---|
| const | 0.00318815 | 0.00366897 | 0.8690 | 0.3849 | |
| Rand/$US | 0.999786 | 0.00042 4908 | 2353. | <0.0001 | *** |
| C | 4.55399e-05 | 1.12830e-05 | 4.036 | <0.0001 | *** |
| Resid(-1)^2 | 0.0739302 | 0.00583322 | 12.67 | <0.0001 | *** |
| GARCH (-1) | 0.925495 | 0.00555113 | 166.7 | <0.0001 | *** |

Null hypothesis: no ARCH effect is present

Test statistic: LM =5759.06 with p-value = P(Chi-square(5) > 5759.06) = 0.0001

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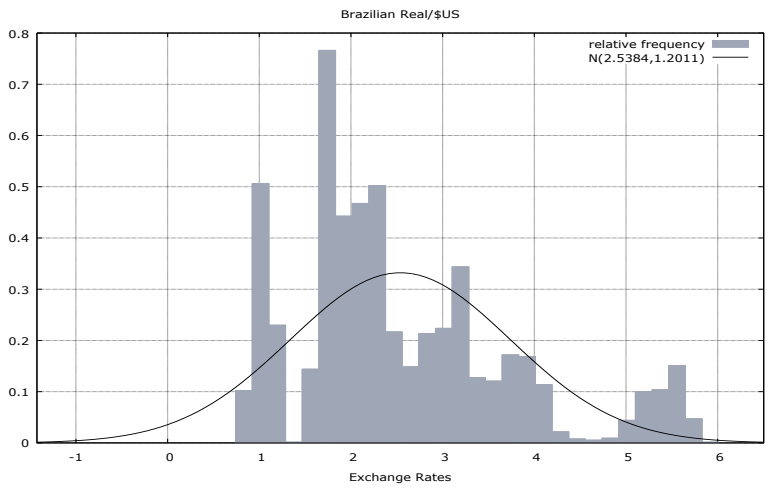


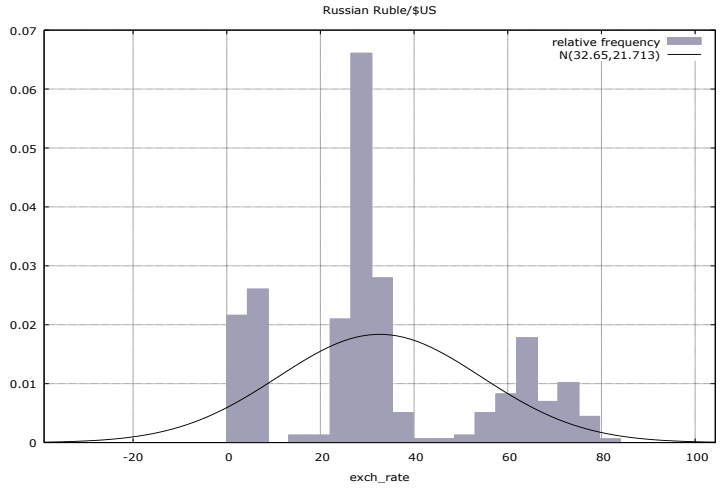


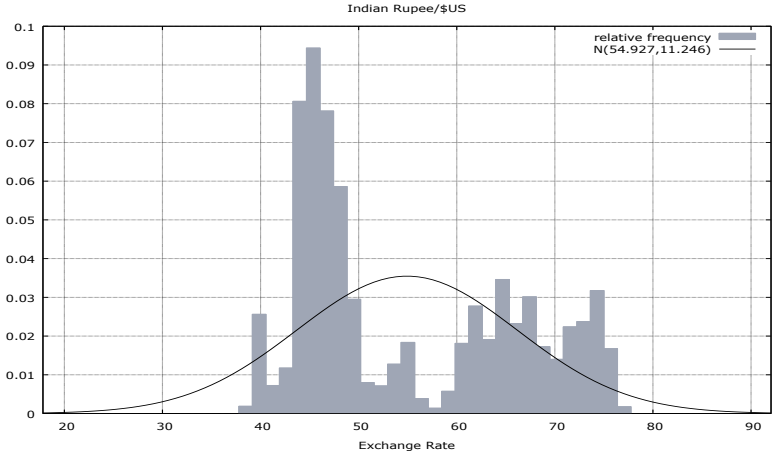


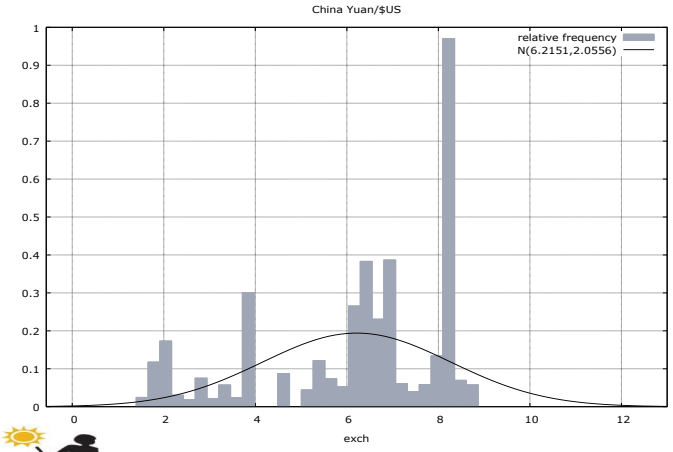


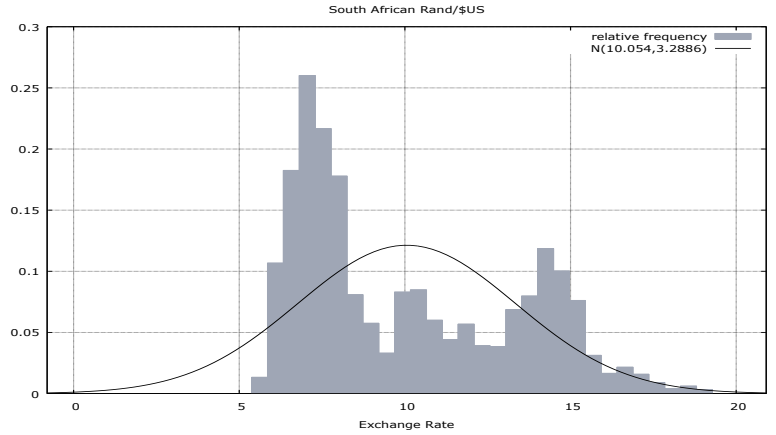


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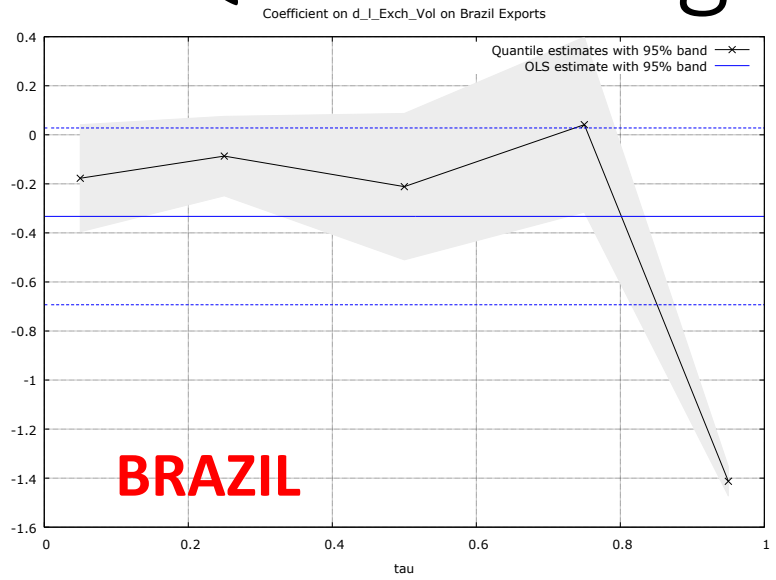
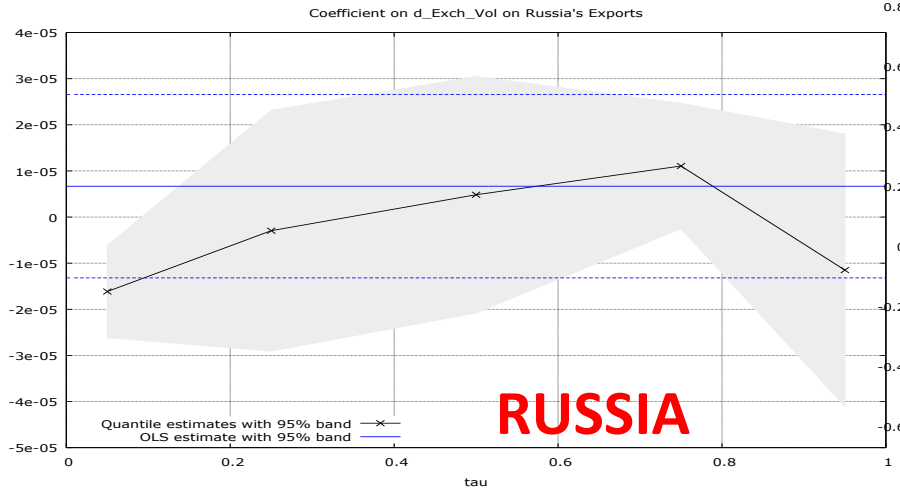
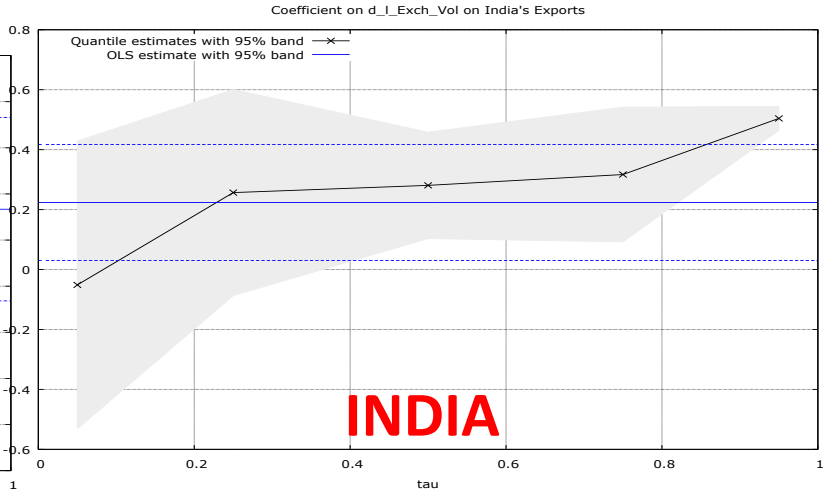
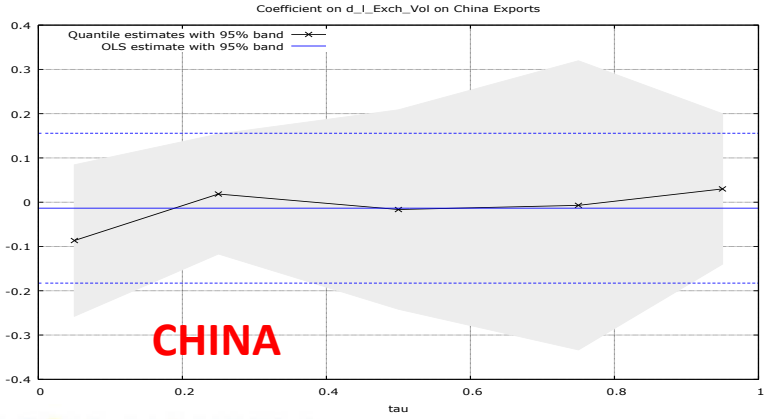
SABTT South African BRICS Think Tank

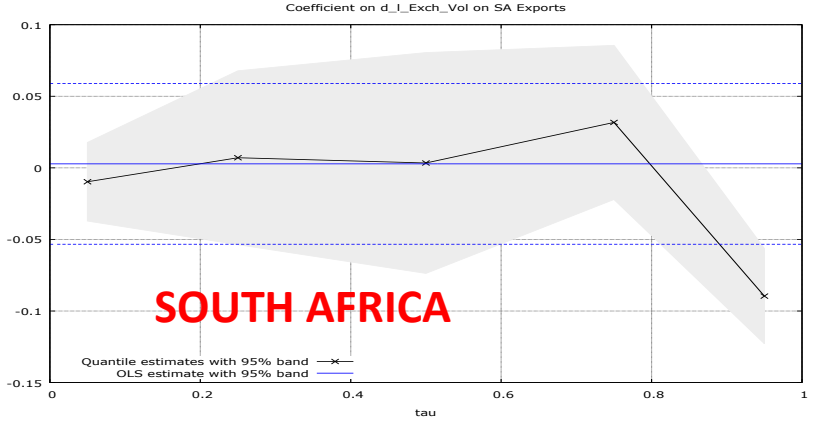
# Exchange Rate Volatility on BRICS Exports – Quintile Regression Results

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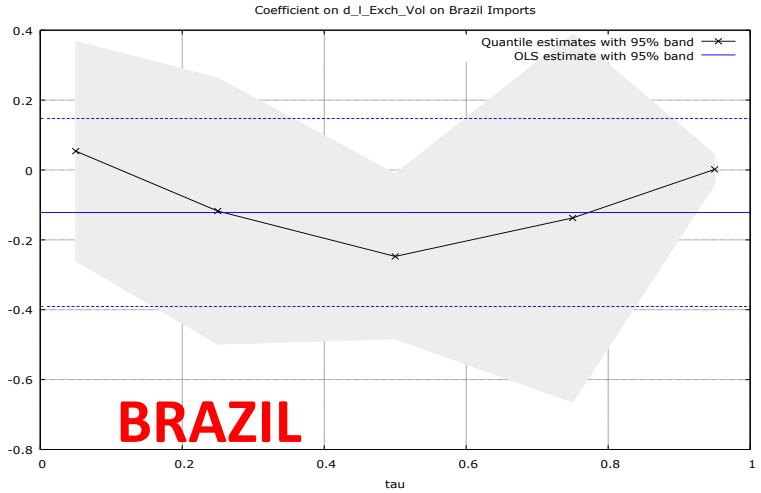
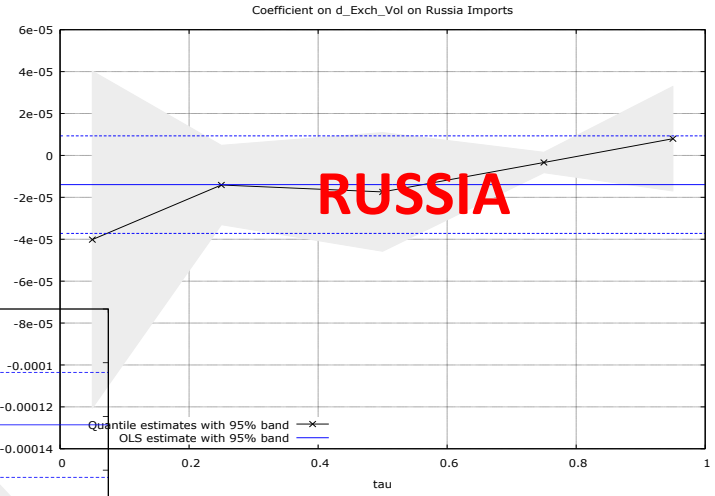
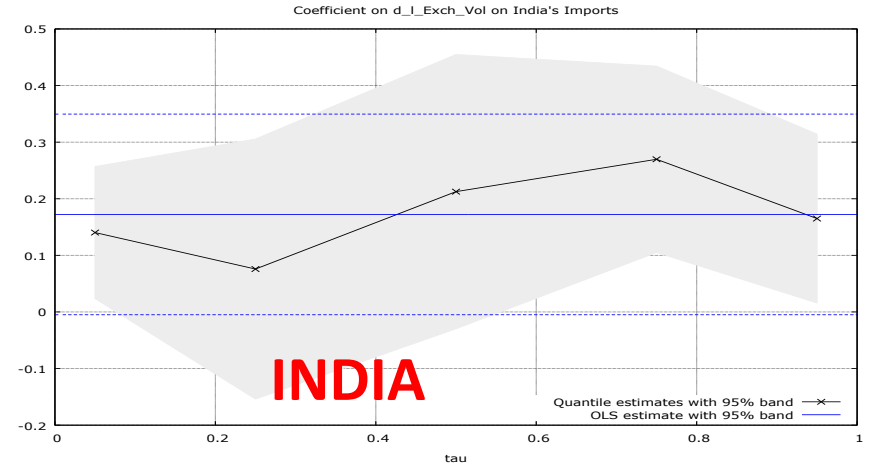
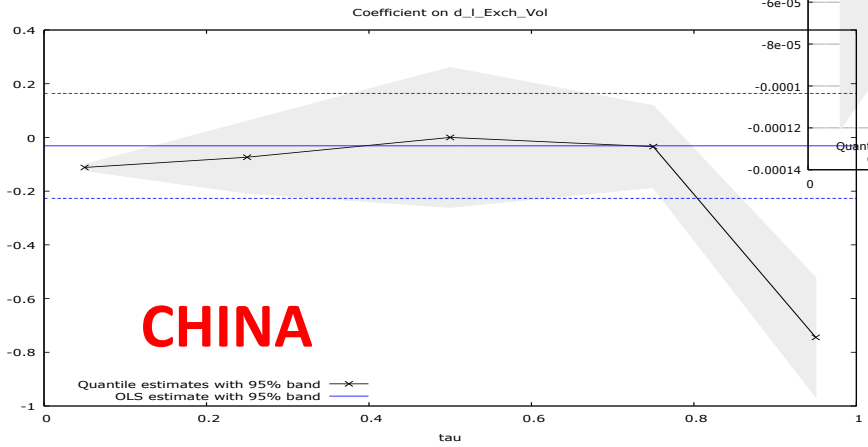
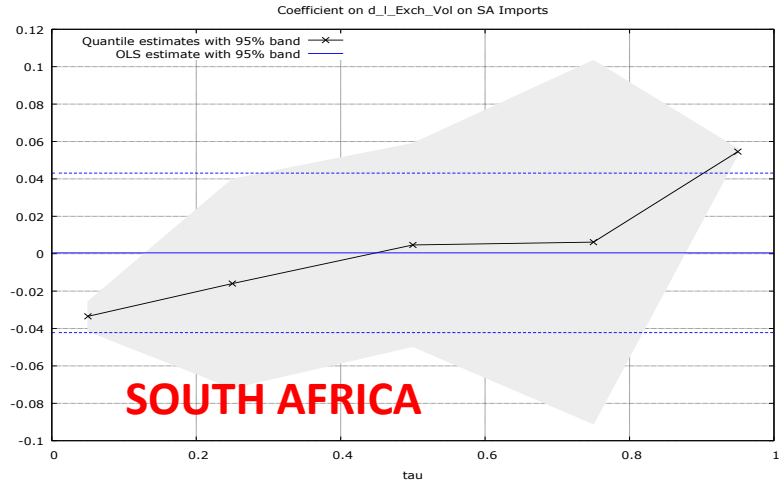
# Exchange Rate Volatility on BRICS Imports – Quintile Regression Results

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# Conclusion

- Despite the best efforts of economists, a basic paradox as to the impact of exchange rate volatility on trade flows remains unresolved at both the theoretical and empirical level (McKenzie & Melbourne, 1999).
- Results are inconclusive due to the heterogeneity of responses to shocks in BRICS economies and this requires further exploration
- Nonetheless, the results suggest that exchange rate volatility has undesirable consequences on trade

# Thank You

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