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India's credit growth and asset prices' movements; Does the global financial cycle have a moderating role to play?

Evolución del crecimiento del crédito y de los precios de los activos en la India; ¿Desempeña el ciclo financiero mundial un papel moderador?

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Abstract

This study examines the effect of the global financial cycle on different financial indicators of the Indian economy through experimental analysis. It detects evidence of a connection between contemporaneous changes in capital flows, asset prices, and credit growth, which are related to the Global Financial Cycle (GFCy). The evolution of the cycle is largely driven by the monetary policy decisions of the Federal Reserve, and existing studies have examined the influence of these decisions in different contexts. The current study experimentally examines the effect of the global financial cycle on credit growth and asset prices in India during the period 2010-2023. For the purpose of achieving its goals, the study utilizes advanced time-series econometric techniques, such as the Granger Causality Test, Vector Autoregression (VAR) methodology, and the Impulse Response Function (IRF) test. The outcomes show that the global financial cycle has significant effects on the stock market, as confirmed by the Granger causality and IRF findings.

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JEL Code: G15, E44, E51, E39, G10
Keywords: global financial cycle; asset prices; financial markets; emerging economy; vector autoregression

Resumen

Este estudio examina el efecto del ciclo financiero global en diversos indicadores financieros de la economía india mediante análisis experimental. Detecta evidencia de una conexión entre las variaciones simultáneas en los flujos de capital, los precios de los activos y el crecimiento del crédito, que están relacionadas con el Ciclo Financiero Global (CFG). La evolución del ciclo está impulsada en gran medida por las decisiones de política monetaria de la Reserva Federal, y estudios previos han examinado la influencia de estas decisiones en diferentes contextos. El presente estudio examina experimentalmente el efecto del ciclo financiero global en el crecimiento del crédito y los precios de los activos en India durante el período 2010-2023. Para lograr sus objetivos, el estudio utiliza técnicas econométricas avanzadas de series temporales, como la prueba de causalidad de Granger, la metodología de autorregresión vectorial (VAR) y la prueba de la función de respuesta al impulso (FRI). Los resultados muestran que el ciclo financiero global tiene efectos significativos en el mercado de valores, como lo confirman los hallazgos de causalidad de Granger y la FRI.

Código JEL: G15, E44, E51, E39, G10
Palabras clave: ciclo financiero global; precios de los activos; mercados financieros; economía emergente; autorregresión vectorial

Introduction

Asian Financial (1997-98) and Global Financial Crisis (2007-08) have made policymakers and academicians learn important lessons regarding the influence of external factors on the domestic economy. Previous empirical studies have found that the impact is more severe in emerging economies (Blanchard et al., 2010; Bruno & Shin, 2013; Sahay et al., 2014). Post Global Financial Crisis, many developed and emerging countries took various extraordinary monetary policy measures to boost the aggregate demand. These extraordinary or unconventional monetary policy measures (UMPs) ranged from ultra-lower policy rates to large-scale asset purchase programs (LSAPs) to reduce long-term interest rates to stimulate investment. Since 2009-10, UMPs in the US, in particular, have injected unprecedented liquidity into the system through LSAPs and thus led to lower volatility in financial markets (Chari et al.;2020). Prolonged low global interest rates increased investors' risk-taking as they switched their investments to emerging markets, searching for higher returns (Miyajima et al., 2014). The spillover effects of an upsurge in global liquidity to emerging markets have been immense. In addition to this, the majority of the emerging Asian economies have adopted liberalized policies since the 1990s and have received an increased amount of foreign capital of $ 25.035 billion per year in 2000 to $ 199.698 billion per year in 2020 (World Economic Outlook, 2020). Global banks are the channel of transmission of such flows through their leverage cycle

and risk-taking channel (Bruno & Shin, 2013; Adrian & Shin, 2010). The domestic currency appreciates as a result of increasing capital flows caused by higher global liquidity.

Moreover, currency appreciation helps financial institutions that borrow in foreign currencies strengthen their balance sheets. (Hofmann et al., 2016). Their financial assets increase relative to their liabilities, and thus improvement in balance sheet makes them appear creditworthy and reduces the risk premiums. They can attract more borrowing and also can lend in the domestic markets if lending conditions are relaxed. This can lead to credit expansion and a credit boom in the domestic markets, which can lead to a crisis-like situation if not handled properly (Gournichas & Obstfeld, 2012). The simultaneous movement of capital flows also leads to the co-movement of asset prices. In this vein, Aggripano & Rey (2012) found that 25% of the variation in risky assets (equity markets) is explained by the global factor, which is called the Global Financial Cycle (GFCy). Wide fluctuations in the financial conditions globally due to UMPs in the US impact financial markets like the stock market, real estate market, and credit growth. In this context, Baks & Kramer (1999) learned that global monetary expansion had a significant impact on the stock prices of G7 countries.

On the other hand, Darius, (2010) studied that global liquidity affects property prices but not stock prices. The literature on the impact of the GFCy on credit growth and asset prices of emerging countries is scarcer. As one of the important emerging market economies, India has received quite a large supply of capital flows since the global financial crisis. Since the global financial crisis, India has received a gross flow growth of 127%. In this context, we hypothesize that an increased supply of liquidity could have an impact on domestic credit growth and the asset prices of an Indian Economy. Nevertheless, no existing study has studied the effects of the global financial cycle on an Indian economy's asset markets. Therefore, this study makes an attempt to analyze how the GFCy influences the asset markets of India and for that purpose, India's credit, stock market, and property prices are considered.

The study makes the following important contributions to the current body of literature. First, this study empirically estimates the impact of the global financial cycle components on the Indian economy's asset prices and credit growth. There are no research studies, as per the best of our knowledge, that have specifically investigated this effect. Most of the studies take EMEs as a whole. Still, idiosyncratic characteristics are not considered while studying the impact of the GFCy on asset prices and credit growth.

Moreover, the previous literature has ignored the impact of the GFCy components on asset prices and credit growth of Emerging Market economies (EMEs (Cerutti et al., 2017; Habib &Venditti, 2019). Most of the existing studies have focussed on the impact of the GFCy on the international capital flow movements of the EMEs Second, it takes the measure of the GFCy as total credit to non-US non-

bank borrowers outside the US. The reason to take this as a measure is to account for cross-border flows and bond issuance in US dollars by non-US corporations, mainly in emerging markets. This includes cross-border loans and the issuance of bonds which are the main components of external debt financing. The role of external debt securities has increased compared to cross-border loans post-crisis. Most of the studies take the volatility index to measure the global financial cycle, but that does not signify the market-driven and policy-driven liquidity (Choi et al., 2017). We believe that this research paper contributes to filling the gap in the literature on finding the role of key components of the GFCy on asset markets and credit growth of an Indian economy during the phase of expansion of global liquidity post-global financial crisis.

The study is presented as follows. The following part of this paper will discuss the role of the GFCy in determining the financial conditions in EMEs. Section 3 presents the empirical model and describes the sources of data used in the study and the methodology used to estimate the empirical model. Section 4 estimates the empirical model and presents the results of the empirical study. Finally, Section 5 gives the conclusion of the study and also discusses the policy implications

Review of literature and theoretical framework

In the past, major global events have highlighted the sensitivity of global risk on the emerging economies' financial markets and asset prices (Lodge & Manu, 2022). In this context, Rey (2015) identified that GFCy signifies the simultaneous movement of cycles of asset prices, capital flows, and credit growth across the globe. The drivers of the global financial cycle are the US Monetary policy decisions and the risk aversion of international investors. Rey (2015) explained that the phenomenon of the GFCy has two dimensions: gross capital flows and asset prices. Lowering of rates by the Federal Reserve triggers a fall in the risk aversion of the investors, which is indicated by the VIX (Volatility Index) and leads to an enormous increase in capital inflows to the EMEs in search of higher yields (Bekaert et al.; 2013; Rey,2015; Forbes & Warnock (2012). Bruno & Shin (2015) highlighted the leverage cycle of international banks as a channel of transmission of cross-border capital flows to EMEs. The increase in cross-border flows to the EMEs after the slashing of rates by the Federal Reserve leads to currency appreciation in the recipient countries. This is also signified by a reduction in risk aversion of markets (a lower VIX). This facilitates the international banks to borrow even more as currency appreciation makes their balance sheets look stronger. The reduction in the risk premium and an overall increase in credit standing due to strengthening balance sheets and lower VIX induce them to take more risk by borrowing more. The expansion of the balance sheets accompanied by lowering volatility and interest rates leads to increased lending, which

releases an abundant supply of financial funding resources. This availability of funding then chases for the available risky assets for purchase which provides higher returns. The model suggested by Bruno & Shin (2015) points out that the changes in US unconventional monetary policy decisions are transmitted internationally through the changes in risk aversion of the markets and investors, which drive the risky asset prices of EMEs. This happens by affecting the leverage and lending of global banks and thereby the portfolio flows (capital flows) to the emerging economies.

The theoretical framework between global risk, gross capital flows, and EMEs asset prices is explained by several authors (Rey, 2015; Yildirim, 2016). The boom phase of higher international liquidity starts with decreased interest rates associated with funding currencies. The most traded currency in the international financial markets is US dollars. Reduced yields on the securities denominated in US dollars encourage investors to reallocate their portfolios by including more profitable assets. The type of investors for the purpose of this framework is defined by Rey (2015) as global banks and asset managers. The increase in borrowings by the global banks due to a reduction in risk aversion makes them invest in risky assets in dollars to increase returns. Asset managers also have access to the assets traded by the global banks, but they hold part of their wealth in regional assets in order to maximize returns and, thereby, their wealth. This share of portfolio allocation in emerging markets depends on the overall degree of risk aversion in the markets. Bond markets have exceeded as a transmission channel, particularly after the global financial crisis (Shin, 2014). There was a surge in the issuance of debt securities by non-financial firms across the borders after the global financial crisis (Shin,2014). Therefore, when Federal Reserve reverse rates in the bust phase, investors settle their positions in the emerging markets to pay off their debts in the US dollars. This leads to the reallocation of their portfolios by reducing investments in emerging markets. This leads to an impact on asset prices of emerging markets. The transmission of global risks to EMEs also depends on the macroeconomic fundamentals of markets and may vary per asset class and country (Yildrium, 2016; Ghosh et al., 2014). This was also evident when Fed Chief Ben Bernanke announced the normalization of unconventional monetary policy actions in 2013, primarily called the Taper Tantrum. Some countries were affected larger than other countries because of their macro-economic fundamentals (Mishra et al.;2014)

There has been an increase in credit in US dollars to non-bank borrowers outside the US. US dollar credit provided to non-banks to non-US borrowers has increased post-crisis relative to world Gross domestic product (GDP). By mid-2020, since the pandemic, it has exceeded 12 trillion USD, which is approximately more than 14% of world GDP. The same figure was less than 10% in 2007 (Lorenzo Forni et al., VOX Column, 2021). This form of external financing has received increased attention due to its more than expected rise in emerging markets. Many factors are responsible for this growth: reduction in

rates of interest by the advanced economies, increasing financial integration of emerging markets, fall in risk aversion of international investors and search for higher yields, and ease in financing/global liquidity conditions (Miyajima et al.; 2014; IMF, 2016). The recent increasing amount of debt inflows to EMEs has raised a big question: What will be the impact when Federal Reserve makes policy reversals. The COVID situation worsened the fears as, at that time, dollar revenues and earnings were lesser as compared to the dollar liabilities. But the lowering of rates by the Federal Reserve in 2020 made these dollar credits flow down again immensely towards EME bonds. There are various concerns regarding increased debt flows to EMEs at the micro-level and macro-level. They are more likely to be concentrated in larger corporations, impacting income distribution and output growth in these economies. At the macro level, the capricious nature of these short-term flows can have an impact on the macro-economic and financial stability of these economies (Goyal et al., 2021., Forbes & Warnock, 2012). Therefore, the impact on asset prices and credit growth created by the GFCy for an important emerging market like India is also very important to be investigated.

Therefore, we extend the literature on the GFCy, credit growth, and asset markets relationship by examining the Global Financial Cycle's effects on India's credit growth and asset prices from 2009 to 2023 by using the quarterly data.

Analytical framework for the linkage between global volatility and asset pricing

The theoretical framework proposed by Agrippano & Rey (2015) is used in this study. This model explains how worldwide asset prices are determined by the wealth distribution between asset managers and risk-neutral global banks. International banks can use leverage to invest in riskier assets (dollars) and borrow at a risk-free US rate. Since they are subject to VaR (Value at Risk Constraint), they are regarded as risk-neutral. This restriction was put in place by the authorities (BASEL II and BASEL IIII regulations). An upper limit known as the VaR limit forecasts the loss on an asset portfolio with a specific probability. The degree of risk aversion is comparable to this limitation. The asset manager is the second category of investor. Additionally, they can purchase riskier products on international markets and borrow at US risk-free rates. Additionally, regional assets that are not tradeable on financial markets are held by asset managers. This is due to the markets' asymmetry of knowledge. In this instance, the asset managers are typical mean-variance investors. Their intention to use leverage is constrained by their level of risk aversion.

The excess returns for tradable assets can be written according to the explained model:

$$\in_t (I_t + 1) = \partial VaR_t(I_t + 1)s_t + \partial CoV_t(I_{t+1}, I_{t+1}^N)x_t$$

I_t is the vector of return in dollars for all the tradable assets, s_t is the vector of net supplies of tradable assets and x_t is the vector of non-tradable assets. ∂ is denoted by the weighted average of risk aversion of both global banks and asset managers. The excess returns (risk premium) of assets depend on the volatility and variations of tradable assets (VaR) and also the co-movement between (CoV) traded assets (stock prices) and non-traded assets (property prices etc.). Therefore, returns that are in excess do have a common component which is global in nature. It is a function of the total volatility of traded risky assets and market risk aversion.

Data

Data measurement

The objective of the present study is to empirically investigate the impact of the GFCy on credit growth and asset prices of an Indian Economy. The present study uses data (quarterly) for India, spanning the period from 2010 to 2023. The data period is selected based on the availability of uniform and consistent data across time. The variables in this study are as follows: global financial cycle (measured in US$ million), Dollar credit outside the US to non-US and non-bank borrowers has been taken as a proxy for the GFCy (Prabheesh et al.; 2021). The other financial variables include credit to GDP, real equity prices, and real house prices. Both the Equity prices and residential prices are deflated by the consumer price index (CPI) and converted into real variables (Behera & Shamra, 2022). Residential Property Price Indices can be taken as a macro-economic indicator for economic growth. Tracking these prices is important because of the increased integration of the world markets (Belke & Orth, 2007). Housing Price Index (HPI) values are obtained from the data given by the Reserve Bank of India. All India index of housing prices has been taken for the same, and the All-India index is a weighted average of city indices. The weights for the same are based on population proportion. This composite index is taken as a proxy of housing Prices in India. The impact of the GFCy on the stock market is evaluated by taking the stock market Index of the Indian Market. The change in dynamics of international flows (esp the equity and debt flows) do affect the stock market (Brana et al.; 2016).

Similarly, Credit to the Private Non-financial Sector as a percentage of GDP (Gross Domestic Product) data have been used to investigate the impact of the GFCy on credit growth in India. The details of data sources have been given in Annex A1.

Methodology and empirical results

Empirical work on the time-series model assumes that variables under study are stationary. If wrong techniques are employed on non-stationary variables, then it might give spurious results. As the first step of an empirical analysis, the Augmented Dickey-Fuller test (ADF test) and Phillips-Perron Test (PP Test) have been applied to check the stationarity of the variables. The optimum lag length has been selected according to the Final Prediction Error method (FPE) and Akaike Information Criterion (AIC). Once the order of integration of the variable is determined, and if they are I (1) then cointegration among them needs to be found out. In order to ascertain the short-run causality among the variables, the Granger Causality test has been conducted. A serial correlation test and residual diagnostics test have been conducted to verify the robustness of the model.

VAR Model-Vector Autoregression Model

If the variables are stationary and are not cointegrated, the following equations would be used in the VaR Model:

$$lGLIB_t = \partial_0 + \sum_{i=1}^{p} \partial_{1i} lGLIB_{t-1} + \sum_{j=1}^{p} \partial\, 2j lPPG_{t-j} + \sum_{k=1}^{p} \partial\, 3k lSTOCKG_{t-k} + \sum_{l=1}^{p} \partial_{4l} CREDITG_{t-l} \quad (1)$$

$$lPPG_t = \emptyset_0 + \sum_{i=1}^{p} \emptyset_{1i} PPG_{t-1} + \sum_{j=1}^{p} \emptyset\, 2j lGLIB_{t-j} + \sum_{k=1}^{p} \emptyset\, 3k lSTOCKG_{t-k} + \sum_{l=1}^{p} \emptyset_{4l} CREDITG_{t-l} \quad (2)$$

$$lSTOCKG_t = \Delta_0 + \sum_{i=1}^{p} \Delta_{1i} lSTOCKG_{t-1} + \sum_{j=1}^{p} \Delta\, 2j lGLIB_{t-j} + \sum_{k=1}^{p} \Delta\, 3k lPPG_{t-k} + \sum_{l=1}^{p} \Delta_{4l} CREDITG_{t-l} \quad (3)$$

$$CREDITG_t = \cup_0 + \sum_{i=1}^{p} \cup_{1i} CREDITG_{t-1} + \sum_{j=1}^{p} \cup 2jlGLIB_{t-j} + \sum_{k=1}^{p} \cup 3klPPG_{t-k} + \sum_{l=1}^{p} \cup_{4l} lSTOCKG_{t-l} \quad (4)$$

These empirical equations comprise the VAR framework. Credit growth, stock returns, the global financial cycle, and the property price index are all modeled using internal and exogenous variable lags, accounting for both time-specific and country-specific fixed effects.

$lGLIB_t$ is the estimate for Global Financial Cycle at time t, $lPPG_t$ is the property price index at time t, $lSTOCKG_t$ is the stock returns estimate at time t, $CREDITG_t$ is an estimate of credit growth at time t.

The generalized Cholesky decomposition method is used to generate the forecast error variance decompositions (FEVD) and impulse response functions (IRFs) following the computation of the VAR coefficients. While the impulse response functions enable us to understand how the endogenous variables respond over time to a shock in another variable in the system, the forecast-error variance decomposition reveals the contribution of each shock to the source of variation of each endogenous variable at any given forecast period.

Analysis and results

Descriptive analysis

Table 1 and Figure 1 illustrate a clear trend of growth in world U.S. dollar credit to borrowers that are not banks outside the United States since 2010, which reflects sustained growth in world liquidity. While this increase in liquidity provides emerging markets with more access to capital, it increases their vulnerability to global financial shocks. The descriptive statistics reveal a high level of volatility in the major financial variables i.e, stock prices, property prices, and credit-to-GDP, revealed from the large values between their highest and lowest levels, especially for stock and residential property prices. Their different sensitivity to the Global Financial Cycle (GFCy) is demonstrated here by this variation. Stock prices are most sensitive to movements in the world economy due to their low skewness, near-normal distribution, and moderate standard deviation. They are both economically significant and statistically reliable for modeling the propagation of global shocks because they are highly liquid and able to react fast to changes in global risk appetite, interest rates, and capital flows. The credit-to-GDP ratio, while steady and well-spread, has little short-term volatility, suggesting that domestic structural factors

such as monetary policy, regulation, and demand for credit play a larger role in determining it than foreign shocks do.

On the contrary, property values show high negative skewness, volatility, and non-normality. These features are likely due to supply-side constraints, illiquidity, and macroprudential regulation, which make them respond incoherently and slowly to global economic changes. Finally, stock prices are the most economically responsive and statistically reliable variable for assessing global financial spillovers. By contrast, credit expansion and real estate values, although important, respond more slowly and erratically due to internal market and institutional imperfections.

The VaR (Vector Autoregression) model is employed to statistically identify the dynamic, time-series interrelationships between variables in order for us to validate the patterns identified in descriptive analysis by subjecting them to testing whether global financial shocks do affect domestic financial variables over time. It goes beyond static cross-sections to offer empirical evidence of response behavior and causality.

Table 1
Descriptive statistics of the variables

	Stock Price (lSTOCKG)	Property Price (lPPG)	Credit to GDP (CREDITG)	Global Financial Cycle (lGLIB)
Mean	5.9025	0.3193	0.0037	16.137
Median	5.2511	0.3636	0.0037	16.171
Maximum	5.7622	0.4701	0.0044	16.412
Minimum	4.9013	-0.0585	0.0033	15.679
Std deviation	0.2314	31.576	0.00028	0.2200
Skewness	0.3874	-1.2519	0.4878	-0.4928
Kurtosis	2.1487	3.7216	2.7327	2.0366
Jarque-Berra	3.0919	15.843	2.3881	4.4317
Probability	0.2131	0.00036	0.3029	0.1091

Source: own calculations

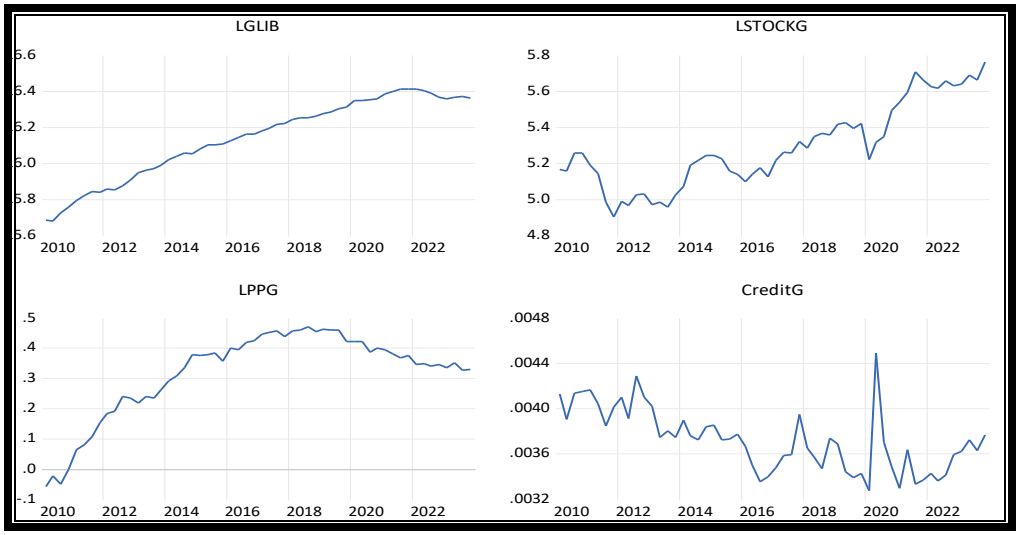

Figure 1. Graphical Presentation of the Variables
Source: own calculations

Lag selection criterion

After the study employed a time series VAR model, the Hannan-Quinn information criteria (HQ), Schwarz information criterion (SC), and Akaike information criterion (AIC) were utilized to determine the lag order estimate and selection. Because the results they produce are far more robust and robust, these information criteria were selected (Qu & Perron, 2007). SC and HQ methods are used for selection of lag length criteria as it is generally used for smaller samples.

Table 2
Lag Selection Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	501.036	NA	5.86	-19.11	-18.96	-19.059
1	751.16	452.15	7.21	-28.12	-27.37*	-27.834*
2	769.89	30.98*	6.57*	-28.22	-26.87	-27.709
3	785.57	23.50	6.58	-28.21	-26.26	-27.466
4	802.93	23.37	6.87	-28.26*	-25.71	-27.289

* Indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Unit root test results

The variables are in the form of indices. All the variables except the credit to GDP ratio variable and global financial cycle have been divided by CPI to get a real value of the variables and for ease of comparison. The global financial cycle variable has been transformed into logarithms. The results of ADF (Augmented Dickey Fuller Test) and Phillips-Perron tests for the stationarity of the variables is shown in Table 2. According to the tests, all the variables under study are integrated at level. If there is a presence of unit roots in the variables, it becomes more important to apply suitable techniques to achieve reliable results. Otherwise, there will be spurious results. Only one variable lSTOCKG is stationary at level as per ADF test, but according to PP test, the variable is integrated at level one. But for the analysis purpose, the results of ADF have been considered. Therefore, all the variables are considered to be stationary at level. Stationarity means that a time series has a constant mean, variance, and autocorrelation over time, which is key to the validity of VAR estimations. Use of VAR with non-stationary data will generate spurious results that invalidate the conclusions of the model (Hou et al.; 2023).

Table 3
Unit root results

Variables	Augmented Dickey Fuller Test		Phillips-Perron Test	
	Level		Level	
	t-stat	Prob.	t-stat	Prob.
lGLIB	-4.186	0.0016***	-3.865	0.0042***
lPPG	-4.161	0.0017***	-4.074	0.0023***
lSTOCKG	-4.612	0.0027***	-2.457	0.3474
CREDITG	-5.327	0.0003***	-5.361	0.003***

Source: Own calculations and *** and ** indicates 1% and 5% level of significance,

Regression results and granger causality test

The analysis is done for the global financial cycle (LGLIB) and its effect on India's stock price, property prices, and credit growth.

After obtaining the results of stationarity of variables and lag lengths, the next step is to check the results of VaR Model. Table 4 shows that past values of global financial cycle impact the current value of global financial cycle and lagged value of global financial cycle affect the stock prices, credit growth and property prices in the Indian Economy. Table 4 shows 97.97% of the variation in stock price appreciation is accounted for by the VAR system. This indicates robust dynamic connection between local asset prices and the global financial cycle. Only 51.09% of the variation in credit growth is accounted for,

i.e., this variable could be more affected by things beyond VAR model, e.g., regulatory policy, real economy considerations, or idiosyncratic shocks. The statistically significant coefficient of the lagged Global Financial Cycle (LGLIB(-1)) is only in the equation for growth in stock price, being 0.3675 (t = 2.30), and this means that global financial conditions have a very significant contemporaneous impact on Indian stock markets. The impact is statistically insignificant in the equations for property price and credit growth

Table 4
VaR Results

	lGLIB	lPPG	lSTOCKG	CREDITG
LGLIB(-1)	0.9210	-0.0078	0.3675	1.90
	(29.94)***	(-0.158)	(2.304)**	(0.0377)
R-Squared	0.9969	0.9319	0.9797	0.5109
Adjusted-R-Squared	0.9967	0.9264	0.9781	0.4718

t-statistic in () and ***, **, * represents significance at 1%, 5%, and 10%, respectively.

VAR output shows that the relationship among the variables exists, but it does not explain the causality or direction of the relationship. Even while VAR models are effective at capturing how several time series variables are interdependent, they are unable to establish causality or the direction of influence on their own. Other tests, like Granger causality and structural VAR approaches (Sims, 1980; Granger, 1969), are needed to establish causation.

Table 5
Granger Causality Test Results

Null Hypothesis	Observations	F-Statistic	Probability
lSTOCKG does not granger cause lGLIB	55	0.3958	0.5320
lGLIB does not granger cause lSTOCKG	55	4.7512	0.0338**
lPPG does not granger cause lGLIB	55	3.4388	0.0694*
lGLIB does not granger cause lPPG	55	3.1367	0.0824*
lCREDITG does not granger cause lGLIB	55	0.1289	0.7210
	55	15.569	0.0002***

lGLIB does bot granger cause lCREDITG			
lPPG does not granger cause lSTOCKG	55	1.729	0.1942
lSTOCKG does bot granger cause lPPG	55	4.103	0.0479**
lCREDITG does not granger cause lSTOCKG	55	1.079	0.3037
lSTOCKG does bot granger cause lCREDITG	55	6.839	0.0116**
lCREDITG does not granger cause lPPG	55	0.0489	0.8257
lPPG does bot granger cause lCREDITG	55	11.002	0.0017**

***, **, * significant at 1%, 5%, 10% level respectively, Source: Own calculations

Results of the Table 5 show that there is a unidirectional causality between stock prices and the global financial cycle. Granger causality tests identify a one-way effect of Global Financial Cycle on Indian stock prices, implying that domestic equity market behavior is substantially influenced by global financial conditions. This finding is consistent with the burgeoning literature emphasizing the vulnerability of emerging economies to global liquidity, risk sentiment, and patterns of capital flows. Changes in global liquidity conditions in the form of cross-border flows and increases in debt flows have an impact on stock prices in India in the short run. This is the line in with the existing literature. Empirical studies suggest that monetary policy shocks influence output and prices depending on the economic conditions (Santoro et al.; 2014). Kishor & Maftaria (2013) found time variation in stock prices due to monetary policy shocks for 35 emerging countries under their study. The changes in rates of interest by the Federal Reserve and unconventional monetary policy measures undertaken by them after the global financial crisis have inducted an excess amount of liquidity into the system. When market volatility is high, this liquidity creation seems insufficient to counter the effect on asset markets of emerging countries. This money flows down to these markets in the form of portfolio flows and debt positions by EME corporations in the bond markets. Excessive creation of money in the system is responsible for disrupting emerging countries stock markets, especially with an immediate effect, i.e., in the short run. Several studies in the past have indicated that US monetary policy shocks propagate globally through the GFC channel, affecting stock markets and financial conditions in emerging markets (Rey, 2015).

The property prices and global financial cycle also show a bi-directional causality at 10% level of significance. Also, stock prices ganger cause property prices at 5% level of significance. This is because when there is huge amount of liquidity enters the markets, it pushes the stock prices (Foreign Institutional Inflows), which in turn pushes the other assets' prices like housing prices. The investors look for investments in other assets like real estate which push their prices. There may be a lagged effect as it takes time to transition but causality is present (Calvo et al.;1996).

The evidence from the VAR model and Granger causality tests indicates a simple pattern: the Global Financial Cycle (GFCy) has a statistically significant and one-way impact on Indian stock prices, while the impact on property prices is comparatively weak. The structural, institutional, and policy-driven dissimilarities across these segments can explain this difference.

Indian equity markets are quite liberalized and are strongly integrated with international capital markets. Foreign portfolio investors (FPIs), who are highly sensitive to global risk sentiment and changes in global liquidity, contribute to equity prices being very sensitive to international shocks. This aligns with Rey (2015) and Miranda-Agrippino & Rey's (2020) findings, which record those global financial cycles, mainly led by US monetary policy and risk appetite, drive equity markets in emerging economies. For India, Bekaert et al. (2002) similarly illustrate that emerging market equity flows are most sensitive to global factors, magnifying the impact on domestic stock prices.

For instance, the Indian property market is structurally less liquid, more regulated, and with less foreign participation. Local conditions of demand and supply, land use control rules, and administrative procedures conditions, property price mechanisms and macroprudential policies generate muted and slower responses to external shocks. Anundsen & Jansen (2013) contend that real estate prices in such an environment react gradually owing to transaction frictions and institutional barriers. This also accounts for the comparatively lower R-squared and non-significant VAR coefficients in the equation of property price in the model.

Asymmetric transmission of the GFC across financial markets is also what is evidenced by India-specific studies. For instance, Eichengreen and Gupta (2013) demonstrate that volatility of capital flows during taper tantrum spells had appreciable impacts on Indian equity markets but had little on credit or property segments. In addition, Kapur & Patra (2010), in a working paper of the IMF, explain how Indian monetary policy continues to have considerable impact on bank credit despite financial globalization.

Reliability and stability of the model

The robustness of the model is indicated by the Table 6 that shows the results of the Breusch-Godfrey Serial Correlation LM test and Breusch Pagan-Godfrey test for heteroscedasticity. It can be seen from the table, p>0.05 for the serial correlation LM test shows acceptance of the null hypothesis of no presence of serial correlation. Similarly, in the case of a test of heteroscedasticity, p>0.05 again implies acceptance of the null hypothesis that residuals are homoscedastic. These results confirm that the established model is reliable and free from serial correlation and heteroscedasticity

Table 6
Stability Tests

Residual Test	Test Statistic	Probability chi-square
Breusch Godfrey LM Test for Serial Correlation	22.387	0.1319
Breusch-Pagan-Godfrey test for heteroscedasticity	96.438	0.1017

Source: Own calculations

Impulse Response Function (IRF)

The coefficients of the variables do not explain the direction or sign of causality within the VAR framework. Whether the global financial cycle impacts the other variables positively or negatively can be inferred from the IRF results. The dynamic effects between the equations can be analysed through impulse response functions. If the graphs and tables of the IRF results show positive before stabilizing, it shows a positive relationship between the explained and explanatory variables. If it is negative, then there is a negative relationship between the said variables. If it shows positive for some time and then becomes negative before stabilizing, it shows that the relationship changes according to the time horizon.

The IRF results also support the results of the Granger causality results. When there is an increase in global liquidity in the system, the stock market gets the feeling of ease in monetary conditions in the world market, and stock prices increase. It is due to the inflow of foreign institutional investments in emerging markets like India. But after a third quarter again, stock prices fall due to the capricious nature of portfolio flows that work abruptly due to the constant change in market sentiments. Most of the variations are seen in stock prices, and the variations are very frequent and sudden. This shows how the Indian market is well financially integrated with the world markets. It responds to the change in the liquidity conditions due to the other global shocks or changes in the other domestic conditions. There is a

constant rise and fall in the stock prices due to the change in the liquidity conditions as investors constantly change their investment destinations in search of higher yields. But throughout the period, there is a positive relationship between global liquidity creation and stock prices most of the time. This shows the decrease in investors' risk aversion and their quest for higher income in emerging markets like India.

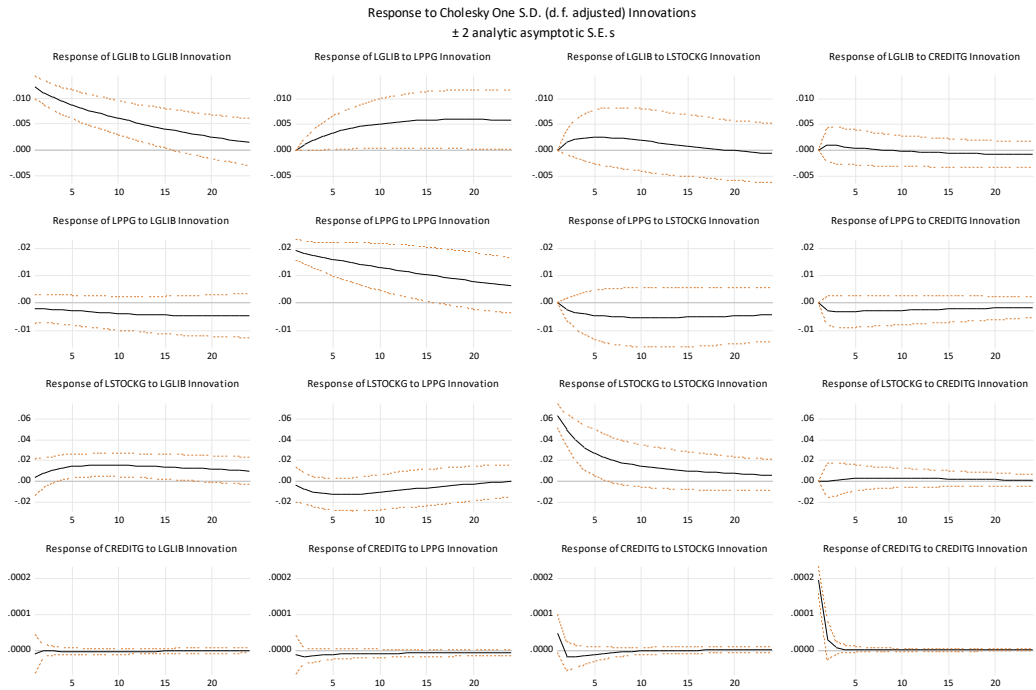

Figure 2. IRF Results
Source: Own calculations

The same is the case with the property prices. The inflation in the house prices is much more volatile and less persistent in the Indian economy, as is evident from the graphical representation. It is related to the faster economic growth and also in consumption growth in emerging markets like India. There is a link between international funds or credit inflow and house prices. House prices depend on the interest rates and the increase in the value of the collateral. Global liquidity affects house prices via the same channels of interest rates and expectations of appreciation and also increased rents due to enhancement in economic activity. The relationship between global money creation and house prices has been positive in India throughout the period. But there is a lot of volatility in the change in housing prices. Also, an abundant amount of liquidity creation and inflows in the country can induce domestic financial

institutions to relax credit constraints and increase domestic credit growth. Increased availability of credit in the domestic markets at reduced rates can also increase the demand for housing. Lack of supply against the extended demand for housing can push the prices exorbitantly. The credit growth does not go in line with the increased flow of international credit in India, as is evident from the IRF results. This shows that credit regulations in the domestic banking system are not compromised. Also, international gross capital flows show a very fluctuating growth in India. This can also be the reason for the frequent volatility and fluctuations in stock prices and property prices in India

Conclusions

With a Vector Autoregression (VAR) approach, empirical support for the differential effect of the Global Financial Cycle (GFC) on the key financial variables in India, such as loan growth, equity prices, and property prices, is offered by the study. The results show that the GFC has had a persistent and significant effect on Indian equity prices, whereas its direct effect on credit growth and property prices is not found. Additionally, the existence of one-way causality between stock prices and the Great Financial Crisis is confirmed using Granger causality tests, thereby supporting the argument that India's equity markets are becoming increasingly vulnerable to the ups and downs of the world economy.

Policy implications of these findings are significant. The large impact of the GFC on stock markets implies that in the interest of domestic financial stability, Indian financial and monetary policymakers need to increase their surveillance of global financial conditions, especially global liquidity flows, interest rate expectations, and risk appetite. RBI has some monetary discretion, particularly through macroprudential policies and tailored regulatory instruments, due to the relatively smaller transmission of international shocks to credit and real estate markets. The imperative of balanced financial openness is emphasized by the fact that such discretion can be lost if capital account liberalization is pursued further.

The need for asset-specific regulatory interventions is also highlighted by the unique channels through which global shocks transmit. Credit and housing markets will most likely gain more benefits in the long term from structural changes, increased data transparency, and building institutional capacity than equity markets, which may require circuit breakers and volatility cushions imposed upon them during periods of global financial stress.

Future research studies can then utilize techniques like Time-Varying Parameter Vector Autoregression (TVP-VAR) or Markov Switching Vector Autoregression to investigate the dynamic and possibly nonlinear nature of the Global Financial Cycle's effect on local financial indicators. Moreover, the differentiation between capital flows classified as Foreign Direct Investment (FDI) and Foreign

Portfolio Investment (FPI) can also allow for the identification of some transmission channels with differential effects on various classes of assets. Cross-country comparison among emerging markets can also shed more light on the degree to which institutional quality, capital account liberalization, and financial market strength determines vulnerability to global economic shocks

Statement and declarations

Authors' Contribution

This research paper is joint work of both the authors

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Annex

Table A1

List of Variables	Abbreviations	Unit of measurment	Data source
Global financial cycle (LGLIB)	lGLIB	In US dollars transformed into logarithms.	Bank of International Settlement
Stock Prices (STOCKG)	lSTOCKG	Stock Prices divided by CPI	Reserve Bank of India
Property Prices (PPG)	lPPG	Housing Prices divided by CPI	Reserve Bank of India
Credit Growth (CREDITG)	CREDITG	% Of GDP	World Bank Database

Order of Statistical Tests for the Study	Section
Descriptive Statistics	4.1
Unit Root Tets (Augmented Dickey Fuller Test and Phillips Perron Test)	4.3
VaR and Granger Causality Test	4.4
Reliability and Stability Test	4.5
Impulse Response Function	4.6