



# The Rupee Odyssey

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**Abstract.** In this paper, the most significant contribution has been a change in the focus of research on exchange rate volatility from a traditional emphasis on events in India to a more comparative approach that examines the experiences of many countries simultaneously. The focus is on using Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) to understand the behavior of British Pound, United States Dollar, Euro and Japanese Yen versus Indian Rupee.

**Keywords.** Volatility; exchange rate; Heteroskedastacity; GARCH; ARMA.

## 1. Introduction

India's monetary policy makers are faced with the task of restoring confidence in the economy and markets which have been shaken by rising oil prices and the falling rupee. The Indian Rupee is back in the news following a sharp depreciation in its value versus the US Dollar during 2019 after a prolonged period of relative stability. It has weakened by a little over 4% since mid July 2019 and nudged the 72 mark to a US Dollar on 23 August 2019 before retracing its steps.

On 3 September 2019, while equities saw their worst single day fall since October 2018, the Indian Rupee registered its biggest single day fall in over a month to close at its lowest level since November 2018 as weak domestic, coupled with concerns over the US China trade tensions, made investors jittery. The rupee which opened weaker at 71.97 a US Dollar as compared to previous close of 71.41, touched the day's low of 72.4 before closing at 72.39 a US Dollar. This is the lowest closing level for the rupee since 13 November 2018. The currency hit an all time low of 74.38 on 9 October 2018.

In the mid 1980s Japanese export industries had grown so strong that the trade surplus with the USA had become a serious problem [1, 2]. The Plaza Accord in 1985 was intended to help even out the imbalance and involved a gradual appreciation of the Japanese Yen from 239 to 135 per US Dollar in 1987. Indian central bankers should emulate the Japanese policy makers and try to strengthen the Indian Rupee against the US Dollar.

## 2. Methodology

Bollerslev (1986) proposed a novel paradigm that allows the conditional variance to be an ARMA process [3–9]. Now let the error process be such that,

$\epsilon_t = v_t \sqrt{h_t}$  where  $\sigma_v^2 = 1$ , and

$$h_t = \alpha_0 + \sum_{i=1}^q \alpha_i \epsilon_{t-i}^2 + \sum_{j=1}^p \beta_j h_{t-j}$$

## 3. Implications

Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) is the methodology originally proposed by Bollerslev, which is an improvised version of Auto Regressive Conditional Heteroskedasticity (ARCH). The results have been obtained using R programming language.

The results in figures 1 and 2 show Auto Correlation Function (ACF) versus Lag.

The impact of Brexit news is shown in the news impact curve in figures 3 and 4.

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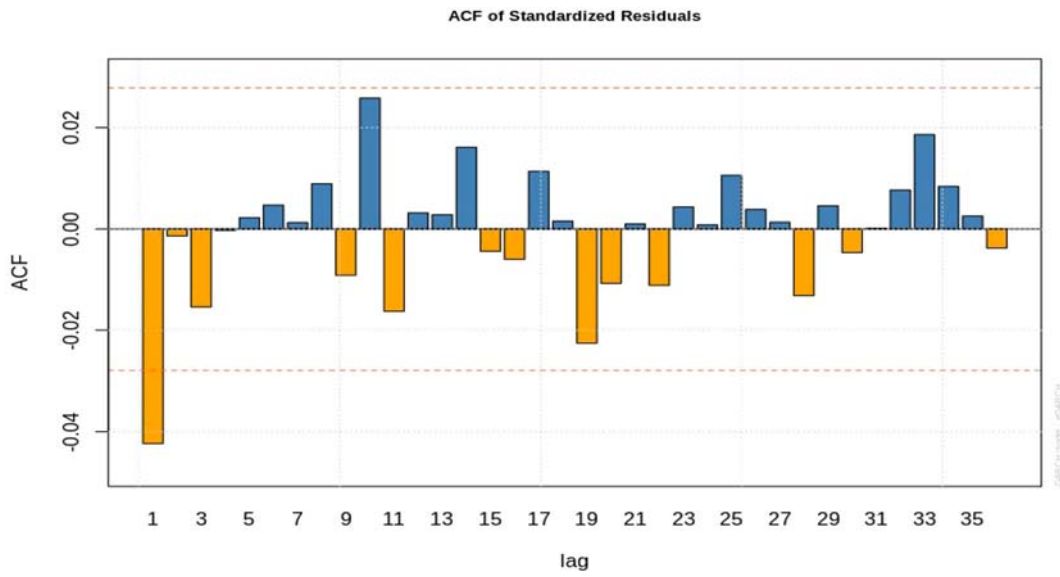


Figure 1. ACF of Standardized Residuals vs Lag.

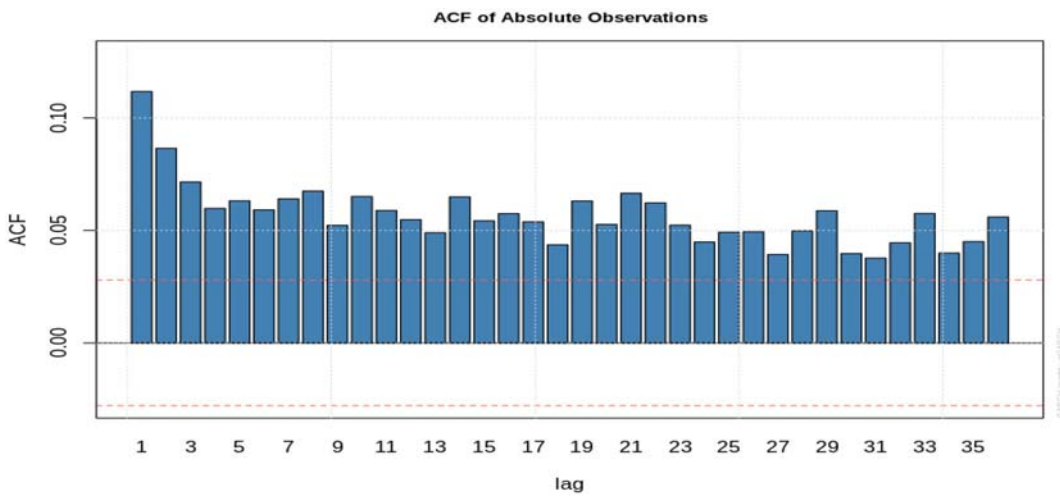


Figure 2. ACF of Absolute Observations vs Lag.

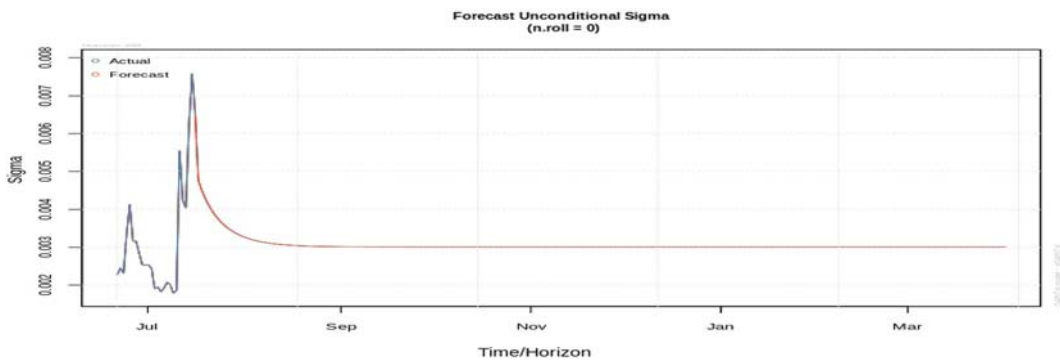


Figure 3. Sigma vs Time/Horizon.

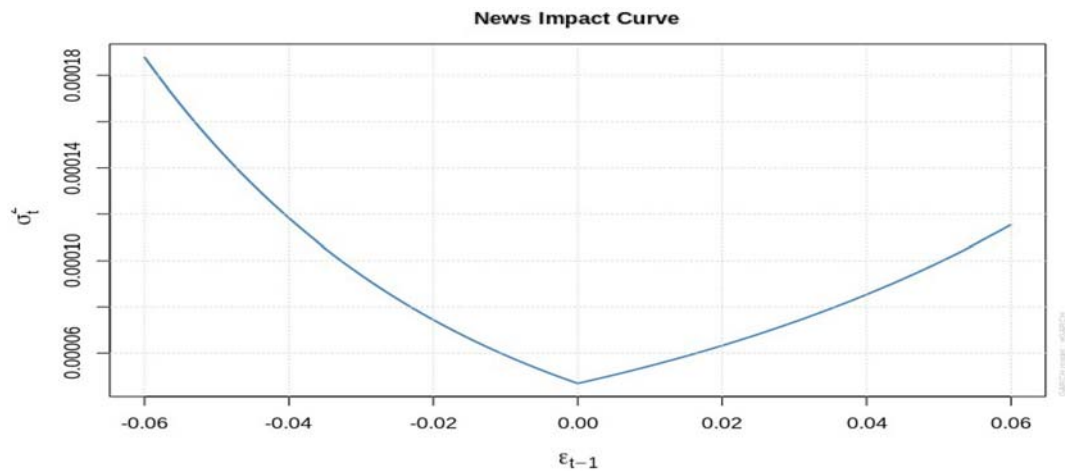


Figure 4. News Impact Curve

#### 4. Conclusion and future work

The present work can be extended by incorporating foreign trade data from Export Import Bank of India (EXIM Bank). Presently, India has trade ties with African nations and the trade flow is improving with Japan. Japanese manufacturing products like automobiles, electronics have a large influence on the Indian market. Research can be carried out on the above mentioned sectors.

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