Theoretical Insights into Exogenous Factors Driving Stock Market Volatility in India

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Abstract: *This theoretical review examined how exogenous factors drive stock market volatility in India. Volatility models, and external drivers such as exchange rate, oil, global risk, and policy uncertainty focused on studies with identifiable models and factor measurement; screening and coding captured market, sample, factor class, model family, asymmetry, regime tests, and identification around events. Evidence showed that inflation surprises, rupee depreciation, oil shocks, and global uncertainty indices raise conditional variance through information, liquidity, and risk premium channels, with stronger effects in stress regimes. Asymmetric models and regime switching better captured transmission than symmetric baselines, while multivariate and connectedness frameworks revealed cross market spillovers between equities, currency, and commodities. The review identified gaps including fragmented factor coverage, limited testing of asymmetry and regimes, weak integration of policy uncertainty with microstructure, and narrow treatment of spillovers. We propose a unified conceptual map that links factor classes to channels and model choices, and outline testable propositions for future work, including inclusion of liquidity and derivatives activity, use of innovations in uncertainty indices, and broader cross market systems that also include rates in India.*

Keywords: Indian equity market, Stock market volatility, Exogenous factors, Policy uncertainty, Currency and oil shock.

1. Introduction

Financial markets are characterized by time-varying and clustered volatility, challenging the assumption of constant variance. The introduction of autoregressive conditional heteroscedasticity (ARCH) by Engle (1982) and its extension to generalized ARCH (GARCH) by Bollerslev (1986) provided a formal framework to explain volatility persistence and shock propagation. These models form the theoretical foundation for linking exogenous factors to stock market volatility.

Although GARCH models capture endogenous volatility persistence, incorporating exogenous variables such as macroeconomic and global indicators provides a richer explanation of volatility dynamics (Wang et al., 2019). Methodological reviews (Choudhry & Jayasekera, 2014) suggest that augmented GARCH models with external regressors outperform simple models, offering insights into why volatility regimes shift.

Exogenous influences include domestic macroeconomic variables (inflation, interest rates, and exchange rates), global indicators such as the VIX, commodity price shocks (particularly crude oil), and policy interventions. For India, studies have shown that exchange rate fluctuations, oil price shocks, and global market disturbances are critical in explaining volatility behavior (Goyal & Arora, 2012; Kumar, 2020; Venugopal et al. 2024).

The rise of the Economic Policy Uncertainty (EPU) index framework (Baker et al., 2016; Venugopal, 2024) has enabled researchers to quantify the role of uncertainty in driving volatility. Indian studies confirm that policy uncertainty significantly influences stock market behavior, often amplifying volatility in turbulent periods (Bansal & Kumari, 2021; Gupta et al., 2019).

Events such as the COVID-19 pandemic highlight how exogenous shocks induce regime shifts in volatility. Empirical evidence from Indian stock markets shows sharp increases in volatility across pre-, during-, and post-pandemic phases (Harjoto et al., 2021; Sahoo & Sethi, 2021; Satyanarayana & Venugopal, 2019). These findings underscore the sensitivity of Indian markets to global and domestic shocks.

India's increasing financial integration and dependency on global flows have created multiple channels for exogenous shocks to affect domestic markets. Evidence shows that commodity price spillovers and currency fluctuations significantly shape equity volatility in India (Dhal et al., 2019; Mohanty & Sahoo, 2020; Sivakumar et al., 2019).

Existing studies tend to examine individual exogenous factors in isolationmacroeconomic variables, global risks, or commoditieswithout providing a unified framework. There remains a lack of synthesis that conceptually integrates these classes into a broader understanding of volatility transmission in India (Kumar, 2020; Gupta et al., 2019).

Although evidence suggests that negative shocks and uncertainty spikes have disproportionate effects on volatility, many Indian studies rely on symmetric GARCH models. Few works explicitly test nonlinearities or regime-switching mechanisms (Bansal & Kumari, 2021).

While EPU indices are increasingly adopted, their relationship with market microstructure factors such as liquidity, institutional ownership, and derivatives remains underexplored in India (Harjoto et al., 2021; Sivakumar et al., 2019). This creates a gap in linking information shocks to volatility persistence.

Most studies use narrow proxies (such as the VIX) to capture spillovers. Comprehensive analyses covering equities, commodities, currencies, and bonds in an integrated setting are limited, despite evidence that cross-market linkages intensify during stress (Mohanty & Sahoo, 2020).Natural experiments such as COVID-19 or demonetization provide valuable opportunities to identify volatility effects, yet systematic comparative reviews of these events remain scarce in Indian contexts (Sahoo & Sethi, 2021).Methodologies vary across studies, from simple GARCH to complex multivariate models, creating inconsistencies. A theoretical synthesis that clarifies when specific models should be employed is absent, limiting coherence in Indian volatility research (Choudhry & Jayasekera, 2014; Lakshmanarao, et al., 2020).

This study consolidates scattered evidence on how external forces like inflation, currency movements, oil shocks, and policy uncertainty shape volatility in India, providing a coherent map of drivers. It further clarifies when asymmetric, regime dependent, and multivariate models are theoretically warranted, improving the match between methods and market reality. It also addresses gaps in prior work by integrating policy uncertainty with market microstructure and by broadening spillover analysis across equity, currency, commodities, and rates.

2. Objectives of the Study

- To identify and classify the major exogenous factors influencing stock market volatility in India
- To analyze theoretical frameworks and models that explain the transmission of exogenous shocks into stock market volatility
- To evaluate research gaps and propose a conceptual foundation for future empirical studies on exogenous volatility drivers in India

3. Literature Review

3.1. *Identifying and Classifying Exogenous Drivers*

- *Macroeconomic indicators*

Foundational research recognizes that stock return volatility is not constant but clusters over time, motivating models that allow volatility to react to new information (Engle, 1982; Bollerslev, 1986; Divya et al., 2023). Building on that foundation, Indian evidence highlights the role of inflation and the exchange rate as salient external drivers of volatility. Using daily and monthly data with GARCH-family approaches, studies report that inflation surprises and rupee depreciation pressures significantly elevate conditional variance of Indian equity returns (Sreenu et al., 2023; Venugopal, et al., 2023). The exchange-rate channel is particularly important for an import-dependent economy, with currency swings operating through

valuation effects, corporate balance-sheet exposures, and foreign investor flows.

- *Global risk and uncertainty*

Global risk sentiment, commonly proxied by the VIX, and economic policy uncertainty (EPU) indices capture exogenous news that re-prices risk premia. Baker, Bloom, and Davis (2016) and Venugopal, et al. (2024)formalize a news-based EPU index and document its strong association with market volatility and real activity; subsequent work applies EPU to emerging markets, including India, finding that policy-related uncertainty elevates volatility and may induce asymmetries (Baker et al., 2016). Complementing this, market commentary and practitioner research around India VIX show phases of compressed implied volatility followed by re-expansion, consistent with shifts in global and local risk regimes (e.g., mid-2025 episodes), underscoring that calm periods can mask latent vulnerability (Economic Times, 2025; Times of India, 2025).

- *Commodity and energy shocks*

Oil is a classic exogenous shock for India given its energy import dependence. Recent work shows asymmetric impacts of crude-oil price uncertainty on Indian market returnsnegative oil shocks (or heightened oil uncertainty) amplify equity volatility more than positive shocks of comparable size (Sreenu & Nikkinen, 2022; Venugopal,2013). Such asymmetry aligns with theories where downside macro shocks tighten financial constraints and impair risk bearing more than upside surprises.

- *Cross-market and currency spillovers*

Spillover studies emphasize that volatility transmits across equities, commodities, and currencies via portfolio rebalancing, hedging, and funding channels. Evidence on India indicates significant cross-market volatility connectedness that intensifies around external shocks; exchange-rate and equity volatilities exhibit feedback effects consistent with open-economy financial accelerator mechanisms (Lakshmanasamy, 2021; Sahoo & Kumar, 2024).

*2. **Theoretical Frameworks and Volatility Models***

- *From ARCH/GARCH to asymmetric and regime-dependent models*

ARCH/GARCH models formalize volatility clustering and the dependence of today's variance on past shocks (Engle, 1982; Bollerslev, 1986; Das, & Venugopal 2013). For exogenous drivers, the conditional variance equation can be augmented with external regressors (e.g., EPU, VIX, oil uncertainty, exchange rate innovations). However, symmetric GARCH often understates leverage effectsthe empirical regularity that negative returns raise volatility more than positive returnsprompting the use of EGARCH and TGARCH specifications. Comparative studies during COVID-19 also show that asymmetric GARCH variants more faithfully capture shock transmission and tail behavior relative to symmetric baselines, justifying their use in stress periods and for policy-uncertainty shocks (Caiado et al., 2023).

- *Modeling exogenous news and uncertainty*

EPU and global risk proxies enter as information shocks that shift perceived risk premia and discount rates. Theoretically, these variables affect volatility via three channels:
(i) Information channelnews raises uncertainty about cash flows and policies;
(ii) Liquidity channelmarket-making capacity thins when uncertainty spikes;
(iii) Risk-bearing channelhigher risk premia magnify the variance of returns. In applied settings, these are implemented by including EPU/VIX (levels or innovations) in variance equations or as exogenous instruments in stochastic volatility frameworks. Empirical findings for India and peers confirm that uncertainty shocks materially increase conditional variance and often exhibit state dependence, with effects stronger in bearish or crisis regimes (Baker et al., 2016; Sreenu et al., 2023; Ranganadh& Venugopal, 2020).

- *Spillover and connectedness approaches*

Beyond single-index models, volatility transmission is captured through multivariate GARCH, Diebold-Yilmaz connectedness, or cross-quantilogram frameworks. Sectoral and cross-market studies document bidirectional volatility spillovers between Indian equities and other asset classes, implying that exogenous shocks propagate through portfolios and funding conditions (Sahoo & Kumar, 2024; Haimanote Belay et al., 2017). For energy shocks, oil-volatility indices (OVX) can be integrated into these systems to map directional spillovers into Indian equities and the rupee.

https://www.researchgate.net/publication/378372144_Volatility_spillover_among_the_sectors_of_emerging_and_developed_markets_a_hedging_perspective?utm_source=chatgpt.com

3. Synthesis, Gaps, and a Conceptual Foundation

- *Fragmentation and measurement issues*

Indian studies often analyzesingle factor classes (e.g., oil or exchange rate) with varied sample windows and model choices, limiting comparability. There is scope for a unified, theory-led framework that nests macro, global risk, commodity, and currency shocks jointly, while addressing measurement error in news-based indices and distinguishing between levels vs. innovations of exogenous variables (Engle, 2001; Baker et al., 2016; Gopalakrishna et al., 2025). https://www.fsb.miamioh.edu/lij14/672_engle.pdf?utm_source=chatgpt.com

- *Asymmetry and regime dependence*

Evidence points to asymmetric and state-dependent responsesuncertainty spikes and negative macro shocks move volatility more than corresponding positive shocks. Yet many India-focused papers still rely on symmetric specifications or do not formally test for Markov-switching or threshold dynamics. Incorporating EGARCH/TGARCH and regime-switching structures, especially around event windows like COVID-19would better match theory and data (Caiado et al., 2023; Sahoo et al., 2021; Nallapuraju A N Raju et al., 2025). https://www.sciencedirect.com/science/article/pii/S1062940823000943?utm_source=chatgpt.com

- *Multi-market transmission and policy interface*

The interaction between policy uncertainty and market microstructure (liquidity, derivatives activity) in India is an open frontier. Mid-2025 market reports show episodes of compressed India VIX and muted rupee implied volatility despite macro shocks, plausibly reflecting derivatives-market depth and RBI communication/operationssuggesting microstructure can dampen volatility transmission (Economic Times, 2025; Times of India, 2025; Reuters, 2025). Future research should integrate policy-uncertainty metrics with microstructure proxies to reconcile muted implied volatility with elevated realized volatility in shock phases. https://economictimes.indiatimes.com/markets/stocks/news/india-vix-sees-5-day-decline-history-suggests-volatility-ahead-axis-securities/articleshow/121270921.cms?utm_source=chatgpt.com

- *Proposed conceptual foundation*

A coherent review for India should: (a) classify exogenous drivers into macro (inflation, output surprises), global risk (VIX, EPU), energy/commodity (OVX, Brent shocks), and currency (rupee shocks); (b) map channels (information, liquidity, risk-bearing); (c) choose models to match mechanisms (EGARCH/TGARCH for asymmetry; multivariate/connectedness for spillovers; regime-switching for state dependence). This scaffolding can anchor hypothesis development and guide robust empirical design.

4. Methodology

This study uses an exploratory research design to map how exogenous forces shape volatility in the Indian equity market. We search Scopus, Web of Science, EconLit, SSRN, and Google Scholar for 2000 to 2025 with strings combining India, volatility models, and external drivers such as exchange rate, oil, global risk, and policy uncertainty. Inclusion requires an identifiable model or measurement of drivers, India focused evidence, and accessible full text; SEBI, RBI, and exchange reports are treated as calibrated grey sources. Sampling is purposive and iterative, with backward and forward snowballing until theoretical saturation. The qualitative approach is interpretive and comparative. We construct a coding book that records market segment, sample window, factor class, transmission channel, model family, tests for asymmetry and regimes, and event identification. Two researchers screen titles and abstracts, then full texts; at least a quarter are double coded and reconciled. An audit trail and reflexive memos maintain transparency, and triangulation across peer reviewed articles, working papers, and policy documents strengthens credibility.

Qualitative analysis relies on thematic synthesis and pattern matching, not meta-analysis. First, we

organize findings by transmission channels and summarize direction with vote counts. Second, we compare configurations across episodes such as demonetization and COVID nineteen to assess state dependence. Third, we run sensitivity reads by data frequency, contrasting symmetric GARCH with EGARCH, TGARCH, connectedness, and regime switching. Findings feed a concept map linking factor classes to channels. Trustworthiness is addressed through intercoder checks; transferability is supported by context notes and decision rules.

4. Analysis and Interpretation

Table 1. Exogenous factors and their links to stock market volatility in India

Factor / Theme	Key sources (examples)	Main transmission mechanism	Qualitative effect on volatility	Context and notes
Macroeconomic indicators (inflation, interest rate, output surprises)	Engle (1982); Bollerslev (1986); Goyal & Arora (2012); Kumar (2020); Sreenu et al. (2023)	Information and risk-premium channels: macro surprises change discount rates and cash-flow uncertainty	Higher inflation surprises and tighter rate expectations are associated with elevated conditional variance; effects can be persistent	Effects stronger during tightening cycles and when inflation uncertainty rises (Goyal & Arora, 2012; Sreenu et al., 2023)
Exchange rate shocks (INR)	Sreenu et al. (2023); Lakshmanasamy (2021)	Balance-sheet and portfolio rebalancing channels; FX volatility spills into equities	Rupee depreciation and FX volatility raise equity volatility; feedback between FX and equity variance	Open-economy setting amplifies sensitivity due to import dependence and foreign portfolio flows
Global risk and uncertainty (VIX, EPU)	Baker et al. (2016); Gupta et al. (2019); Bansal & Kumari (2021)	Information and risk-bearing channels; global risk repricing	Positive association between EPU/VIX shocks and Indian equity volatility; often asymmetric	Uncertainty spikes transmit quickly; domestic amplification depends on liquidity conditions
Commodity and energy shocks (oil price and OVX)	Dhal et al. (2019); Sreenu & Nikkinen (2022); Mohanty & Sahoo (2020)	Cost-push and terms-of-trade; funding and hedging demand	Negative oil shocks or higher oil uncertainty increase volatility; asymmetric effects are common	Energy import dependence makes oil a salient external driver; spillovers observed to sectors and INR
Policy interventions and policy uncertainty	Baker et al. (2016); Bansal & Kumari (2021); Harjoto et al. (2021)	Information and liquidity channels via news-based uncertainty	Policy-related uncertainty elevates volatility; may prolong high-volatility regimes	Magnitude depends on credibility and communication of policy pathways
Cross-market connectedness (equity, commodity, FX, rates)	Mohanty & Sahoo (2020); Sahoo & Kumar (2024)	Spillover and contagion through portfolios and funding	Bidirectional volatility spillovers; connectedness intensifies in stress periods	Direction and strength vary by episode; oil and FX are frequent senders
Shock episodes (COVID-19)	Sahoo & Sethi (2021); Harjoto et al. (2021)	Regime shift and tail risk	Volatility surges across pre/during/post phases; fat tails and clustering	Asymmetry more visible; supports need for state-dependent models

Objective 1 interpretation: identify and classify exogenous drivers

The literature consistently classifies exogenous influences into macroeconomic indicators, currency shocks, global risk and uncertainty, commodity and energy shocks, and policy interventions. Indian studies show that inflation surprises, rupee depreciation, oil price uncertainty, and global uncertainty measures each raise equity volatility through information and risk-premium channels, with notable asymmetries and persistence (Goyal & Arora, 2012; Sreenu & Nikkinen, 2022; Bansal & Kumari, 2021; Sreenu et al., 2023).

Table 2. Theoretical and modeling approaches for exogenous shocks

Model family	What it captures	How exogenous variables enter	Suitability to India	Limitations noted
ARCH / GARCH	Volatility clustering and persistence (Engle, 1982; Bollerslev, 1986)	As regressors in mean/variance equations (e.g., inflation, FX, VIX, EPU)	Baseline for Indian studies; simple and interpretable	Symmetric response may understate leverage and bad-news effects
EGARCH / TGARCH (asymmetric)	Leverage and asymmetric volatility	Same as above; parameters allow negative shocks to weigh more	Fits crisis and uncertainty episodes better; widely recommended	Requires careful diagnostics; parameter instability across sub-samples
Multivariate GARCH / Connectedness frameworks	Cross-market spillovers and directions	Exogenous series as drivers or nodes in networks (e.g., OVX, VIX, INR)	Maps equity–FX–commodity linkages for India	Estimation complexity; results sensitive to windowing and ordering
Regime-switching / state-dependent models	Structural breaks and regimes	State-varying loadings of exogenous shocks	Captures calm vs crisis regimes evident in India	Identification and over-fitting risks; requires longer samples
Stochastic volatility with exogenous inputs	Latent variance dynamics	Exogenous shocks as instruments for variance	Flexible for news-based uncertainty	Data and computation intensive; fewer Indian applications

Objective 2 interpretation: theoretical frameworks and models

ARCH and GARCH provide the base for modeling volatility clustering, but asymmetric and regime-switching specifications align more closely with the Indian evidence during shock phases such as COVID-19 and policy-uncertainty spikes. Multivariate and connectedness approaches are important to capture cross-market transmission between equities, FX, and commodities, which intensifies in stressed states (Mohanty & Sahoo, 2020; Sahoo & Kumar, 2024).

Table 3. Research gaps and implications for design

Gap identified	Why it matters	Implication for research design	Proposed response
Fragmentation across factor classes	Hard to compare effects across macro, global, energy, and FX	Build a unified factor map and include multiple classes jointly	Structured theoretical framework grouping drivers and channels
Under-testing of asymmetry and regimes	Missed leverage and crisis dynamics	Use EGARCH/TGARCH and regime-switching alongside GARCH	Formal tests for asymmetry, thresholds, and breaks
Limited integration of policy uncertainty with microstructure	Mechanistic link from news to trading frictions is unclear	Add liquidity, turnover, and derivatives activity proxies	Joint models: EPU with microstructure controls
Incomplete multi-	Over-reliance on	Multivariate connectedness	Directional spillovers

market spillover coverage	single proxies (VIX or oil)	across equity–FX–commodity–rates	with robustness across windows
Measurement issues for uncertainty indices	Levels vs innovations and media bias complicate inference	Use innovations, alternative indices, and robustness checks	Instrumental variables or news-based event windows

Objective 3 interpretation: gaps and conceptual foundation

The main gaps are fragmented factor coverage, limited testing for asymmetry and regime dependence, and weak integration of policy uncertainty with market microstructure. A theory-led framework that jointly models factor classes, allows asymmetric and state-dependent effects, and embeds liquidity and derivatives proxies would improve explanatory power and policy relevance. Emphasis on innovations in uncertainty indices and event-driven windows can mitigate measurement concerns.

5. Suggestions

- Regulators, the central bank, and exchanges should coordinate a transparent policy calendar, integrate surveillance across equity, currency, and commodity markets, and use dynamic margins and position limits based on simple regime indicators that combine realized volatility, India VIX, oil, and INR volatility. Add real-time risk dashboards on trading terminals, run periodic system-wide stress tests around oil and currency shocks, expand market-maker incentives in index options, and widen access to longer-tenor INR and energy hedges. Share anonymised microstructure statistics with short lags to lower information asymmetry without compromising market integrity.
- Institutional and foreign investors should embed uncertainty and spillover signals in risk budgets, estimate risk with asymmetric or state-dependent models, and pre-fund liquidity sleeves for stress periods. Use rules-based overlays around known event windows, hedge oil and INR exposures that materially affect cash flows, and diversify sector exposure to avoid single-shock concentration. Document these practices in stewardship reporting to dampen herding.
- Corporate treasuries should adopt written FX and commodity hedge policies with clear triggers, prefer layered or collar structures to avoid overpaying for optionality, and time buybacks or issuance outside high-volatility regimes. Align investor-relations updates with major policy events to reduce uncertainty premia.
- Retail investors and advisors should keep systematic investment plans intact across regimes, hold a modest cash buffer for rebalancing, avoid leverage when uncertainty is elevated, and consider simple index-option protection during scheduled events. Data providers, academics, and media can reinforce good behavior by open-sourcing connectedness and uncertainty trackers and by presenting context panels that locate current volatility within its one- and five-year distributions while explaining which driver—policy, commodity, or currencymoved.

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