



Inflation, Money 18032024 0001 Header

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Table VI.1: Fraud Cases – Bank Group-wise			
(Amount in ₹ crore)			
Bank	2019-20	2020-21	2021-22

Group/Institution	Number of Frauds	Amount Involved	Number of Frauds	Amount Involved	Number of Frauds	Amount Involved
1	2	3	4	5	6	7
Public Sector Banks	4,410	1,48,224	2,901	81,901	3,078	40,282
	-50.7	-79.9	-39.4	-59.2	-33.8	-66.7
Private Sector Banks	3,065	34,211	3,710	46,335	5,334	17,588
	-35.2	-18.5	-50.4	-33.5	-58.6	-29.1
Foreign Banks	1,026	972	520	3,280	494	1,206
	-11.8	-0.5	-7.1	-2.4	-5.5	-2
Financial Institutions	15	2,048	24	6,663	10	1,305
	-0.2	-1.1	-0.3	-4.9	-0.1	-2.2
Small Finance Banks	147	11	114	30	155	30
	-1.7	-	-1.6	-	-1.7	-
Payments Banks	38	2	88	2	30	1
	-0.4	-	-1.2	-	-0.3	-
Local Area Banks	2	-	2	-	2	2
	-	-	-	-	-	-
Total	8,703	1,85,468	7,359	1,38,211	9,103	60,414
	-100	-100	-100	-100	-100	-100
-: Nil/negligible.						
Note: 1. Figures in parentheses represent the percentage share of the total.						
2. The above data is in respect of frauds of ₹1 lakh and above reported during the period.						
3. The figures reported by banks & FIs are subject to change based on revisions filed by them.						
4. Frauds reported in a year could have occurred several years prior to the year of reporting.						
5. Amounts involved reported do not reflect the amount of loss incurred. Depending on recoveries, the loss incurred gets reduced. Further, the entire amount involved is not necessarily diverted.						

Source: RBI Supervisory Returns.

The Reserve Bank's approach is to communicate its policy stance and its assessment of the evolving situation by providing rationale as well as supporting information and analysis to all

The screenshot displays a web browser window with the URL `newbank.test.internal.pwc.in/web/rbi/careers/vacancies`. The page features a search bar at the top with the placeholder text "Search For Vacancies". Below the search bar, there are two radio buttons: "Year & Month" (unselected) and "Custom Range" (selected). Under "Year & Month", there are dropdown menus for "Year:" and "Month:". Under "Custom Range", there are input fields for "From Date:" and "To Date:", each with a calendar icon. Below these, there are four dropdown menus for "Employee Type:", "Grade:", "Location:", and "Vacancy Status:". An "APPLY" button is located at the bottom of the form. The browser's taskbar at the bottom shows the Windows logo, a search bar, and various application icons. The system clock in the bottom right corner indicates the time as 2:04 PM on 19/03/2024.

fund industry and exchange traded funds, as a subset of the overall portfolio flows (Ananchotikul and Zhang, 2014).

Among the studies focusing on the BRICS economies, Altunöz (2020) evaluated the dynamics of net portfolio flows in bond and equity and exchange rates for India, Brazil and Russia. The author sourced the portfolio flows data from US TIC System for the period 1997 to 2017. Using non-linear two-state Markov switching specification, the author got mixed results. He found that the net bond flows led to an increase in exchange rate volatility in Russia. However, there was no impact seen in the case of Brazil. Overall, the author found that net equity flows from emerging economies to the US led to an increase in volatility in domestic exchange rates.

While studying the BRICS and other economies, Aydoğan et al. (2020) examined the role of portfolio flows in the exchange rate volatility in Brazil, Russia, India along with Indonesia, Mexico and Turkey. The study found a correlation between the overall portfolio flows and exchange rate volatility. On the other hand, portfolio flows in the bond market, and the correlation was only in the case of Brazil and Mexico. These results indicated that portfolio

flows in bond and equity markets were country specific. Gautam et al. (2020) evaluated the relationship between exchange rates and capital flows in the BRICS countries for the period 1994:Q1 to 2019:Q2. The authors employed the ARDL bound technique and found a positive relationship among the BRICS exchange rates.

Kodongo and Ojah (2012) examined the relationship between net foreign portfolio flows and exchange rates in the major countries of Africa. The authors used monthly portfolio flows data from IIF for 1997:M1 to 2009:M12. Their findings of Granger causality test did not suggest any direction of causality between exchange rates and net portfolio inflows. However, in the case of South Africa, the authors found a bi-directional causality between exchange rate and portfolio flows.

International capital flows are also dependent on the exchange rate regime and openness of the economy. Jiang (2019) provided a comparative analysis of the exchange rate regimes in the BRICS countries and found that Brazil was the only country with a free-floating exchange rate system among BRICS countries. In contrast, the other four countries followed a managed float exchange rate system, though with some differences.

In the case of India, many studies have explored the relationship between foreign capital flows and exchange rate volatility. RBI (2021) analysed the drivers of INR-USD volatility for the period 1996:Q2 to 2019:Q4 using vector auto-regression framework and found the FPI flows to be most volatile among different instruments of capital flows. However, it also found that the INR-USD volatility reduces with an increase in net FPI inflows. By contrast, the other types of capital flows increased the INR-USD volatility.

Kohli (2015) evaluated the role of FPI flows and other macroeconomic variables in determining the INR volatility. Using generalised method of moments, the author observed that financial openness and gross portfolio flows were major external factors impacting rupee volatility. Furthermore, after replacing net portfolio flows with gross flows, the author observed that the flows reduce exchange rate volatility in the short-term. Dua and Sen (2013) examined the relationship between real exchange rate and volatility of capital flows between 1993 and 2010. The authors identified that net capital inflows and their volatility jointly impacted INR-USD exchange rate. Further, the findings suggested that capital inflows appreciated the exchange rate, resulting in a huge trade deficit.

III. Stylised Facts

trade and finance. Regarding the size of these economies, China dominates with a GDP of USD 14.7 trillion followed by India having a USD 2.6 trillion economy. Brazil and Russia have a similar

ARCH and GARCH terms (α_1 and α_2 respectively) in the variance equation are statistically significant (except for South Africa where only the GARCH term is statistically significant), and both coefficients are positive and are close to one (1) indicating presence of ARCH and GARCH effects in the model. The FPI coefficients in all these countries are found to be statistically significant and negative, pointing out that net FPI inflows reduce volatility in the returns. The interpretation of this sign can be ambiguous - rooted on the already mentioned granger causality test. Again, one possible interpretation could be that in the dynamic forex market FPI inflows, central bank interventions can be simultaneous.

We have tested the residual diagnostics for all five countries and found that the residuals and squared residuals are not serially correlated and have no heteroskedasticity in ARCH-LM test. Further, following Meese and Rogoff, (1983) the RMSE values have been compared with a random walk model for all five BRICS country cases. It has been observed that all the RMSE values of the model are lower than its counterpart of random wal). Hence, it is reasonable to conclude that the model offers a good fit.

Moving to the estimation results of equations 5 to 7, we observed that FPI flows – both in bond and equity – have statistically significant coefficients for all the BRICS countries (except Russia for bond flo Further, all the β_3 coefficients signs are negative indicating equity flows are creating appreciation pressure on the domestic currencies. In the variance equation, both ARCH and GARCH terms are statistically significant (except South Africa, where only GARCH term is significant) and close to one, indicating that once volatility is high, it remains high for a long period. Further, the bond and equity coefficients are statistically significant indicating both types of FPI flows have an impact on exchange rate volatility in the returns. The negative coefficients of bond flows for Brazil and South Africa indicate that the FPI flows in bond segment reduce volatility in returns. However, in the case of India the sign is positive, reflecting that the bond flows increase volatility in the exchange rate returns. The equity flows coefficient is positive for Brazil and South Africa, indicating that equity flows increase volatility in the exchange rate returns whereas the coefficients are negative in

the case of Russia, India and China signifying that equity flows reduced volatility in the returns.

Financial asset prices are widely used for predicting exchange rate movements. This paper examines the relationship between the INR/USD exchange rate and select commodity market and stock market variables using a non-parametric causality-in-quantiles approach. The paper finds that changes in crude oil, gold, stock prices and VIX exhibit causality with the exchange rate for all quantiles barring the two extreme ends of the conditional distribution. The causal relationship of the West Texas Intermediate (WTI) oil price, domestic and global stock indices and gold price with the exchange rate of the INR/USD is stronger in mean than in variance, while it is stronger in variance for the Brent crude oil price and net foreign portfolio flows.

JEL classification: C32, F31, G10, Q02

Keywords: Exchange rate, commodity price, stock price, volatility, quantile causality

Introduction

The impact of volatility in domestic and international asset prices on the exchange rate of the Indian Rupee (INR) has increased considerably over time due to greater financial and trade integration. Excessive exchange rate volatility for an extended period may have a negative effect on many economic indicators and pose significant financial stability risks (RBI, 2022). The aim of this paper is to study the causal linkages of domestic and global market indicators with the exchange rate of INR, using the non-parametric causality-in-quantiles technique.

There is a vast literature on the determinants of exchange rate and econometric techniques that could help to predict the exchange rate. The early literature focused on studying the short- and long-run relationships between these variables using Granger causality, cointegration and error correction techniques. Some studies empirically tested the time-varying co-movements and dynamic volatility spillover impact of various macro-economic variables on the exchange rate using various formations of GARCH (Generalised AutoRegressive Conditional Heteroskedasticity) modelling. There are also recent studies providing evidence on the inter-dependencies among these variables and the exchange rate using the wavelet multi-resolution analysis.

The linkages between the macro-economic and financial variables on the one hand, and the exchange rate on the other as captured through the aforementioned approaches are based on the conditional mean distribution of the exchange rate. The results based on conditional mean analysis may be ambiguous, especially when the distribution of a given variable is fat-tailed, as is the case with daily exchange rate returns. Thus, the conditional mean-based method may not delineate the complete causal relationship between two variables.

To address such methodological limitations, the present study uses the conditional quantile method that captures the linkage of one variable with another under various foreign exchange market conditions² i.e., across different quantiles of the exchange rate. The study is based on a long-time series data spanning April 2002 to May 2020, with daily frequency as against monthly, quarterly or annual data typically used in other studies, facilitating a deeper study of the dynamics of the exchange rate changes. The study examines the pairwise causal relationship between exchange rate return and a comprehensive set of macro-economic and financial variables using a non-parametric causality-in-quantiles technique recently developed by Balcilar et al. (2017a).³

This is the first study to the best of our knowledge that examines the causality of exchange rate using a comprehensive set of market indicators and daily data for India. The present study makes useful contributions to the existing literature. First, the non-parametric causality-in-quantiles approach helps in - (i) identifying dependencies for higher order (causality in variance) as there can be weak causality in return (mean) among financial variables but there can be significant causality in variance, due to volatility spillovers; (ii) exploring the dependence structure using a nonparametric procedure, that reduces the probabilities of misspecification errors, (iii) studying non-linear time series having structural breaks, as most of the financial variables (especially with daily frequency) are non-linear. In fact, all variables used in this study are found to be non-linearly related to the exchange rate. Further, it helps to find the presence of causality at each point of the respective conditional distributions during the period of low fluctuations (the lower quantiles), normal fluctuations (median), and high fluctuations (the upper quantiles) of exchange rate return and volatility. This is also important when the dependent variable has fat-tails, as is the case with exchange rate return.

2. Literature Review

Since March 1993, the exchange rate regime of India can be deemed as market-determined with no fixed target (Jalan, 2000). As per the International Monetary Fund's (IMF) classification of exchange rate regimes of member countries as specified in the Annual Report on Exchange Rate Arrangements and Exchange Restrictions (AREAR), India follows a flexible exchange rate regime. The movement of the exchange rate is determined by the demand and supply dynamics of the US dollar (USD) in India, which in turn is influenced by several macroeconomic factors such as the trade balance, current account balance, net capital flows, movements in major global currencies, domestic and global political and economic developments, market expectations of relative interest rates and relative inflation for the INR and USD. The Reserve Bank intervenes intermittently, to maintain orderly market conditions by containing excessive volatility in the exchange rate (BIS, 2013). Pattanaik and Sahoo (2003) investigated the effect of RBI intervention on exchange rate and found that the intervention is effective in achieving the stated objective of policy.

The Indian foreign exchange market has undergone significant changes with improved institutional and market infrastructure, a wide range of instruments and a more liberal regulatory structure. As per the Bank of International Settlements triennial survey of turnover in the foreign exchange market (2019), over-the-counter trades in the Indian rupee constituted 1.7 per cent of the total USD 6.6 trillion global foreign exchange market (BIS, 2019). The turnover of the average daily USD-INR pair increased to USD 110 billion in April 2019 from USD 56 billion in April 2016.

As a result of the calibrated and gradual opening of the capital account and other external sectors of the Indian economy, the forex market has become increasingly integrated with the rest of the world. This is reflected in the increased volume of capital flows and growing trade in the foreign exchange market. Consequent to all these developments, the INR/USD exchange rate has witnessed extended periods of calm followed by intermittent extreme volatility due to sharp fluctuations in capital flows.

As noted earlier, several studies have been undertaken to analyse the interdependencies among the foreign currency market (exchange rate), the commodity market (oil and gold price), the stock market (domestic and global) and capital flows (foreign portfolio investment). As all these markets are closely integrated, fluctuations in any one can have a direct or indirect impact on the others. In this section, we briefly review the empirical studies conducted for examining the relation of the exchange rate with the above-mentioned financial

variables. The relevance of each variable in determining exchange rate movements is mentioned along with the related literature.

2.1 Exchange Rate vs Oil Price

The oil price has been referred to as a non-monetary factor of exchange rate movements in the literature. “For an oil-importing country, rise in the price of oil worsens the balance of payments and eventually leads to currency depreciation, while it generates the current account surplus for oil exporters” (Krugman,1983). In countries having large oil imports, a small increase in the real oil price can result in a rise in the price of tradable goods and may result in the depreciation of the domestic currency.

Chen and Chen (2007) showed the presence of causality from oil price to the exchange rate for G7 countries. Based on Hiemstra and Jones (1994) nonlinear causality test, Bai and Rath (2019) found a unidirectional causality from oil price to exchange rate for two emerging economies, China and India. The results of Tiwari et al. (2013) using the wavelet multi-resolution technique showed no causal relationship between exchange rate and oil price at the lower time scales (high frequencies) but found the presence of causality at higher time scales (lower frequencies) for India. Ghosh (2011) and Mishra and Debasish (2017) investigated the linkages between oil price and exchange rate for India using GARCH and exponential GARCH (EGARCH) models, respectively. Their results showed that an upsurge in oil price results in a weakening of the Indian currency against US dollar. Studies based on linear and non-linear models indicated mixed results for causal relationship between exchange rate and oil price; however, they miss out to explain the linkages of oil price return at various states of exchange rate returns.

Our study attempts to explain the existence of causality-in-mean as well as causality-in-variance from oil price to exchange rate over the entire conditional distribution.

2.2 Exchange Rate vs Gold Price

The significance of gold as an alternate financial asset increases during a period of uncertainty. After the global financial crisis, gold prices shot up considerably due to a surge in its demand all over the world. Various studies on determining the linkages between exchange rate and gold price focus on the role of gold as a hedge or safe haven. Capie and

Wood (2005) found gold as a potential hedge against the USD and observed that US dollar exchange rates (sterling-dollar and yen-dollar exchange rates) are inversely associated with gold prices. Mark (2011), using dynamic conditional correlations for various USD-linked exchange rates, showed that gold is a weak safe haven and a strong hedge against the USD.

Using cointegration and Granger causality tests, Apergis (2014) found the gold price as a strong predictor of the Australian dollar/US dollar exchange rate. Reboredo and Rivera-Castro (2014) showed the existence of a positive relation between gold price and USD depreciation for a varied set of currencies at all time scales using the wavelet multi-resolution analysis. Wang and Lee (2011) investigated the role of gold as a hedge against the yen and their results showed that it depends on the extent of fall in yen. Balcilar et al. (2017b) used causality-in-quantiles technique to test bi-directional causality between exchange rate and gold price for gold-producing countries. The results suggest that gold price return causes exchange rate return as well as exchange rate volatility, while only exchange rate return causes gold price volatility for most of the countries used in the study.

Our study, using the causality-in-quantile, explains the relationship of gold price return with respect to exchange rate return under different market conditions while other studies on exchange rate return specific to India are based on empirical analysis based on the conditional mean.

2.3 Exchange Rate vs Stock Price

Forex and stock markets are among the highly liquid financial markets globally. The interdependency between these two markets has increased over time due to the increase in capital flow and internationalisation of stock markets. Studying linkages between these markets may help to predict interconnectedness and volatility transmission between them. Numerous studies confirm linkages between stock and forex markets in the literature. Chien-Hsiu Lin (2012) found that the co-movements between exchange rates and stock prices are more robust during a crisis period than a normal period in emerging Asian markets. Cristiana and Carmen (2012) also found causality between these two variables in their study for selected developed and emerging financial markets. Malarvizhi and Jaya (2012) examined the co-movement between exchange rate and Indian stock market return and found the presence of bidirectional causality between the two variables. Reboredo et al. (2016) examined the dependence between the exchange rate and the stock price for emerging economies at

extreme points using copula functions. The results of this study indicate the existence of asymmetric downside and upside spillover effects from one market to the other.

Mitra (2017) found evidence of bidirectional volatility spillover and long-term relationship between stock price and the exchange rate using GARCH model. Simona et al. (2019) explored the co-movements between foreign exchange and the stock market by applying a dynamic conditional correlation mixed data sampling (DCC-MIDAS) model. Their results suggested the presence of higher conditional correlations during certain crisis episodes between the two markets. Kalra's (2011) study found that an increase in the global volatility index (VIX) results in the depreciation of east Asia currencies. The methodology based on causality-in-quantile is more general in the sense that it detects the presence or absence of causality from domestic and global stock markets to exchange rate markets under various heterogeneous market conditions of the exchange rate, thus supplementing the literature further, while other studies based on conditional mean are not able to ascertain the same.

2.4 Exchange Rate vs Multiple Financial Variables

Various studies have explored the co-movements and interlinkages among these financial variables using their return and volatility. Samanta and Zadeh (2012) examined interlinkages among gold price, oil price, exchange rate and stock market returns using spillover indices. The findings of the study suggested the existence of a long-run relationship between these markets. Ciner et al. (2013) examined the relationship of stock, bond, gold and oil prices with exchange rate using a dynamic conditional correlation analysis and quantile regression based on the daily data of the US and the UK. Their results indicated that gold acts as a hedge against the exchange rate and bond market for the equity. Further, their results based on quantile regression suggested that gold consistently plays the role of a safe haven when the exchange rates fall significantly.

Jain and Biswal (2016) for their study on India based on DCC-GARCH method inspected the relationship between the global price of gold, crude oil, exchange rate, and the stock market. Their results suggested a fall in gold price or crude oil price causes a weakening of the exchange rate and the stock price index. Atul et al. (2015) found the existence of one-way causality from gold prices to both stock prices and exchange rate using daily data for India. Mollick and Sakaki (2019) examined the relationship of select major currencies with respect to the USD, international oil price and world equity returns using a vector autoregression

(VAR) method. Their study proposed that commodity currencies appreciate subsequent to positive oil price shocks and safe-haven currencies weaken with positive global equity shocks.

Against the backdrop of the literature discussed above, the present study investigates the predictability of exchange rate return and volatility using select financial variables. There can be diverse interlinkages between the financial variables and exchange rate under different degrees of exchange rate movements. The causality-in-quantile helps to measure the causality for each point of the conditional distribution of exchange rate return and volatility. The study is important to fill the gap in the existing literature by finding the financial indicators causing exchange rate movements specific to India and providing useful insights to portfolio managers.

3. Data and Methodology

3.1 Data

Daily data from April 2, 2002 to May 29, 2020 (excluding weekends and holidays), constituting 4,395 observations are used for analysis. High frequency data capture more dynamics of the financial time series data which are typically quite volatile. The study period covers various phases of exchange rate fluctuations including the global financial crisis of 2008-09. However, the selected period for some variables varies as per data availability. These variables are: India VIX (expected stock market volatility index calculated using the NIFTY Index option prices), VIX (expected stock market volatility index calculated using S&P 500 index option prices) and MSCI emerging markets index [Morgan Stanley Capital International index, an indicator to assess equity market performance in emerging markets]. Exchange rate (INR/USD), closing prices of stock indices of BSE, NSE, US S&P 500 index, UK FTSE 250 index and net portfolio investment flows (in rupees million) are sourced from the CEIC database. The gold price (per ounce) is taken from the World Gold Council and is denominated in USD.⁴

The oil prices data used are the spot prices taken from the Energy Information Administration (EIA), US Department of Energy. Both WTI and Brent crude oil prices (Europe price at FOB) are in USD per barrel.⁵ Data for VIX, India VIX and MSCI emerging market index are taken from NSE and other relevant sources.⁶

We have calculated the returns of the variables by taking the first difference of their natural logarithm and then multiplying by 100. Net foreign portfolio investment data are adjusted for negative values before taking log difference as per the standard practice, i.e., by adding a constant positive number which makes the minimum number (negative) in the whole series to a small positive number. For all variables except VIX and India VIX return, the data are in natural logarithm form.

The descriptive statistics of the. The average of daily returns of all the variables is positive (negative for MSCI emerging market return), small as compared to standard deviation and close to zero showing the absence of any type of trend in the data.

It is evident that the stock price return in India is higher as compared to the global stock price return in the US, the UK, and emerging markets. The volatility of these variables as represented by standard deviation shows that the exchange rate has lower variability as compared to return on stock and commodities prices. Oil price returns and stock indices returns, as mentioned in the literature, are some of the most volatile variables among all commodity prices. The skewness statistics of exchange rate return and net portfolio flows are positive and skewed to the right (more positive return than negative return), while it is negatively skewed for all other return variables.

The kurtosis value for each variable is significantly higher than normal distribution indicating that the series is highly peaked and thus leptokurtic. This implies that returns have larger, thicker tails than the normal distribution which reveals the occurrence of extreme returns more frequently. The Jarque–Bera test statistics show that not all the variables are normally distributed.

All the variables are tested for stationarity at the level and if they are not stationary when the first difference (log difference) is taken. All the variables except net FPI, VIX and India-VIX are found to be $I(1)$. Net FPI, VIX and India-VIX are $I(0)$. Since VIX and India-VIX are volatility indices, the analysis is done by taking the log transformation of these two series. As we are examining the pair-wise causality between two financial time series, we have used the return of net FPI even though it is stationary at the level. that all the commodity prices, stock prices and exchange rates have shown an upward trend in general. During the periods 2003-2008 and 2009-2011, the exchange rate recorded appreciation (downward movement) as a result of huge capital inflows in India. However, the exchange rate recorded a sharp

depreciation during the periods of global uncertainties - the global financial crisis (2007-2009); post-announcement effects of quantitative easing programmes by the US Federal Reserve from May 23, 2013 to September 4, 2013 (Fed taper tantrum); and the recent COVID-19 pandemic (February 27, 2020 to May 29, 2020).

ws that most of the series exhibit strong clustering behaviour and sharp movements during the heightened global uncertainties. We have used both international oil prices, Brent crude and WTI oil price in our study as Brent is the benchmark price in India while WTI is the international oil price. The stock indices of the US and the UK are taken as both the countries have significant cross-border transactions in terms of trade and foreign investments with India. Both BSE and NSE indices are used due to their varied compositions.

We check for the existence of nonlinearity in the relationship between exchange rate return with the selected variables in the study by applying the BDS test developed by Brock, Dechert and Scheinkman (1996).⁷ The test is exercised on each residual of VAR(1) model of exchange rate return with selected variables and on the residuals obtained from the AR(1) model of exchange rate return the results of the BDS test which indicate rejection of the null hypothesis at various embedding dimensions (m). This proves statistically that there is a non-linear relationship between the exchange rate return and each selected variable. The results of linear Granger causality indicate all However, any inference based on linear Granger causality results may lead to mis-specification errors as there exist non-linear relationships among the variables.

We conduct the Bai and Perron (2003) test and find multiple structural breaks (the VAR(1) model of exchange rate return with selected variables and the residuals obtained from AR(1) model of exchange rate return). The Bai and Perron test is based on a dynamic programming algorithm which optimises the exhaustive computational procedure for testing multiple breakpoints of global minimiser of squared residuals (SSR). This approach can allow for autocorrelation and heteroskedasticity in the time series. In the test, we employ quadratic spectral kernel-based HAC (heteroskedasticity-autocorrelation-consistent (HAC) correction) covariance estimation using pre-whitened residuals.

The results detect two structural breaks in NSE and S&P 500 returns on September 11, 2008 and April 3, 2014, respectively. There is no break observed in the VAR(1) model of exchange rate return incorporating BSE return, Net FPI, India VIX and VIX. There are three structural

breaks in the VAR(1) model with WTI and two breaks with Brent crude oil price. Most of the break dates are during the global financial crisis and the ensuing quantitative easing programmes by the Federal Reserve. The presence of non-linearity and structural breaks in the selected variables support the use of a nonparametric causality-in-quantile approach, as this test is robust to such mis-specifications.

3.2 Methodology

We use the methodology developed by Balcilar et al. (2017a) for uncovering nonlinear causality through a hybrid approach using the methodology of Nishiyama et al. (2011) and Jeong et al. (2012). We represent the dependent variable exchange rate returns as y_t and the independent variables (selected variables) as x_t .

by the powers vested with it for regulation and supervision of the Indian financial system and its constituents, the money, debt and foreign exchange segments of the financial markets and the country's payment and settlement system support. These are augmented by the critical functions relating to maintenance of foreign exchange reserves and the role as the lender of last resort. The Reserve Bank pursues its core function of issuance of bank notes and currency management as well as its agency functions such as management of public debt, banker to Government (Centre and States) and banker to the banking system, including regulation of bank reserves. As a full-service central bank, it also propels the development and consolidation of the country's financial system and supports inclusive growth.

The Reserve Bank's approach is to communicate its policy stance and its assessment of the evolving situation by providing rationale as well as supporting information and analysis to all

Communication is a key element in functioning of modern central banks, who are placing greater emphasis on transparency and accountability. The increasing preference for a collegial method of monetary policy decision making and thrust on financial stability have laid more emphasis on structured policies/strategies for communication in the realm of central banking.

The Reserve Bank's communication policy follows the guiding principles of relevance, transparency, clarity, comprehensiveness and timeliness: it strives to continuously improve public understanding of developments in the multiple domains under its ambit.

The framework of central banking policy in India has evolved around its objectives specified under the Reserve Bank of India Act, 1934, viz. “to regulate the issue of Bank notes and keeping of reserves with a view to securing monetary stability in India and generally to operate the currency and credit system of the country to its advantage; and to operate a modern monetary policy framework to meet the challenge of an increasingly complex economy, where the primary objective is to maintain price stability while keeping in mind the objective of growth.”

Consistent with the above, the Reserve Bank’s macroeconomic and monetary policy has focussed on maintaining price stability, ensuring adequate flow of credit to sustain the growth momentum, and securing financial stability. The financial stability objective are enabled by the powers vested with it for regulation and supervision of the Indian financial system and its constituents, the money, debt and foreign exchange segments of the financial markets and the country’s payment and settlement system support. These are augmented by the critical functions relating to maintenance of foreign exchange reserves and the role as the lender of last resort. The Reserve Bank pursues its core function of issuance of bank notes and currency management as well as its agency functions such as management of public debt, banker to Government (Centre and States) and banker to the banking system, including regulation of bank reserves. As a full-service central bank, it also propels the development and consolidation of the country’s financial system and supports inclusive growth.

The Reserve Bank’s approach is to communicate its policy stance and its assessment of the evolving situation by providing rationale as well as supporting information and analysis to all stakeholders.

In its medium-term Vision Statement for 2019-22, termed as ‘Utkarsh 2022’, the Reserve Bank has set out for itself the following mutually reinforcing objectives:

Transparent communication, clear interpretation and accurate articulation of the multifarious objectives of the Reserve Bank are the goals of its communication policy. The composite mandate necessitates open, clear and structured communication for its effective functioning as well as for supporting the expanding boundaries of its policy instruments.

The communication policy of the Reserve Bank has the following principal goals:

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- Providing clarity on its role and responsibilities;
- Building confidence in its policy measures;
- Improving transparency and accountability;
- Anchoring expectations of all economic agents to enhance the efficacy of monetary policy and to minimise undue speculation;
- Increasing awareness about financial stability;
- Dissemination of information with minimum time lag;
- Ensuring timeliness and credibility through effective communication; and
- Deepening engagement with the multi-lingual and multi-cultural society.

Attention of banks/financial institutions (FIs) is drawn to the Reserve Bank advisory wherein banks/FIs, inter-alia, were (i) encouraged to cease, and also encourage their customers to cease, entering into new financial contracts that reference London Interbank Offered Rate (LIBOR) as a benchmark and instead use any widely accepted Alternative Reference Rate (ARR), as soon as practicable and in any case by December 31, 2021 and (ii) urged to incorporate robust fallback clauses in all financial contracts that reference LIBOR and the maturity of which was after the announced cessation date of the LIBOR settings.

2. With the concerted efforts of banks/FIs as well as industry associations like the Indian Banks' Association, a smooth transition with respect to LIBOR settings that have ceased to be published/become non-representative after December 31, 2021 has been achieved. The transition away from LIBOR was also facilitated by the continuing publication of US\$ LIBOR settings in five tenors which provided a longer transition period particularly for the insertion of the fallback clauses in legacy financial contracts that reference LIBOR. New transactions are now predominantly undertaken using ARRs such as the Secured Overnight Financing Rate (SOFR) and the Modified Mumbai Interbank Forward Outright Rate (MMIFOR). At the same time, there have been instances of a few US\$ LIBOR linked financial contracts undertaken/facilitated by banks/FIs after January 1, 2022. Also, while banks have reported that substantial progress has been made towards insertion of fallback clauses, the process is yet to be completed for all contracts where such fallbacks are required to be inserted.

3. After June 30, 2023, the publication of the remaining five US\$ LIBOR settings will cease permanently. While certain synthetic LIBOR settings will continue to be published after June 30, 2023, the Financial Conduct Authority (FCA), UK, which regulates the LIBOR, has made it clear that these settings are not meant to be used in new financial contracts. The MIFOR, a domestic interest rate benchmark reliant on US\$ LIBOR, will also cease to be published by Financial Benchmarks India Pvt. Ltd. (FBIL) after June 30, 2023.

4. Banks/FIs are advised to ensure that no new transaction undertaken by them or their customers rely on or are priced using the US\$ LIBOR or the MIFOR. Banks/FIs are also advised to take all necessary steps to ensure insertion of fallbacks in all remaining legacy financial contracts that reference US\$ LIBOR (including transactions that reference MIFOR). Fallbacks in such contracts should be inserted at the earliest so as to ensure that transition of any remaining US\$ LIBOR-linked contracts is completed well before the deadline of end June 2023 and any disruptions due to a last-minute rush to insert fallbacks is avoided. Banks/FIs are advised not to rely on the availability of synthetic LIBOR rates as a substitute for fallbacks in legacy contracts.

5. Banks/FIs are expected to have developed the systems and processes to manage the complete transition away from LIBOR from July 1, 2023. Continued efforts in sensitising customers on the steps to be taken to manage the associated risks will enable a smooth completion of the final leg of the transition.

6. The Reserve Bank will continue to monitor the efforts of banks/FIs for ensuring a smooth transition from LIBOR.

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Indian financial system and its constituents, the money, debt and foreign exchange segments of the financial markets and the country's payment and settlement system support. These are augmented by the critical functions relating to maintenance of foreign exchange reserves and the role as the lender of last resort. The Reserve Bank pursues its core function of issuance of bank notes and currency management as well as its agency functions such as management of public debt, banker to Government (Centre and States) and banker to the banking system, including regulation of bank reserves. As a full-service central bank, it also propels the development and consolidation of the country's financial system and supports inclusive growth

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This site provides bank-wise information on liabilities and assets and earnings and expenses of scheduled commercial banks (including Regional Rural Banks) for the period 1989-90 to 2000-01. The information contained in the site is based on the published annual accounts of banks. Besides detailed annual accounts data, a number of ratios have also been included. The site incorporates intelligent search/selection features that allow extraction of data in a manner useful for the analysis.

The work of preparation of this site was organised in the Division of Banking Studies, Department of Statistical Analysis and Computer Services of the Bank. Considerable time and effort have been spent in collating, compiling and ensuring extensive coverage and accuracy of the data. The officers and staff deserve deep appreciation.

It is hoped that this publication will be useful to all academic researchers, policy makers and bankers.

No. 15: Deployment of Gross Bank Credit by Major Sectors					
(₹ Billion)					
Item	as on			Growth (%)	
	Mar. 20, 2015	2014	2015	Financial year so far	Y-o- Y

		Nov. 28	Oct. 30	Nov. 27	2015-16	2015
	1	2	3	4	5	6
1 Gross Bank Credit	61,023	58,419	63,022	63,466	4.0	8.6
1.1 Food Credit	994	1,064	924	1,069	7.6	0.5
1.2 Non-food Credit	60,030	57,354	62,097	62,397	3.9	8.8
1.2.1 Agriculture & Allied Activities	7,659	7,391	8,232	8,260	7.9	11.8
1.2.2 Industry	26,576	25,419	26,506	26,687	0.4	5.0
1.2.2.1 Micro & Small	3,800	3,576	3,702	3,722	-2.1	4.1
1.2.2.2 Medium	1,265	1,222	1,127	1,148	-9.3	-6.0
1.2.2.3 Large	21,511	20,621	21,677	21,817	1.4	5.8
1.2.3 Services	14,131	13,484	14,503	14,403	1.9	6.8
1.2.3.1 Transport Operators	916	914	962	963	5.2	5.4
1.2.3.2 Computer Software	172	177	192	197	14.4	11.6
1.2.3.3 Tourism, Hotels & Restaurants	370	367	375	378	2.1	3.1
1.2.3.4 Shipping	101	99	103	105	4.1	6.0
1.2.3.5 Professional Services	844	816	930	945	11.9	15.8
1.2.3.6 Trade	3,657	3,311	3,586	3,605	-1.4	8.9
1.2.3.6.1 Wholesale Trade	1,801	1,580	1,623	1,641	-8.9	3.9
1.2.3.6.2 Retail Trade	1,856	1,731	1,964	1,964	5.8	13.5
1.2.3.7 Commercial Real Estate	1,665	1,635	1,708	1,708	2.6	4.5
1.2.3.8 Non-Banking Financial Companies (NBFCs)	3,117	3,050	3,183	3,124	0.2	2.4
1.2.3.9 Other Services	3,289	3,159	3,465	3,377	2.7	6.9
1.2.4 Personal Loans	11,663	11,059	12,857	13,046	11.9	18.0
1.2.4.1 Consumer Durables	153	147	163	165	8.1	12.9
1.2.4.2 Housing	6,285	5,946	6,959	7,052	12.2	18.6
1.2.4.3 Advances against Fixed Deposits	625	553	608	605	-3.3	9.3
1.2.4.4 Advances to Individuals against share & bonds	54	39	58	69	26.7	78.3

1.2.4.5 Credit Card Outstanding	305	295	360	376	23.6	27.7
1.2.4.6 Education	633	627	674	677	6.9	7.9
1.2.4.7 Vehicle Loans	1,246	1,194	1,360	1,379	10.7	15.5
1.2.4.8 Other Personal Loans	2,362	2,258	2,674	2,723	15.3	20.6
1.2A Priority Sector	20,103	19,204	21,225	21,183	5.4	10.3
1.2A.1 Agriculture & Allied Activities	7,659	7,391	8,232	8,260	7.9	11.8
1.2A.2 Micro & Small Enterprises	8,003	7,470	8,200	8,105	1.3	8.5
1.2A.2.1 Manufacturing	3,800	3,576	3,702	3,722	-2.1	4.1
1.2A.2.2 Services	4,203	3,895	4,499	4,383	4.3	12.5
1.2A.3 Housing	3,224	3,159	3,343	3,352	4.0	6.1
1.2A.4 Micro-Credit	177	169	190	192	8.6	13.6
1.2A.5 Education Loans	592	591	605	607	2.6	2.8
1.2A.6 State-Sponsored Orgs. for SC/ST	3	4	5	5	47.0	45.5
1.2A.7 Weaker Sections	4,049	3,899	4,470	4,533	12.0	16.3
1.2A.8 Export Credit	426	416	310	314	-26.3	-24.4
Note: Data are provisional and relate to select banks which cover 95 per cent of total non-food credit extended by all scheduled commercial banks (excludes ING Vysya which has been merged with Kotak Mahindra since April 2015).						
Export credit under priority sector relates to foreign banks only.						
Micro & small under item 2.1 includes credit to micro & small industries in manufacturing sector.						
Micro & small enterprises under item 5.2 includes credit to micro & small enterprises in manufacturing as well as services sector.						
Priority Sector is as per old definition and does not conform to FIDD Circular FIDD.CO.Plan.BC.54/04.09.01/2014-15 dated April 23, 2015.						

exchange rate.

ARCH and GARCH terms (α_1 and α_2 respectively) in the variance equation are statistically significant (except for South Africa where only the GARCH term is statistically significant),

and both coefficients are positive and are close to one (1) indicating presence of ARCH and GARCH effects in the model. The FPI coefficients

Introduction

As a result of the calibrated and gradual opening of the capital account and other external sectors of the Indian economy, the forex market has become increasingly integrated with the rest of the world. This is reflected in the increased volume of capital flows and growing trade in the foreign exchange market. Consequent to all these developments, the INR/USD exchange rate has witnessed extended periods of calm followed by intermittent extreme volatility due to sharp fluctuations in capital flows.

As noted earlier, several studies have been undertaken to analyse the interdependencies among the foreign currency market (exchange rate), the commodity market (oil and gold price), the stock market (domestic and global) and capital flows (foreign portfolio investment). As all these markets are closely integrated, fluctuations in any one can have a direct or indirect impact on the others. In this section, we briefly review the empirical studies conducted for examining the relation of the exchange rate with the above-mentioned financial variables. The relevance of each variable in determining exchange rate movements is mentioned along with the related literature.

2.1 Exchange Rate vs Oil Price

The oil price has been referred to as a non-monetary factor of exchange rate movements in the literature. “For an oil-importing country, rise in the price of oil worsens the balance of payments and eventually leads to currency depreciation, while it generates the current account surplus for oil exporters” (Krugman, 1983). In countries having large oil imports, a small increase in the real oil price can result in a rise in the price of tradable goods and may result in the depreciation of the domestic currency.

Chen and Chen (2007) showed the presence of causality from oil price to the exchange rate for G7 countries. Based on Hiemstra and Jones (1994) nonlinear causality test, Bai and Rath (2019) found a unidirectional causality from oil price to exchange rate for two emerging economies, China and India. The results of Tiwari et al. (2013) using the wavelet multi-resolution technique showed no causal relationship between exchange rate and oil price at the

lower time scales (high frequencies) but found the presence of causality at higher time scales (lower frequencies) for India. Ghosh (2011) and Mishra and Debasish (2017) investigated the linkages between oil price and exchange rate for India using GARCH and exponential GARCH (EGARCH) models, respectively. Their results showed that an upsurge in oil price results in a weakening of the Indian currency against US dollar. Studies based on linear and non-linear models indicated mixed results for causal relationship between exchange rate and oil price; however, they miss out to explain the linkages of oil price return at various states of exchange rate returns.

Our study attempts to explain the existence of causality-in-mean as well as causality-in-variance from oil price to exchange rate over the entire conditional distribution.

2.2 Exchange Rate vs Gold Price

The significance of gold as an alternate financial asset increases during a period of uncertainty. After the global financial crisis, gold prices shot up considerably due to a surge in its demand all over the world. Various studies on determining the linkages between exchange rate and gold price focus on the role of gold as a hedge or safe haven. Capie and Wood (2005) found gold as a potential hedge against the USD and observed that US dollar exchange rates (sterling-dollar and

structured communication for its effective functioning as well as for supporting the expanding boundaries of its policy instruments.

S.No.	Return Name	Return Description	Frequency	Department Concerned		
1	PD's call money transactions with commercial banks (Return from PDs)	Compilation of New Monetary Aggregates	Fortnightly	DEPR		
2	Returns from SIDBI	Details of Mobilisation of Resources/ Certificate of deposit/ term deposit/ inter corp. deposit etc	Weekly	DEPR		

3	Form TC	Compilation of short term credit extended for imports and payments thereof	Monthly	DEPR		
4	Yen holdings of Government of India	International investment position	Monthly	DEPR		
5	WLA Customer complaints	Details of Complaints received, resolved, pending and type of complaints	Quarterly	DPSS		
6	ATM deployment	State and region wise number of ATMs deployed by banks and WLAOs	Quarterly	DPSS		
7	Cards Statistics	Usage of Credit & debit cards at ATM & POS	Monthly	DPSS		
8	WLA Statistics	WLA Statistics	Monthly	DPSS		
9	Prepaid Payment Instrument (PPI) Statistics	Pre-paid Payment Instrument Statistics	Monthly	DPSS		
10	PPI customer grievances	Details of complaints received/ resolved/ pending against PPI issuers	Quarterly	DPSS		
11	Mobile Banking Transactions	Volume and Value of Payment Transactions done through Mobile Banking Application	Monthly	DPSS		
12	Basic Statistical Return - 1 (BSR1)	Bank credit classified according to various characteristics	Quarterly for non-RRBs / Annual for RRBs	DSIM		
13	Basic Statistical Return - 2 (BSR2)	Classification of deposits with SCBs and employment details of SCBs	Quarterly for non-RRBs / Annual for RRBs	DSIM		

14	IBS return	International assets and liabilities of banks in India	Quarterly	DSIM		
15	NRD-CSR	Non-resident deposits comprehensive single return on NR/FCNR deposits and their transactions in a month	Monthly	DSIM		
16	Form ECB	To obtain Loan Registration Number (LRN) for ECB	Before draw down of ECB	DSIM		
17	ECB 2 Return	To report actual ECB transactions	Monthly	DSIM		
18	Revised Form ECB	To report changes in ECB parameters in consonance with the ECB norms	Within 7 days from the changes effected in ECB parameters	DSIM		
19	FETERS (R-return)	Foreign exchange transactions of banks in India	Fortnightly	DSIM		
20	BAL statement	Foreign currency balances of Authorized Dealers and rupee balances of non-resident banks	Fortnightly	DSIM		
21	FLA - Return	Annual return on Foreign Liabilities and Assets (FLA) - under FEMA. Market value of FDI / ODI by equity / debt including FATS.	Annual	DSIM		
22	CPIS - Survey Schedule	Co-ordinated Portfolio Investment Survey - overseas portfolio	Half yearly: end-Mar and end-Sep	DSIM		

		investment (Equity and Debt)				
23	FLA MF - Survey Schedule	Foreign Liabilities and Assets (FLA) of Mutual Fund companies - Market value by equity / debt	Annual	DSIM		
24	ITES - Survey Schedule	Survey on Computer Software & Information Technology Enabled Services (ITES) Exports	Annual	DSIM		
25	ITBS - Survey Schedule	Survey on International Trade in Banking Services (ITBS) collects information on various banking services rendered by Indian Banks operating abroad and foreign banks operating in India	Annual	DSIM		

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Inflation, Money