Are cryptocurrencies really a threat to the financial stability and economic growth? Evidence from the cointegration approach

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Abstract: - The main purpose of this paper is to investigate whether the cryptocurrency market affects financial stability and economic growth of India. The study used quarterly data on bitcoin, financial stability, inflation rate, real GDP, economic volatility uncertainty, exchange rate, and market volatility index for the period 2015Q1-2021Q4. The robustness of the findings was confirmed by the fully modified OLS (FMOLS) and canonical cointegration regression (CCR). The study results demonstrated that an increase in cryptocurrency investments will affect the financial stability of India significantly. Each 1% increase in the cryptocurrency would reduce the financial stability by 5% approximately. However, there was a marginal effect of cryptocurrency on economic growth. The results also found that exchange rate volatility and inflationary pressure would also deteriorate the financial stability of the country. Furthermore, the results also identified positive and significant cointegration between economic growth and financial stability. Due to most transactions in the economy being done through the financial system, it is paramount for economic growth. Going forward, aggressive monetary policy tightening, volatility in capital flows and exchange rates, de-anchoring of inflation expectations, faltering in the economic recovery, disruptions due to global supply chains and climate change will be the major risks to the financial stability and economic growth of India.

Key-Words: - cryptocurrencies, financial stability, bitcoin, GDP growth, cointegration, India

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1 Introduction

The uniform functioning of the economy ensures fund security and appropriate allocation of resources. Hence if there is imparity in the financial system functionalities, the fund flow will be reduced leading to the aggregated economy. In the past few years, the world economy has experienced several major challenges leading to economic uncertainty. One such challenge for an emerging country like India is to regulate the use of cryptocurrencies. As per the sociotechnical systems theory, crypto development is dismembered to crypto operating services, governance, practices, operating platforms and practices. Cryptocurrencies have emerged as a pseudo-asset class in the past few years and have become attractive for market participants despite their high volatility rates [1]. However, it is still debatable whether cryptocurrencies qualify as an actual asset class in the financial market. There has been a growing debate in the world market about legalizing digital currencies and being endowed with a booming cryptocurrency industry. Many countries like China, Egypt, Qatar, Tunisia, Bangladesh, Algeria, Nepal, Morocco, and Iraq have completely ban on the digital currencies and services surrounding cryptocurrencies. According to the report by the Law Library of Congress, 42 other countries and their jurisdictions have prohibited cryptocurrency exchanges. However, a country like India is taking cognizance of regulating and rationalizing cryptocurrency trade. Governments that have banned cryptocurrencies have revealed that the rise of crypto could destabilize their financial systems and they also possess money laundering from illegal sources. Recently, Reserve bank of India Governor Shaktikanta Das warned that banks have serious concerns over cryptocurrencies as these are a big threat to the country's financial and macroeconomic stability due to no underlying asset [2]. He further reiterated that cryptocurrencies are posing similar risks to cyber security and warned investors to be cautious and invest at their risks. China fully banned cryptocurrencies in January 2022 due to its special

concern about using digital currencies for fraud and money laundering. Indian government's stance on digital assets has considerably changed from an outright ban on cryptocurrencies in 2016. Currently, there is no complete ban on the use of cryptocurrencies in India, however, the Reserve Bank of India (RBI) has ordered banks to avoid supporting crypto transactions. Recently, a high-level Inter-Ministerial Committee (IMC) suggested that all private cryptocurrencies, except any virtual currencies issued by a state, will be prohibited in India [3]. In the wake of recent economic uncertainties due to the COVID-19 pandemic and the recent conflict of war-like situation between Ukraine and Russia, there is an urgent need and growing concern about economic policies and financial decisions to avoid any financial and macroeconomic instability.

There have been growing studies that focus on the concerns over cryptocurrencies questioning the economic growth paradigm [4]; exploring the relationship between cryptocurrencies and financial assets [5, 6]; cryptocurrencies and global challenges [7]; cryptocurrencies and stock market indices [6]. However, it must be noted that there is lack of researches focused on the threat that cryptocurrencies pose to the financial stability and economic growth of the country. A financially unstable country will be poised by internal and external shocks. Intuitively, any factor that disrupts the financial system would make the system complex and would affect productive investment, uniform lending, better investment opportunities and economic activity. Theoretically, the economy or financial system is destabilized due to recession, uncertain government policies (policy paralysis), or collapse of financial or non-financial institutions [8]. Policymakers, whose job it is to ensure the stability of the financial markets, as well as investors with cryptocurrency holdings in their investment portfolios, need to understand the risk associated with cryptocurrency investments. Cryptocurrencies available in the form of cryptographic codes, and confirmed through a computer-based mining process, are a 21st century's newly digitized money well known as Blockchain Technology [9]. Cryptocurrencies are also known as crypto coins, virtual currency, or digital currency that operates in a decentralized medium of financial exchange backed by user consensus primarily. The imagination of customers, investors or capitalists, and entrepreneurs are caught by these virtual currencies (Fig.1).

Fig.1 Various cryptocurrencies and their symbol

Bitcoin as a digital currency was first proposed by Nakamoto (2008) for using it as an open-source system. As per the data shown by CoinMarketCap (see: http://www.coinmarketcap.com) the combined market capitalization of cryptocurrencies has received to $ 1.85 trillion as of February 18, 2022, with bitcoin at $ 771 worth, followed by Ethereum with $345 billion worth, Tether at $78.7 billion, BNB coin with the worth of $66.7 billion, USD Coin at $52.5 billion. Crypto assets and stable coins, which typically have no underlying securities and are largely utilized for riskier investments, are examples of new digital assets created as a result of technological advancements fueled by encryption and distributed ledger technology (DLT). From early 2020 to late 2021, when it peaked at approximately USD 3.0 trillion, the market value for crypto assets exponentially increased. It then experienced a dramatic decrease to less than US $ 1 trillion in June 2022.

The issue of financial stability has been the main focus of both academicians and policymakers. After the 2008-2009 financial crisis, new regulations were proposed to frame and supervise the financial system [10]. Due to the unique nature of financial stability as a public good, new regulations have been proposed to frame and supervise the financial system. As shown in figure 2, the bitcoin price had increased from 10000 USD to 55000 USD since 2020, whereas the financial stability of India declined drastically since 2020 together with increased economic volatility. GDP growth was the most affected since 2019 which declined to -8%.

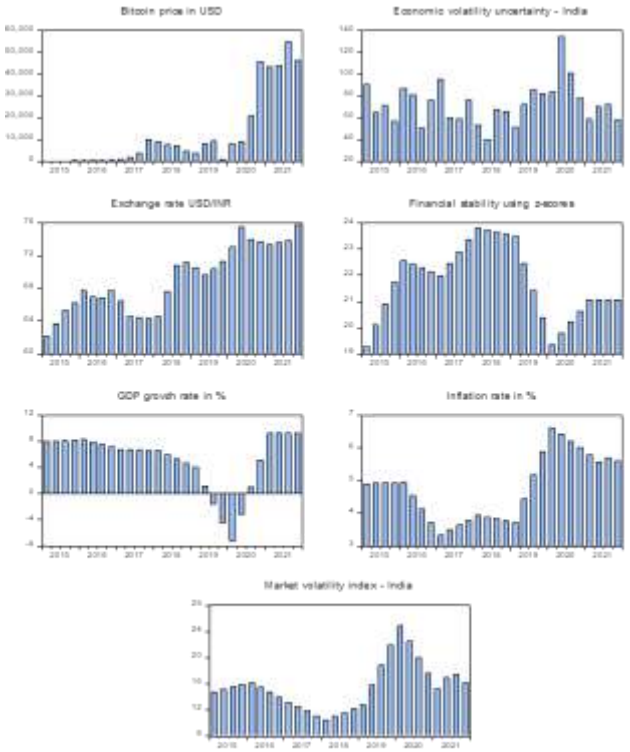

Fig.2: Comparing bitcoin graph with macroeconomic and financial stability factors
Source: Constructed by author using EVIEWS

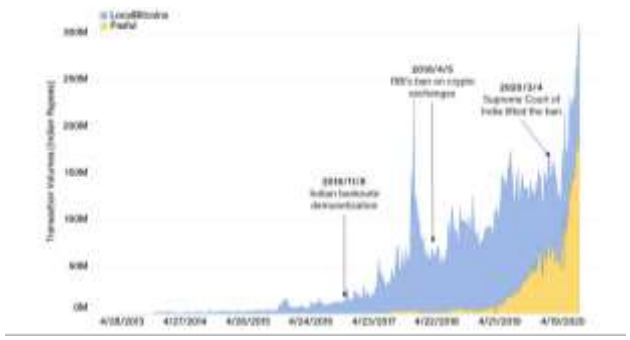

Fig.3: Bitcoin volume in India (2013-2020)
Source: www.coindesk.com

Figure 3 shows the volume of bitcoin trade in India since 2013. Due to the Indian banknote demonetization in 2016, the volume of bitcoin trading started increasing and it reached a peak of 250 million volume transactions in 2018 before RBI banned the crypto exchanges. In 2020, after the supreme court lifted the ban, the volume of bitcoin trading touched 300 million in 2020. This increase in the volume of bitcoin indicates that either investor are getting attracted to the crypto world or they are using crypto investment as a source to convert their black money to white. Chakravaram, Ratnakaram [9] while investigating the threats of cryptocurrencies found that most people who are investing in cryptocurrencies wish to convert their black money, and illegal earnings to white. Few cryptocurrency enthusiasts claim that digital money will democratize finance by redistributing power from the government to the people. Annie [11] in an interview with key economist Eswar Prasad. He further stated that if cryptocurrencies are not regulated under the financial system to improve investors' protection, it might contribute to financial and monetary instability.

There has been significant and different opinion on the role of cryptocurrency and its impact on financial innovation and economy. Table 1 provides the systematic literature review of previous researchers on the aspect of cryptocurrency-economy crux.

Table 1. Previous literature on cryptocurrency and economy relationship

Authors	Findings	Economic crux
[12]	The welfare costs should be pinned down with an insight through double spending constraints and using costly mining of cryptocurrencies.	Bitcoin creates huge welfare loss to the economy which is about 500 times that of the monetary economy with 2% inflation.
[13]	Cryptocurrency negatively affect economic growth	Cryptocurrencies are a good growth tool for poor nations, but only if their future use leads to an improvement in the level of financial knowledge required to access the online resources.
[14]	Cryptocurrency trading sparked economic growth, which attracted more funding for advancing smart and environmentally friendly technology to reduce carbon emissions from economic growth.	Increasing cryptocurrency trading will improve economic growth and globalization. However, in the long run the relationship between cryptocurrency and GDP is not confirmed.
[15]	the correlation of the Stock Market, Financial Innovation and Cryptocurrency to Indonesia's	Cryptocurrency will be give more impact to economic growth if it is treated as legal money in trading.

	economic growth, in the long run, all the variables give a positive correlation.	
[16]	Cryptocurrency has given highest returns compared to other investment instruments.	Government should regulate and adopt cryptocurrency to secure investors and economic growth.
[17]	study of cryptocurrency volatility is important in terms of financial instruments for hedging traditional assets, as well as in terms of pricing	economic factors such as inflation and the Fed rate have a long-term negative effect on the price of Bitcoin.

Despite the fact that cryptocurrencies are being used more frequently to purchase products and services as well as financial assets, the economic driving force behind this phenomenon is still up for debate. Majority of previous literature on cryptocurrency and economic performance has focused on the development of prices and regulatory issues. Theoretically, an increase in uncertainty leads to information asymmetry making opaque characteristics of borrowers [18]. It is quite difficult for lenders to differentiate between good and bad borrowers, leading to investment decline and correction in economic activity consequently. Different aspects of cryptocurrencies as a digital assets have been investigated in finance, including risk-return characteristics [19], returns volatility [20] and transaction activity [21].

Most of the existing studies have focused on the volatility spillovers of the stock market and cryptocurrencies [22], cryptocurrencies as a backstop for the stock market [23], cryptocurrencies as a safe haven for the stock market [24]. Despite the wide literature on cryptocurrencies and their empirical relationship with the stock market, few empirical studies have dealt with the financial instability threats that cryptocurrencies possess on the economy. This study contributes to the literature by adding a strand of literature that examines the role of cryptocurrencies on various economic and financial stability issues. This study hereby, argues that more distortion by cryptocurrencies would deteriorate the financial and economic conditions. A high regulatory framework would reduce the uncertainty and exposure to financial distorted instruments and be less affected by the vulnerability. The hypothesis is motivated by the rising concern about cryptocurrencies that could be a threat to the economy and financial stability. That is, it becomes difficult to manage the financial system and economic growth if disrupted by the so called crypto digital currencies. Furthermore, the effect of cryptocurrencies on economic and financial stability depends on the financial system and regulatory framework.

The remaining sections apart from the introduction are the "methodology" section that deals with the data source and types, econometric estimation and definition of the variables in detail. The empirical estimation of the model and its interpretation is provided after the methodology section. Finally, the conclusions and policy implications are described in the last section.

2 Methodology

2.1 Data Source and Type

Secondary data was collected from the World bank database, also known as World Development Indicator (WDI) database, the policy uncertainty index, investing.com and from yahoo finance. Annual data for GDP growth rate, inflation rate, exchange rate, financial stability, and lending rate, collected from the WDI database were converted to quarterly data. Whereas, Bitcoin price, India volatility index and economic policy uncertainty were converted from monthly to quarterly data. The new dataset converted to quarterly produced longer time series, improve consistency, and improvised control as suggested by [25]. Quarterly time series data from 2015 to 2021 of all the constructs, with a total of 28 observations were employed. Data originated in 2015 because bitcoin as a cryptocurrency was first introduced in October 2014. Other cryptocurrencies were excluded from the study investigation due to their lack of data availability and a maximum of them were launched in the recent five years since 2017. It also used quarterly data for lending rates as it precisely reflects the effect of monetary and macroeconomic policy from the central bank.

Numerous scholarly investigations have looked into the variables affecting economic growth and financial stability. To estimate the long-run co-integration between CO2 emissions and economic growth, Khan, Panigrahi [26] performed the FMOLS analysis. Similarly, Pradhan [27] used FMOLS and VECM estimation to investigate the cointegration between remittance and economic growth. This study used FMOLS for the co-

integration between the variables and CCR for the robustness of the model.

2.2 Model Description

Following Mbilla, Atindaana [28], this section specifies an appropriate model for the analysis determining the link between financial stability, macroeconomic stability and cryptocurrency. Financial stability and GDP growth rate were represented as the dependent factors whereas, bitcoin was the independent factor and the exchange rate, inflation rate, lending rate, risk-free rate, India volatility index, and economic policy uncertainty were used as control variables for the model.

The regression relationship of the model is stated as:

$$Z\_scores_{i,t} = \alpha + \beta_1 BTC_{i,t} + Control_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$GDP_{i,t} = \alpha + \beta_1 BTC_{i,t} + Control_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where z_scores in eq (1) is the proxy for the financial stability used as a dependent variable, *BTC* represents the cryptocurrencies, i indexes the country, t represents the quarterly time. Other macroeconomic and market-related variables were also employed in the modelling framework. Similarly, GDP in eq (3) is the proxy for the economic growth used as a dependent variable,

2.3 Variable Description

Bitcoin was first introduced by a code developer named Satoshi Nakamoto, and it was then conceived as a decentralized digital currency validated by cryptography [29]. Since then, bitcoin has been attractive to traders as a means of exchange. Bitcoin was represented as the main cryptocurrency and is described in US Dollar. Bitcoin is a digital asset that operates free of any central control and relies on peer-to-peer software and cryptography [30]. A bitcoin transaction is kept private with the help of cryptography and is electronically signed [31]. In early October bitcoin started trading officially on the online platform and reached the price of $123 by December 2014. Thus, this study included the data for bitcoin from 2015Q1 till 2021Q4. Table 2 describes the variables used in this study and the sources of these variables. Amongst the different cryptocurrencies, only Bitcoin was chosen due to its popularity and maximum market capitalization in the global as well as the Indian cryptocurrency market. Data for Bitcoin was obtained from the official website www.coinmarketcap.com.

Table.2. Variable descriptions

Variables	Descriptions	Source
Financial stability (z-scores)	Country level z-score	World Bank Global Financial Development Database
GDP Growth	Percentage changes in GDP	World Bank Development Indicators (WDI)
Cryptocurrency	Bitcoin prices (closing basis)	www.coinmarketcap.com
Inflation rate	Consumer price index (CPI) changes	World Bank Development Indicators (WDI)
Lending rate	Interest rate of lending	World Bank Development Indicators (WDI)
Exchange rate	The currency exchange rate between USD/Indian Rupee	World Bank Development Indicators (WDI)
Risk free rate	Government bond maturity	www.investing.com
Market volatility index (VIX)	Volatility index to measure market's anticipation for volatility and fluctuations	www.yahoofinance.com
Economic policy uncertainty	Possibility of government policies and regulatory frameworks becoming ambiguous	www.policyuncertainty.com

Financial stability for India was calculated using the z-score value retrieved from the WDI database. Z-score is the common measure of stability at the level of individual institutions or countries. It compares returns or capitalization with the risk to measure a bank's solvency risk. The probability of insolvency is low when the z-score level is high.

Many previous studies [32-34] have used the z-score as a proxy to measure financial stability. Financial instability may lead to hyperinflation, bank runs, and stock market crash. GDP growth was measured as a percentage change in GDP. The yearly data for GDP was extracted from World Bank Database and was converted to quarterly data.

The inflation rate was calculated as a change in the consumer price index. The data for the inflation rate was extracted from World Bank Development Indicators. The lending rate was calculated as the interest rate of lending by the banks. The exchange rate was calculated as the currency exchange rate between the United States Dollar (USD) and Indian Rupee (INR). The data for the inflation rate, exchange rate, and the lending rate was extracted from World Bank Development Indicators. The risk-free rate was calculated by government bond maturity. The data for the risk-free rate was extracted from the investing.com website. Indian market volatility index (VIX) was used to measure the market anticipation for volatility and fluctuations. VIX was extracted from the yahoo finance website. Economic volatility index uncertainty (EVIU) is the possibility of government policies and regulatory frameworks becoming ambiguous shortly. The data for EVIU was taken from the policy uncertainty website. The EVIU takes into account volatility, which may cause enterprises to postpone spending and investments.

3 Results and Discussion

Empirical analysis using time series secondary data was performed for the quarterly data from 2015 to 2021. Table 3 presents the basic characteristics of the variables in the study showing the mean, median, maximum, minimum, standard deviation, skewness, kurtosis, Jarque-bera and probability statistics. The Jarque-bera supported the normal pattern of the variable and represented the peak by kurtosis [35, 36].

Table 3. Descriptive statistics

Descriptive	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Mean	12302.46	69.130	21.750	5.1466	4.7822	9.3726	5.3446	15.535	73.175
Median	5920.19	68.735	21.8675	6.697	4.9153	9.4633	5.4488	15.286	71.727
Maximum	54876.6	75.782	23.82	9.2	6.6	10.0	6.26	24.8	134.5
Minimum	2385.65	62.092	19.27	-7.252	3.333	8.88	4.34	10.37	39.882
Std. Dev.	17150.04	3.9999	1.3818	4.4455	0.9900	0.3488	0.6444	3.6044	18.985
Skewness	1.4764	0.0500	-0.107	-1.4322	0.2335	-0.2281	-0.2225	0.8084	1.0864
Kurtosis	3.579	1.7533	1.9930	4.0300	1.7779	2.2581	1.7911	3.2522	5.1412
Jarque-Bera	10.562	1.8287	1.3990	10.807	1.9997	1.0100	1.9441	3.0888	10.856
Probability	0.005	0.4011	0.4999	0.0055	0.3688	0.6063	0.3794	0.2144	0.0044

Note: 1) Bitcoin; 2) Exchange rate; 3) Financial Stability using z-score; 4) GDP Growth; 5) Inflation rate; 6) Lending rate; 7) Risk free rate; 8) India volatility index; 9) Economic policy Uncertainty

The mean value of bitcoin was found to be $12302.46 which is quite lower as compared to the current price of $16700 as of 20 December 2022. Exchange rate mean value was found to be 69.13 INR/USD, followed by the GDP growth mean value of 5.146%. Inflation rate mean value was 4.78% which is quite lower as compared to the current inflation rate of 7%. This increase in inflation rate was due to recent hike in the interest rate by the central bank in order to curb inflation.

In order to test the associations between the dependent, explanatory and control variables, it is important to confirm the stationarity through the integration of order one. To confirm the stationarity, unit root tests by applying Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) were inspected. The empirical results as shown in Table 4 shows that there is no stationarity in all the variables at the level, thus accepting the ADF and PP hypothesis. However, at the first difference, the ADF and PP hypotheses were rejected confirming there is stationarity for all the variables.

Table.4. Unit root test results.

Constructs	ADF	PP	Level of stationarity
BTC	1.81	-0.03	-
Δ BTC	-2.99*	-4.57*	I(1)
GDP	-2.74	-1.65	-
Δ GDP	-2.47*	-2.35*	I(1)
EXCH	-0.93	-1.11	-
Δ EXCH	-3.37*	-3.35*	I(1)
EVIU	-3.56*	-3.59*	-
Δ EVIU	-6.50*	-10.5*	I(1)
INF	-1.94	-1.23	-
Δ INF	-2.26*	-2.34*	I(1)
VIX	-3.06*	-1.59	-
Δ VIX	-2.49*	-2.49*	I(1)
LR	-0.91	-0.85	-
Δ LR	-1.78*	-1.84*	I(1)
RFR	-1.95	-1.04	-
Δ RFR	-2.16*	-2.27*	I(1)

Note: ADF-Augmented Dickey-Fuller test, PP-Phillips-Perron test;. * means significant at 5% level. Source: Calculated by the author using eviews-12 software.

In the next step, we examined the correlation between the variables as available in Table 5. The results indicated that there is a negative association between bitcoin price and financial stability. Meanwhile, exchange rate, GDP growth and the Indian volatility index were found to have a positive association with bitcoin price. Furthermore, the exchange rate is negatively correlated to financial stability and GDP growth. In addition, GDP growth was also having a negative relationship with the inflation rate.

Table.5: Correlation matrix for the variables

	1	2	3	4	5	6	7	8	9
Bitcoin price	1	0.676	-0.254	-0.215	-0.509	-0.856	-0.773	-0.200	-0.058
Exchange rate		1	-0.307	-0.380	-0.661	-0.872	-0.692	-0.591	-0.281
Financial Stability			1	0.319	0.814	0.234	0.319	0.799	0.554
GDP Growth				1	-0.421	-0.201	-0.092	-0.681	-0.482
Inflation rate					1	0.571	0.441	0.883	0.472
Lending rate						1	0.905	0.413	0.135
Risk free rate							1	0.362	0.202
Volatility Index								1	0.615
Economic Uncertainty									1

Note: 1) Bitcoin; 2) Exchange rate; 3) Financial Stability using z-score; 4) GDP Growth; 5) Inflation rate; 6) Lending rate; 7) Risk free rate; 8) India volatility index; 9) Economic volatility index Uncertainty
Source: Calculated by the author using eviews-12 software.

Co-integration test was performed to check the long-term association between the variables. Long term effect of bitcoin on financial stability and economic growth and other macroeconomic factors discussed in this study are expressed quantitatively, and it can be said that there is a strong interaction with each other. Results of FMOLS and CCR model estimation with financial stability as a dependent variable are presented in Table 6. The result finds that there is negative and significant cointegration between financial stability and bitcoin (β = -5.73, $p<0.001$) indicating that in the long run cryptocurrencies may contribute to the monetary and financial instability of the country if they were to spawn a large and unregulated financial system and retail investor's protection. The interaction between financial stability and economic growth estimated that a 1% increase in economic growth would result in an increase of 0.15% in the financial stability of the country. When the effect of the exchange rate is considered, it can be estimated that a 1% increase in the exchange rate would yield to decrease of 0.10% in financial stability. The results obtained provided are similar to previous studies [37, 38] which mentioned that exchange rate volatility may decline the financial stability or stress of the country. The cointegration between economic volatility uncertainty and financial stability was not significant indicating that in the long run economic uncertainty is unable to destabilize the Indian financial system. Indian financial system display resilience because they came into the epidemic with

relatively solid balance sheets that were bolstered by greater liquidity buffers and stronger capital. Losses have been manageable, and unlike during the global financial crisis (GFC), when banks deleveraged and reduced lending, global bank lending has remained strong. It is reassuring to note the stability of these institutions' fundamental solvency and liquidity positions. Furthermore, inflation was found to have strong negative cointegration on financial stability estimating 1% increase in the inflation rate would yield to decrease the financial stability by 1.65%. Reflecting the uncertainty due to the COVID-19 pandemic and war, rising interest rates in response to hardening inflationary pressures will further tighten the financing conditions.

Table.6. Long-run model estimation with financial stability as a dependent variable

	FMOLS estimation		**CCR**	
Variables	Coefficients	t-statistics	Coefficients	t-statistics
BTC	-5.73***	-5.900	-5.75***	-4.39
EXCH	-0.10***	-3.55	-0.11***	-3.23
EVIU	0.001	0.440	0.001	0.200
INF	-1.65***	-9.52	-1.667***	-6.67
VIX	0.129**	2.45	0.134**	1.98
LR	-10.06***	-11.88	-10.18***	-12.56
RFR	3.06***	12.57	3.10***	11.68
C	112.47***	13.69	114.27***	14.00
R^2	0.959***		0.961***	

Note: p<0.001 - ***, p<0.05**. BTC – Bitcoin, GDP – gross domestic product, EXCH – exchange rate, EVIU – economic volatility index uncertainty, INF- inflation, VIX -Indian volatility index, LR – lending rate, RFR – risk-free rate, R^2 – Regression square. Source: Calculated by the author using eviews-12 software.

Table 7 presents the cointegration test for the variables with GDP growth as a dependent variable. The study findings divulge that cryptocurrencies are subjected to have a marginal effect on economic growth in the long run. However, financial stability was having strong cointegration with economic growth. The interaction between financial stability and economic growth is estimated that a 1% increase in financial stability would yield to increase of 3.45% in economic growth. Despite a hostile foreign climate, the Indian economy and local financial system continue to be strong and resilient thanks to solid domestic macroeconomic fundamentals. The Indian financial system is well-positioned to help the economy grow due to strong capital buffers and rising asset quality levels. The interaction between the exchange rate and economic growth estimated that a 1% increase in the exchange rate would result in an increase of 0.57% in economic growth. Due to geopolitical conflicts due to increased global uncertainty, the surge in crude oil prices and tightening monetary policy led the USD-INR exchange rate to touch an all-time low of 81.92 on October 6, 2022.

Table.7. Long-run model estimation with GDP as a dependent variable

	FMOLS estimation		**CCR**	
Variables	Coefficients	t-statistics	Coefficients	t-statistics
BTC	0.003***	8.310	0.003***	5.72
Fin_stab	3.45***	5.270	3.48***	6.23
EXCH	0.579***	4.179	0.62***	3.61
EVIU	-0.02	-1.470	-0.019	-0.70
INF	6.80***	6.060	6.96***	5.22
VIX	-0.99***	-4.597	-1.048**	-3.13
LR	46.21***	10.47	47.63***	9.28
RFR	-13.36***	-8.011	-13.67***	-7.78
C	-490.9***	-8.990	-505.73***	-8.29
R^2	0.903***		0.907***	

Note: p<0.001 - ***, p<0.05**, p<0.10*, BTC – Bitcoin, FIN_STAB-financial stability, EXCH – exchange rate, EVIU – economic volatility index, INF- inflation, VIX - Indian volatility index, LR – lending rate, RFR – risk free rate, R^2 – Regression square

Similarly, other macroeconomic factors like inflation rate, lending rate, volatility index and risk-free rate were having strong cointegration with economic growth. Due to an increase in global financial stability risks, the macroeconomic and financial developments of India have posted a modest improvement. However, due to overwhelming geopolitical tension, maintaining

macroeconomic and financial stability would be a great challenge for central banks over the world.

4 Conclusion

This study explored the relationship between cryptocurrency, financial stability and economic growth in India from 2015 to 2021. We utilized eight different determinants including bitcoin, exchange rate, economic volatility uncertainty, inflation rate, volatility index, lending rate, and risk-free rate to analyze its impact on financial stability and economic growth. FMOLS regression analysis was performed to explore the relationship whereas; canonical cointegrating regression (CCR) was estimated for the robustness of the model.

The results show that all the determinants have cointegration with financial stability and economic growth, except economic volatility uncertainty. Bitcoin representing cryptocurrency was found to have a negative relationship with financial stability. This result indicated that a 1% increase in cryptocurrency will decrease the financial stability of the country by 5%. Although there haven't been any big defaults by financial institutions as a result of the recent considerable volatility of crypto-assets, the risks of these events are growing. Increased financial institution involvement could accelerate the growth of crypto-assets and raise the risks to financial stability. The rising options provided by cryptocurrency exchanges for investors to enhance their exposure through leverage could heighten the threats to financial stability. According to estimates, leverage on crypto assets has significantly increased in recent years.

The coefficient of GDP is positively significant with financial stability at a 1% significant level. Where a 1% increase in GDP growth increases financial stability by 0.15%. Greater financial stability could result from faster economic growth. On the other side, increased inflation or unstable prices could hurt financial stability. Financial stability can aid monetary policy by enhancing growth and inflation's reaction to changes in interest rates. Regulators should make sure the system runs smoothly and support regional growth. A prerequisite for sustainable economic development is consequently the soundness of financial institutions. The empirical findings show a correlation between India's economic development and a better level of financial system stability. Therefore, strong economic performance is encouraged and is favourably predicted by financial stability.

The coefficient of the exchange rate was negatively related to financial stability at a 1% significant level. Where a 1% currency depreciation increase would decrease the financial stability by 0.10%. Our findings imply that the exchange rate significantly influences the net worth and credit availability of Indian non-financial enterprises. With tighter US monetary policy and a greater depreciation of the rupee against the dollar, credit conditions for businesses often deteriorate. While it may be beneficial to counter US monetary tightening with higher domestic interest rates to slow rapid currency depreciation, doing so is likely to result in more output volatility.

The results of the inflation rate indicated that a 1% increase in the inflation rate, decreases financial stability by 1.65%. Significant inflation surprises can cause market volatility and raise the likelihood of an uncontrolled asset revaluation. Market participants attempt to predict how central banks may react to preserve price stability when faced with an inflation shock. Furthermore, the real value of outstanding debt may reduce with a higher-than-expected increase in inflation.

The result of economic volatility uncertainty and financial stability was not significant at the 1% level indicating that economic volatility uncertainty has a greater impact on financial stability in nations with higher levels of competition, lower levels of capital adequacy, and weaker financial systems. Therefore, the administration should not just recognize that regulations themselves influence the economy but also pay attention to the consequences of the volatility caused by frequent reforms in the financial system. This is because economic policy uncertainty has a significant influence on investor sentiment and financial stability. Therefore, while creating policies, the government should carefully assess whether they are consistent with the actual norms of society and should pay closer attention to how frequently policies are released and changed. In conclusion, going forward aggressive monetary policy tightening, volatility in capital flows and exchange rates, de-anchoring of inflation expectations, faltering in the economic recovery, disruptions due to global supply chains and climate change will be the major risks to the financial stability of India.

5 Policy Implications

Cryptocurrencies have seen reputational damage since 2021 due to many scandals and measures need to be taken by the regulatory agencies in terms of crypto investments to protect Indian retail investors. Furthermore, the results also identified positive and significant cointegration between economic growth and financial stability. Due to most transactions in

the economy is done through the financial system, it is paramount for economic growth. Financial instability may lead to bank runs, a stock market crash, and hyperinflation and it can severely shake financial and economic confidence. The latest Global Financial Stability report in 2021 by International Monetary Fund (IMF) described the risk posed by the crypto ecosystem due to a lack of strong operational, governance and risk practices. Thus, it is recommended to policymakers, regulators and supervisors monitor rapid developments in the crypto ecosystem and the instability they create in the financial system. Regulators should also emphasize the risk that crypto poses to economic functions. Time is important, and appropriate action needs to be taken that must be broad, quick and well-coordinated to address the vulnerabilities.

Risks to financial stability have so far been kept in check thanks to continuing governmental support as the world navigates the pandemic. However, there are still many sectors with high financial vulnerabilities. The inflation outlook continues to raise concerns, and some market segments have overvalued assets. Despite rising funding costs, emerging and frontier markets still have significant financing needs. Some nonbank financial organizations are experiencing increased risks as they strive to increase yield to satisfy return objectives. Cryptocurrencies may impair capital account control in developing economies, which may affect the management of exchange rates. In addition, disintermediation from the established financial system caused by cryptocurrencies can undermine financial stability.

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