This paper examines the causality relation between stock returns and foreign portfolio (FPI) flows in the Indian context during the COVID-19 pandemic. Using daily data and the Toda and Yamamoto Granger causality test, the study finds that unidirectional causality runs from FPI flows to stock returns during the pandemic.

I. Introduction

The global capital flows play an important role in driving financial markets of emerging market economies (EMEs). The financial integration and consequent cross-border capital flows have accentuated the relation between global capital flows and stock returns in EMEs (Henry, 2000). Further, Rey (2015) states that asset prices in EMEs are more sensitive to global market conditions than domestic policy changes. The recent COVID-19 pandemic outbreak increased the overall global risk, and thus EMEs experienced the sharpest reversal of portfolio flows on record, valued at over $100 billion within a month (IMF, 2020). This adversely affected the stock market performance of these economies. In the Indian context, it is found that FPI flows are driven by the higher stock returns in the country (Gupta & Gordon, 2003; Rai & Bhanumurthy, 2004), and a unidirectional causality runs from stock returns to FPI flows (Mukherjee et al., 2002). On the other hand, the findings from Babu & Prabheesh (2008) suggest a bidirectional causality. The existing literature on the impact of COVID-19 is evolving. The literature has found that the pandemic adversely impacts economic growth and trade (Vidya & Prabheesh, 2020) and stock markets (Ertul Gur et al., 2020; Haroon & Rizvi, 2020; He et al., 2020; Huang & Zheng, 2020; Iyke, 2020; Phan & Narayan, 2020; Prabheesh, Garg, et al., 2020; and Prabheesh, Padhan, et al., 2020). However, no specific study examines the FPI and stock market returns relationship during the COVID-19 pandemic. Thus, the present study aims.

Figure 1: Trends in stock market returns and foreign portfolio investment for India

This figure shows the trends in stock market returns proxied by the log returns on the S&P CNX Nifty, the index of the National Stock Exchange of India, and the net foreign portfolio inflows to equity markets in India.

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to fill this research gap.

The rest of the article is organized as follows. Section II deals with the data and methodology. Section III reports the empirical results. Section IV concludes.

II. Data and Methodology

We use daily data for the S&P CNX Nifty, which is the index of the National Stock Exchange, comprised of 50 stocks from 24 sectors of the Indian economy. We also obtain daily data on aggregate net foreign portfolio inflows. All data are for the period January 2, 2019 to September 30, 2020 and are obtained from the China Economic Information Center. The FPI flows are measured in Indian rupees (crore). Daily stock returns are calculated as $r_t = \ln(P_t) - \ln(P_{t-1}) \times 100$, where $r_t$ and $P_t$ denote daily return and price, respectively.

The dynamics of the FPI and stock market returns are analysed using the Modified Wald (M WALD) Granger causality test proposed by Toda & Yamamoto (1995). The inference of the null hypothesis follows a $\chi^2$ distribution and uses $m$ degrees of freedom, instead of $m + d_{\text{max}}$. The following system equations is estimated to analyse the causality between FPI and stock market returns.

\[
ret_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i ret_{t-i} + \sum_{i=1}^{d_{\text{max}}} \alpha_{i+1} fpi_{t-i+1} + \varepsilon_t
\]

\[
fpi_t = \mu_0 + \sum_{i=1}^{m} \mu_i fpi_{t-i} + \sum_{i=1}^{d_{\text{max}}} \mu_{i+1} ret_{t-i+1} + \varepsilon_t
\]

where $\varepsilon_t$ is the serially uncorrelated random error term; $m$ is the optimal lag length; and $d_{\text{max}}$ is the maximum order of integration. The statistical significance of $\beta_{pi}$ indicates that causality runs from FPI to stock market returns, whereas the statistical significance of $\beta_{rt}$ denotes causality running from stock market returns to FPI.

III. Empirical findings

Table 1 contains the Narayan & Popp (2010) unit root test results. The findings are: $ret$, is stationary at levels in all sample periods. On the other hand, $fpi$, is stationary only in levels in the full sample and non-stationary in the pre-COVID-19 and COVID-19 periods. The implication is that the integration order of variables is mixed for COVID-19 and pre-COVID-19 sample periods. Hence, in the subsequent analysis the maximum order of integration is treated as 1 ($d_{\text{max}} = 1$). After identifying the maximum order of integration, the appropriate lag length should be chosen. As per the Akaike information criterion and Schwarz information criterion, the lag length of 5 is chosen. At this lag length the VAR is autocorrelation free and is stable. Table 2 contains associated results. It can be observed that the null hypothesis that FPI does not Granger cause stock market returns and vice versa cannot be rejected during the pre-COVID-19 period, implying no causal relation between the two variables. During the COVID period, however, the null hypothesis that FPI does not cause stock market returns is rejected, indicating that FPI improves predictability of stock market returns. This indicates that the FPI withdrawal during the COVID-19 outbreak led to a significant decline of the Indian stock market.

In the case of the full sample period, the same finding is also observed.

Table 1: Unit Root Test Results

| Variables | M1: Two Breaks in Intercept | M2: Two Breaks in Intercept and Trend |
|-----------|-----------------------------|---------------------------------------|
|           | Pre-COVID-19 Sample (02/01/2019-31/12/2019) | COVID-19 Sample (01/01/2020-30/09/2020) | Full Sample (02/01/2019-30/09/2020) |
| Stock Returns | FPI | Stock Returns | FPI | Stock Returns | FPI |
| Lag | t-stat | TB1 | TB2 | Lag | t-stat | TB1 | TB2 |
| 3 | -0.558 (5.219)* | 03.10.2019 | 07.10.2019 | 1 | -0.470 (4.244)* | 07.05.2019 | 07.10.2019 |
| 4 | -0.166 (3.836) | 04.03.2020 | 07.07.2020 | 1 | -0.208 (3.228) | 04.03.2020 | 07.07.2020 |
| 3 | -0.503 (7.118)* | 03.10.2019 | 07.10.2019 | 3 | -0.555 (6.706)* | 10.07.2019 | 24.03.2020 |
| 1 | -0.230 (5.145)* | 01.07.2019 | 26.08.2019 | 1 | -0.250 (5.379)* | 01.07.2019 | 26.08.2019 |

Critical Values for the NP test

| Model | 1% | 5% | 10% |
|-------|----|----|-----|
| Model M1 (Break in the intercept only) | -4.731 | -4.136 | -3.825 |
| Model M2 (Break in both the intercept and trend) | -5.318 | -4.741 | -4.430 |

The table shows results from the unit root test of the variables based on the Narayan-Popp (NP) procedure. The acronyms, M1 and M2, denote the two models used for the NP test: Model 1 allows for the two endogenous breaks in the intercept and Model 2 allows for two endogenous breaks in each of the intercept and the trend. The critical values are taken from Narayan & Popp (2010, p. 1429), and *, ** and *** represent the 1%, 5%, and 10% significance levels, respectively.
Table 2: Granger Causality Test Results

| Causality Pattern                  | t-Statistics | Probability |
|-----------------------------------|--------------|-------------|
| **Pre-COVID-19 Sample (02/01/2019-31/12/2019)** |              |             |
| FPI Net to Stock Returns          | 5.051        | 0.168       |
| Stock Returns to FPI Net          | 5.356        | 0.147       |
| **COVID-19 Sample (01/01/2020-30/09/2020)** |              |             |
| FPI Net to Stock Returns          | 8.874        | 0.031**     |
| Stock Returns to FPI Net          | 1.500        | 0.682       |
| **Full Sample (02/01/2019-30/09/2020)** |              |             |
| FPI Net to Stock Returns          | 10.990       | 0.026**     |
| Stock Returns to FPI Net          | 4.884        | 0.299       |

The table shows the Granger causality test results obtained from the Modified Wald (MWALD) test proposed by Toda & Yamamoto (1995). The test results are based on \( m = 5 \) and \( d_{max} = 0 \). The null hypothesis is that there is no causal relationship and the alternative hypothesis is that there is a causal relationship. Finally, ** denotes rejection of the null hypothesis at the 5% significance level.

IV. Conclusions

This paper examines the causal relationship between FPI flows and stock market returns for India during the COVID-19 period. The empirical findings suggest a unidirectional causality running from FPI to stock market returns during the COVID-19 period. During the pre-COVID-19 period, no causality relationship is observed. Our findings suggest that the Indian stock market movement is highly exposed to the volatile nature of the FPI during financial instability, suggesting that policy should focus on improving the soundness of the financial sector.

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REFERENCES

Babu, S. M., & Prabheesh, K. P. (2008). Causal relationships between foreign institutional investments and stock returns in India. *International Journal of Trade and Global Markets*, 1(3), 259–265. https://doi.org/10.1504/IJTGM.2008.02043

Bekaert, G., & Harvey, C. R. (2000). Foreign speculators and emerging equity markets. *The Journal of Finance*, 55(2), 565–613. https://doi.org/10.1111/0022-1082.00220

Errunza, V., & Losq, E. (1985). International asset pricing under mild segmentation: Theory and test. *The Journal of Finance*, 40(1), 105–124. https://doi.org/10.1111/j.1540-6261.1985.tb04939.x

Ertuğrul, H. M., Güngör, B. O., & Soytaş, U. (2020). The Effect of the COVID-19 Outbreak on the Turkish Diesel Consumption Volatility Dynamics. *Energy Research Letters*, 1(3). https://doi.org/10.46557/001c.17496

Gupta, M. P., & Gordon, M. J. P. (2003). Portfolio flows into India: Do domestic fundamentals matter? *International Monetary Fund, No. 3-20.*

Haroon, O., & Rizvi, S. A. R. (2020). Flatten the Curve and Stock Market Liquidity - An Inquiry into Emerging Economies. *Emerging Markets Finance and Trade*, 56(10), 2151–2161. https://doi.org/10.1080/1540496x.2020.1784716

He, P., Sun, Y., Zhang, Y., & Li, T. (2020). COVID-19’s Impact on Stock Prices Across Different Sectors - An Event Study Based on the Chinese Stock Market. *Emerging Markets Finance and Trade*, 56(10), 2198–2212. https://doi.org/10.1080/1540496x.2020.1785865

Henry, P. B. (2000). Stock market liberalization, economic reform, and emerging market equity prices. *The Journal of Finance*, 55(2), 529–564. https://doi.org/10.1111/0022-1082.00219

Huang, W., & Zheng, Y. (2020). COVID-19: Structural changes in the relationship between investor sentiment and crude oil futures price. *Energy Research Letters*. https://doi.org/10.46557/001c.13685

IMF. (2020). COVID-19 Crisis Poses Threat to Financial Stability. *IMF Blog.*

Iyke, B. N. (2020). COVID-19: The reaction of US oil and gas producers to the pandemic. *Energy Research Letters*, 1(2). https://doi.org/10.46557/001c.13912

Jeon, J. Q., & Moffett, C. M. (2010). Herding by foreign investors and emerging market equity returns: Evidence from Korea. *International Review of Economics & Finance*, 19(4), 698–710. https://doi.org/10.1016/j.iref.2010.03.001

Kim, W., & Wei, S.-J. (2002). Foreign portfolio investors before and during a crisis. *Journal of International Economics*, 59(1), 77–96. https://doi.org/10.1016/s0022-1996(01)00109-x

Mukherjee, P., Bose, S., & Coondoo, D. (2002). Foreign institutional investment in the Indian equity market: An analysis of daily flows during January 1999 – May 2002. *Money & Finance*, 2, 9–10. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=430700

Narayan, P. K., & Popp, S. (2010). A new unit root test with two structural breaks in level and slope at unknown time. *Journal of Applied Statistics*, 37(9), 1425–1438. https://doi.org/10.1080/0266476090303883

Phan, D. H. B., & Narayan, P. K. (2020). Country responses and the reaction of the stock market to COVID-19: A preliminary exposition. *Emerging Markets Finance and Trade*, 56(10), 2138–2150. https://doi.org/10.1080/1540496x.2020.1784719

Prabheesh, K. P., Garg, B., & Padhan, R. (2020). Time-varying dependence between stock markets and oil prices during COVID-19: The case of net oil-exporting countries. *Economics Bulletin*, 40(3), 2408–2418. http://www.acessecon.com/Pubs/EB/2020/Volume40/EB-20-V40-I3-P210.pdf

Prabheesh, K. P., Padhan, R., & Garg, B. (2020). COVID-19 and the oil price–stock market nexus: Evidence from net oil-importing countries. *Energy Research Letters*, 1(2), 15745. https://doi.org/10.46557/001c.15745

Rai, K., & Bhanumurthy, N. R. (2004). Determinants of foreign institutional investment in India: The role of return, risk, and inflation. *The Developing Economies*, 42(4), 479–493. https://doi.org/10.1111/j.1746-1049.2004.tb00246.x

Rey, H. (2015). *Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence* (NBER Working Paper Series 21162). Cambridge, Mass.: National Bureau of Economic Research.
Singh, A., & Weisse, B. A. (1998). Emerging stock markets, portfolio capital flows and long-term economic growth: Micro and macroeconomic perspectives. *World Development, 26*(4), 607–622. [https://doi.org/10.1016/s0305-750x(98)00003-5](https://doi.org/10.1016/s0305-750x(98)00003-5)

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics, 66*, 225–250. [https://doi.org/10.1016/0304-4076(94)01616-8](https://doi.org/10.1016/0304-4076(94)01616-8)

Vidy, C. T., & Prabheesh, K. P. (2020). Implications of COVID-19 Pandemic on the Global Trade Networks. *Emerging Markets Finance and Trade, 56*(10), 2408–2421. [https://doi.org/10.1080/1540496X.2020.1785426](https://doi.org/10.1080/1540496X.2020.1785426)