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Global Financial Cycle and Its Determinants: A VECM Approach

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Abstract

The determinants of the global financial cycle are empirically investigated in this study report. The presence of concurrent changes in capital flows, asset prices, and global bank leverage is associated with the Global Financial Cycle (GFCy). According to the research now in publication, the Chicago Board of Exchange's VIX (Volatility Index), which gauges market uncertainty and risk aversion, indicates this cycle. The Federal Reserve's monetary policy decisions are the driving force behind this cycle, and the literature already in existence has examined the ramifications of these decisions. The GFCy and, thus, the financial circumstances of emerging market economies (EMEs) could be impacted by additional global shocks. Other global shocks have the potential to impact the global financial cycle and analysis of the same is required to make the existing literature more robust. Our analysis, which includes a study of identifying the potential global shocks for a period of 23 years data (quarterly), indicates that the global financial cycle is driven by global liquidity and global economic policy uncertainty. VECM, Granger Causality, Impulse Response functions were applied. There is a unidirectional causal relationship between the global financial cycle and global liquidity, as well as a unidirectional relationship between the global financial cycle and global economic policy uncertainty.

Keywords: Emerging Markets, Global Financial Cycle (Gfcy), Global Liquidity, Global Shocks, Global Uncertainty, Monetary Policy.

Introduction

As the financial markets worldwide are getting increasingly integrated, it is being debated that global financial cycle exists, which is shown by simultaneous co-movements of gross capital flows, asset prices, and credit growth. The US monetary policy is believed to drive this GFCy (1). The existence of a GFCy has serious implications, particularly for EMEs. It would make it difficult for policymakers to take any decisions regarding domestic conditions by ignoring global trends; for example, a decision regarding a flexible exchange rate regime and an independent monetary policy (2). US monetary Policy and global risk aversion are the two determinants of GFCy. The boom phase of this cycle starts with reduction in rates of interest by the Federal Reserve. This leads to fall in the risk aversion of international investors. Investors, at this point, search for other options and invest in high yielding assets in the EMEs, which causes intensified movements of gross flows, increase in prices of risky assets and increase in leverage among banks (3). Increase in flows and bank leverage would boost the credit expansion in other domestic economies. After the Global Financial Crisis (GFC 2008-09), spill over from unconventional monetary policies undertaken by the US gained particular attention in the literature. This is also due to the significant role played by the US dollar currency in international financial markets. For example, expansionary monetary policy measures by the US induce global banks to expand their balance sheets and take more risks by international lending also (2). The bust phase of the cycle starts when there is a tightening of monetary policy by the Federal Reserve. This leads to a decline in external funding availability to other economies. These movements increase the probability of the external vulnerability and likely disruption in the economies through currency devaluation. Therefore, US interest rates and all the related monetary policy decisions are the important driving forces behind the movement of global financial cycle. The presence of this cycle has serious implications especially for EMEs. The presence of GFCy also disregards the Mundell

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Fleming Trilemma, which states that a country can choose two out of three policy goals (free capital mobility, monetary policy independence and, exchange rate stability). It has rather converted it into a dilemma and choice is between monetary policy independence and free capital mobility as exchange rate regime doesn't matter (1). Global liquidity increases when the U.S. Federal Reserve lowers interest rates, which encourages capital flows to emerging countries. An emerging market suffers exchange rate appreciation, which hurts exports, if it maintains high interest rates to avoid excessive credit growth. It imports the U.S.-set global financial conditions and may lead to asset bubbles if it lowers rates to stop appreciation. The quantitative relevance of GFCy and its driver US Monetary Policy, in influencing the financial and business conditions in EMEs is still not unanimously accepted in the existing literature. The large stream of existing literature has focused on time-series analysis and analysed the role of global factors like VIX - Volatility index (a measure for GFCy) in driving the financial variables in EMEs (1, 4-6). On the other side, few studies had assessed that the GFCy (indicated by global factors like VIX, US Monetary Policy measure does not explain much variation in capital flows among developing and EMEs (7). Although there has been much discussion in the literature on the effects of US monetary policy measures, other global shocks could potentially have an impact on the GFCy and the economic cycle and financial conditions in EMEs. Therefore, this study focuses on identifying the causes of this cycle in order to add to the body of existing literature. This study is significant in a number of ways. First, it will strengthen the existing literature on GFCy and will be helpful in doing a comprehensive study about their impact on financial and real variables of economies both advanced and emerging economies. Second, this will pave a way for framing of internationally co-ordinated policies to deal with spill-over effects of global shocks. This is how the study is presented. The influence of additional global forces in propelling the global financial cycle will be covered in the next section of this study. The empirical model is introduced in next section, together with the data and methodology that were employed in its estimation. The empirical model is estimated and the empirical findings are shown in Section ''Data Analysis and Results''. Lastly, Conclusion presents the study's findings and talks about the consequences for policy. There is an increase in financial integration among the world economies, widely accepted and acknowledged by academic economists and policymakers, resulting in the free flow of capital movements across borders (1). These capital and financial flows are more influenced by changes in global factors after the increase in globalization and financial integration. Therefore, these flows are more procyclical and volatile (8). If global factors impact the credit and capital flows to the countries more, the results of which might not be suitable for the business cycle conditions of many connected economies? In a similar vein, asset values share essential elements with corporate bonds and stock prices. One frequent element that has a significant impact on financial indicators including loan growth, asset prices, and capital flows is a GFCy. The VIX (Volatility Index), which is published by the Chicago Board of Exchange, indicates this cycle. It gauges the S and P 500 index options' implied short-term volatility and serves as a gauge of global financial markets' risk aversion. The market is said to be in a bullish mood and financing conditions are easier when the VIX is low. It causes market liquidity to rise, which in turn causes capital inflows to soar into the EMEs, creating domestic credit in those economies and increases in asset prices like stocks and bonds. The VIX is extensively taken as a measure of the GFCy in the literature (7, 5). The current debate on the existence of the GFCy is that the US Monetary policy and risk-aversion of the investors are the two major determinants of it (9-11). The boom phase of this cycle starts with a reduction in rates of interest by the Federal Reserve. The introduction of unconventional monetary measures like quantitative easing programs by developed nations also accompanies this. The creation of an abundant amount of liquidity in the system and interest rates hitting almost zero lower bounds leads to a fall in the risk aversion of international investors. Investors, at this point, search for other options and invest in high-yielding assets in the EMEs (3), which causes intensified movements of gross flows, an increase in prices of risky assets, and an increase in leverage among banks. The global credit cycle leads to an increase in credit supply in the EMEs through the 'risk-taking' channel of financial institutions (12).

Excessive credit growth indicates a crisis, as per the existing literature (13). When capital inflows occur and domestic lending requirements are eased, recipient economies may experience a credit boom, which raises the possibility of systemic risk (14). The impact of global financial conditions on the real economy, through equity and asset markets should be considered (15). Therefore, a phenomenon called the GFCy has a relevance that needs to be understood in detail (7). The existence of the cycle has several policy ramifications; the major one is that it reduces the ability of policymakers to follow an independent monetary policy without paying heed to the monetary policy decisions of the US (2). It also reduces the benefits of diversification for the investors in the market as the price of assets move in tandem with each other across the globe. The existing literature has focussed more on understanding the role of the GFCy in impacting the direction of capital flow movements to emerging economies (7, 16, 17). Few studies have focussed on the role of the GFCy, and its impact on the credit cycle or business cycle of emerging economies (18, 19). No study has explored other factors that can drive the GFCy other than US Monetary Policy. Global factors like global economic news regarding trade growth or tariffs and other economic policy uncertainties in significant countries will likely impact volatility in financial markets. Consequently, even though the existing studies appear to conclude that either a global factor or US monetary policy plays a significant role in driving financial factors and real factors, our reading of the literature points to inconclusive empirical evidence on these issues, our research tries to close this gap. The studies on uncertainty gained momentum in the year 2009 (20). Those studies mainly studied the impact of country-level uncertainty (US uncertainty) on the economic variables within a country. With the increase in financial globalization and financial integration of the world markets, uncertainty has become a global phenomenon (21). The existing literature has found that an increase in uncertainty level influences economic activity negatively (22, 23). Higher uncertainty may lead to an increase in the cost of capital (22, 24, 25). A high degree of financial and economic uncertainty may also impact the firm's investment decisions and reduce the level of external trade and, thus, the growth (26). The impact of uncertainty is not confined to the respective countries alone but has spillover effects on other connected economies. This uncertainty has played a more significant role in influencing other countries' macroeconomic and financial variables. The incidents include the Brexit reference, the Donald Trump election, and later government changes in the US (27). Additionally, empirical evidence is presented to support the theoretical argument regarding the impact of future uncertainty on financial markets (28). Even after accounting for a mechanism of current and prospective stock market volatility mitigation initiatives, the effect of uncertainty persists. Macroeconomic shifts can affect the earnings of some enterprises. As a result, economic events are heavily weighted in earnings and management estimates, particularly during unfavourable events (29). In light of this, uncertainty can be a crucial component of business risk management. Hence, economic policy uncertainty significantly impacts the prediction of future economic growth (30). Some claim that future results in the financial market can be predicted using the economic policy uncertainty index (31). It was also demonstrated using the options market that the stock prices are lower when there is much uncertainty. Investors take uncertainty into account when setting their prices. As a result, exposure to an uncertain economic policy may factor in the risk in the cross-section of returns. Thus, the EPU index can predict market shocks, and EPU hence affects volatility and stock returns (32, 33). The existing literature has emphasized the volatility of returns from the stock markets and volatility in firms' profitability as a proxy of uncertain environments under which certain decisions are made or altered and it was argued that stock market volatility might not be an accurate and close picture of economic uncertainty (21, 23). Numerous measures have been taken to measure the uncertainty in the existing literature (34-36). The uncertainty-based index was constructed initially with news-based keywords (22). The respective news was based on news articles in the US. The news-based indicators assume that when the uncertainty is higher, the number of counts in the articles related to economic uncertainty will increase, which could be interpreted as an indicator of growing uncertainty in an economy (37). The existing literature is quite bent toward taking US-centric variables and

considering them as a proxy for global conditions. Economic Policy Index is generally taken as a measure of respective uncertainty (22). However, this index is created based on economic news related to the US only. In this study, we take GEPU (Global Economic Policy Index) as this index is a GDP-weighted average of national Economic Policy Uncertainty indices of 21 countries. Global economic activity is also believed to impact the movement of capital flows (38, 39). The existing literature also shows the relationship between global economic activity and VIX (20). The existing literature has analyzed the role of global real activity in determining the movements of capital flows (40, 41). The negative global output can show the impact on the world economy through various variables like inflation, import prices, commodity prices, and financial markets because of the increased integration of world markets (42). Changes in macroeconomic volatility on a global scale significantly impact the global economy. They may impact capital flows and financial markets by increasing investor uncertainty, which could change a nation's level of external exposure position (43). Also, it is critical to take global volatility variations into consideration when evaluating the downside risks related to the forecast for the global economy. Governments and central banks often rely on stabilization programs to reduce the negative impacts of macroeconomic volatility. Since the time it was empirically observed and presented in the literature the structural drop in the output volatility of the US economy beginning in the mid-80s, there has been increased interest in understanding the dynamics and drivers of changes in macroeconomic volatility. This tendency, sometimes known as the Great Moderation, has been observed in other advanced countries and is not only confined to the US economy, suggesting possible commonalities in production volatility between nations (44, 45). OECD Industrial Production Index is taken into account as a proxy for global real activity/global economic output. International investors' risk aversion and US monetary policy actions were the main causes of the Great Financial Crisis. There are two aspects to the global financial cycle phenomenon: asset prices and gross capital flows. When the Federal Reserve lowers interest rates, investors' risk aversion decreases, as shown by the VIX (Volatility Index), and capital inflows to EMEs in pursuit of greater yields skyrocket (4, 9). The leverage cycle of global banks was emphasized as a means of transferring cross-border capital flows to EMEs (10). The movement of the global financial cycle can be influenced by global liquidity conditions brought about by the monetary policy decisions made by the major economy, such as the US. Through global imbalances, global liquidity may pose a threat to the financial stability of the world economy (46). To put it another way, growing global liquidity limits the ability of EME officials to carry out monetary policy. It strengthens a procyclical loan cycle by causing asset price bubbles to form (47).

Lastly, EMEs with high dollar-denominated liabilities are particularly exposed to unexpected domestic currency depreciation versus the dollar, which increases actual debt burdens. Global liquidity is a broader concept, and it includes both policy liquidity and market-driven liquidity. Liquidity in the market, mainly induced by the changing interest rates of the center economies like the US and its unconventional monetary policy measures, includes bank finance and market finance available in bond markets. Therefore, the global liquidity indicator given by the Bank of International Settlements, which comprises bank finance and bond market issuance, has been taken as one of the probable driving factors of the GFCy. Stock markets and economic policy are similarly impacted by abrupt fluctuations in oil prices (48). Because increased production costs lower predicted profits for firms, a shock to the contraction of the oil supply raises oil prices while lowering non-energy share values in the US. Policymakers and financial investors have placed a high priority on the connection between oil prices and market volatility (49). Returns on the stock market are said to be impacted by fluctuations in oil prices and it was emphasized that changes in oil prices have an indirect effect on costs, stock market volatility, and firm cycles (50). Oil price shocks have an uneven effect on local economies, while fluctuations in oil prices have a negative effect on the trading activities of international stock markets (51, 52). It was empirically demonstrated in the existing literature that in Central and Eastern European countries, stock returns have a statistically significant and adverse correlation with oil price shocks (53). When oil prices rise, US non-energy equity prices fall, which

is caused by an increase in the corporations' production costs and consequently their profits (54). The price of the dollar and the weakening of the US dollar currency impact the volatility of financial markets. Therefore, the model also includes this variable to understand the impact.

Methodology

Investigating the causes of the GFCy empirically is the aim of the current study. The data used in this analysis is quarterly and covers the years 2000–2023. The availability of consistent and uniform data over time is the basis for choosing the data period. For thorough results, additional data points for the chosen time period are necessary. The VIX data was sourced from the Federal Reserve website as end-of-quarter statistics. The OECD website is the source of the OECD Industrial Production Index statistics. Davis, Steven J., "An Index of Global Economic Policy Uncertainty," provided the data for the Global Economic Policy Uncertainty Index. October Macroeconomic Review. The Federal Reserve Economic Data website is the source of the oil price information. The data for Global Liquidity is taken from Bank for International Settlement. The study relies on macroeconomic-financial indicators sourced from the Federal Reserve, OECD, and Bank for International settlement, which are widely recognized for their credible and regularly updated economic datasets.

Econometric Methodology

This section discusses the steps involved in using analytical tools to study the determinants of the global financial cycle. Due to their ability to capture dynamic interrelationships between macro-financial variables, Vector Autoregression (VAR) and Vector Error Correction (VECM) models are frequently used. The choice of either of the methods depends' on stationarity and cointegration among the variables. The Granger Causality test (55), which is based on Vector Autoregression (VaR), is used in this work to investigate the connection between the global financial cycle and its factors. The premise of this test is that time series variables have to be level and steady. The VaR model's stability requirement is not satisfied if the provided time series is not stationary. If the variables are not stationary at level and are co-integrated the, VECM (Vector Error Correction Model) is used. The time-series model's empirical research is predicated on the stationary nature of the variables. Inappropriate methods applied to non-stationary variables may produce erroneous findings. Stochastic trends dominate the unit roots of many financial and macroeconomic trend series, and the existence of unit root tests indicates the presence of a stochastic trend (56). According to the VaR and VECM (Vector Error Correction Model) representations, the presence of stationarity and non-stationary suggests the presence of cointegration and causation. There is a causal relationship between two variables in at least one direction if they are cointegrated and integrated of order one (55). To prevent any misleading regression and to determine the common trend of time-series variables, cointegration testing is therefore necessary (55, 57, 58).

Johansen Maximum Likelihood Procedure

To determine the long-term equilibrium connection between the variables, the cointegration test is important. There is no long-term equilibrium between the variables when there is no cointegration, and they have a tendency to stray from one another at random (59). Instead of using OLS (Ordinary Least Square) estimation, the Johansen Method uses maximum likelihood estimation to construct the cointegrated variables. In contrast to the Engle-Granger Test, the Johansen Test allows for many cointegrating relationships. There are two versions of this test: Maximum Eigenvalue and Trace test.

VECM-Vector Error Correction Model

Following the stationarity test and the Johansen Test for cointegration, the Vector Error Correction Model (VECM) is applied as the third stage in the time series analysis process. VECM is applicable when there is cointegration between the variables and the variables are I(1).

The historical value of the EC (Error Correction) term aids in forecasting future values in the VECM Model. The historical value of the EC (Error Correction) term aids in forecasting future values in the VECM Model. The relationship between the cointegrated variables is indicated by the error term's coefficient, and a significant coefficient indicates that the previous equilibrium plays a crucial role in shaping the current results. The individual coefficients of the first difference terms are used to examine the short-run dynamics. This

model also depicts the fluctuation in the variables and how much of that variation will be restored in a short period to restore the long-run equilibrium among the variables.

Results and Discussion

Descriptive Analysis

The statistical distributions of the quarterly observations of all the variables are presented in Table 1. The difference between maximum and minimum values is more in VIX and it shows more variability. The difference between maximum and minimum values is much higher in GEPU that shows more variability. As this is a global variable of uncertainty, it clearly shows that uncertain events worldwide are the causes of the same. The standard deviation, kurtosis, skewness of all the series is more than zero which implies that distributions are not normally distributed, which usually happens with financial time-series distributions. The skewness of all the distributions except OECD is positive that shows the distributions are skewed to the right. The kurtosis of three distributions is more than 3 which shows the leptokurtic characteristics. The graph of VIX shows that volatility was highest in 2008, i.e., during the time of the global financial crisis. It was again very high in 2013 because of an episode of the taper tantrum. Global economic activity (OECD) was also at the lowest during 2008-09, as the global economy was experiencing recession at that time due to GFC. After the recovery from GFC, OECD has been increasing but has reached a pre-crisis level.

Table 1: Descriptive Statistics

	VIX	OECD	GLIB1 (In billion USD)	GEPU	COP-sa_
Mean	19.535	95.354	6658767	130.407	15.637
Median	17.435	96.485	6288194	116.601	15.003
Maximum	45.450	106.060	12129654	335.0948	52.749
Minimum	9.45	83.935	2328455	57.027	4.022
Std Dev	7.739	6.502	3181963	60.732	8.628
Skewness	1.358	-0.142	0.15134	1.173	1.242
Kurtosis	4.596	1.903	1.65681	4.168	5.931
Jarque-Bera	33.096	4.283	6.31961	22.925	49.213
Probability	0.000	0.117	0.04244	0.000	0.000

Table 2: ADF and PP Tests Results

Variables	ADF Test Values		PP Test Values	
	Level	First difference	Level	First difference
LVIX	-2.6119	-4.010***	-0.452	-13.809***
LOECD	-1.5026	-5.206***	1.032	-4.441***
GLIB	1.7122	-7.251**	7.104	-4.044***
LGEPU	-1.4321	-13.726***	0.818	-14.533***
LCOP	-1.1535	-7.5084***	0.173	-12.511***

*** indicates significant at 1%, * indicates significant at 10%; Source: authors' calculations

Unit Root Tests

Verifying the stationarity of the specified variables is the first stage in the VECM model estimate process. The variables' integration was examined using the PP (Phillips-Perron) and ADF (Augmented Dickey Fuller) tests. At a 95% confidence level, it was found that every series displayed a unit root in at least one test. Additionally, the robustness of the regression results are unaffected if a stationary series is added to the aforementioned VEC model and the cointegrated vector is discovered among the non-stationary series (60). Table 2 shows the results of ADF and PP tests for the stationarity of the variables. The variables discussed are converted into logarithms. According to the ADF and PP tests, all the variables under study are integrated at first difference.

VECM Analysis and Empirical Results

The analysis is done for the global financial cycle (LVIX) and its drivers. The dependent variable is LVIX and its explanatory variables are LOECD, LGEPU, GLIB1, and LCOP. The next step is to check the number of appropriate lags in order to determine the inter relations among the variables in the VEC Model. Apart from selection of

information criterion to determine the lag length, it is very important to observe the behaviour of residues (61). There is no standard criterion for selecting the lag length. Sometimes different criteria will give contradictory results (62). FPE and AIC are chosen for selecting lag length when the sample size is smaller (t=30, t=60, t<120) (63). According to FPE (Final Prediction Error) and AIC (Akaike Information Criterion), the lag length suggested is 2. As behaviour of residues is also considered in the lag selection, we started from 2 lags as it is a minimum quantity to assess the complex roots in the structure of equations, but the determined model according to the same lag length suffers from heteroskedasticity but no serial correlation (Table 4). A lag length of 6 has been selected for further analysis as the rest of the results remain the same as with lag length of 2 and the model with an increased lag of 6 does not suffer from heteroskedasticity (Table 5). The estimations at Lag 6 does not have the same problem and estimation at VEC (6) has better AIC and FPE values as compared to VEC (7) (Table 3). In nutshell, with the selection of lag length (2), model suffers from heteroskedasticity but not serial correlation. So, higher lag length is chosen for robustness of the model. Lag 6 is chosen because model does not suffer from serial correlation and heteroskedasticity and also AIC and FPE values are stronger if compared to higher lag (7). Therefore, Lag 6 is adopted for the estimation and analysis.

Table 3: AIC and FPE Information Criterion Results and Lagrange Multiplier Residual Autocorrelation and White Heteroskedasticity Tests

Lag 2		**Lag 3**		**Lag 4**		**Lag 5**		**Lag 6**		**Lag 7**	
AIC	FPE	AIC	FPE	AIC	FPE	AIC	FPE	AIC	FPE	AIC	FPE
19.34	174.2	19.57	225.4	19.73	275.7	19.89	352.7	20.16	523.4	19.92	494

Table 4: Serial Correlation LM Test (Null Hypothesis: No Serial Correlation)

Lag 2	**Lag 3**	**Lag 4**	**Lag 5**	**Lag 6**
29.83 (Stats)	25.42 (Stats)	33.35 (Stats)	26.59 (Stats)	12.27 (Stats)
0.23 (prob)	0.44 (prob)	0.12 (prob)	0.38 (prob)	0.98 (prob)

Table 5: White Heteroskedasticity Test (Null Hypothesis: No Heteroskedasticity)

Lag 6	635.7 (Chi-Sq Stats)	0.428 (p-value)

Table 6: Results of Johansen Cointegration Test

	Unrestricted Co-integration Test (Trace)		
Hypothesised Number of CE (Cointegrated Eq)	**Trace Stats**	**0.05 Critical Value**	**Probability**
None*	78.705	69.818	0.0082
(*denotes rejection at 0.05 level.)			
At most 1	46.275	47.856	0.0699
At most 2	23.327	29.797	0.2303
At most 3	7.981	15.494	0.4674
At most 4	0.0461	3.841	0.8300

Checking the co-integration of the variables comes next, following the acquisition of the stationarity of the variables and lag lengths. The Johansen Co-integration test has been used to confirm the long-term link between the variables. The results of the trace statistics indicate that the equation contains cointegrating vectors. At the 5% level of significance, the trace test shows the existence of one cointegrating equation. Table 4 makes the results clear since, at the 5% level of significance, the null hypothesis that there are no cointegrating equations is rejected.

According to the Johannsen cointegration test results (Table 6), there is a long-term equilibrium link between the variables LVIX, lGLIB1, LGEPU, LOECD, and LCOP. One co-integrating equation is present, according to the results of the trace statistics. The table shows that absence of cointegrating equations is rejected (as the probability for the same is 0.0082 which is less than 1%. Therefore, there is a presence of atleast

one cointegrating equation. If the variables are stationary at first difference and are cointegrated, VECM model is preferred. The VECM model is used to examine the relationship since the co-integration test indicates a long-term link. The model's error correction term's coefficients are:

Table 7: VECM and ECT (Error Correction Term) Output

	coefficient	**Std error**	**t-statistic**	**prob**
ECT (t-1)	-0.4840	0.22618	-2.1239	0.0340** (significant at 5%)
R-squared	0.70206			
F-stats	4.2596			
Prob	0.0340			

The goodness of fit is indicated by the coefficient of determination (R-squared). It demonstrates the degree to which the explanatory factors represent or account for the variance in the dependent variable, which is the global financial cycle. According to Table 7, the explanatory variables account for 70.21% of the variation in the dependent variable, with an R-squared of 0.70206. There is a long-term link between the variables, as indicated by the correctly signed coefficient of error correction term (ECT), which is -0.4840. Corrections will pull it back in the other direction to restore balance if there is a deviation in one direction, as shown by the negative sign.

Granger Causality Test

Although the VECM result indicates that there is a relationship between the variables, it does not clarify its direction or causality. The Granger causality test has been used to examine the short-term causal link. Finding the direction of the variables' causation is the goal of the Granger causality test in the provided VECM model.

Table 8: Results of Granger Causality Test

Null Hypothesis	**Statistics**	**Probability (Note: ***, **, * show significance at 1%, 5% and 10% respectively)**
GLIB1 does not granger cause LVIX	12.153	0.0327**
LOECD does not granger cause LVIX	2.0506	0.8421
LGEPU does not granger cause LVIX	12.429	0.0293**
LCOP does not granger cause LVIX	5.476	0.3605

As the results shown in Table 8 indicate that there is a unidirectional causality between the global financial cycle and global liquidity. When there is a change in dollar credit made to non-US borrowers, it is done on account of a change in the Federal Reserve rate (FED rate). When the rates are lowered in the US and monetary policy rates are tightened in other countries then the dollar credit is available at cheap rates. Therefore, the demand for the same from offshore borrowers increases. In addition to that, the monetary policy stance was taken by the FED (in the form of a bond-buying program) has also induced investors to provide dollar credit to non-US borrowers. After an extensive bond buying program of the Fed govt, there was a compression in term premia in treasury bonds. Corporations and the governments outside the US issued dollar bonds mostly rated BBB and non-bank investors invested in them in return of a premium more attractive than that of US treasury bonds. This shows when there is an uncertainty in a change in rates of interest by the US, then investors who made investments in the bonds and loans issued by EME corporates and governments, are more prone to herd behavior and sudden reversal of the liquidity can drive the markets highly volatile. Uncertainty in global economic policy has a unidirectional causal relationship with the global financial cycle (Table 8). Financial market volatility rises in tandem with a rise in global uncertainty around economic policy decisions in both major advanced and emerging economies. No evidence of short-term causality from LOECD and LCOP to LVIX has been found.

Reliability and Stability of the Model

The results of the Breusch-Godfrey Pagan-Godfrey test for heteroscedasticity and the Breusch-Godfrey Serial Correlation LM test are displayed in Table 9 to assess the model's robustness. The table indicates that the serial correlation LM test accepts the null hypothesis that there is no serial

correlation (p>0.05). Likewise, in the case of a heteroscedasticity test, p>0.05 indicates that the null hypothesis—that the residuals are homoscedastic—is accepted. These findings support the model's dependability and lack of heteroscedasticity and serial correlation.

Table 9: Diagnostics Test

Residual Test	Test Statistic	Probability Chi-Square
Breusch Godfrey LM Test for Serial Correlation	26.591	0.3795
Breusch-Pagan-Godfrey test for heteroscedasticity	797.28	0.3259

Impulse Response Function (IRF) and Forecast Error decomposition analysis (FEVD)

The sign of causation is not explained by the coefficients in the VECM framework. It is impossible to determine directly from VCEM equations whether endogenous variables have a positive or negative effect on the global financial cycle. Impulse response functions can be used to investigate the dynamic effects between the equations. There is a positive link between the dependent and independent variables if the IRF results' graphs and tables show positive before stabilizing. There is a negative correlation between the variables in question if it displays negatively. It indicates that the relationship varies based on the time horizon if it first exhibits a positive trend before turning negative and then stabilizing.

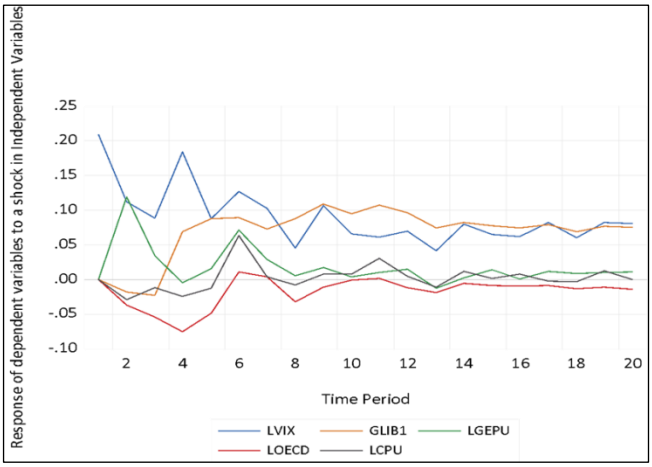

Figure 1: IRF Result

The results of Granger causality are supported by IRF results (Figure 1). The X-Axis shows the time period after the shock. Twenty time periods have been chosen and each time period depends on data frequency, which is quarterly in this case. The Y-Axis represents the magnitude of the response of the dependent variable to a unit shock in an explanatory variable. The coloured lines show the response of lVIX to change in independent variables (Glib1, lGEPU, lOECD, lCPU). There is an increase in global volatility (LVIX) in financial markets when there is an increase in global economic policy uncertainty (LGEPU). Initially, it increases at a faster rate till 3 quarters and slows down. After that, it again increases after 4 quarters and the relationship between the two variables remains positive. Therefore, when there is uncertainty concerning economic policy and economic activity globally, there is an increase in global volatility. When there is an increase in money supply and dollar credit (GLIB1), global volatility initially falls for the first 3 quarters. This is due to the ease of financing environment created in the world market by the supply of abundant liquidity. But after 3 quarters, VIX increases and there is an increase in volatility in financial markets. It is due to the availability of huge cheap credit which flows to other advanced and EMEs. When there is a change in economic conditions in lending countries or when there are policy reversals in the form of change in interest rates in those economies, then it is difficult for borrowing economies to sustain those debt positions. The outcome can be sudden reversals or defaults. These conditions make the markets more volatile. Therefore, after 4 quarters relation between global

liquidity and global volatility remains positive and stabilizes after some time. This result aligns with the observation made by the author Rey in her paper '' Global Financial Cycle after Lehman'' (64). When the economic real activity is improved (LOECD) and increased then global volatility is at a low level. This is shown by IRF results which show a constant negative relation between global economic output/global real activity and global volatility. When the global economic output is showing positive results globally then risk aversion among the investors reduces and this leads to less volatility in the financial markets.

Conclusion

The US monetary policy has been extensively discussed in the literature as a primary cause of the Great Financial Crisis. Both traditional and unconventional monetary policy actions made by the US government are included in the comprehensive measure of global liquidity that we have taken in this research. Our findings demonstrate that the abundance of liquidity brought about by the US's shift in monetary policy decisions affects financial market volatility. Furthermore, the short-term volatility of financial markets can be influenced by the uncertainty surrounding economic policy decisions made in large nations, whether they are developed or developing. The findings of the Granger and FEVD causality tests make this clear. Therefore, when it comes to driving the global financial cycle, global factors are more important than any country-specific factors. The findings suggest that in order to control the interconnected non-bank international financial channel, international regulatory intervention is required. Additionally, these findings support the global financial cycle phenomena and the resulting greater susceptibility of financially connected economies. Future study will have to do the in-depth analysis of how the global shocks examined in this paper affect emerging, developed and developing countries, comparison between the countries' response to such shocks and the policies they implement to prevent the negative effects.

Abbreviations

COP: Crude oil price, EMEs: Emerging Market economies, EPU: Economic Policy Uncertainty, FEVD: Forecast Error decomposition analysis, GEPU: Global Economic policy uncertainty, GFCy: Global Financial Cycle, GLIB: Global Liquidity, IRF: Impulse Response Function, OECD: Organization for Economic Co-operation and Development, VAR: Vector Auto regression, VECM: Vector Error Correction Model, VIX: Volatility index.

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Author Contributions

Shikha Malhotra: Conceptualization, Methodology, Software, Investigation, Resources, Writing, Dhanya KA: Data curation, Draft preparation, Review Writing.

Conflict of Interest

The authors declare that there is no conflict of interest.

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