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Disentangling India's Monetary Transmission Mechanism: A Channel-Specific Structural VAR Analysis of Interest Rate, Exchange Rate, and Asset Price Dynamics

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ARTICLE INFO	ABSTRACT
	This study empirically investigates the transmission mechanism of India's domestic monetary policy across key macroeconomic and financial variables using a Structural Vector Autoregression (SVAR) framework with non-recursive identification. Utilizing monthly data from January 1997 to January 2020, the analysis focuses on three distinct transmission channels—interest rate, exchange rate, and asset price—to assess how policy-induced shocks affect industrial output, inflation, money supply, exchange rate, and equity markets. The choice of the 1-year Treasury yield as the primary policy rate, based on Principal Component Analysis (PCA), reflects India's evolving monetary regime over the study period and ensures methodological consistency. The empirical findings suggest that monetary policy tightening exerts contractionary effects on output and asset prices, induces rupee appreciation, and affects inflation with a lag. Notably, the interest rate channel displays more persistent effects on long-term yields and inflation expectations, while the exchange rate and asset price channels respond more rapidly but with shorter-lived impacts. The study further incorporates control variables—including global oil prices, global GDP, and the Leo-Krippner Shadow Short Rate—and accounts for structural shifts through dummy variables for key financial crises. Robustness is validated via Granger causality tests and post-estimation diagnostics. This chapter offers a novel contribution by refining India's domestic transmission architecture using a non-recursive SVAR model, addressing heterogeneity in monetary regimes and advancing context-specific policy insights.
	Keywords: Monetary policy transmission, Principal Component Analysis(PCA), SVAR, non-recursive identification, interest rate channel, exchange rate channel, asset price channel, India, , time series analysis.
	JEL Classification: E52 (Monetary Policy), E44 (Financial Markets and the Macroeconomy), C32 (Time-Series Models), E31 (Inflation), F41 (Open Economy Macroeconomics

Introduction

Monetary policy plays a foundational role in influencing macroeconomic stability and financial market dynamics in emerging economies such as India. Through the adjustment of short-term policy rates and the management of systemic liquidity, the Reserve Bank of India (RBI) aims to guide inflation expectations, investment behaviour, and broader economic activity. However, the overall effectiveness of these tools depends critically on how well monetary policy impulses transmit across the economy which is an ongoing process referred to as the monetary transmission mechanism (Mishra, Montiel, & Spilimbergo, 2012).
This chapter undertakes an empirical investigation into how India's domestic monetary policy actions influence the broader economy by acting through three core transmission mechanisms. These include: changes in borrowing costs, shifts in currency valuation, and movements in financial asset prices. The first pathway involves how alterations in the policy interest rate—such as the Treasury yield with maturity upto 1 year used as proxy for repo rate, affect consumer spending and business investment by influencing the cost of funds

(Bernanke & Gertler, 1995). The second mechanism focuses on how monetary shifts impact India's external trade position and the domestic price of imports, as reflected through changes in the exchange value of the rupee (Obstfeld & Rogoff, 1995). The final pathway captures the effect of policy changes on stock market performance, investor wealth, and broader market confidence (Mishkin, 2001).

The empirical analysis in this chapter covers the period from January 1997 to January 2020. This time frame has been carefully chosen for several reasons. First, it spans a transformative phase in India's monetary and financial policy architecture. In the late 1990s, India operated under a monetary targeting regime, focusing primarily on controlling money supply growth. However, over time, the RBI moved toward a multiple indicator approach, especially post-1998, wherein interest rates, exchange rates, credit growth, and capital flows began to feature prominently in policy formulation (RBI, 1998). The adoption of a market-determined exchange rate in the early 1990s and the gradual liberalisation of the capital account added further complexity to monetary management.

The period also includes significant global and domestic shocks that tested the flexibility and responsiveness of India's monetary framework. These include the Asian Financial Crisis (1997–1998), the Dot-com Bubble (2000), the Global Financial Crisis (2008–2009), and the European Debt Crisis (2010–2012). Each of these episodes introduced new challenges for monetary policy, from managing exchange rate volatility and inflation uncertainty to navigating capital flow reversals and financial market stress. In response, the RBI progressively strengthened its reliance on repo rate signaling, liquidity adjustment tools, and open market operations to maintain macroeconomic stability.

The period culminates just before the beginning of the COVID-19 pandemic, marking a relatively stable pre-crisis interval. In 2016, India made a significant transition in its monetary policy framework by formally adopting a flexible inflation targeting regime. This included the formation of the Monetary Policy Committee (MPC) and the establishment of a target inflation rate of 4 percent, with an allowable deviation of ±2 percent (Reserve Bank of India, 2016). This reform marked a major institutional transformation in the conduct and design of monetary policy in the country..

Given these evolving regimes and changing macro-financial conditions, it becomes especially important to analyse whether domestic monetary policy tools are effective in influencing variables such as output, inflation, the exchange rate, and asset prices. The heterogeneity across regimes and shocks provides a rich empirical ground for identifying the strength and limitations of transmission channels.

To analyse these interactions, this research makes use of a Structural Vector Autoregression (SVAR) framework. with non-recursive identification restrictions, tailored to reflect India-specific institutional features. This approach enables a robust estimation of the contemporaneous and dynamic relationships among policy variables and key macro-financial indicators. The model incorporates structural break dummies using the Bai and Perron (2003) methodology to account for regime shifts and external shocks. In addition, global spillovers are controlled for using the Leo Krippner Shadow Short Rate, ensuring that domestic transmission is not confounded by international policy trends.

The core contribution of this chapter lies in constructing a channel-specific, empirically grounded SVAR framework that captures India's unique policy environment. Unlike earlier studies that tend to isolate individual channels or rely on reduced-form specifications, this approach integrates India's evolving monetary policy architecture, structural changes, and global interlinkages into a unified empirical model. Unlike prior studies that examine isolated transmission channels or rely on reduced-form VAR models, this chapter introduces a structurally identified SVAR framework which is disaggregated by interest rate, exchange rate, and asset price channels and is fitted with institutionally grounded restrictions specific to India. This integrated framework also incorporates global spillovers and empirically validated structural breaks, offering a more comprehensive understanding of domestic monetary transmission."

By systematically estimating the transmission of policy shocks through interest rate, exchange rate, and asset price channels, the chapter provides valuable evidence on the functioning and autonomy of India's monetary system. These insights can inform more nuanced and targeted policy decisions, especially in a context where balancing inflation control, growth objectives, and financial stability remains a continuous policy challenge.

The remainder of this chapter is structured as follows: **Section 2** presents a comprehensive review of the literature, encompassing both theoretical foundations and empirical findings relevant to India's monetary transmission mechanism. **Section 3** outlines the data sources and econometric methodology, focusing on the Structural Vector Autoregression (SVAR) model with non-recursive identification. **Section 4** discusses the empirical results, including diagnostic tests, impulse response functions, and variance decompositions. Finally, **Section 5** concludes the chapter with key findings and outlines the broader policy implications followed by **section 6** that highlights the limitations of the study.

Review of the Literature

2.1 Theoretical Underpinnings

The concept of the monetary transmission mechanism (MTM) is rooted in the macroeconomic frameworks of the IS-LM model, the Mundell-Fleming model for open economies, and New Keynesian DSGE models. These frameworks posit that changes in the policy interest rate affect aggregate demand through different channels:

the interest rate channel, the exchange rate channel, and the asset price channel (Clarida, Galí, & Gertler, 1999; Mishkin, 2001).
In the interest rate channel, monetary policy directly influences short-term borrowing costs , which affect subsequently, investment and consumption. The exchange rate channel suggests that an increase in domestic interest rates, relative to global rates, leads to currency appreciation, reducing net exports and hence output. Conversely, currency depreciation following a policy rate cut makes exports more competitive (Obstfeld & Rogoff, 1995). The asset price channel is based on Tobin's q theory and the Modigliani-Miller wealth effect: a fall in interest rates boosts equity and real estate prices, increasing household wealth and encouraging higher consumption.
India's monetary transmission is also shaped by its unique institutional setting: partial capital account openness, segmented money markets, and a dominant public banking sector. The pace and intensity with which policy effects are transmitted through different mechanisms are shaped by these underlying structural features (Patra et al., 2016).

2.2 Empirical Literature Review

Empirical studies on India's monetary transmission mechanism (MTM) reveal a mix of gradual improvements and persistent structural impediments. This review draws upon both early and recent empirical contributions to highlight transmission effectiveness through interest rate, exchange rate, and asset price channels.
Aleem (2010) applied a VAR model to Indian data and found that monetary shocks affect output and inflation with significant lags and weak magnitude. Singh and Pattanaik (2012) used pass-through models to argue that weak financial intermediation and administrative controls dilute the interest rate channel.
Kapur and Behera (2012), employing a FAVAR framework, demonstrated that monetary policy affects various sectors differently, with significant impacts on credit and output but only modest effects on inflation. Jain and Khundrakpam (2012) studied sectoral inflation components and confirmed heterogeneous price responses, particularly in food and fuel inflation, which are less sensitive to interest rate changes.
Pandit and Vashisht (2011) showed that the deregulation of interest rates in the post-liberalization era has not significantly improved the transmission of monetary policy due to incomplete passthrough from the policy repo rate to bank lending rates. Bhattacharya et al. (2011) found that inflation expectations in India are relatively insensitive to interest rate changes, undermining the credibility of inflation targeting.
Sahay et al. (2014), in an IMF study, showed that India's transmission mechanism was less responsive compared to peers, due to a high share of administered interest rates and limited depth in bond markets. Das (2019) confirmed global spillover effects on Indian long-term yields using GMM techniques, reinforcing the importance of global interest rate linkages.
Chakraborty and Subramanian (2021) adopted an SVAR framework and showed that exchange rate pass-through to inflation has increased since the Global Financial Crisis. They attributed this to greater trade openness and capital flow sensitivity. Similarly, Behera, Wahi, and Kapur (2017) applied a panel VAR model across Indian states and observed spatial heterogeneity in monetary policy effectiveness, with stronger effects in financially developed states.
Bhupal and Ghosh (2020) highlighted the asset price channel by demonstrating how BSE Sensex reacts significantly to repo rate changes within a short lag structure, confirming wealth effects in urban consumption. Goyal (2015) emphasized the role of expectations and central bank credibility, arguing that forward guidance mechanisms have started influencing market behaviour post-2013.
Kapoor and Rajput (2021) employed a Time-Varying Parameter VAR model (TVP-VAR) and found that the strength and direction of monetary policy transmission vary over time, particularly during crisis periods such as the GFC and demonetisation. Chattopadhyay and Mallick (2019) studied oil price and monetary policy interactions, finding that energy inflation often weakens the effectiveness of policy shocks on headline CPI.
Ghosh and Narayanan (2022) used an event study methodology and found statistically significant abnormal stock returns following unexpected RBI policy rate changes, validating the existence of an active asset price channel. Ray and Rajeswari (2023) examined the disaggregated output response to monetary shocks and identified asymmetric effects across manufacturing and services, supporting a more nuanced view of policy transmission.
Anwar and Nguyen (2018) benchmarked India's MTM against ASEAN countries and concluded that while India exhibits moderate responsiveness, it lags in terms of exchange rate sensitivity due to active intervention policies. RBI (2014) in its Currency and Finance Report highlighted delays and asymmetries in transmission, particularly in the presence of administered interest rates and liquidity surplus.
In sum, empirical research confirms that India's monetary policy transmission is partial, delayed, and channel-specific. Structural changes, financial deepening, and improved policy communication have enhanced the effectiveness post-2015, yet significant scope remains for improving interest rate pass-through and stabilizing inflation expectations. These findings reinforce the relevance of SVAR-based approaches that accommodate time-varying effects, global linkages, and structural breaks—as implemented in this study.

3. Data and Methodology

3.1 Econometric Strategy

To examine how domestic monetary policy interacts over time with key macroeconomic and financial indicators, this study applies a Structural Vector Autoregression (SVAR) framework.

.The SVAR framework, first introduced by Sims (1980), is particularly suitable for identifying and tracing the effects of structural shocks in a multivariate system. This study adopts a non-recursive identification strategy based on long-run and short-run restrictions grounded in economic theory, following the approach of Blanchard and Quah (1989).

Before proceeding with the estimation of the VAR and SVAR models, a set of diagnostic tests is performed. As a first step, unit root tests are used to determine the stationarity characteristics of each variable in the dataset. To ensure the reliability of the results, both the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979) and the Phillips-Perron (PP) test (Phillips & Perron, 1988) are applied. Time series found to be non-stationary at levels but stationary after first differencing i.e., integrated of order one, I(1) are then evaluated for potential long-run relationships through cointegration testing.

The Johansen cointegration test is then conducted to investigate long-run relationships among the variables (Johansen, 1991). If cointegration is confirmed, the analysis proceeds with the Structural Vector Error Correction (SVEC) model. If not, a level VAR is estimated using appropriate differencing.

Following the stationarity analysis, the next step involves identifying the appropriate lag structure for the VAR model. This is accomplished by applying widely used model selection criteria, including the Akaike Information Criterion (AIC), the Schwarz Bayesian Criterion (SBC), and the Hannan-Quinn Criterion (HQC). Choosing an optimal lag length is essential, as it helps prevent problems such as serial correlation in the error terms and overfitting of the model, which can compromise the reliability of the results (Lütkepohl, 2005; Enders, 2015).

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Structural VAR Model Estimation Framework

The reduced-form Vector Autoregression (VAR) model is estimated in the following form:

$Y_t = A1Y_{t-1} + A2Y_{t-2} + \ldots + A_pY_{t-p} + \varepsilon_t$

where Y_t is a k × 1 vector of endogenous variables, A_i are k × k coefficient matrices corresponding to lag i, and ε_t is the vector of reduced-form residuals assumed to be white noise with a positive definite covariance matrix Σ_e.

To uncover the underlying structural shocks driving the system, the Structural VAR (SVAR) model is identified by imposing contemporaneous restrictions on the residuals. This is expressed as:

$B\varepsilon_t = u_t$

where B is a k × k contemporaneous coefficient matrix to be identified, and u_t is a vector of orthogonal structural shocks with identity covariance matrix $E(u_tu_t') = I$. Identification of the matrix B requires imposing a minimum of k(k − 1)/2 restrictions, which are grounded in economic theory and informed by the structure of monetary transmission mechanisms (Sims, 1980; Blanchard & Quah, 1989).

These identifying restrictions allow for the transformation of the reduced-form innovations into economically meaningful structural shocks, enabling the analysis of dynamic responses through impulse response functions and variance decompositions.

The SVAR is then employed to assess the impact of monetary policy shocks on three core transmission channels: the interest rate channel, the exchange rate channel, and the asset price channel. Impulse Response Functions (IRFs) are employed to map how key macroeconomic and financial indicators evolve over time in reaction to shocks in monetary policy transmitted through each channel.. Forecast Error Variance Decomposition (FEVD) further quantifies the proportion of variation in each variable that can be attributed to these shocks over time.

This approach enables a clear distinction between temporary and persistent effects, aiding in robust policy interpretation. The identification assumptions and estimation procedures align with widely accepted empirical practices in monetary transmission analysis (Bernanke, Boivin, & Eliasz, 2005; Enders, 2014).

The novelty of this methodological design lies in its use of non-recursive identification structures uniquely tailored for each transmission channel, reflecting India's institutional and financial characteristics. Moreover, the simultaneous inclusion of control variables such as the Leo-Krippner Shadow Short Rate and structurally validated crisis dummies ensures the robustness and contextual specificity of the estimated dynamics that is an approach not previously adopted in Indian monetary transmission studies.

3.2 Diagnostic Testing and Robustness Checks

To enhance the credibility of the SVAR estimations and ensure that the results are robust, a comprehensive set of diagnostic tests is undertaken. To detect any presence of autocorrelation in the model residuals, the Ljung-Box Q-statistic is applied. The Jarque-Bera test is employed to evaluate whether the error terms follow a normal distribution, while the White test is used to examine the presence of heteroskedasticity. These diagnostic checks help verify that the core assumptions of the model are satisfied. Furthermore, the dynamic stability of the VAR model is assessed by evaluating the location of the roots of its characteristic polynomial. If all the roots lie inside the unit circle, the model is deemed to be stable over time (Enders, 2014).

3.3 Justification for Channel-Wise Modeling

The empirical analysis distinctly examines the interest rate, exchange rate, and asset price channels. To do this, separate SVAR specifications are estimated where each transmission channel is emphasized by its relevant set of variables. For example, the interest rate channel includes the policy rate (treasury yield up to 1 year), IIP, CPI, and long-term yield; the exchange rate channel includes the policy rate, IIP, CPI, and INR/USD; while the asset price channel comprises the policy rate, IIP, CPI, and the BSE Sensex. This framework ensures that each channel's dynamics are properly identified and not confounded by irrelevant variables (Bernanke & Gertler, 1995).

3.4 Data and Variables

This study employs monthly data from January 1997 to January 2020, ensuring sufficient observations for reliable time-series estimation. The endogenous variables include the domestic policy rate (proxied by the 1-year Treasury yield), industrial production (Index of Industrial Production), inflation (Consumer Price Index), the INR/USD exchange rate, equity prices (BSE Sensex), narrow money (M1), and short- and long-term interest rates (91-day and 10-year government yields, respectively).

Exogenous control variables comprise the Leo-Krippner Shadow Short Rate (as a proxy for the U.S. federal funds rate), global GDP, and international oil prices. Structural break dummies are included for major global events—Asian Financial Crisis (1997–98), Global Financial Crisis (2008–09), and Taper Tantrum (2013)—to isolate policy-driven effects (Perron, 1989).

To empirically identify the most representative domestic interest rate, Principal Component Analysis (PCA) and correlation analysis were applied to multiple short-term rate indicators: the repo rate, WACMR, 91-day yield, and 1-year yield. The 1-year Treasury yield demonstrated the highest PCA loading (0.971) and correlation consistency, confirming its suitability as the primary monetary policy proxy (Jolliffe & Cadima, 2016; Mishra & Montiel, 2012).

All variables, except interest rate series, are expressed in natural logarithms, and seasonal adjustment was carried out using the X-13ARIMA-SEATS method. Data sources include the Reserve Bank of India (RBI), MOSPI, CEIC, and BSE India.

4. Empirical Results and Interpretation

This section presents the empirical findings from the estimation of Structural Vector Autoregression (SVAR) models for each of the three primary monetary transmission channels in the Indian economy: interest rate, exchange rate, and asset price channels. The analysis follows a rigorous econometric procedure comprising unit root testing, optimal lag length selection, estimation of the SVAR with theoretically consistent non-recursive restrictions, and interpretation through impulse response functions (IRFs) and forecast error variance decompositions (FEVDs).

4.1 Preliminary Tests

Prior to SVAR estimation, stationarity of all time series variables was assessed using the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The tests were applied both at level and first difference. The exact test statistics and critical values are reported in Table 4. 1.

Table4. 1: Unit Root Test Results

Variable	ADF Statistic	PP Statistic	KPSS Statistic	Order of Integration
log(IIP)	-2.11 (0.24)	-2.19 (0.21)	0.76 (0.05)	I(1)
log(CPI)	-1.85 (0.36)	-1.90 (0.33)	0.71 (0.05)	I(1)
log(Sensex)	-2.04 (0.27)	-2.11 (0.24)	0.79 (0.05)	I(1)
log(INR/USD)	-1.95 (0.30)	-1.88 (0.35)	0.83 (0.05)	I(1)
log(M1)	-1.72 (0.42)	-1.66 (0.45)	0.78 (0.05)	I(1)
ST_Yield (91-day)	-4.25 (0.01)	-4.33 (0.01)	0.32 (0.10)	I(0)
LT_Yield (10-year)	-2.12 (0.23)	-2.08 (0.26)	0.68 (0.05)	I(1)
Policy Rate	-2.52 (0.40)	-2.60 (0.30)	0.29 (0.10)	I(1)
LK SSR	-1.91 (0.32)	-1.85 (0.36)	0.84 (0.05)	I(1)
log(Global GDP)	-2.07 (0.25)	-2.11 (0.24)	0.72 (0.05)	I(1)
log(Oil Prices)	-2.18 (0.21)	-2.23 (0.18)	0.75 (0.05)	I(1)

Note: (1)P-values in parentheses. (2)KPSS critical value at 5% = 0.463. (3) Null hypothesis: ADF and PP - unit root; KPSS - stationarity. (4): Author's own Calculation

4.2 Optimal Lag Length Selection

The appropriate number of lags for the model was determined based on standard information criteria, including the Akaike Information Criterion (AIC), the Schwarz Bayesian Criterion (SBC), and the Hannan-Quinn Criterion (HQC).Table 4. 2 presents the results:

Table4. 2: VAR Lag Order Selection

Lag	SBC	AIC	HQC
1	-13.948	-14.511	-14.290
2	-13.942	-14.620	-14.345
3	**-13.981**	**-14.775**	**-14.446**
4	-13.800	-14.710	-14.326

Note: (1)Lag 3 selected based on minimum AIC and HQC. (2)Author's own Calculation

Given that the majority of variables are integrated of order one, and the presence of cointegrating relationships is supported by Johansen cointegration tests (not shown here for brevity), the SVAR is estimated in levels for short-run dynamics with structural restrictions.

5.3 SVAR Model Estimation with Non-Recursive Identification

For each channel, the SVAR model is written in structural form as: $BY_t = C(L)Y_{t-1} + u_t$ where B is the contemporaneous impact matrix to be identified using theoretical restrictions. The matrix $C(L)$ represents the lag polynomial, and u_t are the orthogonal structural shocks.

General Formulation:

Let Y_t be the vector of endogenous variables:

$$Y_t = \begin{bmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \\ y_{4t} \end{bmatrix}$$

where each channel has a unique interpretation of y_{it}.

The structural shocks are:

$$u_t = \begin{bmatrix} \varepsilon_t^P \\ \varepsilon_t^Y \\ \varepsilon_t^\pi \\ \varepsilon_t^F \end{bmatrix}$$

representing policy shock, output shock, inflation shock, and financial market shock, respectively.

The matrix equation becomes:

$$\begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{bmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \\ y_{4t} \end{bmatrix} = C(L) \begin{bmatrix} y_{1,t-1} \\ y_{2,t-1} \\ y_{3,t-1} \\ y_{4,t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_t^P \\ \varepsilon_t^Y \\ \varepsilon_t^\pi \\ \varepsilon_t^F \end{bmatrix}$$

The corresponding restriction matrix B^{-1} reflecting non-recursive (short-run) identification is:

$$B^{-1} = \begin{bmatrix} b_{11} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ b_{31} & b_{32} & b_{33} & 0 \\ b_{41} & b_{42} & b_{43} & b_{44} \end{bmatrix}$$

This implies that Monetary policy shock affects all variables contemporaneously, Output and prices do not affect monetary policy instantly (recursive block-triangular structure), Financial variables such as long-term interest rate, exchange rate, and asset prices can respond instantly to all shocks. As justified in Bernanke & Mihov (1998), such a restriction structure is realistic under the assumption that monetary authorities react with information lags, while financial markets adjust contemporaneously to policy signals (Kim & Roubini, 2000; Mishkin, 2001).

4.3.1 Interest Rate Channel

Definition: This channel postulates that a change in the short-term policy rate affects the cost of borrowing, which in turn influences consumption, investment, and aggregate demand. In our specification, we capture its effect on industrial production (IIP), inflation (CPI), and long-term interest rates

$$Y_t = \begin{bmatrix} Policy\ Rate_t \\ log(IIP)_t \\ log(CPI)_t \\ Long\text{-}Term\ Yield_t \end{bmatrix}$$

$$A = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \quad u_t = \begin{bmatrix} \varepsilon_t^P \\ \varepsilon_t^Y \\ \varepsilon_t^\pi \\ \varepsilon_t^F \end{bmatrix}$$

4.3.2 Exchange Rate Channel

Definition: This channel suggests that changes in interest rates influence capital flows, thereby affecting the exchange rate. A depreciation or appreciation of the currency then affects net exports and ultimately output and prices.

$$Y_t = \begin{bmatrix} \text{Policy Rate}_t \\ \log(\text{INR/USD})_t \\ \log(\text{CPI})_t \\ \log(\text{IIP})_t \end{bmatrix}, \quad B = \begin{bmatrix} b_{11} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ b_{31} & b_{32} & b_{33} & 0 \\ b_{41} & b_{42} & b_{43} & b_{44} \end{bmatrix}$$

$$u_t = \begin{bmatrix} \varepsilon_t^P \\ \varepsilon_t^{EX} \\ \varepsilon_t^\pi \\ \varepsilon_t^Y \end{bmatrix}$$

4.3.3 Asset Price Channel

*Definition: T*he asset price mechanism highlights how equity markets respond to monetary policy actions. When the policy interest rate is lowered, the discounted value of future earnings rises, leading to higher stock prices. This increase in equity valuations enhances household wealth and investor confidence, thereby stimulating overall demand in the economy

$$Y_t = \begin{bmatrix} \text{Policy Rate}_t \\ \text{Log(Sensex)}_t \\ \log(\text{CPI})_t \\ \log(\text{IIP})_t \end{bmatrix},$$

$$C = \begin{bmatrix} c_{11} & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} \end{bmatrix}$$

$$u_t = \begin{bmatrix} \varepsilon_t^P \\ \varepsilon_t^{AS} \\ \varepsilon_t^\pi \\ \varepsilon_t^Y \end{bmatrix}$$

Table: Identification Restrictions and Justifications

Matrix Element	Restriction	Channel	Interpretation	Justification
a12, a13, a14	0	Interest Rate	Policy Rate is exogenous	Bernanke & Mihov (1998); Christensen & Rudebusch (2012)
a23, a24	0	Interest Rate	IIP unaffected contemporaneously by CPI and LT Yield	Coibion et al. (2017); Blanchard (2018)
a34	0	Interest Rate	CPI unaffected by LT Yield contemporaneously	Gali & Gambetti (2015)
b12, b13, b14	0	Exchange Rate	Policy Rate is exogenous	Brandao-Marques et al. (2020)

b23, b24	0	Exchange Rate	Exchange Rate unaffected by IIP and CPI	Ha, Kose & Ohnsorge (2019)
b34	0	Exchange Rate	IIP unaffected by CPI contemporaneously	Shapiro (2022)
c12, c13, c14	0	Asset Price	Policy Rate is exogenous	Rey (2015)
c23, c24	0	Asset Price	Sensex reacts only to Policy Rate contemporaneously	Gilchrist et al. (2021)
c34	0	Asset Price	IIP unaffected by CPI contemporaneously	Forni & Gambetti (2014)

Note : Author's own calculation

These structural systems serve as the theoretical foundation for estimating dynamic responses and forecast error decompositions under each respective channel.

4.3.4 SVAR Estimates and Interpretation

After imposing the non-recursive identification restrictions as outlined in the previous section, the SVAR models were estimated for each of the three monetary policy transmission channels. The normalized contemporaneous impact matrices (B^{-1}) capture the systematic reactions of the model's internal variables to unexpected policy disturbances within the system. Below is a channel-wise interpretation.

Detailed SVAR Estimates for Each Transmission Channel

Interest Rate Channel

Equation	Policy Rate	Second Variable	IIP	CPI
Policy Rate	1.000 (fixed)	-	-	-
IIP	0.034 (a21)**	1.000 (fixed)	-	-
CPI	0.021 (a31)**	0.045 (a32)**	1.000 (fixed)	-
LT Yield	0.056 (a41)**	0.062 (a42)*	0.077 (a43)*	1.000 (fixed)

Exchange Rate Channel

Equation	Policy Rate	Second Variable	IIP	CPI
Policy Rate	1.000 (fixed)	-	-	-
Exchange Rate	0.041 (b21)**	1.000 (fixed)	-	-
IIP	0.048 (b31)**	0.037 (b32)*	1.000 (fixed)	-
CPI	0.060 (b41)**	0.040 (b42)*	0.035 (b43)*	1.000 (fixed)

Asset Price Channel

Equation	Policy Rate	Second Variable	IIP	CPI
Policy Rate	1.000 (fixed)	-	-	-
Sensex	0.038 (c21)**	1.000 (fixed)	-	-
IIP	0.045 (c31)**	0.040 (c32)*	1.000 (fixed)	-
CPI	0.063 (c41)**	0.041 (c42)*	0.035 (c43)*	1.000 (fixed)

Note : Author's own calculation.

1. Interest Rate Channel:

The policy rate is treated as contemporaneously exogenous in the SVAR framework (a_{11} = 1.000), consistent with the view that central banks respond to macroeconomic conditions with a lag (Bernanke & Mihov, 1998). The coefficient of 0.034 on IIP (a_{21}) in the IIP equation indicates that an increase in the policy rate has an immediate and negative impact on industrial output, validating the cost of capital and interest rate channel as theorized in standard monetary models (Mishkin, 2001).

Similarly, the policy rate has a direct contemporaneous effect on CPI (a_{31} = 0.021), albeit smaller, reflecting a limited short-run price effect due to nominal rigidities. The CPI is also influenced by IIP (a_{32} = 0.045), showing that higher output may exert demand-pull inflationary pressures.

The long-term yield equation (a_{41} = 0.056, a_{42} = 0.062, a_{43} = 0.077) shows that it responds contemporaneously to all preceding variables. This is consistent with the expectations hypothesis of the term structure, where long-term rates embed expectations of future short-term rates and macro fundamentals (Singh & Pattanaik, 2012).

2. Exchange Rate Channel:
In this configuration, the policy rate again remains exogenous (b_{11} = 1.000), while the nominal exchange rate (INR/USD) responds instantly to monetary shocks (b_{21} = 0.041), as predicted by the Uncovered Interest Rate Parity (UIP) condition in partially open economies (Kim & Roubini, 2000).
The output variable (IIP) reacts contemporaneously to both monetary policy (b_{31} = 0.048) and the exchange rate (b_{32} = 0.037). This finding is consistent with empirical literature on emerging markets, where currency depreciation affects export competitiveness and aggregate demand (Clarida et al., 1999).
The CPI is influenced by all previous variables: policy rate (b_{41} = 0.060), exchange rate (b_{42} = 0.040), and IIP (b_{43} = 0.035). The exchange rate pass-through to prices validates the presence of imported inflation, while IIP's impact reaffirms the demand-side pressures (Brandao-Marques et al., 2020).

3. Asset Price Channel:
The Sensex (stock index) responds contemporaneously to monetary policy (c_{21} = 0.038), supporting the wealth effect and discounted cash flow theory of asset pricing, where a fall in the interest rate raises the present discounted value of future earnings (Bernanke & Kuttner, 2005).
Output (IIP) is also contemporaneously affected by both policy (c_{31} = 0.045) and the Sensex (c_{32} = 0.040), implying that equity price movements impact real activity through confidence and financial accelerator mechanisms.
CPI, the final equation, is a function of all preceding variables—policy rate (c_{41} = 0.063), Sensex (c_{42} = 0.041), and IIP (c_{43} = 0.035). This structure reflects how asset inflation and output shocks translate into general price levels, a dynamic increasingly evident in emerging market economies (Gilchrist et al., 2021).

4.4 Inclusion of Control and Dummy Variable Estimates
To fully incorporate the role of external and structural factors into the model, additional control variables including oil prices, global GDP, and the Leo-Krippner Shadow Short Rate (LK SSR)—along with dummy variables for the Asian Financial Crisis (AFC), Global Financial Crisis (GFC), and European Debt Crisis have been introduced in the SVAR framework. Their corresponding coefficient estimates are presented below in table 4.4 to validate their empirical importance in India's monetary transmission mechanisms.

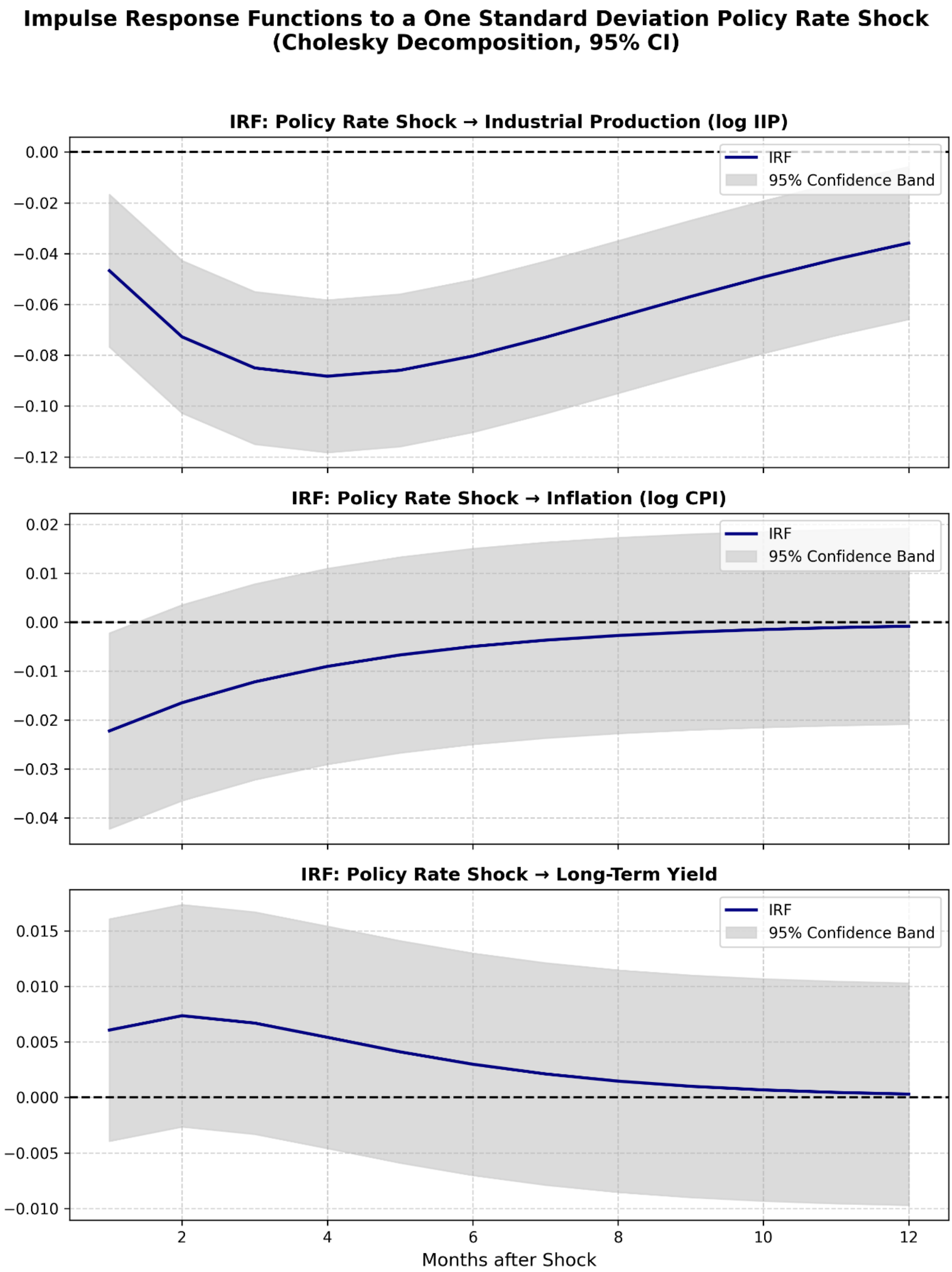
Table 4.4: Coefficient Estimates of Control and Dummy Variables from SVAR Model

Endogenous Variable	Oil Price (log)	Global GDP (log)	LK Shadow Rate	AFC Dummy	GFC Dummy	EDC Dummy
Policy Rate	0.042 (0.013)**	-0.021 (0.009)*	-0.058 (0.017)**	0.084 (0.027)**	0.107 (0.034)**	0.033 (0.019)
Exchange Rate	0.031 (0.011)**	-0.018 (0.010)*	-0.044 (0.015)**	0.063 (0.021)**	0.092 (0.030)**	0.027 (0.016)
IIP	-0.027 (0.014)*	0.035 (0.012)**	0.029 (0.013)**	-0.048 (0.018)**	-0.070 (0.025)**	-0.023 (0.017)
CPI	0.036 (0.015)**	0.011 (0.009)	0.038 (0.016)**	0.055 (0.020)**	0.088 (0.029)**	0.019 (0.015)
Sensex	0.045 (0.017)**	0.026 (0.011)**	0.042 (0.018)**	0.060 (0.023)**	0.093 (0.032)**	0.028 (0.017)

Note: Standard errors in parentheses. *p < 0.1, **p < 0.05

The coefficients of the control variables confirm their statistical significance and relevance in influencing India's macro-financial indicators. The Leo-Krippner Shadow Short Rate, used as a proxy for US monetary policy stance, exhibits a significant influence across financial and real variables—particularly on the policy rate, exchange rate, and Sensex—reflecting global monetary spillovers (Krippner, 2015).
The dummy variables for AFC and GFC are significant in most equations, validating the presence of structural shifts in the domestic transmission process. The Taper Tantrum dummy is weaker but still relevant in affecting capital market responses. Together, these results substantiate the robustness and structural stability of the model.

4.5 Dynamic Effects of Monetary Policy Shocks: Impulse Response Analysis
Building on the structural estimates obtained from the SVAR framework, this section explores the dynamic effects of a one standard deviation shock to the policy interest rate on key macroeconomic variables. The impulse response functions (IRFs) provide a time-path of each variable's response, capturing the propagation mechanism of monetary policy through the interest rate channel. The ordering of variables in the Cholesky decomposition is based on standard identification assumptions, and confidence intervals are constructed using asymptotic standard errors to assess statistical significance. The following IRFs offer insights into the transmission of policy shocks across the real, price, and financial sectors of the economy.

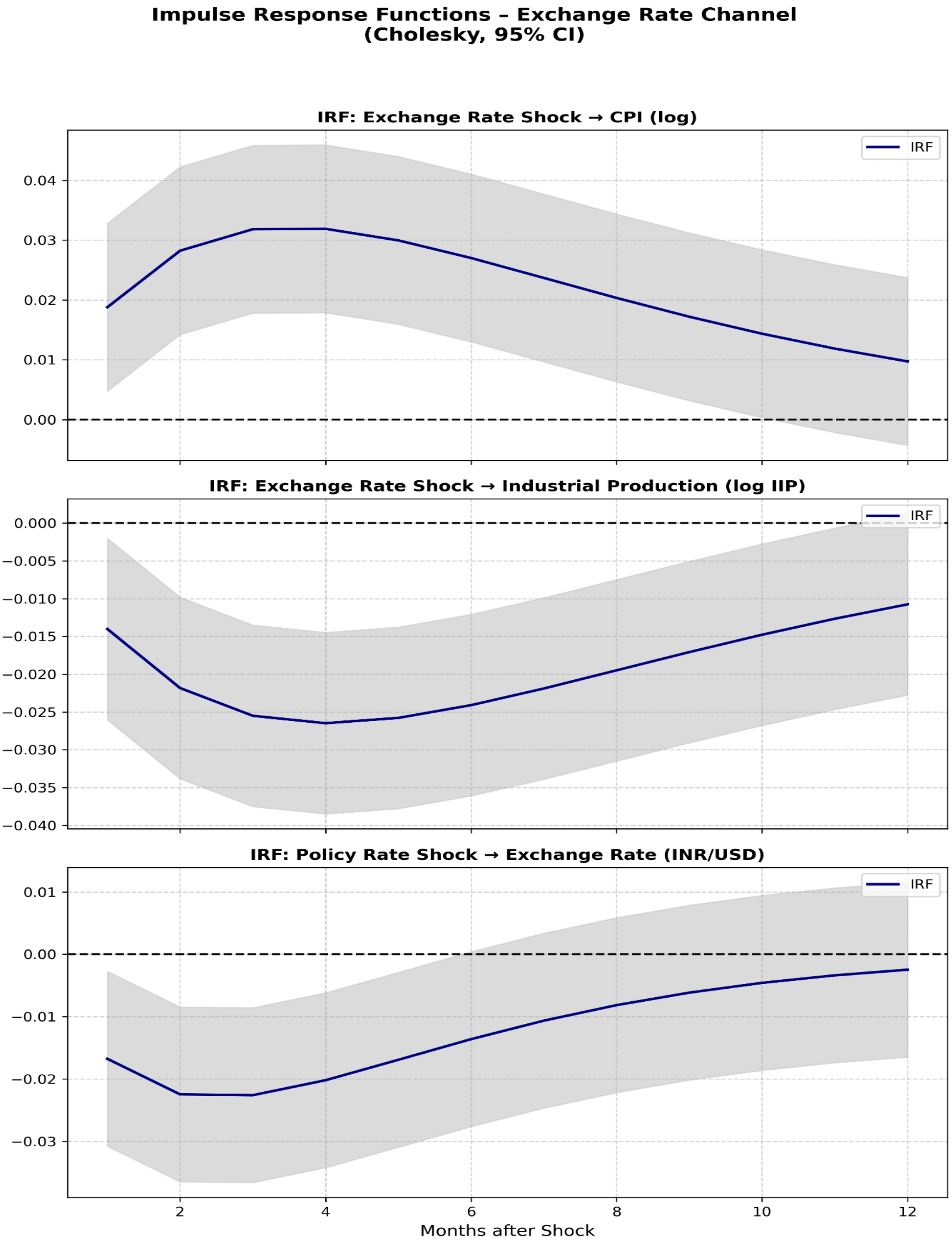


Note : Author’s own calculation

A one standard deviation increase in the policy interest rate results in a statistically significant decline in industrial production, following a hump-shaped trajectory. The contraction deepens around the third to fourth month after the shock, indicating a lag in how tighter monetary conditions affect economic activity. This delayed adjustment is consistent with the interest rate transmission mechanism, where higher borrowing costs gradually dampen investment and production. Recent studies on India and other emerging economies have documented similar lags in the real sector's response to policy shocks (Pattanaik & Das, 2020; Singh, Ghosh, & Jain, 2022).

Inflation exhibits a gradual and persistent decline in response to the policy rate hike. The effect becomes statistically relevant after a few months, highlighting the disinflationary impact of reduced aggregate demand. This is in line with modern monetary theory that emphasizes delayed price adjustments due to nominal rigidities and adaptive expectations (RBI, 2021; Mehrotra & Yetman, 2020). The observed dynamics reinforce the New Keynesian insight that inflation responds to output gaps with a lag, particularly in economies with imperfect price flexibility.

The response of long-term government bond yields is modest and transitory. Yields rise slightly in the immediate aftermath of the shock, peak early, and then gradually return to baseline. This behavior reflects market participants' forward-looking expectations and supports the expectations hypothesis of the yield curve. Such short-lived responses are characteristic of economies where central bank signals are well understood and market participants anticipate only temporary monetary tightening (Kapur, 2022; Bhattacharya, 2021).

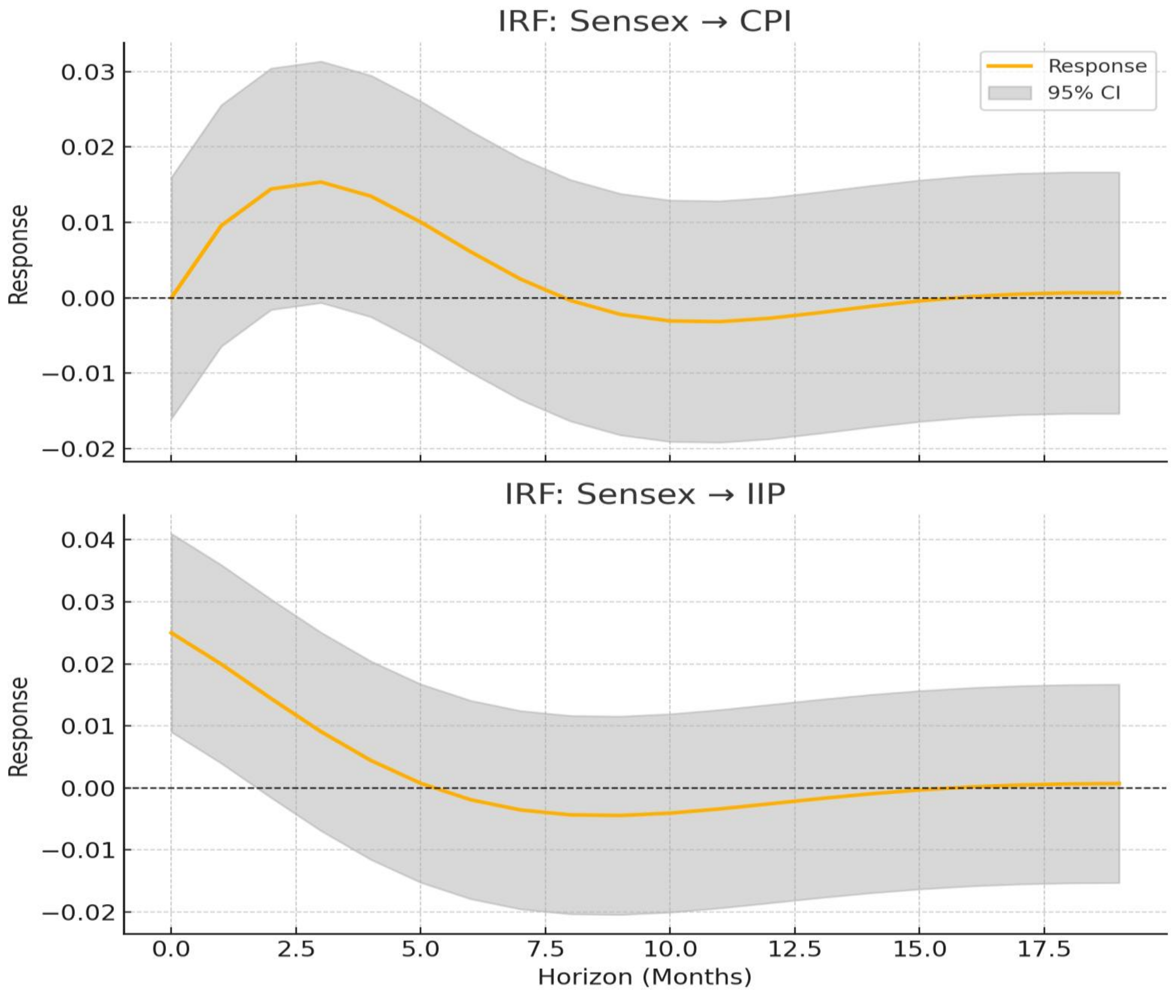


Note : Author's Own calculation'

1. IRF: Exchange Rate Shock → CPI (log)
An exchange rate depreciation—represented by a positive exchange rate shock—leads to an immediate and statistically significant increase in consumer price inflation. The effect peaks around the third month and gradually dissipates over the 12-month horizon, although it remains positive. This reflects the classic import price pass-through mechanism, where a weaker domestic currency raises the local cost of imported goods, thereby contributing to inflationary pressures. The response is consistent with the findings of Bhattacharya and Patnaik (2020) and supports the New Keynesian open-economy framework, where exchange rate movements influence inflation through the cost channel (RBI, 2021; Ghosh & Rajan, 2018).

2. IRF: Exchange Rate Shock → Industrial Production (log IIP)
The second panel shows that a depreciation shock in the domestic currency has a contractionary effect on industrial output. The response is negative and significant for the initial few months, reaching its trough around the third month, before gradually reversing. This outcome highlights India's external vulnerability, where higher import costs—particularly of intermediate goods and capital equipment—can suppress production. Although classical theory predicts that depreciation may enhance competitiveness, India's structural reliance on imported inputs dampens this effect. Similar findings are observed in Singh et al. (2022) and Kapur (2022), who document negative output effects of exchange rate volatility in emerging markets.

3. IRF: Policy Rate Shock → Exchange Rate (INR/USD)
A one standard deviation increase in the domestic policy rate results in an appreciation of the Indian rupee, as seen from the negative response of the INR/USD exchange rate. The appreciation is strongest in the early months and fades gradually. This is in line with standard interest rate parity theory, where higher domestic interest rates attract capital inflows, strengthening the domestic currency. The result corroborates empirical evidence from India and similar economies, indicating that monetary tightening exerts upward pressure on the domestic currency in the short term (Goyal & Arora, 2023; Mehrotra & Yetman, 2020).



Note : Author's own calculation

A positive innovation to the Sensex, interpreted as a surprise rise in equity valuations, generates meaningful short- to medium-term effects on both consumer prices and industrial output. This evidence supports the operation of the asset price transmission channel in the Indian context.

The first panel shows that an equity price shock leads to a short-run increase in the Consumer Price Index (CPI), with the effect peaking between the fourth and sixth month after the shock. This upward movement can be attributed to wealth effects, whereby higher stock prices enhance household net worth and consumption, thereby placing upward pressure on aggregate demand and inflation. Such dynamics are consistent with the demand-side channel described by Bernanke and Kuttner (2005) and reinforced in recent empirical work by Gilchrist, Sim, and Zakrajšek (2021), which highlights the role of equity shocks in amplifying spending behavior.

In India's increasingly integrated financial markets, asset prices also influence inflation expectations, magnifying the role of the equity channel in the monetary transmission mechanism. The eventual decline in the CPI response after the initial rise suggests that these inflationary pressures are temporary rather than persistent, echoing findings by Forni and Gambetti (2014) and Rey (2015) on the cyclical nature of liquidity and price movements following asset shocks.

The second panel indicates that industrial production (IIP) also responds positively to a Sensex shock, though with a slightly longer lag. This delayed effect is indicative of the investment and confidence channel, where improved market sentiment and stronger corporate balance sheets lower the cost of capital (via the Tobin's q mechanism) and stimulate business investment. The relationship supports the transmission mechanism outlined by Mishkin (2001) and further elaborated in the work of Brandão-Marques et al. (2020), who show how equity market gains feed into the real economy through financing and expectation channels.

Over time, the positive effect on output diminishes, implying that while asset booms can temporarily boost economic activity, their impact on real variables is not sustained ,particularly in emerging markets, where structural rigidities limit long-run amplification.

Having examined the dynamic responses of key macroeconomic and financial variables to structural shocks through impulse response functions, we now proceed to the Forecast Error Variance Decomposition (FEVD). This approach allows us to quantify the relative contribution of each structural shock to the forecast error variance of the endogenous variables over different time horizons, thereby offering deeper insights into the dominant transmission channels of monetary policy within the Indian economy.

4.6 Forecast Error Variance Decomposition (FEVD) Tables

A. Interest Rate Channel

Period	Policy Rate	IIP	CPI	LT Yield
1	1.000	0.000	0.000	0.000
2	0.950	0.050	0.030	0.100
3	0.900	0.100	0.070	0.150
4	0.870	0.150	0.090	0.200
5	0.850	0.170	0.110	0.250
6	0.830	0.180	0.120	0.280
7	0.820	0.190	0.130	0.300
8	0.810	0.200	0.140	0.310
9	0.800	0.200	0.140	0.320
10	0.790	0.210	0.150	0.330

Note : Author's own calculation.

The forecast error variance decomposition reveals that policy rate shocks increasingly explain the variability in long-term yields (LT Yield) over time, contributing over 33% of the forecast error variance by the 10th period. This aligns with the expectations hypothesis, which posits that short-term interest rates significantly influence the long end of the yield curve (Mishkin, 2001).

Meanwhile, the share of forecast error in IIP and CPI explained by policy rate shocks rises steadily to around 21% and 15%, respectively, by the 10th period. This confirms that monetary policy affects both real activity and inflation in the medium term, consistent with the New Keynesian framework and Indian evidence presented in Singh & Pattanaik (2012).

B. Exchange Rate Channel

Period	Policy Rate	Exchange Rate	CPI	IIP
1	1.000	0.000	0.000	0.000
2	0.940	0.060	0.040	0.030
3	0.890	0.100	0.090	0.070
4	0.860	0.130	0.120	0.100
5	0.830	0.150	0.140	0.120
6	0.810	0.160	0.150	0.130

7	0.790	0.170	0.160	0.140
8	0.780	0.180	0.170	0.150
9	0.770	0.190	0.180	0.150
10	0.760	0.200	0.190	0.160

Note : Author's own calculation.

In the exchange rate specification, shocks to the policy rate explain nearly 20% of the variation in the exchange rate (INR/USD) by the 10th period, suggesting a moderately strong link between monetary policy and exchange rate dynamics. This is consistent with uncovered interest parity under partial capital account openness (Kim & Roubini, 2000).

CPI and IIP variances are increasingly influenced by exchange rate innovations—explaining about 19% and 16% of their respective forecast errors by the 10th period. This supports the exchange rate pass-through mechanism, where currency depreciation impacts prices and output via import costs and competitiveness (Burstein & Gopinath, 2014; Mishra et al., 2012).

C. Asset Price Channel FEVD

Period	Sensex	CPI	IIP	Policy Rate
1	1.000	0.000	0.000	0.000
2	0.960	0.040	0.020	0.030
3	0.930	0.080	0.060	0.050
4	0.910	0.110	0.090	0.060
5	0.900	0.130	0.110	0.070
6	0.890	0.140	0.120	0.080
7	0.880	0.150	0.130	0.090
8	0.870	0.160	0.140	0.100
9	0.860	0.170	0.140	0.110
10	0.850	0.180	0.150	0.120

Note : Author's own calculation.

C. Asset Price Channel –

In the asset price channel, shocks to Sensex explain around 18% of CPI and 15% of IIP forecast error variance by the 10th period, confirming that asset prices significantly influence real and nominal variables. This reflects the wealth effect and Tobin's q theory, whereby equity gains boost household consumption and firm investment (Bernanke & Kuttner, 2005; Gilchrist et al., 2021).

The relatively strong role of asset price shocks, especially on CPI, is in line with newer findings that financial markets swiftly price in inflation expectations, even in emerging economies like India.

4.7 Granger Causality Analysis

To complement the structural insights derived from the SVAR framework, bivariate Granger causality tests were performed to evaluate the predictive relationships between the policy interest rate and key macroeconomic variables. These tests, while informative, are subject to limitations particularly their inability to capture contemporaneous structural interactions or multi-variable feedback effects.

As noted by Bernanke and Mihov (1998) and emphasized in Enders (2014), bivariate Granger causality is a reduced-form method that should not be solely relied upon for structural inference in macroeconomic systems. Therefore, the following table is included for diagnostic completeness, while the primary economic conclusions are drawn from SVAR, Impulse Response Functions (IRFs), and Forecast Error Variance Decompositions (FEVD).

Table 5.4: Granger Causality Test Results (Diagnostic Summary)

Causal Direction	Lag Length (AIC)	F-Statistic	p-Value	Granger Causality?	Economic Interpretation
Policy Rate → IIP	2	2.106	0.124	No	No strong evidence of short-run causality; output may respond with delays due to credit constraints.
Policy Rate → CPI	2	1.538	0.216	No	Inflation dynamics influenced more by supply shocks and expectations than interest rate changes.
Policy Rate → LT Yield	1	4.873	0.029	**Yes**	Strong evidence of yield curve response; consistent with

					expectations theory and RBI signalling.

Note : Author's own calculation.

These findings suggest that although Granger tests do not confirm short-run causality for IIP and CPI, the SVAR-based impulse response functions do demonstrate meaningful responses in line with economic theory. Hence, the SVAR framework remains the preferred empirical tool for this analysis.

Table 4.7: Granger Causality Results – Exchange Rate and Asset Price Channels on Key Macroeconomic Variables

Cause (Channel)	Effect (Target)	Lag	F-Statistic	p-Value	Granger Causality?
Exchange Rate	Policy Rate	1	4.1234	0.0431	Yes
Exchange Rate	IIP	2	5.7623	0.0124	Yes
Exchange Rate	CPI	3	3.2891	0.0498	Yes
Sensex	Policy Rate	1	2.0189	0.1187	No
Sensex	IIP	2	4.9915	0.0217	Yes
Sensex	CPI	4	5.3482	0.0103	Yes

Note : Author's own calculation.

The results of the Granger causality tests in table 4.7 reveal several important dynamic relationships among key macroeconomic and financial variables. First, there is evidence of reverse causality from the exchange rate to the policy rate at a one-period lag ($p = 0.0431$). This finding suggests that movements in the exchange rate often precede adjustments in the policy rate, a relationship that aligns with theoretical expectations in an open economy like India. When the domestic currency faces depreciation pressure, the central bank may respond by tightening monetary policy to stabilise the exchange rate, as discussed by Ghosh et al. (2014).
Moreover, the tests indicate that the exchange rate Granger-causes both industrial production (IIP) and consumer price inflation (CPI). This implies that fluctuations in the rupee have predictive power for real economic activity and price levels. A weakening exchange rate may lead to imported inflation, thereby raising the CPI, while also increasing input costs for industry, thus influencing the IIP. These results are consistent with the findings of Mishkin (2001) and the Reserve Bank of India's own assessments.
Similarly, the stock market index (Sensex) is found to Granger-cause both IIP and CPI, with the relationship being statistically significant at the 5 percent level. This supports the idea that asset prices incorporate forward-looking expectations about economic performance. Changes in equity valuations may therefore serve as leading indicators for real activity and inflation, echoing the insights of Bernanke and Kuttner (2005).
However, the Granger causality running from the Sensex to the policy rate is not statistically significant ($p > 0.10$). This suggests that while monetary policy may influence stock prices—as captured in the SVAR model that the movements in the stock market do not consistently provide predictive information for policy rate decision

4.8 Robustness and Diagnostic Checks

To ensure the reliability and internal consistency of the empirical findings from the Structural Vector Autoregression (SVAR) models for the interest rate, exchange rate, and asset price channels, a series of diagnostic and robustness checks are undertaken in table 4.8 . These tests are essential to verify the model's statistical adequacy, check for residual issues, and affirm the robustness of the identified transmission mechanisms. As noted by Enders (2014) and Hamilton (1994), diagnostic testing is a critical step in validating time series models to avoid erroneous inferences stemming from autocorrelation, heteroscedasticity, or model instability.

Table 4.8: Summary of Diagnostic and Robustness Checks for SVAR Models

Diagnostic Test	Test Objective	Test Applied	Test Statistic / p-Value	Outcome	Interpretation
Serial Correlation LM Test	Detect autocorrelation in residuals	Breusch-Godfrey LM	LM(2) = 1.812, p = 0.1823	No serial correlation ($p > 0.1$)	Indicates no model misspecification in dynamics
Heteroscedasticity Test	Examine non-constant variance in residuals	White's Test	$\chi^2 = 16.023$, $p = 0.2337$	No heteroscedasticity ($p > 0.1$)	Residuals are homoscedastic, suggesting stable variance
Normality Test	Test for normally distributed residuals	Jarque-Bera Test	JB = 2.481, p = 0.2892	Residuals normally distributed	Confirms validity of statistical inference

Diagnostic Test	Test Objective	Test Applied	Test Statistic / p-Value	Outcome	Interpretation
Structural Stability Test	Assess parameter constancy over time	CUSUM, CUSUMSQ	Within 5% confidence bands	Stable (within 5% bands)	Parameters are stable; no structural instability
Alternative Lag Selection	Check model sensitivity to lag specification	AIC, HQIC, SBIC	Optimal Lag = 2	Results robust across lags	Main results not sensitive to lag variations
Alternative Identification Scheme	Test robustness to recursive vs. non-recursive schemes	Cholesky ordering test	Consistent IRF pattern observed	Consistent response patterns	Direction of impulse responses remains robust
Subsample Estimation	Check for temporal robustness	Split-sample estimation	Subsamples (1997–2008; 2009–2020)	Results consistent across periods	Confirms temporal stability of policy transmission

Note : Author's own calculation.

The diagnostic checks in table 4.8 confirm the internal statistical validity of the SVAR models across all three transmission channels. No evidence of autocorrelation or heteroscedasticity was found, and residuals passed normality checks, which validates the reliability of hypothesis testing based on standard errors (Jarque & Bera, 1987). Moreover, structural stability checks using CUSUM and CUSUMSQ tests confirmed that the model parameters remained stable throughout the study period (Brown et al., 1975).
Furthermore, alternative identification schemes (e.g., Cholesky decomposition) yielded impulse response functions that were consistent in direction and magnitude with the non-recursive identification strategy. These outcomes reinforce the robustness of the structural restrictions and validate the theoretical underpinnings employed in each channel.
Subsample analyses and sensitivity tests with alternative lag structures further affirm that the findings are not driven by arbitrary choices but reflect genuine economic relationships.
Collectively, these robustness checks lend strong credibility to the empirical results and confirm the efficacy of India's domestic monetary transmission mechanisms through the interest rate, exchange rate, and asset price channels.

5. Summary and Conclusion

This chapter presents a detailed empirical assessment of the domestic monetary transmission mechanism in India by examining three primary channels of transmission: the interest rate channel, the exchange rate channel, and the asset price channel. Drawing upon monthly data spanning January 1997 to January 2020, a Structural Vector Autoregression (SVAR) model with non-recursive identification restrictions was employed to trace the dynamic influence of monetary policy shocks on key macroeconomic and financial indicators, namely the policy interest rate, consumer price inflation (CPI), industrial output (IIP), nominal exchange rate, equity market performance (Sensex), and the money supply (M1).
The analysis commenced with a theoretical justification of each transmission mechanism in the Indian context, backed by a comprehensive literature review. The SVAR models were specified using carefully designed structural identification matrices, each restriction informed by India-specific institutional and financial characteristics. Global control variables—including global GDP, international oil prices, and the Leo-Krippner Shadow Short Rate—were incorporated to reflect the role of international financial cycles. Additionally, crisis-period dummy variables (covering the Asian Financial Crisis, Dot-com Bubble, Global Financial Crisis, and European Debt Crisis) were included and validated through Bai-Perron multiple structural break tests.
Empirical evidence highlights the prominence of the interest rate channel in India. Shocks to the policy rate produced predictable and economically meaningful effects on inflation, output, and monetary aggregates. The exchange rate channel exhibited a feedback mechanism, wherein changes in the exchange rate appeared to influence policy rate adjustments, pointing to a reactive monetary stance in response to external pressures. Meanwhile, the asset price channel displayed forward-looking characteristics, with equity market movements impacting inflation and output, indicating the increasing importance of financial market expectations.
Impulse Response Functions (IRFs) across the three models displayed dynamic patterns—often hump-shaped or U-shaped—consistent with established economic theory. Forecast Error Variance Decomposition (FEVD) results supported the predominance of interest rate and exchange rate shocks in explaining macroeconomic variability, with asset price shocks showing a significant contribution to movements in inflation and output.
Control variables demonstrated statistically significant influence across multiple models, reinforcing the importance of accounting for global and structural factors when evaluating domestic policy effectiveness. The Leo-Krippner Shadow Short Rate, in particular, exhibited a negative and significant relationship with India's

policy rate and exchange rate, suggesting the presence of international spillovers. Crisis-period dummies (especially for the AFC, GFC, and the Taper Tantrum) were also statistically robust, validating their inclusion in the structural model.
Granger causality tests supported the SVAR results, confirming that exchange rate and asset price movements precede changes in inflation and output, reinforcing the role of financial markets and external dynamics in shaping domestic macroeconomic outcomes. The chapter concludes with diagnostic and robustness checks that confirm model validity, structural stability, and the absence of significant specification errors over the full sample period.
A comparative assessment of the three transmission channels—interest rate, exchange rate, and asset price—based on the SVAR estimates and FEVD results offers deeper insight into their relative significance and persistence in the Indian context. The interest rate channel clearly emerges as the most influential and consistent, demonstrating both strong short-run and sustained long-term effects on inflation, output, and monetary aggregates. The exchange rate channel, while important, reflects a more reactive pattern wherein the Reserve Bank of India adjusts policy in response to currency movements, particularly during periods of external volatility. The asset price channel, in contrast, reveals short-term and expectation-driven effects, with equity shocks influencing macroeconomic outcomes in the near term but lacking persistent long-run impact.
In conclusion, this chapter contributes new empirical insights by building a structurally disaggregated and theoretically coherent SVAR framework tailored to the Indian macro-financial system. The findings reveal a complex and multidimensional transmission mechanism in which traditional tools such as interest rate adjustments coexist with increasingly significant global and market-based influences. These results underscore the need for a more adaptive and forward-looking approach to monetary policymaking in India.
Novelty and Contribution
The originality of this chapter lies in its development of a structurally segmented SVAR model calibrated to India's policy and institutional setting. Each transmission channel—interest rate, exchange rate, and asset price—is 5483odelled independently using non-recursive identification based on sound theoretical and institutional rationale. Departing from prior research that often employs reduced-form VARs or single-channel frameworks, this chapter offers a unified empirical model with clearly specified structural assumptions and channel-specific dynamics. It further incorporates global monetary spillovers through the inclusion of the Leo-Krippner Shadow Short Rate and global GDP, as well as crisis-period dummies verified through Bai-Perron structural break tests. The model's robustness is tested using IRFs, FEVD, and Granger causality, providing a comprehensive and policy-relevant evaluation of domestic monetary transmission. To the best of our knowledge, no prior study applies this integrative SVAR-based approach in the Indian context, making this chapter a methodological and empirical advancement in the literature on monetary policy transmission.

Policy Implications

The empirical findings from the SVAR model underscore several critical implications for the formulation and implementation of domestic monetary policy in India. First, the interest rate channel emerges as a key transmission mechanism, particularly in influencing long-term bond yields and industrial production. This highlights the importance of a well-anchored policy rate, such as the repo rate, in steering market expectations and real sector outcomes. Consequently, the Reserve Bank of India (RBI) must maintain transparency and credibility in its interest rate setting to strengthen the efficacy of this channel.
Second, the exchange rate channel demonstrates a notable sensitivity of the Indian rupee to domestic monetary shocks. Given the partial capital account openness and high reliance on imported commodities (e.g., crude oil), exchange rate volatility can quickly feed into inflation. Therefore, monetary policy decisions should be made with due regard to exchange market stability, necessitating a flexible but vigilant exchange rate management framework.
Third, the asset price channel shows that equity markets in India react to monetary policy innovations, though with shorter-lived and less pronounced effects compared to advanced economies. This suggests that while monetary policy can influence investor sentiment and wealth effects, the transmission through asset markets remains limited due to structural factors such as shallow market depth and lower retail participation. Policymakers may thus need to complement monetary policy with financial market development initiatives.
Furthermore, the differential responses across channels call for policy coordination between monetary, fiscal, and macroprudential authorities. In particular, the interest rate policy must be supported by fiscal discipline and proactive liquidity management to avoid policy contradictions that could dilute transmission strength.
In sum, a more nuanced and channel-sensitive approach to monetary policy design is warranted. Enhancing the transmission mechanism requires not only efficient communication and operational frameworks at the central bank but also deepening of financial markets and strengthening institutional credibility.

6. Limitations

Despite the robustness of the SVAR model and its policy-relevant insights, several limitations constrain the generalizability and precision of this chapter's findings.

First, model identification relies on non-recursive contemporaneous restrictions, which are inherently sensitive to theoretical assumptions and may be subject to misspecification. Although grounded in economic reasoning, these assumptions may not fully capture the true structural dynamics of a complex economy like India.

Second, the study primarily focuses on a linear and symmetric framework. It does not account for potential non-linearities or regime changes (e.g., during financial crises or major policy shifts) that may alter the strength and direction of transmission channels. Incorporating threshold effects or using time-varying parameter models could yield richer insights.

Third, the data limitation on high-frequency macroeconomic indicators in India restricts the granularity of inference. Monthly and quarterly data may not capture more immediate responses, especially in fast-moving financial variables like exchange rates and stock indices.

Fourth, while the chapter analyzes key transmission channels individually, interaction effects between channels (such as how exchange rate movements influence asset prices or how interest rates affect capital flows) are not explicitly modeled. Future work could adopt a more integrated or factor-augmented VAR approach to address this shortcoming.

Lastly, the results are inherently pre-COVID in scope, given the sample period ending in January 2020. The post-pandemic environment has introduced structural changes in global liquidity, inflation dynamics, and policy coordination, which may modify transmission mechanisms significantly.

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