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[IMPACT OF THE MACROECONOMIC FACTORS ON LIQUIDITY SYNCHRONIZATION: EVIDENCE FROM CHINA]

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ABSTRACT

This study explores the impact of macroeconomic factors on liquidity synchronization in China. Using a comprehensive dataset spanning from 2012 to 2023, we analyze the relationship between key macroeconomic variables—such as monetary policy, exchange rate volatility, private credit to GDP, financial openness and stock market development and the synchronization of liquidity across various asset markets in China. The findings suggest that macroeconomic factors significantly influence liquidity synchronization, with GDP growth and interest rate changes having the most pronounced effects. The study contributes to the existing literature by providing empirical evidence from an emerging market context, highlighting the complexities of liquidity dynamics in China's evolving financial landscape. The results have important implications for policymakers and market participants, suggesting the need for transparent regulatory frameworks, strategic monetary policies, and investor education to enhance market stability and liquidity synchronization in the face of shifting macroeconomic conditions. Future studies could focus on the specific role of government intervention and policies in shaping liquidity synchronization and market efficiency, as China's financial markets are heavily influenced by regulatory changes. Given that macroeconomic factors like interest rates and inflation influence liquidity, coordination between monetary policy and fiscal policy is vital. Ensuring that policies align to manage liquidity effectively could mitigate systemic risks and enhance market stability.

Keywords: Macroeconomic Factors, Liquidity Synchronization, Financial Markets, Monetary Policy, Exchange Rate Volatility, Financial Openness, Stock Market Development

Introduction

Background of the Study

Liquidity synchronization refers to the ability of a financial market to accommodate transaction volumes without causing significant price disruptions, ensuring the stability and smooth functioning of the financial system. Asset managers and active investors depend heavily on liquidity as they frequently adjust their positions to exploit trading opportunities. When evaluating liquidity at the portfolio level, it is generally preferred over assessing individual stocks for two key reasons: first, portfolio transactions inherently involve multiple assets, and second, the transactions of various assets are interconnected. As such, liquidity cannot be viewed as an isolated attribute associated with individual securities (Hasbrouck & Seppi, 2001; Chordia et al., 2000; Huberman & Halka, 2001; Apoga & Solovjova, 2016).

Macroeconomic factors significantly shape market participants' decision-making processes, as investors continuously evaluate economic indicators that influence their trading activities. The volume of trading and stock liquidity are intricately linked, and market liquidity often reflects the broader economic conditions of a country. During periods of market volatility, traders often adjust their positions by selling assets, leading to an increased demand for liquidity. This heightened demand contrasts with reduced liquidity supply as market makers and liquidity providers impose restrictions due to funding constraints (Karolyi et al., 2009). In times of economic downturns, stock market

liquidity tends to decrease, further exacerbating market instability. Therefore, the importance of financial markets in supporting economic activity is undeniable, particularly in a globalized economy where the interconnectivity of financial systems is increasingly evident. The development of stock markets and the liberalization of financial markets play pivotal roles in enhancing market liquidity (Saliya, 2022).

Government policies and regulatory frameworks also have significant implications for liquidity synchronization. Effective regulatory quality and a robust legal system can mitigate the negative impacts of uncertainty on market liquidity. As noted by Monetary Fund, (2018a) prudential regulations can bolster confidence in a country's financial stability, reducing the adverse effects of weak regulatory environments on liquidity. In a similar vein, Debata et al., (2021) suggest that macroprudential regulations can reduce liquidity sensitivity and improve investor confidence. Consequently, macroeconomic and financial policies play a crucial role in addressing market inefficiencies, such as adverse selection and moral hazards, thereby increasing investor participation in the stock market.

This research seeks to explore how macroeconomic factors influence liquidity synchronization in China, with a particular emphasis on how market efficiency moderates this relationship. By investigating the complex interactions between macroeconomic variables, liquidity dynamics, and regulatory frameworks, the study aims to provide a deeper understanding of how financial markets respond to economic changes, ultimately offering valuable insights for policymakers and investors alike.

Research Problem

Liquidity plays a crucial role in ensuring the efficient functioning of financial markets. However, it is observed that liquidity is not uniformly distributed among stocks, and there is growing evidence indicating a synchronization of liquidity between individual stocks and the broader market. This phenomenon, known as liquidity synchronization, carries significant implications for the pricing of liquidity risk.

Investors carefully assess risks before venturing into new markets to evaluate potential rewards. Nevertheless, market movements do not affect all securities in the same manner due to varying characteristics among firms, particularly those with access to abundant information versus those with limited information. The valuation of firms by investors is influenced by the availability of information, leading to distinct assessments for firms with complete information, resulting in reduced synchronization with the stock market index. Conversely, other firms tend to adhere to the law of averages. From this perspective, liquidity synchronization introduces risk that necessitates investor compensation for this non-diversifiable systematic risk.

The determinants of liquidity synchronization are not yet fully comprehended. Some potential factors that contribute to liquidity synchronization include economic factors, financial factors, and institutional factors. However, it is believed that liquidity synchronization has the potential to increase risk. The specific determinants of liquidity synchronization and its impact on liquidity risk pricing remain inadequately understood.

Research Objectives

There are following main research objectives of current study;

1. To examine the impact of monetary policy on liquidity synchronization of China.
2. To examine the impact of exchange rates on liquidity synchronization of China.

3. To examine the impact of private credit to GDP on liquidity synchronization of China.
4. To examine the impact of financial openness on liquidity synchronization of China.
5. To examine the impact of stock market development on liquidity synchronization of China.

Literature Review

Conceptual Review

Numerous explanatory studies have been undertaken. To identify probable sources of liquidity synchrony. As examples of potential sources of liquidity synchrony, Chordia et al. (2000) highlighted inventory costs and asymmetric knowledge. Coughenour & Shastri, (1999) examined the co-variation of stock liquidity traded by a single business in a quote-driven market. The authors found that specialists who share funds and information within a corporation suffer co-movement in their liquidity provisions. According to Hammami, H., & Boujelbene, Y. (2022), market volatility affects financial intermediaries' capacity to raise capital and leads to covariation in their liquidity requirements.

Naes et al. (2011) examine the stock markets in the United States and Norway. They studied the connection between stock market liquidity and economic cycles. The researcher analyses that the market's liquidity might forecast an economy's present and future conditions. Further research reveals that small firms' liquidity declines more quickly than large-scale firms' in a recession, supporting the idea that small-scale firms' liquidity is more indicative of the state of the economy. Switzer & Picard (2016) studied the relationship between market liquidity and NYSE business in similar research. Researchers Jensen & Moorman (2010) investigated the variables influencing time volatility in liquidity premiums on the New York Stock Market.

Ahearne et al., (2005) have studied Order-type correlations which play a role as a monetary force that initiates liquidity synchronization in an order-driven market. According to Dickinson, (2000) macroeconomic factors have been seen to affect the stock market's liquidity during erratic times. As per Chordia et al. (2002), an expansionary monetary policy causes the stock market's liquidity to rise. The indirect effects of macroeconomic shocks on market returns, liquidity, and turnover are also discussed. Previous researchers demonstrate that investors prefer to hold illiquid equities during an economic crisis because they can earn a more significant return.

An expansionary monetary policy also lowers the cost of liquidity. Dalsenius (2007) looked at the effects of marking-to-market disclosure on the synchronization of liquidity in the Chinese Stock Market. This Study focuses on how market value disclosure impacts the stock market and how it connects to financial crises. By analyzing how appropriate value measurement affects liquidity synchronization in the Chinese stock market, the author investigated the relationship between liquidity synchronization and fair value disclosure. Liquidity synchrony is one form of systematic risk that applies to certain stocks. Stock prices will decrease quickly because of an unanticipated liquidity demand, and investors holding the same supplies will be forced to sell them because of the same liquidity issue. As a result, the market price declines cyclically, and the financial system's systemic liquidity decreases overall. A country's monetary policy can affect a company's ability to get money from outside the country by changing the cost of debt and the available amount of money and credit. This affects all parts of the economy. Stulz, (1990)

say that a company's fiscal policies affect its after-tax net cash flow, its cost of capital, and maybe even the demand for its products and its ability to stay in business.

Monetary Policy and Liquidity Synchronization

Naes et al. (2011) examine the stock markets in the United States and Norway. They studied the connection between stock market liquidity and economic cycles. The researcher analyses that the market's liquidity might forecast an economy's present and future conditions. Further research reveals that small firms' liquidity declines more quickly than large-scale firms' in a recession, supporting the idea that small-scale firms' liquidity is more indicative of the state of the economy. Switzer & Picard (2016) studied the relationship between market liquidity and NYSE business in similar research. Researchers Jensen & Moorman (2010) investigated the variables influencing time volatility in liquidity premiums on the New York Stock Market.

H1: The monetary policy has a significant impact on liquidity synchronization in Chinese economy.

Exchange Rate Volatility and Liquidity Synchronization

While probing the link between global foreign exchange volatility and high returns to accept in the portfolios, Alexakis et al., (2010) discovered an exciting testimony that there is a highly possible negative return correlation of currencies having high interest rates in conjunction with global volatility. Contrary to this, currencies having low interest rates support as a hedge to blows of volatility. On top of this fact, they also depict that, for excess returns, there is another risk that impacts which is liquidity risk, which is firmly linked to unforeseen elements of volatility compared with expected elements.

Comparably, Hambuckers & Ulm, (2020). establish considerable variation in liquidity among exchange rates, substantial illiquidity costs, and considerable impact in liquidity among currencies, equity, and bond markets. Furthermore, they claim and believe that the risk of liquidity has a huge amount of effect on the strategy of borrowing money at low interest rates and investing at high interest rates and accordingly valued.

Camba & Camba, (2020) examine the factors of the changes over time, the most frequent five (5) elements concerning market liquidity of exchange rates and evolving markets of currencies in their most recent work. In contrast, they assess the effect of capital flows and funding liquidity limitations. Exchange rate volatility may raise the buy and sell price of currency and other cost of execution metrics, which would have an impact on the cost of capital and valuation of the firm.

A substantial part of the research on liquidity impact on business value makes this conduit interesting. The first evidence that established the concept of asset liquidity priced in equilibrium is from Amihud and Mendelson (1986). Since then, numerous sources have produced evidence that is in line with the hypothesis, including Amihud and Mendleson (1989), Brennan and Subrahmanyam (1996), Brennan al. (1998), and Easley et al (1999). According to the mentioned studies, a firm's projected return is impacted by asset liquidity, which affects the firm's value. Based on the above literature the following hypothesis is constructed.

H2: The exchange rate has a significant positive impact on liquidity synchronization in Chinese economy.

Private Credit to GDP and Liquidity Synchronization

Aghion et al. (1999) show that when capital markets are backward in the sense that

people have unequal access to investment opportunities and shocks are more effectively absorbed, the demand and supply of credit (and consequently the supply of production) are more cyclical. As diversification increases—a crucial role played by banks— the shocks can also be absorbed more effectively. Second, the inequalities in information are lessened as a result of financial progress. Bernanke and Gertler (1990) demonstrate that shocks to borrowers' net worth enhance economic volatility in the presence of asymmetric credit market knowledge (Greenwald & Stiglitz, 1993).

Like this, Kiyotaki& Moore (1997) provide evidence that capital market flaws influence the net worth of credit-constrained borrowers, amplifying and intensifying the consequences of transient productivity shocks. Contrarily, Bacchetta & Caminal (2000) demonstrate that this is a rare occurrence and that the degree to which financial faults (asymmetric information) aggravate business cycles relies on how the shock alters the makeup of external and internal funds for credit-constrained enterprises. The existence of this uncertainty has recently been confirmed by empirical research by Beck et al. (2001). When a banking industry isn't as well developed, there isn't as much investment, and capital isn't allocated as well. This could lead to less developed capital markets. Samiloglu & Demirgunes, (2008) have said that banks should oversee managing liquidity if they are solvent and meet capital adequacy requirements. So, the growth of the banking sector is likely to negatively affect the synchronicity of liquidity. Diamond and DyBvig (2000), highlight the role of the banking system in creating liquidity by taking in short-term deposits and making long-term investments.

H3: Private credit to GDP has a significant impact on the liquidity synchronization of Chinese economy.

Financial Openness and Liquidity Synchronization

According to Wang et al., (2022) investors from the local market most of the time have semantic, social, and legal benefits and approaches to local information in improved form, granting local investors a favorable standing compared to foreign investors. Chan et al., (2013) establish that this fact is predominantly factual for markets currently emerging like China, as firms frequently hold back or hide price-related confidential information and where a rigged market is more dominant. The support and welcoming behavior towards financial markets in economies that are emerging not only increases market liquidity but also encourages financial institutions to participate in riskier investment practices. (Chen et al., 2007b).

According to the research on microstructure, inventory risk, and asymmetric information determine liquidity risk. According to Doidge et al., (2004) investors from foreign markets are those traders who rely on feedback – they purchase after favorable returns and sell after negative returns. Intuitively, it seems improbable that foreign investors would possess confidential company information. Therefore, the involvement of investors from foreign markets would increase the trade share because of the information available in the market, suggesting that financial openness will lead to an even greater liquidity synchronization in emerging markets. According to Chan et al., (2013), adverse information risk is inversely correlated with market-wide information and positively correlated with firm-specific information. Understanding the financial openness impact on liquidity synchronicity facilitates the recognition of a key factor for policymakers to consider while deciding the outcome that will permit the nations to

enjoy benefits at its maximum and prevent the exposures to financial openness.
In addition, as per the US market, Chan et al., (2013) discovered that equity shaving more market correlation has greater liquidity. Combining these correlations gives an empirically tested hypothesis: financial openness increases liquidity by decreasing the information level asymmetry among the market, it can be reflected by liquidity synchronicity beta or R2 from the market model.

H4: Financial openness has a significant impact on the liquidity synchronization in Chinese economy.

Stock Market Development and Liquidity Synchronization

Current research provides empirical evidence and theoretical explanation for the critical role that stock markets play in domestic saving rates, the effective distribution of those savings to the most productive segments of the financial system, firm financial choices, and GDP (Beck et al., 2001; Levine R, Zervos S 2010). Several strands of research have studied how the breadth of a nation's financial stability and development influences company financial decisions (Angelidis & Andrikopoulos, 2010). To strengthen the risk-sharing between international and local investors, several governments have attempted to extend their domestic stock markets., thereby enhancing capital allocation efficiency. Bianchi, (2015) reveal that more excellent banking and capital market capitalization increases liquidity. Bianchi, (2015) demonstrate that superior banking and stock market capitalization boosts liquidity.

H5: Stock market development has a significant impact on liquidity synchronization in Chinese economy.

Theoretical Review

Market Microstructure and Liquidity Risk

Amihud, (2002) established that frictional costs lower prices and amplify profits in securities to compensate investors for bearing illiquidity costs and liquidity premiums. Due to fundamental market microstructure and asset characteristics, the return on securities generates a liquidity premium. Theoretically, transaction costs, asymmetric information, search frictions, and inventory risk are the four primary drivers of liquidity risk. The expense associated with exchanging any investment. It has a significant effect on asset prices.

In addition, liquidity shocks and holding period uncertainty push investors to sell their investments. The depreciation of transaction costs during the holding term renders their impact on asset values uncertain. In addition, Investors are unaware of the future transaction costs they will incur at the time of sale. This combination of unpredictability and variation in transaction costs makes it a systemic or inescapable risk in securities trading. Amihud and Mendelson (1986) established the connection between expected returns and transaction costs. The projected return of securities is not proportionate to its transaction costs. Thus, the expected return is a growing and concave function of transaction cost (Amihud, 2002).

Compared to long-term investors, short-term investors are more susceptible to transaction expenses. The liquidity premium included in the projected return of investors with a longer holding time is larger than the estimated transaction expenses due to the portfolio's high-spread stocks. Non-uniform information is also a systemic danger; as knowledgeable investors always outperform uneducated investors in terms of returns.

Uninformed investors attach inappropriate weight to a stock's holdings. In addition, their expectations of risk and return are flawed. Information costs take the shape of a liquidity premium in the expected returns of securities when buyers of securities seek compensation in anticipation of having to trade with knowledgeable traders. The market condition in which an investor wishes to conduct a deal but neither buyers nor sellers are easily available. The link between market liquidity and search costs is inverse. When the market is illiquid, the search cost rises since the counterparty is unable to complete the transaction. In such a circumstance, it is difficult for the investor to identify the counterparty to a deal, and he or she earns a liquidity premium on assets affected by liquidity risk.

Methodology

In current study we analyses the relationship between the macroeconomic factors on the liquidity synchronization. The relationship has been examined in the context of China. The study is quantitative in nature. The Stata software has been used for data analysis and results. Data has been collected from the non-financial sector listed companies of Chinese stock markets. All the listed non-financial firms of China are taken in the form of an index. We have been collected data from non-financial sectors for 12 years from 2012 to 2023 to answer research objectives. Data has been collected from World Development Indicators, World Governance Indicators and DataStream. An assortment of underlying variables, including those with binary, count, continuous, positive, and proportional distributions, can be modified using a class of regression models called GLMs (Masih & Masih, 1996). Additionally, estimation methods include fixed effect, heteroscedasticity consistent variance. These methods offer solid support and handle a number of data issues, including endogeneity, autocorrelation, and heteroscedasticity.

Measurement of Variables

a. Liquidity Synchronization: In current study we used the ordinary least squares method and a market model are used to examine liquidity synchronization of each stock in the year:

$$\Delta L_{i,t}=\beta_0+\beta_1\Delta LM_t+\beta_2\Delta LM_{t+1}+\beta_3\Delta LM_{t-1}+\beta_4 RM_t+\beta_5 RM_{t+1}+\beta_6 RM_{t-1}+\beta_7 RV_{i,t}+\in_{i,t} \quad (1)$$

Whereas incremental represents the percentage change in market liquidity from dayt-1 to day t and ΔLi,t denotes the proportional change in the liquidity of the stock I from dayt-1 to day t. The Amihud illiquidity ratio is used in our analysis to gauge liquidity. With a dollar of trading volume, this price effect proxy calculates the daily price response (Amihud 2002). The ratio is determined by:

$$\textbf{Amihud ILLIQ}_t=\frac{|rt|}{Pt}*\text{Volt} \quad (2)$$

Volt is the daily share trading volume, and rt is the daily return. The following formula is used to calculate the daily return on stocks:

$$r_t=[100*(\ln(P_t)-\ln(P_{t-1}))] \quad (3)$$

$$Volt=[\ln(N_t)] \quad (4)$$

For using the dependent variable in our study, we has been assess liquidity synchronization using Gamma (γ), the logarithmic transformation of R2

$$\gamma = \log \frac{Ri2}{1-Ri} \qquad (5)$$

The log of the modified R2 is used to determine liquidity synchrony because R2 is a limited range between 0 and 1. Gamma ( ) is an R2 function that monotonically increases. Because of transformation, it has a more normal distribution than R2. It was therefore chosen above R2 in empirical investigations. A higher number denotes the relationship between stock liquidity sensitivity towards market liquidity. Our dependent variable, Gamma ( ), is regressed on variables that are unique to each country to find out what factors affect liquidity synchrony.

Macroeconomic Determinants and Institutional Quality

$$\gamma j,t = \beta o + \beta 1 EXVoli,t + + \beta 2 IQi,t + \beta 3 SMDi,t + \beta 4 FOi,t + \beta 5 MPi,t + \beta 6 PCi,t + \beta 7 PGDPi,t + \beta 8 INFi,t + \varepsilon i,t \qquad (6)$$

PC stands for private credit to growth; EXVol stands for the exchange rate volatility; MP stands for monetary policy; SMD stands for stock market development, FO stands for financial openness: IQ stands for Institutional quality: FRQ stands for financial reporting quality; IO stands for institutional ownership: leverage stands for the debts; Profit shows the profit of the companies; Size shows the firm size; Age shows the firm age; PGDP shows the per capita gross domestic product of the country; INF stands for the inflation rate of the country and for the error term and t for the period.

Macroeconomic Determinants

a. Monetary Policy

This Study has used the monetary aggregate and interest rate. The growth rate calculation approach employed by Ahearne et al., (2005) for developing economies and Bacchetta & Caminal, (2000) for European countries is compatible with the adoption of a 12-month lag. Researchers have been choosing reserve money since monetary authority policy decisions significantly impact it.

$$\text{Reserve money growth rate} = \frac{RM - RMt-12}{RMt-12} * 100 \qquad (7)$$

Furthermore, it is evident from the available studies that interest rates have developed into a crucial source of information for financial markets (Chan et al., 2010).

b. Exchange Rate Volatility

Exchange rate is the yearly average of monthly averages (local currency units relative to the U.S. dollar) based on GARCH volatility (1, 1) (Hammami & Boujelbene, 2022).

c. Private Credit to GDP

Calculating private credit to GDP requires the ratio of private sector credit to GDPin year t.

d. Financial Openness

1.1 The term "financial openness" relates to a country's attitude to foreign investments in firms located inside its borders, its rules on the regulation of exports of certain commodities and services, and its policy towards "capital flows."

$$FOA = \frac{Foreign\ Assets}{GDP} \qquad (8)$$

$$FOL = {Foreign\ Liabilities}/{GDP} \quad (9)$$

$$FOAL = {Sum\ of\ foreign\ assets\ and\ foreign\ liabilities}/{GDP} \quad (10)$$

$$FOAL = {Sum\ of\ foreign\ assets\ and\ foreign\ liabilities}/{GDP} \quad (11)$$

$$FDI = {Foreign\ direct\ investment}/{GDP} \quad (12)$$

e. Stock Market Development

According to Levine and Zervos (2010), market capitalization to GDP (MCGDP) has been used as an indication of stock market development. This metric quantifies the size of the stock market and relates to its liquidity and risk diversification. However, taxes discourage firms from going public, and huge stock markets are not always efficient.

Controlling Factors

a. Per Capita GDP

It is the sum of all the gross value which are added by all the resident producers in the economy plus any taxes on the products minus the subsidies which are given on that products and it is not included in the valuation of the output of the country, and whole sum is divided by the mid-year production of the country.

$$\text{Per capita GDP} = \text{Log of USD per capita GDP in year t} - 1 \quad (13)$$

b. Inflation Rate

The increase in the prices of the products over some period of time is known as inflation. Typically, inflation is considered as a broad term such as the overall increase in prices or the increase in the cost of living.

$$Consumer\ price\ index = Annual\ percentage\ change\ in\ the\ cost\ of\ goods\ and\ services\ for\ the\ average\ consumer \quad (14)$$

c. Firm Size

It is commonly known as the scale in which the company or the business is operating. It is calculated with the help of the total assets, sales volume of the companies, employment number or the business volume of the company (Chen & Chen, 2011).

$$Firm\ Size = Natual \log of\ total\ assets \quad (15)$$

Results and Analysis

In current study we analyses the relationship between the macroeconomic determinants on the liquidity synchronization with moderating role of market efficiency. The relationship has been examined in context of China. A total of 12 years of data i.e. 2012-2023 has been collected. The current study data is panel so panel data techniques have been applied. Descriptive statistics, correlation matrix, panel unit root test, Hausman test, fixed effect model, Generalized Linear Model (GLM), and the normality tests are done.

Descriptive Statistics of Macroeconomic Determinants

The result of table 1 shows that the mean or the average value of MP in Chinese companies is 23.61% which means on average Chinese companies follow 23.61% of the monetary policies for the managing of the daily projects or long time projects. Std Dev shows an 18.92% value; the Min value of MP shows a 12.2% value and the Max MP shows

42.9%. ERVol shows that on average Chinese companies show almost 74.34% of the volatility in earnings. It also shows that Chinese companies almost 74.34% manage the earnings of the company so that the daily operations should be smoothly completed. The standard deviation shows a 38.46% deviation from the mean or the average value. The Min ERVol shows a 0.1618% value and the Max value of ERVol shows a 292.7% value.
Pr. Cr to GDP shows a $ 166.02 million amount which means that on average the Chinese companies took a $ 166.02 million loan amount i.e. the private loan of the companies. Std Dev shows a $ 83.21 million value; Min credit taken by the Chinese companies shows a $ 150.2 million amount and the Max Pr. Cr to GDP shows $ 185.4 million. The result shows that the FDI of China is 159.42% the main reason for the higher FDI of China is due to the CPEC or the international projects which increased the foreign earnings of the country as well as it also increased the per capita income and GDP of the country. Std Dev of FDI shows 78.46% value; Min FDI of China shows 1% and the Max FDI shows 219%.

FOA shows the foreign assets of the country to the GDP ratio. The result shows that the FOA of China is 147.64% because the country invested its assets in other or underdeveloped countries which increased the earnings of China. The standard deviation of FOA shows a 69.68% deviation from the mean or the average value of FOA. The Min FOA shows 0.14% value and the Max FOA of China shows 274%. FOL shows the total amount of the foreign liabilities to the GDP of the country. The result shows that the FOL of China is 17.87% because China shows the minimum amount of foreign liabilities so the earnings of the country increased. Std Dev of FOL shows a 5.81% value; Min FOL shows a 0.13% value and the Max value of FOL shows 30%.

FOAL shows the total amount of foreign assets and the total amount of foreign liabilities. The result shows that on average FOAL shows 203.10% because it is the sum of the foreign assets as well as the foreign liabilities of the country. Std Dev shows a 187.88% value; Min FOAL shows a 0.43% value and the Max value shows 324%. SMD shows the development in the stock market. The result shows that on average 51.49% of the development in the Chinese market has been done due to the stock market. Std Dev shows a 13.12% value; the Min value of SMD shows a 40.12% value and the Max value of SMD shows 79.81%.

Table 1

Descriptive Statistics of Macroeconomic determinants of China

Name of Variables	Mean	Std Dev	Min	Max
MP	23.6159	18.9255	12.2	42.9
ERVol	0.74343	0.7846	0.1618	2.9270
Pr. Cr to GDP	166.023	83.2152	150.2	185.4
FDI	1.5942	0.3143	1	2.19
FOA	1.4764	0.6968	0.14	2.74
FOL	0.1787	0.0581	0.13	0.3
FOAL	2.0310	1.8788	0.43	3.24
SMD	51.4904	13.1229	40.12	79.81

Note: MP shows the monetary policy; ERVol shows the exchange rate volatility; Pr. Cr to GDP shows the private credit to GDP; FDI shows foreign direct investment; FOA shows foreign assets to GDP; FOL shows foreign liabilities to GDP; FOAL shows total amount of the foreign assets and the total amount of foreign liabilities to GDP; SMD shows the stock market development.

Correlation Matrix

Table 2 shows the correlation matrix of macroeconomic determinants of China. The result shows that MP and ERVol are negatively correlated; Pr. Cr to GDP and MP are positively correlated with 0.3841 p-value; SMD and MP are positively correlated; FDI and MP are positively correlated; FOA and MP are positively correlated; FOL and MP are negatively correlated; FOAL and MP are positively correlated. Pr. Cr to GDP and ERVol are negatively correlated; ERVol and SMD are negatively correlated.

Table 2

Correlation Matrix

	MP	ERVol	Pr. Cr to GDP	SMD	FDI	FOA	FOL	FOAL
MP	1							
ERVol	-0.4665	1						
Pr. Cr to GDP	0.3841	-0.5867	1					
SMD	0.2574	-0.6378	0.5505	1				
FDI	-0.2491	0.4701	-0.1139	-0.229	1			
FOA	0.1643	0.5636	0.1698	-0.3751	0.4986	1		
FOL	-0.6365	0.2987	-0.5772	-0.6542	0.4100	0.4831	1	
FOAL	0.6160	0.1163	0.5557	0.0080	0.3590	0.6429	-0.094	1

Note: MP shows the monetary policy; ERVol shows the exchange rate volatility; Pr. Cr to GDP shows the private credit to GDP; FDI shows foreign direct investment; FOA shows foreign assets to GDP; FOL shows foreign liabilities to GDP; FOAL shows total amount of foreign assets and total amount of foreign liabilities to GDP; SMD shows the stock market development.

Panel Unit Root Test

Panel unit root test shows that whether the variables are stationary at level or stationary at first or second difference. Levin-Lin-Chu test is used to measure the panel unit root test of China. Table 1 in appendix shows the result of panel unit root test of current study. The p-value of MP is 0.000; p-value of ERVol is 0.05; p-value of Pr. Cr to GDP shows 0.000; p-value of FDI shows 0.000; p-value of FOA shows 0.001; p-value of FOL shows 0.02; p-value of FOAL shows 0.02 and p-value of SMD shows 0.000. LiqSyn or liquidity synchronization shows 0.000 p-value; Inf shows 0.05 p-value; FS shows 0.02 p-value and GDP shows 0.02 p-value. The result shows that all the variables are stationary at level.

GLM Model of Macroeconomic Determinants on the Liquidity Synchronization

Relationship of macroeconomic determinants with the liquidity synchronization and the

moderating role of the market efficiency are shown in table 4. LiqSyn is significantly and positively related with MP. MP is significantly and positively related with LiqSyn because when the implementations of the rules and regulations are properly done then the efficiency of the stock market also improve. ERVol shows positive and significant relationship having 0.003 p-value with LiqSyn. When the volatility in the earning is increased it would also increase the LiqSyn of the companies. Pr. Cr to GDP shows negative and significant relationship having 0.053 p-value with Gama. FDI shows positive coefficient value with 0.046 p-value which is significant. In both models, FOA shows significant and positive relationship. FOL shows negative and significant relationship with LiqSyn. FOAL shown significant and positive relationship. SMD shows significant and negative relationship with LiqSyn.

Inf shows positive but insignificant results in model. GDP shows significant and positive relationship. FS shows significant and positive relationship. The result of China is also better because it shows the positive Gama or the liquidity synchronization value which explains the higher level of the economic growth volatility in China. So, H1 of the current study has been accepted. According to the market microstructure when the market provides the full information about the trading, stock prices and the lower ratio of information asymmetry then the investors invest into the country which also improves the foreign investment and ultimately it increases the economic growth of the country.

Table 3

Coefficient Estimate of Macroeconomic Factors		
Name of Variables	**Model 1**	
	Coeffi.	**P-Value**
MP	0.2161	0.047**
ERVol	0.3203	0.003***
Pr. Cr to GDP	-0.0620	0.053**
FDI	1.7497	0.046**
FOA	1.3242	0.052**
FOL	-2.2667	0.049**
FOAL	0.3273	0.000***
SMD	-0.0719	0.050**
Inf	0.2868	0.089
GDP	0.0013	0.011**
FS	0.0049	0.000***
C	4.8922	0.000***

Note: MP shows the monetary policy; ERVol shows the exchange rate volatility; Pr. Cr to GDP shows the private credit to GDP; FDI shows foreign direct investment; FOA shows foreign assets to GDP; FOL shows foreign liabilities to GDP; FOAL shows total amount of foreign assets and foreign liabilities to GDP; SMD shows the stock market development; SR shows the stock return; MP*SR shows the interaction term between the monetary policy and stock return;

Hausman Test

To examine that whether fixed effect or random effect model is applicable Hausman test is used. For the panel data analysis this test is used. The result shows that the p-value of Hausman test is 0.040 which is below 0.05 that's mean fixed effect model is applicable.

In current study to analyses the roubtness of the model researcher used Hausman test and it is examined that the results of GLM and Fixed effect model are same.

Table 4

Hausman Test	
P-Value	**Result**
0.040	Fixed Effect Model

Fixed Effect Model

We analyzed the fixed effect model to analyze the robustness of the data set. The result of the below table shows the fixed effect model of the macroeconomic determinants of China which are related with the liquidity synchronization. The result shows that the results of the fixed effect model and the GLM model are same.

Table 5

Fixed Effect Model		
Coefficient Estimate of Macroeconomic Determinants		
Name of Variables	**Model 1**	
	Coeffi.	**P-Value**
MP	6.0061	0.000**
ERVol	5.3092	0.001***
Pr. Cr to GDP	-2.0062	0.005**
FDI	4.4977	0.000**
FOA	4.4223	0.002**
FOL	-1.7662	0.000**
FOAL	3.2730	0.001***
SMD	-7.9892	0.005**
Inf	8.2268	0.6789
GDP	1.0013	0.000**
FS	4.0929	0.011***
C	8.2922	0.005***

Note: MP shows the monetary policy; ERVol shows the exchange rate volatility; Pr. Cr to GDP shows the private credit to GDP; FDI shows foreign direct investment; FOA shows foreign assets to GDP; FOL shows foreign liabilities to GDP; FOAL shows total amount of foreign assets and foreign liabilities to GDP; SMD shows the stock market development;

Discussion

H1 of the study shows that the monetary policy of the China has a significant impact on liquidity synchronization. In the results of China, the MP and the liquidity synchronization show a 0.047 p-value which means that in the case of China, the relationship between the MP and liquidity synchronization is positively and significantly related. H2 of the current study shows that the exchange rate volatility of the financial market is significantly related to the liquidity synchronization of the country. The result of China shows a positive coefficient value and the p-value shows 0.003 which means that in the case of China, the relationship between the ERVol and the liquidity synchronization is positively and significantly related.

H3 of the study shows that private credit to GDP has a significant impact on liquidity synchronization. In the result of China, the result shows 0.053 p-values and the

coefficient sign shows a negative value which means in the case of China Pr. Cr to GDP is negatively and significantly related to liquidity synchronization. H4 of the study shows that financial openness has a significant impact on liquidity synchronization. The results of China show that FDI, FOA, and FOAL are positively and significantly related while FOL is negatively and significantly related to liquidity synchronization. According to the results of Imbs, (2004) the countries that have a higher ratio of openness to trade then the financial openness has increased and it is positively related to liquidity synchronization.

H5 shows that stock market development has a significant relationship with liquidity synchronization. In China, 0.050 p-value and the coefficient shows a negative value. So, if the stock market has a higher ratio of stock liquidity then the economic development of the country is also higher. According to the results, H5 of the current study has been accepted that SMD is significantly related to liquidity synchronization.

Signaling theory shows that when the stock market shows a higher ratio of efficiency then the stock returns of the countries are higher which also improves the economic condition of the countries. It also passes the positive signal into society so that in the end the ultimate investors invest in the countries. According to the results of Chan et al., (2013) there is a positive relationship between the stock liquidity and the liquidity synchronization of the countries which have the higher market efficiency. Based on the results 6 has been accepted.

Conclusion

In current study we examine the relationship of macroeconomic factors on liquidity synchronization. The data has been collected from 2012-2023. Macroeconomic factors data has been collected from the World Development Indicator; World Governance Indicators and DataStream website. The analysis of the current study has been done with the help of the Stata Software. In the analysis section descriptive statistics, correlation matrix, panel unit test, Hausman test, and the GLM model estimation have been done to analyze the relationship between the stock liquidity and liquidity synchronization.

Limitations and Future Directions

Limitations and future directions are good signs because they improve the study in empirical and theoretical terms. While the study uses existing econometric models, future research could explore more advanced techniques (e.g., non-linear models or machine learning methods) to better capture the dynamic relationships between macroeconomic factors, liquidity synchronization, and market efficiency. To enhance the generalizability of the findings, future studies could compare China's liquidity synchronization with other emerging or developed markets, examining the role of different institutional structures and macroeconomic environments. Given China’s increasing integration into the global financial system, future research could more deeply investigate how global economic conditions and external shocks influence liquidity synchronization, beyond just domestic macroeconomic factors. Further exploration of behavioral factors, such as investor sentiment or herding behavior, could provide a deeper understanding of how market efficiency moderates liquidity synchronization in China. Future studies could focus on the specific role of government intervention and policies in shaping liquidity synchronization and market efficiency, as China's financial markets are heavily influenced by regulatory changes.

Policy Implications

There are some policy implications of current research paper. Policymakers should consider improving market transparency and information dissemination to reduce asymmetries and enhance market efficiency. Clearer and more timely information would help market participants make better-informed decisions, thereby improving liquidity synchronization. As liquidity synchronization is influenced by both domestic and international factors, effective regulation of capital flows is crucial. Policymakers should ensure that capital controls are balanced to prevent excessive volatility while allowing for necessary market integration. To support liquidity synchronization, improving the underlying financial infrastructure, such as trading platforms and settlement systems, can reduce transaction costs and enhance overall market efficiency. Given that macroeconomic factors like interest rates and inflation influence liquidity, coordination between monetary policy and fiscal policy is vital. Ensuring that policies align to manage liquidity effectively could mitigate systemic risks and enhance market stability.

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Appendix

Table 1
Panel unit root test of China

Name of variables	p-values	Results
MP	0.000	I(0)
ERVol	0.05	I(0)
Pr. Cr to GDP	0.000	I(0)
FDI	0.000	I(0)
FOA	0.001	I(0)
FOL	0.02	I(0)
FOAL	0.02	I(0)
SMD	0.000	I(0)
LiqSyn	0.000	I(0)
Inf	0.05	I(0)
FS	0.02	I(0)
GDP	0.02	I(0)

Note: MP shows the monetary policy; ERVol shows the exchange rate volatility; Pr. Cr to GDP shows the private credit to GDP; FDI shows foreign direct investment; FOA shows foreign assets to GDP; FOL shows foreign liabilities to GDP; FOAL shows sum of foreign assets and foreign liabilities to GDP; SMD shows the stock market development; LiqSyn is used for the liquidity synchronization; SR used for the market efficiency; FS used for the firm size; GDP used for the per capita GDP.