Inter-relationship among Crude Oil, Exchange Rate, and FII

1. Introduction

This study examines the dynamic relationship between **Crude Oil Prices (Oil)**, **USD/INR Exchange Rate (ER)**, and **Foreign Institutional Investments (FII)** in India. The objective is to determine the direction of causality and the extent to which shocks in global oil prices and currency fluctuations impact foreign capital flows.

2. Data & Methodology

- **Variables:** Natural Log of Crude Oil (`Ln_Oil`), Natural Log of Exchange Rate (`Ln_ER`), and Level of FII (`FII`).
- **Period:** Monthly data from September 2011 to 2025.
- **Econometric Framework:** Vector Error Correction Model (VECM) was employed after testing for stationarity and cointegration.

3. Empirical Results

3.1. Descriptive Statistics & Normality

The descriptive analysis shows that Crude Oil prices exhibit significant volatility.

- **Normality (Jarque-Bera Test):**
  - `Ln_Oil` ($p = 0.004$): Non-normal distribution.
  - `Ln_ER` ($p = 0.078$) and `FII` ($p = 0.299$): Follow a normal distribution.

3.2. Unit Root Analysis (Stationarity)

The Augmented Dickey-Fuller (ADF) test was conducted to determine the order of integration.

- **Ln_Oil & Ln_ER:** Found to be non-stationary at **Level** ($p>0.05$) but stationary at **First Difference** ($p<0.01$). They are **I(1)** variables.
- **FII:** Found to be stationary at **Level** ($p<0.001$).
- *Inference:* The mix of I(1) and I(0) variables suggests a dynamic relationship where non-stationary macro variables (Oil, Currency) may drive stationary capital flows (FII).

3.3. Cointegration Test (Johansen's Approach)

To test for a long-run equilibrium relationship, the Johansen Trace Test was applied using an optimal lag length of **8** (selected via Akaike Information Criterion).

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Result
None (r=0)	**34.30**	29.80	**Rejects Null**
At most 1 (r≤1)	6.49	15.49	Accepts Null

- **Result:** The Trace statistic (34.30) exceeds the critical value (29.80).
- **Inference:** There exists **1 Cointegrating Vector**. This confirms a stable **long-run relationship** between Oil, Exchange Rate, and FIIs, meaning they move together over time despite short-term deviations.

3.4. Granger Causality (Block Exogeneity Wald Test)

This test determines the direction of causality between the variables.

Dependent Variable	Chi-Sq P-Value	Inference
FII	**0.046**	**Significant Causality Detected**
Ln_ER	0.196	No Causality
Ln_Oil	0.732	No Causality

- **Inference:** Causality is **unidirectional**.
    - **Oil Prices & Exchange Rates → Cause → FII Inflows.**
    - Changes in global oil prices and currency value significantly predict future FII movements. However, FII inflows do not significantly influence Oil prices or the Exchange rate in return.

3.5. Variance Decomposition (FEVD)

Variance Decomposition helps quantify how much a variable is influenced by shocks to others over a 10-month horizon.

- **Ln_Oil:** 93.3% of its variation is explained by its own past shocks (Highly Exogenous).
- **Ln_ER:** 93.8% is explained by its own shocks (Highly Exogenous).
- **FII:** Only **74.6%** is explained by its own history.
    - **10.7%** of FII variation is explained by **Oil Price shocks**.

- **14.7%** of FII variation is explained by **Exchange Rate shocks**.

4. Conclusion

The results suggest that **Foreign Institutional Investment (FII) in India is highly sensitive to macroeconomic shocks.**

1. **Oil & Currency are Dominant:** Global crude oil prices and the USD/INR exchange rate act as external drivers that significantly impact foreign investment decisions.
2. **Predictability:** Since Oil and ER "Granger Cause" FII, investors and policymakers can monitor oil price trends and currency volatility as leading indicators for potential foreign capital flight or surges.
3. **Vulnerability:** FII is the most "endogenous" variable in the system, meaning it is a reactor to the broader macroeconomic environment rather than a driver of it.

Remarks: Due to limited availability of Data, we were unable to perform the tests on other factors and indices, but we are working on data gatheration and we will soon run the tests on other factors and for a longer period of time to support robustness. After the test is done, we will move forward on the weight allocation part.