

**FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH
IN INDIA: A PRE AND POST LIBERALIZATION FINANCIAL
CYCLE DETERMINATION**

A Thesis

**Submitted in Fulfilment of the Requirements for the Degree of
DOCTOR OF PHILOSOPHY**

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Declaration

I, **Ridhima**, affirm that this thesis titled “**Financial Development and Economic Growth in India: A Pre and Post Liberalization Financial Cycle Determination**” submitted to Thapar Institute of Engineering & Technology (Deemed to be University), Patiala, in fulfillment of the requirement for the reward of **DOCTOR OF PHILOSOPHY** in **ECONOMICS**, is a record of the original research work carried out by me under the guidance and supervision of **Dr Ash Narayan Sah**, Associate Professor, School of Humanities and Social Sciences, Thapar Institute of Engineering and Technology. I certify that this work, in whole or in part, has not been submitted for any other academic award.

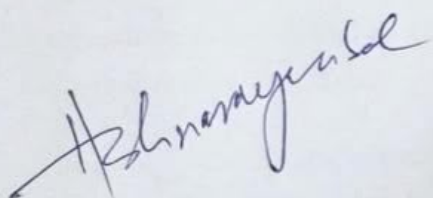
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“Arise, awake, and stop not till the goal is reached.” – Swami Vivekananda

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Abstract

This thesis examines the role of financial development in influencing economic growth from 1980 to 2021, focusing on bank credit—measured through non-food gross bank credit (NFGBC), commercial bank credit, and agricultural credit—broad money supply (M3), stock market capitalization (BSE and NSE), and productive investments captured through gross fixed capital formation (GFCF). The study aims to examine both linear and nonlinear relationships between financial variables and macroeconomic indicators, while also identifying the presence of financial cycles in India and their interaction with business cycles. Annual data are mainly used for macroeconomic analysis, while monthly data are employed for the stock market and economic growth. In doing so, the study addresses a significant gap in the existing literature by jointly examining linear and nonlinear finance-growth relationships, financial cycles, structural relationships, and regional heterogeneity.

To achieve these objectives, the study employs various econometric methodologies, including the Autoregressive Distributed Lag (ARDL) model to examine short-run and long-run dynamics, Threshold regression to capture nonlinear effects, and Structural Vector Autoregression (SVAR) to identify structural relationships among variables. Financial and business cycles are extracted using the Hodrick-Prescott Filter, with lead-lag relationships also examined to analyze whether financial cycles lead business cycles over time.

The empirical results confirm a stable long-run relationship between financial development and economic growth. Bank credit and broad money supply exert positive and significant influences on GDP, indicating the importance of liquidity and credit availability in supporting economic activity. The study captures heterogeneity across states in terms of financial development and economic performance. The regional results indicate a significant role of banking credit in influencing economic growth, despite differences in financial depth. Moreover, despite periods of slowdown and economic shocks, the positive relationship between financial variables and growth remains intact. Stock market development has a significant influence on real economic activity, supporting the supply-leading hypothesis. Threshold regression results reveal a nonlinear relationship between stock market development and growth, with effects varying across market size and different phases of expansion and contraction. These findings highlight the importance of considering regime-dependent behavior when evaluating the finance-growth nexus in emerging economies. The cyclical analysis further confirms the presence of financial cycles in India, which are highly

synchronized with business cycles, with credit and investment leading economic activity. The SVAR results show that shocks to NFGBC and GFCF play a significant role in output dynamics, underscoring the central role of credit and investment in driving economic fluctuations.

Overall, the findings underscore the critical role of financial markets and productive investment in promoting sustainable growth in India and emphasize the importance of well-coordinated financial and economic policies. Policymakers should adopt a macro-financial approach that ensures stable credit provision, supports productive investments, and strengthens capital markets to smooth financial cycles and sustain long-term economic growth. Future research may extend this study by incorporating sectoral analysis and a cross-country panel framework with emerging economies, using higher-frequency data and advanced time-varying nonlinear econometric methods.

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List of Abbreviations

GDP	Gross Domestic Product
NPA	Non-Performing Assets
CRR	Cash Reserve Ratio
SLR	Statutory Liquidity Ratio
BSE	Bombay Stock Exchange
NSE	National Stock Exchange
SEBI	Securities and Exchange Board of India
IIP	Index of Industrial Production
RTGS	Real-Time Gross Settlement
NEFT	National Electronic Funds Transfer
PMJDY	Pradhan Mantri Jan Dhan Yojana
MUDRA	Micro Units Development and Refinance Agency Banks
UPI	Unified Payments Interface
M3	Broad Money Supply
CPI	Consumer Price Index
SVAR	Structural Vector Autoregression
NFGBC	Non-Food Gross Bank Credit
ARDL	Autoregressive Distributed Lag
RBI	Reserve Bank of India
MoSPI	Ministry of Statistics and Programme Implementation
IMF	International Monetary Fund
ECM	Error Correction Mechanism
ECT	Error Correction Term
GFCF	Gross Fixed Capital Formation
SCBs	Scheduled Commercial Banks
DFIs	Development Financial Institutions
NBFCs	Non-Banking Financial Companies
MSMEs	Micro, Small and Medium Enterprises
BRICS	Brazil, Russia, India, China and South Africa
GMM	Generalized Method of Moments

FEOLS	Fixed Effect Ordinary Least Squares
PCE	Principal Component Analysis
VECM	Vector Error Correction Model
FDI	Foreign Direct Investment
BVAR	Bayesian Vector Autoregression
HP	Hodrick-Prescott
ADF	Augmented Dickey-Fuller
PP	Phillips-Perron
JB	Jarque-Bera
CUSUM	Cumulative Sum
CUSUMQ	Cumulative Sum of Square
AIC	Akaike Information Criteria
PMG	Pooled Mean Group
FRED	Federal Reserve Economic Data

Chapter I

INTRODUCTION

The introduction lays the foundation for the study by examining the theoretical and historical evolution of financial development indicators and their influence on economic growth in India. Section 1.1 discusses the key theories related to financial development and growth, followed by an overview of channels through which financial intermediaries operate. Further, it traces the major financial reforms and their impact on the financial system. Section 1.2 presents the conceptual framework, introducing the variables used and their role in promoting economic growth. Section 1.3 discusses the key problems, followed by Section 1.4, which outlines the research questions. Section 1.5 presents the objectives of the study, aligning with the research questions. Section 1.6 introduces the hypotheses to test the given indicators and their impact on economic growth. Furthermore, Section 1.7 describes the data used and the econometric methodology employed. It also highlights the research significance. Finally, Section 1.8 details how the study is structured into different chapters, each addressing a specific aspect of the research, including an overview of the financial development and economic growth relationship, an extensive literature review, methodology, research-specific chapters, and a conclusion with policy recommendations.

1.1 Background

In the post-World War era, economists began examining the relationship between financial development and economic growth. An efficient financial system, in both developed and developing countries, enables them to increase their gross domestic product (GDP). The debate on the finance-growth nexus started when (Schumpeter, 1911) highlighted the importance of financial sector development in boosting economic growth. Schumpeter argued that the financial sector's advancement plays a pivotal role in driving economic growth, especially through its support of technological innovations. He believed that financial development influences economic growth by identifying and funding productive investments, aligning with (Goldsmith, 1969), who emphasized the efficiency of investment for financial development. (McKinnon, 1973) and (Shaw, 1973) supported this view, highlighting the importance of financial liberalization in promoting savings and, consequently, investments. (Gurley & Shaw, 1955) challenged neoclassical views that downplayed the role of the financial sector,

emphasizing its crucial contribution to economic growth. Similarly, (Patrick, 1966) proposed two key hypotheses regarding the finance-growth relationship: the supply-leading hypothesis and the demand-leading hypothesis. Patrick argued that in the early stages of a country's economic development, the financial system drives economic growth, whereas, as the country advances towards becoming a developed nation, growth creates demand for a more developed financial sector. Over time, the importance of the financial system for economic prosperity gained recognition. During Britain's Industrial Revolution (1760-1840), the country's substantial financial resources, including surplus capital from colonies like India, fueled the shift from an agrarian to an industrial economy. This period marked a pivotal change, as noted by (Bagehot, 1873) and (Hicks, 1969). While India supplied capital for other countries, its indigenous banking system declined, and colonies directed capital flows towards British interests. (Bagehot, 1873) suggested that during crises, it becomes crucial for banks to lend freely through liquidity injections. Notably, during the 2008 crisis and COVID-19, central banks in London applied this principle to stabilize financial markets (Leloup & Trautwein, 2024).

The link between financial development and economic growth has been extensively studied in India since the financial reforms in 1992. India's financial sector is diverse, including commercial banks, insurance companies, non-banking financial institutions, cooperatives, mutual funds, pension funds, and other markets. Commercial banks hold 64% of the total resources in the financial system. As the main source of credit, the banking sector plays a vital role in providing funds to productive sectors. Improved access to bank credit has led to increased investment and industrial growth. As financial reforms deepened the economy, financial intermediation channels evolved, strengthening the finance-growth relationship.

1.1.1 The channels through which financial development promotes economic growth:

- Facilitates risk trading, diversification, and pooling.
- Ensures efficient resource allocation.
- Mobilizes savings for productive activities.
- Supports monitoring, management, and corporate control.
- Enables the smooth exchange of goods and services.
- Improves access to external finance.

A well-developed financial system promotes growth by fostering capital accumulation and raising total factor productivity (Greenwood & Jovanovic, 1990). Financial intermediaries are highly effective at sourcing information about investment projects, enabling high-quality investments via technological innovation. These investments often involve low risk and high returns, positively impacting economic growth. Banks primarily provide savings to investors by attracting household deposits and offering loans, leading to physical capital accumulation. The financial system allows participants to deposit savings as liquid assets for ready use, reducing liquidity risks and the need for constant monitoring to manage risks and uncertainties. Additionally, an efficient financial system supports a smooth payment mechanism, facilitating secure and simple business transactions.

1.1.2 Evolution of Financial Sector Reforms in India

In India, the relationship between financial development and economic growth has evolved, particularly following the reforms. Under the License Raj, the financial system was heavily regulated and controlled, leading to deficits in the balance of payments and a growing non-performing assets (NPA) ratio of 16.3%. The average GDP growth rate was around 3.5%, often called the Hindu growth rate. To address the balance of payments issue and the Gulf oil crisis, Manmohan Singh acted swiftly to stabilize growth and macroeconomic conditions. Liberalization reforms were undertaken to empower the financial sector to fulfil its role effectively. The Indian banking system shifted to a more market-oriented system with the reduction of the cash reserve ratio and the statutory liquidity ratio. Interest rates were also deregulated following the recommendations of two committees: the Narasimham Committee (1991) and the Narasimham Committee (1998), to introduce greater flexibility and simplicity in banking operations. The pre-liberalization financial sector was characterized by financial repression, which imposed strict controls on banking activities and limited the allocation of credit. These reforms aimed to promote liberalization and facilitate the better allocation of credit and savings. The cash reserve ratio (CRR) and statutory liquidity ratio (SLR) were gradually reduced to 10% and 25%, respectively, to enhance lending capacity. At least 10% of fixed credit must be allocated to priority sectors. The government's ownership in public sector banks was reduced by allowing them to source capital from the equity market up to 49% of paid-up capital. The entry of new private and foreign banks, which were better capitalized and technologically advanced, increased competition in the market. Foreign investment in the banking sector was permitted up to 74%, with voting rights restricted to 10%. The Monopolies

and Restrictive Trade Practices (MRTP) Act became obsolete and was replaced by the Competition Commission of India (CCI) to promote sustainable competition in the market. Additionally, the liquidity adjustment facility was institutionalized in 2000-01, under the guidance of the Narasimham Committee, to manage short-term liquidity, using repo and reverse repo rates. The monetary policy targeting was undertaken to stabilize inflation and promote economic growth.

Liberalization reforms brought significant changes in the equity market as well. The Bombay Stock Exchange (BSE), the oldest stock exchange in Asia, was initially confined to Bombay and dominated by the broker community, leading to restrictions and barriers to trade. Trading was primarily conducted through traditional open outcry and spot market trading. The period between 1992 and 1996 marked a remarkable phase for the Indian equity market with the establishment of the Securities and Exchange Board of India (SEBI) and the National Stock Exchange (NSE) in 1992. NSE was set up as a public sector institution while also functioning as a private entity. Within a year, it became the largest stock exchange in the country with a significant volume of shares traded. National Stock Depository Limited (NSDL) was introduced in 1996 as the depository holder for securities in electronic form, thereby reducing transaction costs and risk. The adoption of an online trading platform enhanced the price discovery process by integrating domestic and global investors. Demat trading improved liquidity, reduced settlement cycles, and provided individual stock futures.

The merger of weaker public sector banks with stronger banks reduced NPAs, which had been increasing quarterly, while also generating economies of scale. The NPA ratio decreased to 1.9% in 2006 from 7% in March 1997. After peaking at 14.58% in March 2018, it subsequently fell to 3.12% by 2024. Banking consolidation led to improved efficiency and lowered operational costs. Similarly, the number of public sector banks decreased from 27 in March 2017 to 12 by April 1, 2020. The RBI introduced Real-Time Gross Settlement (RTGS) in April 2004 for interbank electronic transactions, allowing real-time online transactions across the country. The National Electronic Funds Transfer (NEFT) also went live, facilitating low-value fund transfers across banks. The Pradhan Mantri Jan Dhan Yojana (PMJDY) was launched in 2014 to broaden access to financial services, including bank accounts, credit, insurance, and remittances. The Micro Units Development and Refinance Agency (MUDRA) was established in 2015 to provide easy credit to Micro and Small Enterprises. RBI amended flexible inflation targeting in 2016, following recommendations by the Urjit Patel Committee (2014). Under this

framework, the RBI and government decided to maintain inflation with a target of 4% and a tolerance band of ± 2 ; i.e., implying an acceptable range between 2% and 6%. A significant transformation occurred in 2016 with the introduction of the Unified Payments Interface (UPI) and, along with platforms like BHIM, Aadhaar-Enabled Payment Systems (AEPS), and QR codes, which initiated a digital revolution in retail transactions. The Goods and Services Tax (GST) was implemented in 2017 to consolidate various indirect taxes and initially supported growth; however, after 2018, economic growth declined due to the impact of COVID-19.

1.1.3 Impact of Various Reforms on the Financial Sector

- Between 2014 and 2024, India experienced sustained growth, with GDP growth averaging around 6.6%.
- A self-sufficient banking sector helped the economy overcome the Global Financial Crisis of 2008.
- The share of private banks increased by 8% between 2001 and 2006, reducing the public sector banks' deposits and advances from 82% and 80% to 74% and 72%, respectively.
- The operating expenses of Indian banks amounted to around 2% of total assets, in line with international standards.
- The equity market has the lowest transaction costs for screen-based and paperless transactions.
- The BSE daily turnover ratio increased substantially from ₹13 crores in 1980 to ₹2054 crores in 2004-05, further surging to ₹9054 crores by 2021-22. Market capitalization increased from 42.8% to 54.7% in 2004-05, reaching ₹18 lakh crores, while the NSE rose to ₹23 lakh crores by August 2005.
- Under the PMJDY, over 42 crore bank accounts were opened until 2021, helping the unbanked population by enabling direct fund transfers.
- MUDRA banks sanctioned nearly 29 crore loans, particularly empowering women and non-farm microenterprises.
- India is a global leader in digital payments, with 89.5 billion transactions in 2022, UPI accounting for 46% of transactions.

Overall, India's financial system has evolved through a combination of institutional changes, policy reforms, technological advancements, and market-driven mechanisms. India's financial development trajectory not only improved economic growth but also the accessibility and

efficiency of the financial sector itself. Given this scenario, investigating the finance-growth nexus becomes imperative. The present study tries to identify the gaps and unresolved issues, as understanding the dynamics of financial institutions over time provides valuable insights for policymakers and stakeholders.

1.2 Conceptual Framework

The primary view in the literature is that investment is a function of savings; accordingly, the financial system allocates savings into productive investments. The classical dichotomy assumes that monetary variables do not influence real variables but affect only nominal variables, such as price changes. Keynesians, however, argue that credit formation is the primary function of the financial system, which leads to increased investment and thus savings. Neoclassical economists highlight that financial influence grows directly or indirectly through finance or technological advancement. The financial system comprises financial institutions and financial markets. Both banks and financial markets provide financial services. In economies with a dominant bank-based system, banks are the source of long-term credit. It is held that banks have the power to determine the profitable assets and risks in advance (Levine, 2002), and banks improve efficiency with prior information from investors and firms. In a finance market-based system, investors source long-term funds from equity and bonds. Financial markets play a crucial role in providing information quickly, thereby improving the effectiveness of financial markets.



Figure 1.1 Key Role of Financial Institutions

The conceptual framework has been drawn from the various theories of the finance-growth nexus. Figure 1.2 displays the three main indicators of financial development: Bank credit—this variable reflects the amount of funds available and transferred within a period (Ductor & Grechyna, 2015). The broad money supply, M3, is an indicator of financial depth; high liquidity implies depth in the banking system. Interest rates are an important instrument in monetary policy. McKinnon-Shaw financial liberalization theory suggests that interest rates are determined by market forces, thereby improving savings and capital allocation. Moreover, neoclassical economists posit that interest rates reflect the cost of capital, influencing

investment decisions. So, banking credit and monetary policy operate through interest-rate mechanisms. Another important indicator of financial development is stock market capitalization, which reflects improved firms' valuation and increased confidence among investors, promoting investor markets and economic growth. The combined market capitalization of the Bombay Stock Exchange and the National Stock Exchange has been utilized in this study. These indicators represent the depth and efficiency of a financial system in allocating resources. The framework assumes that increased financial depth improves credit distribution and liquidity, which further enhances capital formation and, in turn, economic growth.

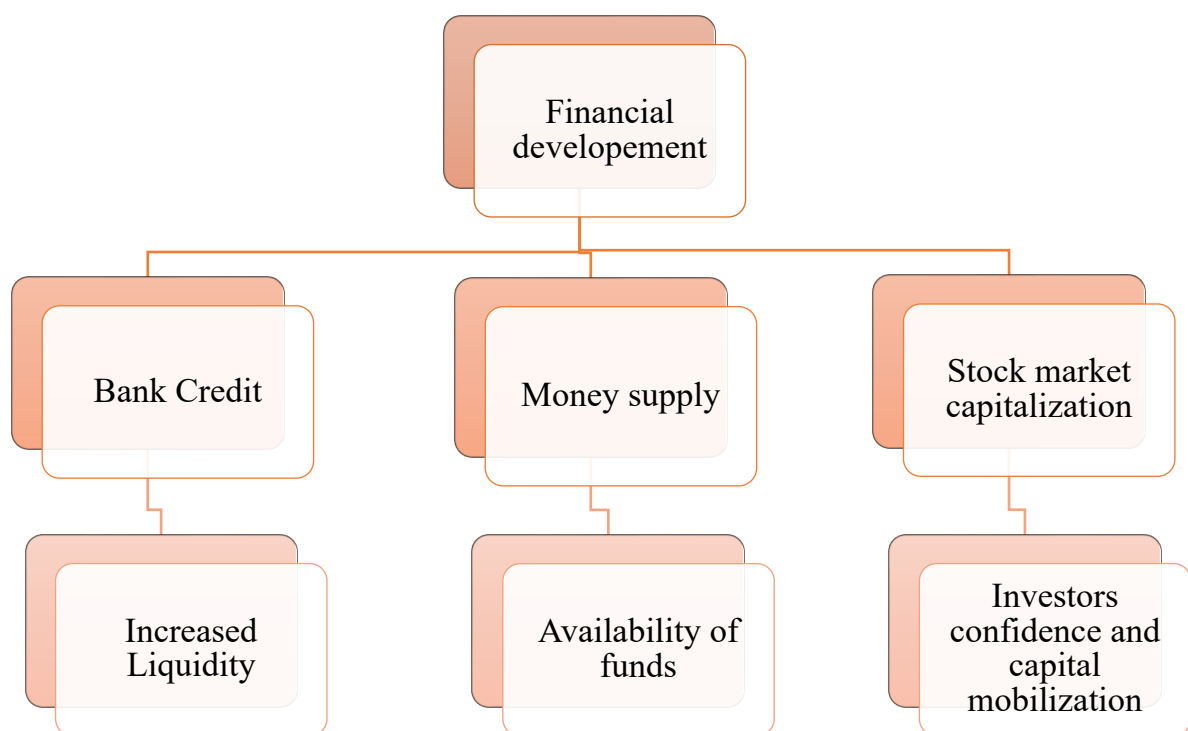


Figure 1.2 Structure of Financial Development

The second part of the framework is the cyclical interaction between the indicators of financial development and real economic activity. By analyzing business, financial, and monetary cycles, this study examines how these variables behave during periods of expansion and contraction. It also aims to understand how financial booms contribute to fluctuations in economic growth. Furthermore, it also captures the long-run relationship between financial and business cycles, whether financial cycles lead or lag business cycles.

Taken together, this framework offers a comprehensive perspective on the depth of financial development and financial stability.

1.3 Statement of the Problem

Since the mid-20th century, achieving sustainable economic growth has been the primary macroeconomic goal of nations, particularly in the context of Europe's post-war recovery and the developmental challenges faced by newly independent Asian and African countries. Many theories of growth and development have been proposed by prominent economists, including the Harrod-Domar model, Joan Robinson's Golden Age model of economic growth, Solow's model of growth, Romer's endogenous growth model, and others. While these theories emphasize capital, labor, and innovation, the efficiency of financial institutions has gained prominence in recent decades. The positive link between financial development indicators and economic growth is evident in more developed countries, and these countries have also developed robust financial markets. Indeed, many consider the important role of financial development in achieving high economic growth. In contrast, the famous classical dichotomy (Patinkin, 1965) suggests that monetary and financial variables are independent of real economic variables, such as income, output, and economic growth. This theory posits that money and financial structures play a neutral role in contemporary economic development, suggesting that they do not directly determine economic growth and development. John (Robinson, 1952) emphasized "that where enterprise leads, finance follows," implying that causality flows from economic growth to financial development. Likewise, development economists, including Nobel laureates, paid limited attention to the role of finance in the process of economic development. (Lucas, 1988) further argued that economists tend to overemphasize the role of financial factors in economic growth; instead, economic development creates demand for specific types of financial instruments and arrangements, to which financial systems naturally adapt.

Empirical studies have contributed to the understanding of the positive relationship between finance and growth; however, several gaps remain to be addressed. While several studies examine the positive relationship between bank credit and economic growth, they overlook whether the same relationship holds at the state level. Given regional disparities in terms of infrastructure, banking credit, and industrial base, the relationship between them might differ, motivating the need to do a disaggregated analysis. This insight motivates a more nuanced inquiry into whether the credit-growth nexus is uniform. Moreover, there's still a long-standing

debate about whether financial development leads to economic growth or it's the other way around. This study will examine the direction of the relationship between financial development and economic growth. Additionally, this study contributes by examining all the financial development indicators together. Money supply and banking credit have been widely studied. However, the combined market capitalization of BSE and NSE is still unexplored as a driver of growth in the context of liquidity and capital formation. At the same time, financial intermediation has led to a virtuous circle of savings, promoting investment, and, in turn, economic growth (Joshi, 2016). Rising NPAs and liquidity mismatch further question the efficiency of the banking system in supporting real growth. This study, therefore, provides updated evidence on the relationship between financial development and economic growth.

While it's well established that bank credit and broad money supply have a positive influence on India's economic growth, there's limited research on how these variables interact with each other during periods of crises and structural shocks. India has experienced instability over the last four decades, such as the balance of payments crisis of 1991, the global financial crisis of 2008 and the COVID-19 pandemic. These crises have also impacted the stock market, the most volatile segment of the financial system. Therefore, this study focuses on examining the impact of these shocks on the finance-growth nexus by incorporating the crisis-period dummy variables, thereby offering a richer and better understanding of the dynamic relationship involved.

While several studies examine the linear effect of financial development on economic growth, others suggest the presence of a non-linear relationship. As (Cecchetti & Kharroubi, 2012) illustrate, a U-shaped relationship exists between financial development and economic growth; beyond a certain point, it starts negatively affecting GDP. For example, (Louis, Berkes, & Panizza, 2015) emphasize that once domestic credit to the private sector reaches 100% of GDP, it negatively affects growth. Recently, (Pham & Nguyen, 2024) supported the nonlinear relationship between financial development and economic growth across 64 developing countries during 2003-2017. The study found a U-shaped effect of financial development on economic growth. These findings motivate a more nuanced inquiry into whether a finance-growth threshold exists. While threshold effects have been studied in the context of the banking sector, there is limited evidence related to the stock market. To address this gap, this study incorporated threshold regression to investigate whether the stock market exhibits regime-specific effects on economic activity.

While economists generally reached a consensus on the essential role of financial development in economic growth theoretically, the Indian financial sector has experienced a large and negative credit-output gap since 2012 (MacDonald & Xu, 2022). In this context, this study aims to fill the existing gap in the literature by empirically examining the cyclical role of the financial system in influencing India's economic growth. The global literature has increasingly focused on financial cycles; however, it remains limited in the context of India, despite the country's exposure to multiple crises and shocks. Firstly, existing studies rely on the long-run or co-integrating relationship and do not explain how financial variables behave during expansion or contraction. Secondly, few studies examine the lead-lag relationship between financial markets and real economic activity. Thirdly, studies rarely incorporate structural vector autoregression (SVAR) to distinguish between the contemporaneous and long-term interactions among financial and business cycles. This study addresses the gap by incorporating SVAR on cyclical values and the lead-lag relationship to examine how financial shocks transmit to real economic activity, providing a macro-financial assessment.

1.4 Research questions

Understanding the complex relationship between financial development and economic growth, particularly in developing countries like India, remains a significant area. The study aims to address questions that explore the combined impact of various financial development indicators on economic growth. The research questions outlined below guide the objectives of the study:

- Do banking sector development and its indicators exhibit a correlation with India's real GDP growth rate?
This question investigates whether banking credit can be a catalyst for India's economic growth.
- What is the effect of monetary aggregates on the real GDP growth rate?
This question investigates whether the NM3 positively influence consumption and investment behavior.
- What role does the combined market capitalization of NSE and BSE play in predicting India's economic growth trends over time?
This question examines whether increased market capitalization leads to long-term financial development and investment-led growth.
- Does a financial cycle exist in India, and if so, does it lead or lag the business cycle?

This question answers whether fluctuations in credit and money supply cycles influence GDP cycles.

1.5 Objectives

The primary objective of this study is to investigate the relationship between financial development and economic growth in India. Unlike the developed nations of Europe and America, India continues to follow a bank-based financial system, where credit and monetary aggregates play a central role in financing economic activity. Following (Levine R. , 1997) and (Beck, Levine, & Loayza, 2000), this study employs total credit issued by scheduled commercial banks and non-food gross bank credit, along with the other two indicators, broad money supply and the combined market capitalization. These measures provide a comprehensive view of both the banking and market-based segments of the financial system.

Specifically, the following are the objectives of the study:

- 1- To examine the relationship between the banking system credit and the real gross domestic product of India.
- 2- To examine the effect of NM2 and NM3 (broad money) on the economic growth of India.
- 3- To examine the relationship between the combined market capitalization of NSE and BSE and India's economic growth.
- 4- To determine the financial cycle in India.

1.6 Hypotheses

The following hypotheses are to be tested in the study. These hypotheses are listed below, objective-wise:

O_{1A}: To examine the impact of banking credit on economic growth.

H_{1a}: There is no significant long-run relationship between non-food gross bank credit (NFGBC) and GDP.

H_{2a}: Agricultural credit has no significant impact on GDP.

H_{3a}: There is no significant relationship between lending rates and GDP.

O_{1B}: To identify if the long-run relationship exists between bank credit and GDP among Indian states.

H_{1b}: There is no co-movement between bank credit growth and GDP growth at the state level.

H_{2b}: There is no significant long-run relationship between bank credit and GDP across Indian states.

H_{3b}: Bank credit does not cause GDP in Indian states.

O₂: To determine the influence of broad money (M3) on economic growth.

H_{2a}: There is no long-run relationship between M3 and GDP.

H_{2b}: The impact of M3 on GDP growth is not linear during the period of economic shocks and crises.

H_{2c}: Inflation (CPI) has no significant effects on GDP.

H_{2d}: Inflation (CPI) has no significant effects on GDP during structural instability.

H_{2e}: Interest rates do not have a more direct impact on GDP across the sample.

H_{2f}: The financial crisis of 2008 has no short-run significant effects on GDP.

H_{2g}: The COVID-19 pandemic has no short-run impact on GDP.

O₃: To examine the relationship between the market capitalization of BSE and NSE and economic growth proxied by IIP.

H_{3a}: There is no significant long-run relationship between combined stock market capitalization and economic growth.

H_{3b}: Crude oil has no significant impact on India's economic growth.

H_{3c}: COVID-19 has no significant short-run and long-run impact on economic growth.

H_{3d}: There is no nonlinear relationship between market capitalization and economic growth.

O₄: To determine the financial cycles in India.

H_{4a}: Financial cycles measured through non-food gross bank credit (NFGBC), credit-to-GDP ratio, and construction GDP (house prices proxy) do not exhibit cyclical components.

H_{4b}: The financial cycles do not differ significantly in duration or amplitude from business cycles.

H_{4c}: Credit cycles are not synchronized with business cycles.

H_{4d}: Credit cycles do not lead business cycles.

H_{4e}: There is no structural relationship among credit, investment and business cycles.

1.7 Methodology

To achieve the first objective of the study, this research, grounded in extensive literature on the finance-growth nexus, employs various combinations of econometric tools. The first objective uses both national and state-level data; this dual approach enables the examination of whether bank credit acts as a driver of growth at both levels. At the national level, the study uses data from 1980 to 2021, including indicators like non-food gross bank credit (NFGBC), agriculture credit, spliced GDP (2011-12), and the lending rate. At the state level, annual data on bank credit by commercial banks is used, limited to 32 states from 2001 to 2021 due to data availability. State-level GDP is based on GDP at factor cost/GVA, with data standardized to the 2011-12 base year for consistency. All variables are transformed into natural logarithms, except the lending rate, which serves as a control variable. The Data are sourced from the Reserve Bank of India (RBI), 'Handbooks of Indian States.' The study applies the autoregressive distributed lag (ARDL) model and the panel ARDL model for the estimation.

Moving on to the second objective, the study examines the impact of monetary aggregates on economic growth. Broad money supply (M3) is directly linked to India's growth and serves as an important indicator (Kutumbale & Phatak, 2018); (R, 2018). The time frame set for the study is 1980 to 2021. As far as prices are concerned, the consumer price index (CPI) has been utilized to represent the movements in prices and call money rates (interest rates) are considered an important channel of monetary policy transmission. The data are sourced from the India Monetary Policy Report (RBI), the Ministry of Statistics and Programme Implementation (MoSPI), and the International Monetary Fund (IMF). Real GDP and M3 are transformed into logs, while CPI and IR growth rates are used. The ARDL model, bound tests, and error correction mechanism (ECM) are employed to analyze the short-run and long-run dynamics between them. Additionally, dummy variables are incorporated to capture the effects of the financial crisis and COVID-19 on the relationship between M3 and GDP.

To capture the impact of the combined market capitalization on economic growth, the BSE, NSE, and the global indicator, Brent crude oil, are employed. The study covers a monthly frequency from April 1996 to December 2021. Monthly real GDP is spliced at a common base

of 2011-12. The data are sourced from the Handbook of the Indian Economy (RBI), Federal Reserve Economic Data (FRED), and MoSPI. Market capitalization serves as a measure of the depth of financial markets; it reflects the share of all listed equities as a percentage of GDP (Levine & Zervos, 1996); (Demirgüç-Kunt & Levine, 1996), capturing volatility in the equity market. A combined market capitalization is computed by summing the BSE and NSE market capitalization. To account for the impact of economic shocks such as the dot-com bubble burst, the financial crisis and COVID-19, dummy variables are introduced. The ARDL approach is applied to examine the short-run and long-run relationship between these variables. Moreover, the non-linear regression analysis is computed using threshold regression for the identification of critical points beyond which the stock market's influence on output may shift.

The final objective is to determine the characteristics of financial cycles in India from 1980 to 2021, utilizing annual data. Using the HP filter, cyclical components in credit, the credit-to-GDP ratio, house prices, and economic growth are captured. NFGBC is included to capture the credit flow in the economy. Other variables like M3 and gross fixed capital formation (GFCF) are incorporated to represent the monetary and investment trends. The peaks and troughs are determined through visual inspection of the HP-filtered series. The study evaluates the lead-lag behavior of credit, money, and investment cycles, thereby offering insights into whether financial indicators serve as early warning indicators for volatility in real economic output. Furthermore, SVAR analysis is undertaken to examine the structural relationship between credit, investment and business cycles, and whether shocks in one variable cause systemic, predictable changes in another variable.

1.8 Rationale of the Study

India is an emerging economy, making it essential to identify the drivers of economic growth and support strategic economic planning. The relationship between finance and growth in India has evolved over the years, especially after the post-liberalization reforms. This research significantly enhances the understanding of the link between financial development and economic growth. Though existing literature has extensively studied this relationship, some key indicators of financial development have been ignored. While some studies focus on the banking sector and others on the stock market, few have combined these areas to evaluate their joint impact on long-term growth. This study examines multiple components of the financial system—bank credit, money supply, and the stock market—over a long period (1980-2021), covering financial reforms, crises, and structural shifts experienced by India.

Furthermore, this research advances the literature by conducting a panel analysis across 32 Indian states. Unlike prior studies, which focus on financial depth indicators at the state level, this study employs bank credit growth and GDP growth rates to assess whether changes in bank credit contribute to GDP growth among different states, highlighting regional disparities and the effectiveness of the financial system in driving economic development.

Additionally, this study adopts a multidimensional approach by capturing both cyclical and structural dynamics, contributing to the expanding literature on financial cycles in India, which has gained prominence after the 2008 global financial crisis. These uncertainties suggest that liquidity surges, credit booms, and market fluctuations can impact growth. While previous studies have explored the cyclical co-movements between financial cycles and macroeconomic indicators, they did not analyze lead-lag relationships or the direction of causality. This study addresses that gap by using the Hodrick-Prescott filter to isolate cyclical components and applying lead-lag analysis to examine their dynamic interactions. Another key contribution is the examination of the structural relationship between financial market shocks and business cycles through Structural Vector Autoregression (SVAR). While VAR models are atheoretical, SVAR allows for imposing short-run and long-run restrictions. When applied to the cyclical components, this enhances the understanding of how financial shocks transmit to real economic activity.

In summary, this research emphasizes going beyond a simple linear relationship between financial development indicators and economic growth by incorporating dummy variables to capture periods of structural shocks. This approach helps to understand the impact of financial development during uncertain and turbulent times. Additionally, the study introduces a methodological innovation through threshold regression, which identifies different levels at which the stock market influences economic growth. The findings assist policymakers in designing proactive strategies and macroprudential policies to maintain a stable financial system and promote sustainable growth. Furthermore, this approach benefits investors, regulators, and financial institutions by revealing which parts of the financial system are more vulnerable to shocks and how targeted interventions can enhance stability and long-term economic development. Overall, by integrating time-series, panel, cyclical, and structural analyses, this study offers a comprehensive and policy-relevant assessment of the finance-growth relationship in India.

1.9 Organization of thesis

This thesis is structured around three core components of financial development in India: banking credit, monetary aggregates, and stock market performance and their influence on overall economic growth. It also examines the interaction between the variables during the period of economic crisis and structural shocks. The study employs a multidimensional approach and examines the channels through which financial development is transmitted in the real economy, such as interest rates, capital formation, and inflation, using multiple time approaches, depending on the variability and nature of the variables.

The thesis comprises nine chapters: introduction, overview of financial development and economic growth, literature review, methodology, four empirical analyses, and conclusion.

The first chapter presents the research context and background, which reflects the pioneering role of Schumpeter in the finance-growth nexus, followed by the financial reforms comprising banking, capital, and other reforms and their impact on the development of the financial system. Additionally, it includes the statement of the problem, research questions, the objectives and hypotheses to be investigated, followed by the data and methodology, research significance, and overall research design.

The second chapter provides an overview of financial development and economic growth. This chapter presents the structure of the Indian financial sector, followed by the theoretical literature on the finance-growth nexus. Moreover, it highlights important indicators of financial development, the overall background of financial development, and economic growth. Additionally, it outlines the evolution of financial development and macroeconomic indicators using recent trends and charts. Lastly, it addresses the challenges faced by the Indian financial system.

The third chapter offers a theoretical and empirical review of the relationship between financial development and economic growth. This includes key indicators such as bank credit, broad money supply, and the stock market, along with cyclical dynamics. The chapter discusses how these financial development indicators influence economic growth across different countries, highlighting various findings and insights.

The fourth chapter details the methodology and variables used in the study. The chosen time frame is 1980 to 2021 to capture both pre- and post-liberalization economic growth. It also

specifies the sources of the variables. Advanced econometric tools such as ARDL, SVAR, Threshold regression, the HP filter, and lead-lag cross-correlation are employed to analyze both the structural and cyclical relationships among the variables.

Chapters five through eight present the empirical analysis. These chapters examine 1) the relationship between banking credit and economic growth, 2) the relationship between broad money supply and economic growth, 3) stock-market growth analysis, and 4) the characteristics of financial cycles and their interaction with business cycles.

Finally, the ninth Chapter presents the findings of the study, providing a detailed conclusion. It discusses the policy implications for the government and policymakers, and also acknowledges the limitations of the study. This also extends a few recommendations for future research.

Chapter II

AN OVERVIEW OF FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN INDIA

This chapter provides a comprehensive overview of financial development and its interaction with economic growth in India. It begins by examining the structure of financial systems and the indicators that have influenced the economy's development over time. Also engages with the major theoretical perspectives, such as Schumpeter's hypothesis, McKinnon-Shaw's framework and endogenous growth theory, asserting the positive influence of financial development on economic growth. The predominant view suggests that investment depends on savings and that financial intermediaries allocate these savings into productive investments. The chapter aims to establish a foundation for understanding the institutional and conceptual basis of India's financial development. To support this, different macroeconomic and financial development indicators were visually analyzed.

To achieve this, the chapter is structured as follows: the subsequent sections present the structure of the Indian financial sector, highlighting the role of Scheduled Commercial Banks (SCBs), Non-Banking Financial Companies (NBFCs), and Development Financial Institutions (DFIs) and the segmentation between money and capital markets. This is followed by a theoretical framework, highlighting monetary theories and finance-growth models. Section 4 introduces a classification of financial development indicators, categorized into three subsections: access, depth, and stability. Section 5 reviews the background of the financial development and economic growth nexus. Section 6 highlights the evolution of financial development and economic growth. Finally, the last section discusses the challenges the Indian economy has faced in terms of both economic growth and financial development.

2.1 Structure of the Indian Financial Sector

Financial development is characterized by the growth of financial services provided by banks, financial institutions, and other intermediaries. An effective and robust financial system, comprising financial institutions such as commercial banks, non-bank financial institutions, and financial markets—including money markets, stock markets, bond markets, and foreign exchange markets—plays a crucial role in driving and expanding economic growth. These

institutions act as intermediaries between suppliers and borrowers. They generate information and direct resources to their most productive uses, facilitating optimal resource allocation. They enhance economic growth by boosting aggregate savings and facilitating effective investment, thereby accumulating physical capital. Furthermore, financial development supports competition and stimulates innovation, thus promoting dynamic efficiency. Consequently, sound and efficient financial systems channel savings into more profitable investments. Financial institutions are classified into depository and non-depository institutions based on the services they offer. Commercial banks and credit unions are depository institutions that raise funds from individual and business deposits. These banks mobilize savings through time and demand deposits, known as demand deposits, creating liquidity and facilitating money creation in the economy. In contrast, insurance companies, mutual funds, and provident funds are non-depository institutions. They cannot source funds from the savings or deposits of individuals. Instead, they acquire funds by selling their securities, with premiums serving as the primary source of funding. Unlike depository institutions, these institutions are not regulated by the government. The IRDA Act of 1999 serves as a regulator for these insurance companies.

DFIs played an important role in the overall development of India's financial system. These institutions were established to provide medium- to long-term credit to sectors like infrastructure, industry, agriculture, and small- and medium-scale enterprises. The first successful DFIs were set up in 1948: the Industrial Finance Corporation of India, the Industrial Development Bank of India (1964), and the Industrial Credit and Investment Corporation of India (1955). Other important DFIs include the National Bank for Agriculture and Rural Development (established in 1981) and the Small Industries Development Bank of India (established in 1990). The RBI and the government funded DFI's occasional loans through the National Industrial Credit. In addition to this, NBFCs play an important role in financial development, registered under the Companies Act, 1956, depending on their business activities. They do not hold a banking license but perform banking activities. These are the last resort for the unbanked and underbanked sectors, including those in rural areas. These NBFCs source their funds by borrowing advances from commercial banks and the government and by issuing securities.

The following chart, Figure 2.1, represents the circular flow of financial development, wherein the funds are supplied and demanded through institutions and financial markets, mobilizing savings into productive areas and creating capital.

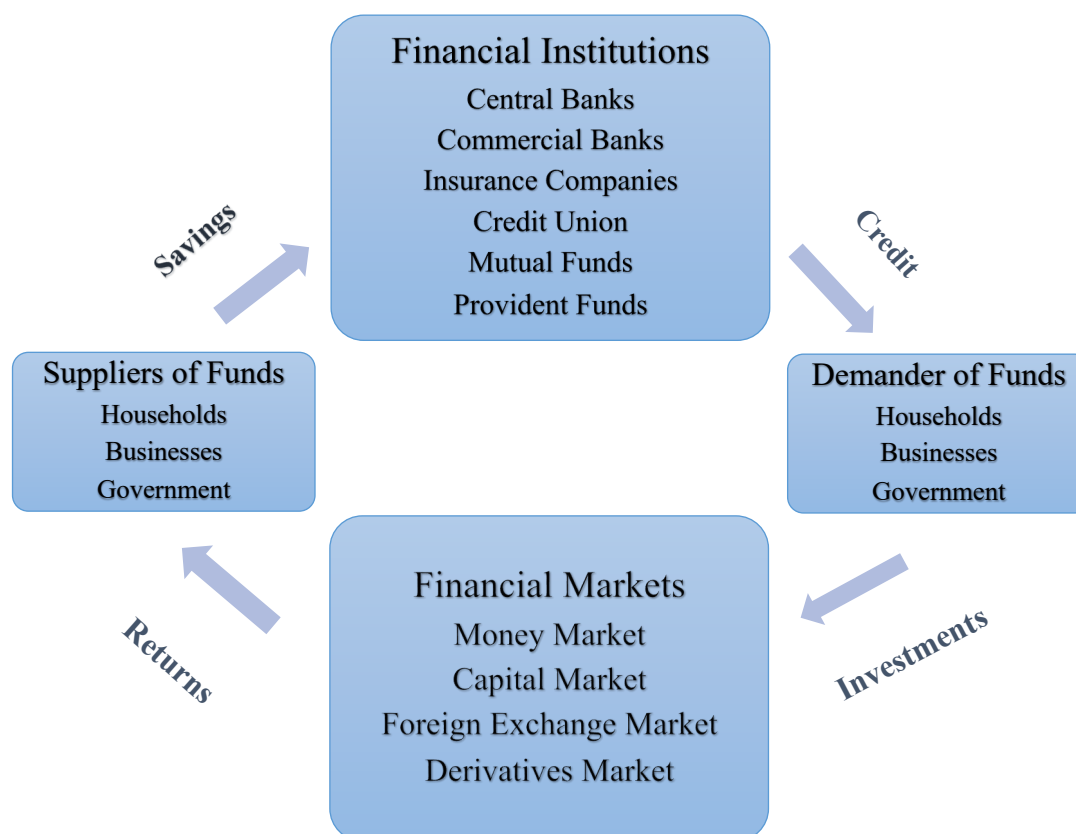


Figure 2.1 Cyclical Interactions within the Financial System

Money markets provide short-term funds that serve as close substitutes for money, such as securities, primarily focused on their demand and supply. Borrowing and repayments occur over a period ranging from a day to a year. In India, the money market is further divided into organized and unorganized sectors. The organized sector includes the Reserve Bank of India, the State Bank of India, Commercial Banks, Cooperative Banks, and Non-Bank Financial Institutions, all of which are regulated by the RBI. The unorganized sector comprises private moneylenders and unregulated financial institutions, traditionally managed by families and individual committees. The RBI oversees liquidity conditions in India through the money market. A well-regulated money market indicates an effective monetary policy. Various instruments are utilized in the money market, including call money, representing overnight lending for up to 14 days; treasury bills and cash management bills, issued at a discount and sell by the RBI on behalf of the central government; ways and means advances, which are

temporary loans or overdraft facilities provided to both central and state governments; certificates of deposit, which are securities issued by SCBs; commercial paper, representing an unsecured short-term loan issued by corporations; and trade bills, negotiable instruments issued by buyers and sellers, each designed to meet the needs of participants. The money market plays a crucial role in ensuring financial stability and the proper functioning of financial institutions.

While the money market caters to short-term needs, the capital market serves long-term financial requirements by selling stocks and bonds. Indian capital markets consist of the primary market, secondary market, mutual funds, and foreign institutional investors. The primary market is where new shares, debentures, and bonds are issued, such as Initial Public Offerings (IPOs) and Follow-on Public Offerings (FPOs), while in the secondary market, existing shares are traded, such as on the Bombay Stock Exchange, the oldest stock exchange, established in 1875, and the National Stock Exchange, founded in 1992. Additionally, mutual funds serve as a platform that pools money from investors for investment in stocks, bonds, and short-term money markets. Foreign Institutional Investors (FIIs) bring foreign capital into the domestic country and are registered under SEBI, contributing to liquidity. Capital markets are further classified into debt and equity markets. Debt markets provide a platform for trading debt instruments like bonds and debentures, essentially a type of loan primarily issued by corporations and governments. This involves lower returns and is often less risky. The equity market represents ownership shares in a company and typically involves high returns; however, it carries more risk.

The role of financial institutions in economic growth has been under discussion since (Schumpeter, 1911). Well-developed financial institutions foster economic growth, and for a better understanding of the nexus between financial development and economic growth, it's important to understand the theories behind them.

2.2 Theoretical framework

2.2.1 The theory of economic development

(Schumpeter, 1911) emphasized that banks have the power to create purchasing power out of nothing, enabling them to use this for innovation to improve the quality of financial activities and stimulate economic growth. The entrepreneur can break the monotonous cycles and bring about new changes or innovations, and this is known as creative destruction. A new combination of factors of production, products, and methods is called innovation. The services

provided by financial intermediaries involve allocating savings into productive channels that foster technological and economic development. Since these intermediaries act as a bridge between savers and borrowers, they have the discretion to choose which firms to source savings from, ensuring efficient allocation. They not only channelize savings but also create credit. The post-liberalization era focused on market-oriented policies, increased private participation, technological development, and globalization. The development of OLA, Uber, Zomato, and Amazon illustrates Schumpeter's innovation in the modern economy. A positive relationship between financial innovation and growth is supported by researchers (Nazir , Tan, & Nazir , 2020) (Qamruzzaman & Jianguo, 2018). Another important aspect is credit availability, like the Pradhan Mantri Mudra Yojana, which was launched in 2014. It has played an important role in funding non-corporate, small, and micro enterprises by providing loans of up to ₹20 lakhs in 2024. More recently, financial technology (fintech) has made it easier and more accessible to fund small and medium enterprises. Fintech is a technology-driven financial innovation that utilizes information and communication technology (ICT) to deliver efficient financial services. India's fintech sector is ranked 4th worldwide, receiving significant investments and securing 21% of the total funding sourced by Indian start-ups across all sectors.

2.2.2 Supply-Leading and Demand-Following Hypotheses

These hypotheses were formulated by (Patrick, 1966), who suggested that a causal relationship explains the direction between financial development and economic growth. The supply-leading hypothesis supports the view that financial development acts as a catalyst for economic growth. As financial institutions and markets expand their financial services, there's growth in the real sector. There are several channels through which financial development influences growth: by helping to allocate tangible wealth and resources from savers to investors, increasing the rate of physical capital accumulation, and providing savings. (Schumpeter, 1912), (Goldsmith R. , 1969), and (McKinnon, 1973) support the supply-leading hypothesis. Additionally, GDP growth in the post-1991 period resulted from financial liberalization and reforms. The GDP growth rate increased to 6-7%, which was earlier 3-4% before 1991. Banking services expanded with the entry of private banks and foreign banks. The demand-following hypothesis posits that as the real sector develops, the demand for financial services also grows, meaning financial developments respond to economic growth (Robinson, 1952). Recently, (Karimo & Ogbonna, 2017) argued that there exists a neutral or feedback hypothesis

between financial development and economic growth, suggesting a mutual or bidirectional relationship. The findings align with those of (Chow, Vieito, & Wong, 2019), who also reported a bidirectional relationship between financial development and economic growth in India.

The direction of the relationship between financial development and economic growth depends on the growth phases. In early phases, the supply-leading hypothesis exists, benefiting both savers and investors from developed financial systems. Later, increasing economic growth demands financial services. It can be concluded that in the initial phase of growth, a supply-leading hypothesis exists, and the demand-following hypothesis prevails later.

2.2.3 McKinnon and Shaw Hypothesis

They coined the term "financial repression" in 1973, which refers to the strict regulation and intervention of the government that affects the volume of investment. High interest rates, restrictions on international capital movements, reserve requirements imposed on commercial banks, new banking entrants, and unconventional monetary policy. They introduced two channels through which financial development influences economic growth, i.e., savings and investments. Before 1991, international capital flows were restricted by various tariffs and quantitative restrictions. These restrictions discouraged savings, investments, and economic growth. They argued that financial liberalization is the most effective way to boost economic growth, particularly in developing countries. Gradually, after 1991, India's government lifted these restrictions through financial reforms. The cash reserve ratios and statutory liquidity ratios declined to 10% over four years and 25% within three years, respectively. Administrative constraints were eliminated, and new private banks were encouraged. The Securities and Exchange Board of India (SEBI) was set up to regulate the capital market. Financial deepening increased to 45% in 1990 and to approximately 80% by 2010 (Pal, 2014).

They refuted the traditional practice of keeping below-the-level-of-interest rates, as low interest rates decrease the overall efficiency of investment, and put forward a hypothesis reflecting a complementary relationship between money and physical capital.

$$\frac{M}{P} = F(Y/P, I/Y, d-i)$$

Where $\frac{M}{P}$ is the broad money supply.

Y/P is the real GNP.

I/Y is gross investment.

$d-i$ is the real deposit rate of interest.

This implies that if $d-i$ is greater, indicating high real returns, it encourages financial deepening and the effective mobilization of resources, thereby inducing economic growth. The post-1991 reforms encouraged savings and investments, leading to greater monetization of the economy.

2.2.4 Endogenous Growth Theory

(Lucas, 1988) identified three key elements crucial for economic growth. Lucas believed that economic growth is not only dependent on external factors but also on internal factors such as research and development, human capital, and technological progress. This study further emphasized the role of financial intermediaries; economies with active intermediaries tend to have high growth rates (Romer, 1990). A higher level of investment and productivity leads to economic growth, as production with greater knowledge yields better returns. Investments in education lead to human capital formation. (Levine, 1996) suggested that technological advancements reduce transaction costs. Financial development is a predictor of technological advancement and growth, particularly in developing economies. (Greenwood & Jovanovic, 1990) identified the channel through which financial intermediaries allocate funds. The financial system provides liquidity, minimizes risk, and transforms savings into efficient investments. (Bencivenga & Smith, 1991) developed an endogenous model that stresses the important role of financial intermediaries in generating liquidity, suggesting that savers should invest in productive assets. (Michalopoulos, Laeven, & Levine, 2009) emphasized financial innovation as a key driver of growth. They built a model that involves financial entrepreneurs who can earn monopolistic profits by investing in better goods.

2.2.5 Financial Intermediation Theory

Financial intermediation is a financial entity that bridges the gap between different economic units: borrowers and lenders. It mobilizes funds into productive channels, including depository institutions, investment banks, mutual funds, and insurance companies. Key players in the Indian financial intermediation sector include banks, non-banking financial companies (NBFCs), and mutual funds. This concept originated with (Gurley & Shaw, 1960), who emphasized that financial intermediaries mitigate information asymmetry between borrowers and lenders. Financial markets possess better information about the creditworthiness of

borrowers through effective monitoring and screening, which helps avert problems of adverse selection. Another important aspect is the reduction of transactional costs due to the available marketplace (Benston & Smith, 1976). It also relies on the various technologies used by the participants; by lowering the costs, they can reap the economies of scale. This trend was observed in India due to increased participation by private banks and foreign banks, leading to an improvement in overall efficiency and a decline in operating expenses from 2.77% in 1996 to 2.11% in 2006. Finally, an important aspect of financial intermediation is the creation of money. The end product provided by intermediaries consists of loans and advances given to customers, while the input is the deposits from participants. They also facilitate a smooth payment system by enabling electronic transfers and card payments.

The contribution of NBFCs to lending increased from 6% in 2008 to 15% in 2017. They began providing loans to small and medium enterprises because bank loans were primarily utilized by large corporations. Micro, small, and medium enterprises (MSMEs) constitute 37% of industrial output, and even then, only 5.7% have access to formal institutional credit. COVID-19 significantly impacted these institutions, but NBFCs played an important role in maintaining liquidity (Ray, 2022).

2.3 Indicators of Financial Development

Financial development is understood by two pillars: financial institutions and financial markets, often measured by indicators that reflect the accessibility, depth, efficiency, and stability of financial services and the structure of the financial system. The perfect measure of financial development does not exist, so prior literature has employed proxies for financial intermediaries and stock markets. Private sector credit as a percentage of GDP is considered an important indicator, which is strongly correlated with long-run growth and reflects the depth of financial institutions (Beck, Levine, & Loayza, 2000). However, it is not the only indicator; the degree of competition among the banks reflects the efficiency of the banks (Claessens & Laeven, 2005).

A) The depth of financial systems illustrates the accessibility of financial markets, which can be measured by

1. The ratio of liquid liabilities to GDP represents the broad size of intermediation in the economy. This includes the broad money supply (M3), demand deposits, time deposits held with the banking sector, and certain liabilities of non-banking financial intermediaries.

2. The ratio of banking credit to GDP represents the private credit extended by financial institutions as a share of total GDP.

3. The ratio of stock market capitalization to GDP reflects the value of listed companies. It captures the size of the stock market as a percentage of GDP, including the BSE and NSE market capitalization.

B) The structure of the financial system illustrates who holds a more empowering or dominant role in the economy: banking or the capital markets, broad money or the narrow money, which can be measured by

1. The ratio of banking credit to stock market capitalization determines whether the economy is bank-based or market-based; India is a bank-based economy, with more credit flowing through banks.

2. The ratio of broad money to narrow money, where narrow money is the most liquid form of money and broad money comprises currency along with demand and time deposits. Savings deposits increase more as the financial market expands than transaction balances.

Another important indicator reflecting the size of the financial services sector is the total assets of the financial sector, which encompass the assets of commercial banks, central banks, and other non-banking financial institutions. Additionally, the value traded in the stock market as a percentage of GDP, called the Value Traded Ratio (TVT), is another indicator that reflects the efficiency of stock markets (Levine & Zervos, 1996). Along with the domestic turnover ratio, financial efficiency is also reflected by the return on assets (ROA) or the return on equity (ROE). ROA illustrates how profitably the banking system is working, and utilizing its assets, and its operational health. ROE represents the net profit divided by its average total capital for the last year and the current year. Another key indicator is net interest margin (NIM). The World Bank defines it as the accounting value of a bank's net revenue as a share of its average interest-bearing assets. Additionally, the deposit-to-loan ratio indicates the proportion of deposits that are converted into loans (Wang, Chen, Hu, & Xu, 2014).

Lastly, stability is another aspect that highlights the resilience of the market to economic shocks. Non-performing assets (NPAs) are defaulted loans or advances; the borrower has failed to repay, and if this continues, the NPA stops generating income for the bank. The z-score, which compares capital and returns with risk, indicates that a higher z-score means greater

financial stability and a lower chance of insolvency. Similarly, stock price volatility and the price-earnings (P/E) ratio illustrate stability in the stock market. Stock price volatility reflects the degree of fluctuations in the returns of the stock market over time. While the P/E ratio evaluates a stock's worth by dividing the stock price by earnings per share, a high P/E ratio suggests instability and overvaluation.

Table 2.1 Classification of Financial Development Indicators

Dimensions	Financial Institutions	Financial markets
Depth	Non-food gross bank credit, Private credit, M3, life and non-life insurance premiums.	Stock market capitalization, international debt securities to GDP, and total debt securities to GDP.
Accessibility	Bank branches and ATMs per 100,000 adults, insurance density, and depositors with banks per 1,000 adults.	Nonfinancial corporate bonds to total debt securities, value trading excluding top 10 companies.
Efficiency	Return on assets, deposit-to-loan ratio, return on equity.	Stock market turnover ratio, trading volume.
Stability	Non-performing assets to total assets and banks' Z-score.	Stock price volatility and price-earnings ratio.

The overall health of a financial system is also reflected in interest rates; it's a financial cost borne by borrowers and the returns to lenders. Financial intermediaries can induce investments by reducing this cost (Levine, 1996). A developed financial system should have a stable rate of interest that aligns with people's expectations, encouraging them to make productive investments. Table 2.1 displays the classification of financial development indicators based on the depth, accessibility, efficiency, and stability of financial institutions and financial markets.

2.4 Financial Development and Economic Growth Background

While numerous studies have explored the financial growth dynamics, the section outlines the key work that gained recognition and frames the present analysis. (Goldsmith, 1969) gained particular recognition for documentation about financial systems and financial intermediaries.

He emphasized that the bank grows larger relative to the nation's output as the economy expands. His famous work revealed a positive relationship between financial development and economic growth in 35 countries, using data from before 1964.

(King & Levine, 1993) made a major contribution to the finance-growth nexus. They used four main indicators: liquid liabilities, deposits of money to the bank, domestic assets as a percentage of deposits to the bank, domestic assets plus central bank domestic assets, domestic asset distribution, and the non-financial private sector's contribution to GDP. They conducted a panel analysis on 77 countries spanning over 30 years, from 1960 to 1989. The findings established a statistically significant and positive relationship between the financial development indicators and growth in real per capita GDP, real per capita capital stock, and total productivity. The results are consistent with the view that the financial system facilitates capital accumulation and thereby promotes economic growth. Similarly, (Leitao, 2010), employed a panel data approach to examine the relationship between financial development and economic growth for European Union countries and BRICS during the period from 1980 to 2006. The study employed a fixed effects and generalized method of moments (GMM) approach, and its findings coincide with the literature view that financial development promotes economic growth by stimulating productivity and international trade. (Phan, Sizhong, & Vo, 2019) investigated the causal relationship between financial development, liberalization, and economic growth in five ASEAN countries – Indonesia, Philippines, Malaysia, Singapore and Thailand over the period 1980-2012, focusing on technological innovation using fully-effected ordinary least squares (FEOLS). The study found that technological deepening was primarily driven by financial development, rather than by changes in market size. These findings highlight that financial sector improvements, including credit expansions and deregulation, can play a critical role in promoting growth through innovation. Such evidence from emerging economies provides useful insights for India, suggesting that policies aimed at financial liberalization could support long-term growth.

Furthermore, (Beck & Levine, 2004) examined whether the stock market and banking sector both influence economic growth from 1976 to 1998. With the help of GMM, they concluded that an efficient financial system helps with investment information and reduces transaction costs, which leads to the efficient allocation of resources. They also suggested that both banks and stock markets independently influence economic growth. In contrast, (Saci, Giorgioni, & Holden, 2009) employed the GMM techniques on 10-year annual data from 1988 to 2001 for

30 countries, utilizing variables such as domestic credit to the private sector, liquid liability or M3 as a % share of GDP, the ratio of commercial banks' assets to all bank assets for the banking sector, and the turnover ratio and ratio of value shares traded in the stock market. The findings revealed a positive relationship between the stock market and economic growth, while a negative influence of banking indicators on growth was found.

Numerous studies have been done, particularly in the context of India. (Lenka, 2015) employed principal component analysis (PCA) and combined 11 measures (a combination of financial institutions and financial markets) into a single index. The study concluded that financial development is a sole indicator of India's economy from 1980 to 2011. Similarly, (Lenka & Sharma, 2020) used a similar approach, PCA, to construct a financial index, and with the help of ARDL and ECM models, found a short-run and long-run relationship between the financial development index and economic growth during the period 1980 to 2017. Also confirmed a bi-directional relationship between them. However, (Chakraborty, 2010) investigated the impact of financial sector development on India's economic growth during the quarterly period from 1993 to 2005, based on the Solow growth model. The cointegration and vector error correction model (VECM) was employed, and the findings revealed a positive relationship between the capital-output ratio and human capital and economic growth. VECM confirmed that market capitalization of the stock market adjusts to short-run dynamics only, and no evidence of long-run impact was observed. However, interest rates had a positive impact on economic growth. (Yadav & Rani, 2024) found an insignificant relationship between Sensex, CPI and crude oil; this highlights the existence of a regime-dependent relationship between financial and real sectors.

Another important contribution (Sehrawat & Giri, 2015), used both financial development indicators, bank-based and stock market, to examine the influence of financial development on economic growth during the period 1982 to 2012. The cointegration and ARDL confirmed the presence of short-run and long-run impacts of both of these indicators on India's economic growth. (Kumar, 2015) employed co-integration and Granger causality tests on quarterly data from 1991Q1 to 2015Q4 to examine the impact of M3 on GDP, and the co-integration revealed a long-run relationship between them. Interestingly, the Granger test revealed a unidirectional relationship from financial development to growth; however, no relationship was found from economic growth to financial development. Recently, (Sahoo, 2024) found a positive

relationship between Indian states' GDP and financial development during the period 2001-2018 using a pooled mean group. Foreign direct investment (FDI) negatively influenced GDP.

2.5 Evolution of Financial Development and Economic Growth in India

An efficient financial system allows for the transfer of risk to the bearers during times of crisis and fluctuations. Financial liberalization aimed to make the existing banking sector more efficient by reducing state intervention and allowing free market forces to determine the price. With high unemployment and a lack of knowledge, the only financial investment options were investments in gold, the safety offered by banks, company deposits, and government-sponsored small savings schemes, which were highly state-regulated. The economy has experienced a dynamic transformation in the post-reform period in response to domestic policy shifts and global developments. The following section gives a brief overview of the GDP performance over the decade, highlighting the key phases of economic transformation.

2.5.1 Macroeconomic Growth Trajectory in India

Under the license Raj, characterized by central planning, heavy regulation, and an average GDP growth rate of around 3.5%, referred to as the Hindu rate, is reported in Table 2.2. After 1991, financial reforms were undertaken in many sectors to enhance the productivity and efficiency of the financial sector. These reforms reflected a positive impact on average GDP growth, which increased to 6.1% in 1992, sometimes also called the "New Hindu growth rate."

Table 2.2 Macroeconomic Indicators (1990-2023), as a % of GDP

Indicators	1990	2000	2010	2020	2023
GDP growth (annual)	5.5	3.8	8.5	-5.8	8.2
Agriculture, value added	27.6	21.6	17%	18.7%	16
Services, value added	37	42.7	45	47.9	50
Gross domestic savings	21.6	24.3	34.3	27.3	29.3
Gross fixed capital formation	26	26	33	27	31

The economy recovered from negative growth rates, the impact of the oil crisis and the tensions in the Middle East. India, once a predominantly agricultural economy, has transformed into a service-driven economy, with the service sector contributing 50% of GDP growth, and has emerged as a global hub for industries. India's GDP growth trend has undergone several shifts over the decades. The average GDP growth rate in 2000 was approximately 7%, up from an average of 4% over the past four decades. The GDP growth rate peaked at 8.5% in 2010. India outsources services to the global economy due to growth in financial services, information and communications technology, and technological advancements (Born, 2025).

Figure 2.2 depicts the fluctuations in growth, highlighting the expansions and contractions, aligning with the reflection of the impact of structural reforms, economic crises, and evolving macroeconomic conditions. Post 1947, India experienced a sharp decline in agricultural GDP in the years 1964 and 1979, by -16.6% and -15.5%, respectively. This was caused by the poor monsoon and drought, which further caused food shortages; these factors caused GDP to decline by 3.66%.

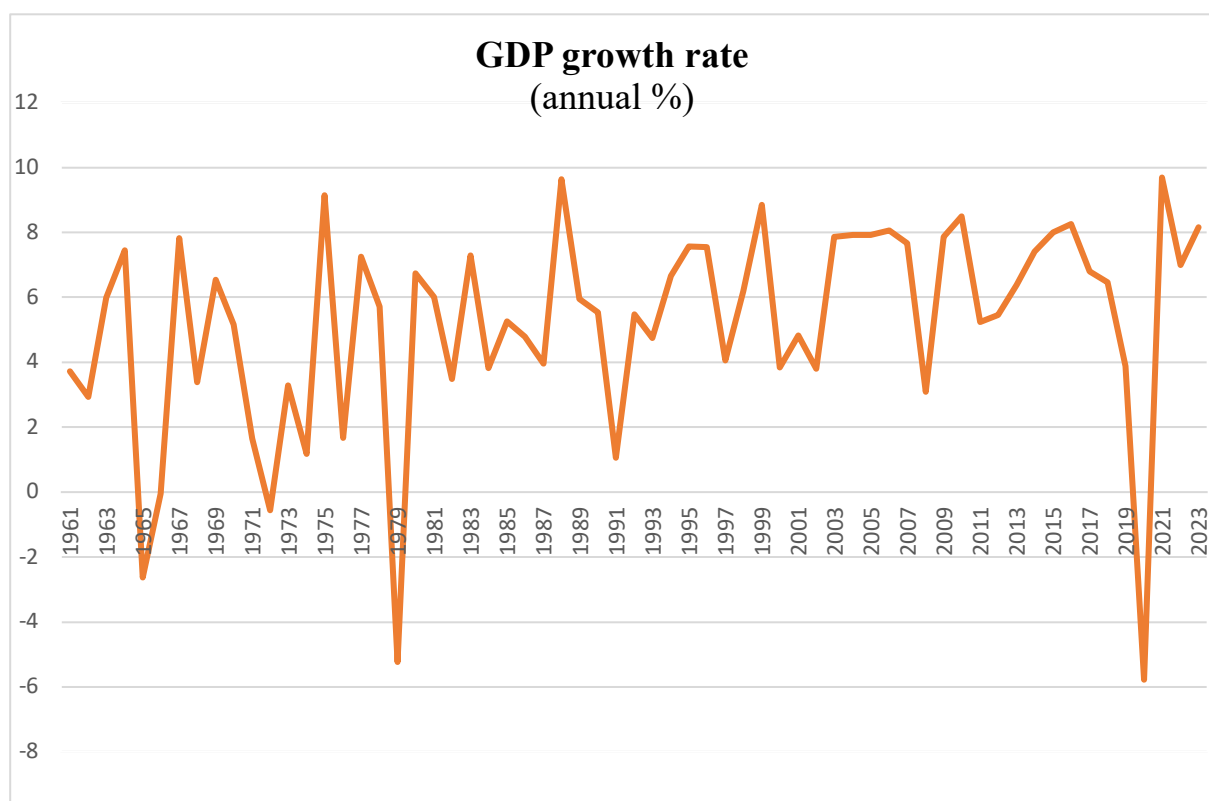


Figure 2.2 Annual GDP Growth Rate (1961-2023)

The global dot-com bubble in 2000-01 had a notable impact on the Indian economy and influenced many sectors, including stock market trade, the IT sector and the internet services sector. During the global financial crisis, the GDP growth rate declined from 7.6% in 2007 to 3.08%; however, recovery started immediately after due to extensive monetary and fiscal measures taken by the RBI and the central government. India imposed a nationwide lockdown in March 2020, affecting all economic sectors. According to surveys, 35% of MSMEs were on the verge of shutting down, and 13 million people lost their jobs (Ramakumar & Kanitkar, 2021). The interest rates reached an all-time high in 1992. The decline in growth was primarily due to a decline of 2.4% in the manufacturing sector.

2.5.2 Interest rate dynamics in India

While GDP growth rates reflect overall economic performance, lending interest rates play a crucial role in shaping borrowing, investments, and credit flow. According to the World Bank, the interest rate meets both short-term and long-term financing needs of the private sector. The classical theory of interest suggests that the rate of interest is determined by the interaction of demand and supply. James Tobin's theory highlights the role of interest rates in stimulating savings and investment, thereby promoting economic growth. The demand for money is influenced by the interest rate, which is the fee charged by a lender for using the borrowed money (Teriba, 1974).

The movements in lending interest rates have shown a gradual decline in India. From 1980 to 1989, India experienced a stable lending interest rate of 16.5%. In 1992, the interest rate was the highest, standing at 18%, reflecting a tight monetary policy amid a crisis. Due to the financial reforms, it declined to 12.5% by the end of the decade. Interestingly, in 2010, it reached its lowest at 8.3% due to the post-global crisis impact. A period of moderate tightening followed between 2011 and 2015, and the rate stabilized at 10%.

Following the introduction of the marginal cost of funds-based lending rate (MCLR) in 2016, the RBI brought transparency to loan pricing. The State Bank of India, the Bank of India, and the Bank of Baroda reduced their lending rates due to the ongoing COVID-19 pandemic. The repo and reverse repo rates were also cut by 75 bps and 90 bps, respectively (ETBFSI, 2020). In 2022, the lending interest rate stood at 8.6%, which is lower than the long-term average of 13.15%. Post-pandemic, increased repo rates led to higher lending interest rates, which can

also be seen in Figure 2.3, causing borrowers' costs to rise, thereby affecting the MSME sector (Lakayil & Shree, 2024).

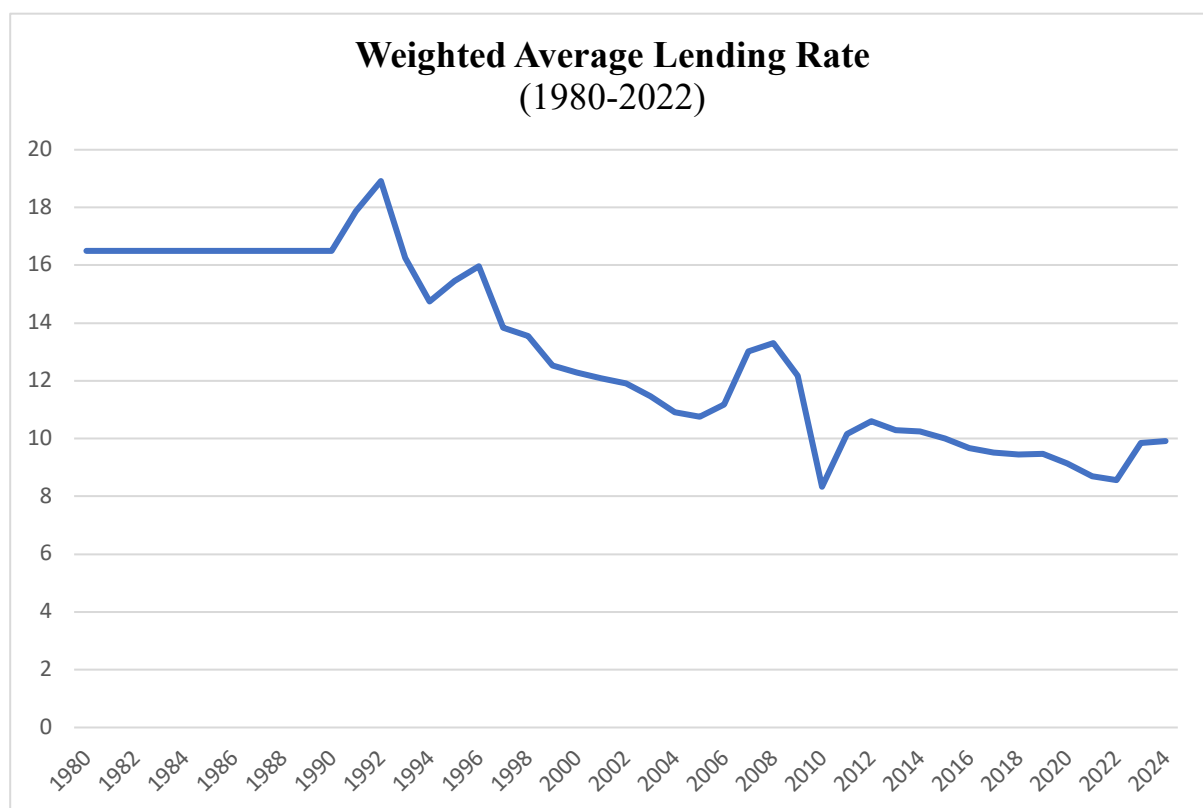


Figure 2.3 Trends in Weighted Average Lending Rates (WALR)

2.5.3 Financial Inclusion and Access in India

Financial reforms enabled the financial sector to fulfil its primary role, allocating resources to productive channels. Financial inclusion is determined by two indicators: depth and accessibility. Table 2.3 provides an overview of the expansion of commercial banks in India from 1969 to 2022. The commercial banks experienced significant growth post-reforms in 2005, reaching their highest number of institutions, 288. However, after 2020, there was a decline in this trend due to consolidation; public sector banks were burdened with a high level of NPAs. The government and the RBI decided to merge these banks to create technologically advanced institutions with stronger balance sheets. While the number of branches increased, the banks retained and expanded their network. In 2015, the Indian finance minister introduced Indra Dhanush to improve the functioning of public banks through capital reallocation. The asset quality review was conducted by the RBI in 2015 to assess the true state of assets. These measures helped in improving transparency and recapitalization of banks with high NPAs.

Table 2.3 Scheduled Commercial Banks in India (1969-2022)

Year	No. of commercial banks	No. of bank branches	Population per office ('000)
1969	73	8,262	64
1980	154	35,594	16
1999	272	60,570	13
2005	288	68,339	16
2010	163	95,000	11
2015	148	120,000	10.6
2017	140	125,000	10.2
2022	135	140,000	10

The health of public sector banks improved with capital reallocation and mergers, and their balance sheets strengthened with the entry of private banks and foreign banks, allowing for more competition; there was a fundamental improvement in the banking sector, with credit creation as the dominant force.

Table 2.4 displays the total assets of financial institutions as a percentage of GDP, highlighting the depth and composition of these financial institutions. Over the period, scheduled commercial banks have maintained and even increased their dominant share of financial assets. The total share of SCBs and non-SCBs increased from 58.8% in 1997 to 118.2% in 2022. Following the reforms, private sector banks increased nearly 9.74 times, while public sector banks experienced a significant decline. Public sector banks contributed 80% of credit in the early 1990s, and this has dropped to 50%, with private banks and NBFCs filling the gap (Agarwal, 2023).

The role of NBFCs has expanded exponentially, now standing at 16 times their previous influence. These banks are often referred to as shadow banks, providing credit facilities to participants, but are not regulated by the RBI. They not only complement banking services but

also serve as substitutes (Prudhvi & Bhattacharya, 2020). They sourced credit from the wholesale market, holding a share of 58% in 2018, while commercial banks contributed 12.6% of capital funding in 2018. Their contribution increased from 8.4% in 2006 to 12.9% in 2015, reaching ₹54 lakh crore in 2021, accompanied by a 25% increase in the asset size of the banking sector. Until 2018, any shortfalls in the banking sector's credit, such as when the RBI conducted asset quality checks in 2015, caused a collapse of public sector banks, which were addressed by NBFCs filling these credit gaps. The banking sector subsequently increased its lending to NBFCs and the consumer sector after 2015, with these sectors growing at a rate of 17%. Furthermore, interest rates declined from 2014 to 2017; the return on 10-year government securities decreased to 6.25%, and the simultaneous reduction in interest rates and liquidity funding contributed to a decrease in the funding cost of NBFCs (Sengupta, Song, & Vardhan, 2021).

Table 2.4 Total Assets of Financial Institutions (as % of GDP)

Category	Institution type	Total assets % of a GDP	
		1997	2022
Scheduled commercial banks	Public Banks	40.4	54.1
	Private banks	3.2	31.4
	Foreign banks	1.2	5.8
Non-scheduled banks	Cooperative Banks	1.7	4.4
	Small finance and other non-scheduled banks	0.9	0.2
Non-bank financial institutions	Non-bank financial companies	2.6	16.3
	Development financial institutions	9.5	5.2

DFIs have played an important role in post-independence India. While developed economies require 7-8% infrastructure growth, India's infrastructure investment has remained around 5.55% of GDP. Earlier, they sourced capital from the RBI and the government, but later, due

to a lack of funds, many transformed into commercial banks. Recently, a new DFI was established through the National Bank for Financing Infrastructure and Development Bill (NABFID) in 2020. It was announced in the Union Budget 2021-22 that IIFCL would be recapitalized with 20,000 crore (Chaturvedi & Vohra). The new DFIs are fully owned by the government entity. As of 2024, NABFID had sanctioned loans amounting to ₹1.3 trillion. Despite government initiatives, their positions remained moderate, at 5.2% in 2022 (Agarwal, 2023).

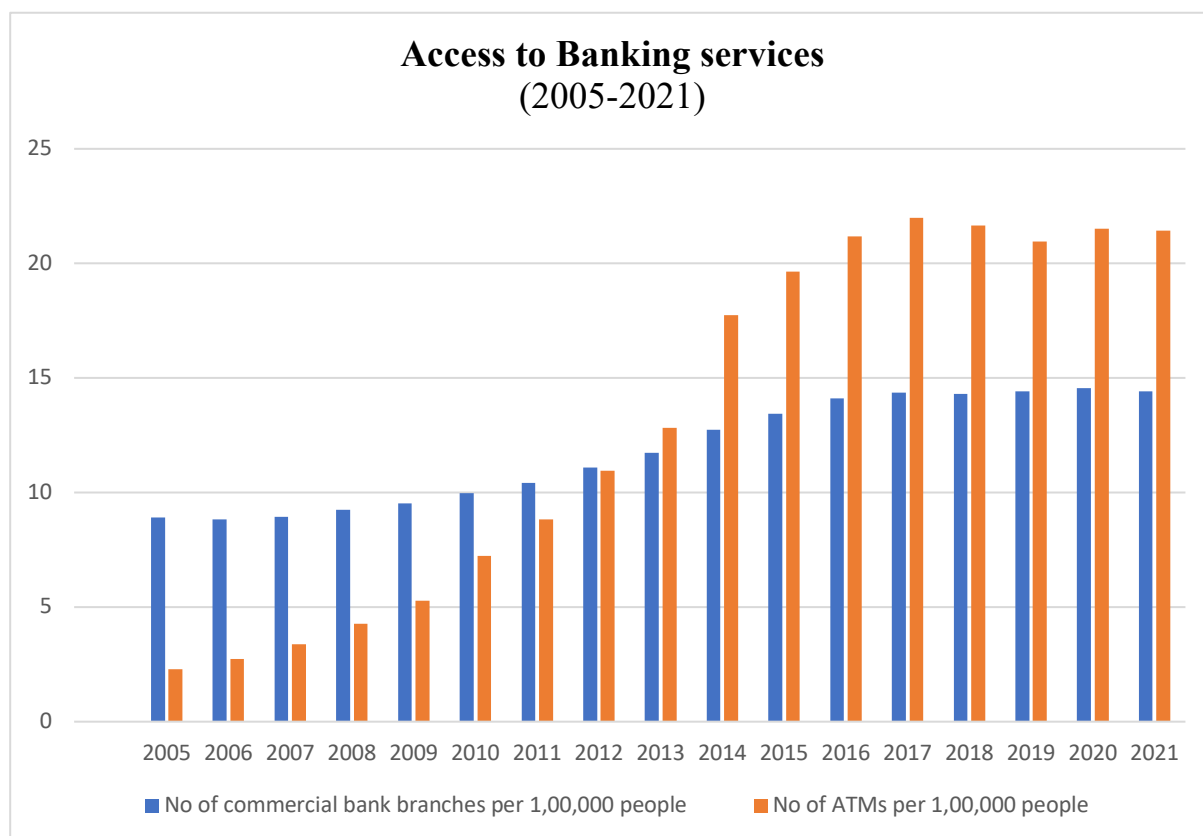


Figure 2.4 Trends in Commercial Bank Branches and ATM Access

The growth in the number of commercial banks and ATMs has played an important role in promoting financial inclusion, as illustrated in Figure 2.4. Earlier, the commercial banks' growth reflected traditional banking activities. The first automated teller machine (ATM) in India was set up by HSBC Bank in 1987 in Bombay. As per the RBI guidelines, a minimum of two ATMs are mandatory in 3 to 6 tiers, functioning 24/7 to provide funds and accept deposits during emergency hours. The Pradhan Mantri Jan Dhan Yojana (PMJDY), the biggest financial inclusion measure taken by Narendra Modi in 2014, aimed to provide one account for every household and to reduce the gap between rich and poor and the gender-based gap. This led to

a boost in the growth of the number of ATMs. In 2010, there were 41,268 on-site and 34,377 off-site ATMs, respectively, which grew to 109,809 and 98,545, indicating a substantial increase. (G, 2018) revealed that post-demonetization, the number of ATM transactions has increased from 39.95 crores in 2011 to 71.07 crores in 2017, and over 6 billion were recorded in 2023. And now the ATM density is reflected as a key indicator of access to financial services.

2.5.4 Digital Financial Inclusion in India

Digital financial inclusion refers to payments made through mobile phones and internet banking. The evolution of digital financial services began in 2014, with a steady growth of 2% in digital transactions per month until 2017. According to a World Bank report, only 35% of fifteen-year-olds had bank accounts in India in 2011. Under the PMJDY scheme, 330 million bank accounts were opened. Narendra Modi announced Digital India due to the rapid expansion of mobile and internet penetration across all sectors of the economy. Demonetization, motivated solely by the goal of creating a cashless economy, temporarily increased digital payments and marked a period of remarkable growth. The key building blocks include Aadhaar digital identification and UPI. UPI, introduced by the National Payments Corporation of India (NPCI), represents a major development in India, providing low-cost, large-scale payments virtually through mobile phones.

In 2018, UPI transactions increased by 450%, surpassing credit and debit cards in terms of transactions. Due to the widespread mobile penetration in rural and urban areas, people have started preferring to make payments through UPI. This increased participation of individuals in formal banking and payment services has boosted economic growth by reducing poverty, empowering small entrepreneurs, reducing exchange costs, and providing fast and secure exchange. It has also motivated informal sector participants by improving access to digital finance (Agarwal A. , 2024).

The significant growth of UPI is evident in Figure 2.5. This graph depicts the number of transactions, both traditional measures, like RTGS, NEFT, and card payments (credit and debit cards), as well as modern measures. These indicators represent a broader picture of the impact of digitisation on financial institutions, covering monthly data from 2021 to 2023, sourced from “Payment System Indicators” published by the RBI. The graph shows that digital payments increased by almost 40% on average year over year. This rapid expansion highlights a structural shift in India’s payment system, highlighting the dominance of UPI.

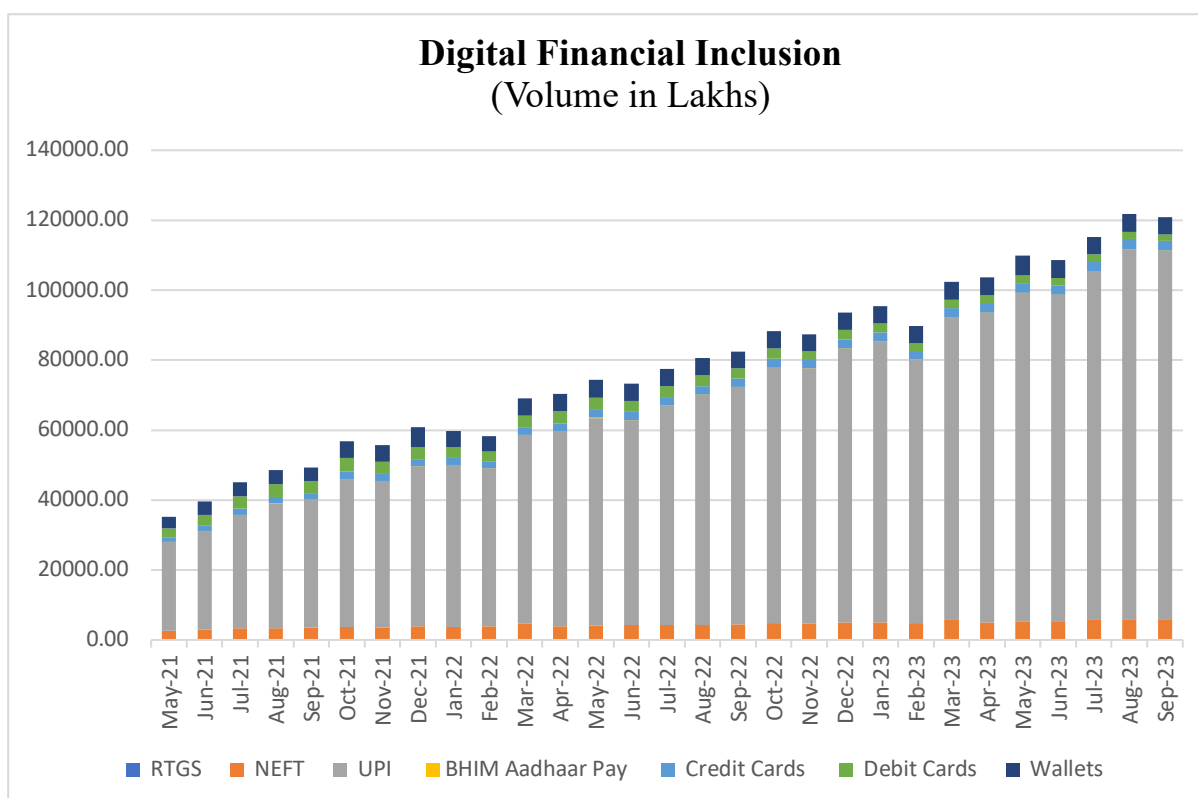


Figure 2.5 Trends in Digital Payments in India: UPI and the Rise of E-Payments

Mobile transactions grew from 19.75 million in 2015 to 106.18 million in 2017. Similarly, mobile wallet transactions increased to 387.6 million, worth ₹15,408 crore, from 11.96 million transactions in 2015 (Draboo, 2020). In July 2021, UPI had recorded over 3.2 billion transactions worth 70 billion, with a remarkable jump in 2023 to 117.64 billion transactions. Over 72 billion in monthly transactions were made through BHIM in June 2023.

The National Electronic Funds Transfer (NEFT) and Real Time Gross Settlement (RTGS) are used to settle the retail and wholesale payments managed by the RBI. RBI in 2019 announced 24*7*365 operations, enabling round-the-clock funds transfer. These upgrades led to significant growth in these payment methods. The total volume of transactions processed through NEFT increased to 803.7 million in 2022, up from 113.8 million in 2013. While the RTGS transactions reached 38 million, up from 13.9 million in October 2013. The private banks contributed more to the development of these payment settlements, with HDFC Bank having the highest number of NEFT and RTGS transactions, leading in terms of online banking (Chandravathi, 2022). So, demonetization and digitalization have surged the use of digital platforms in India.

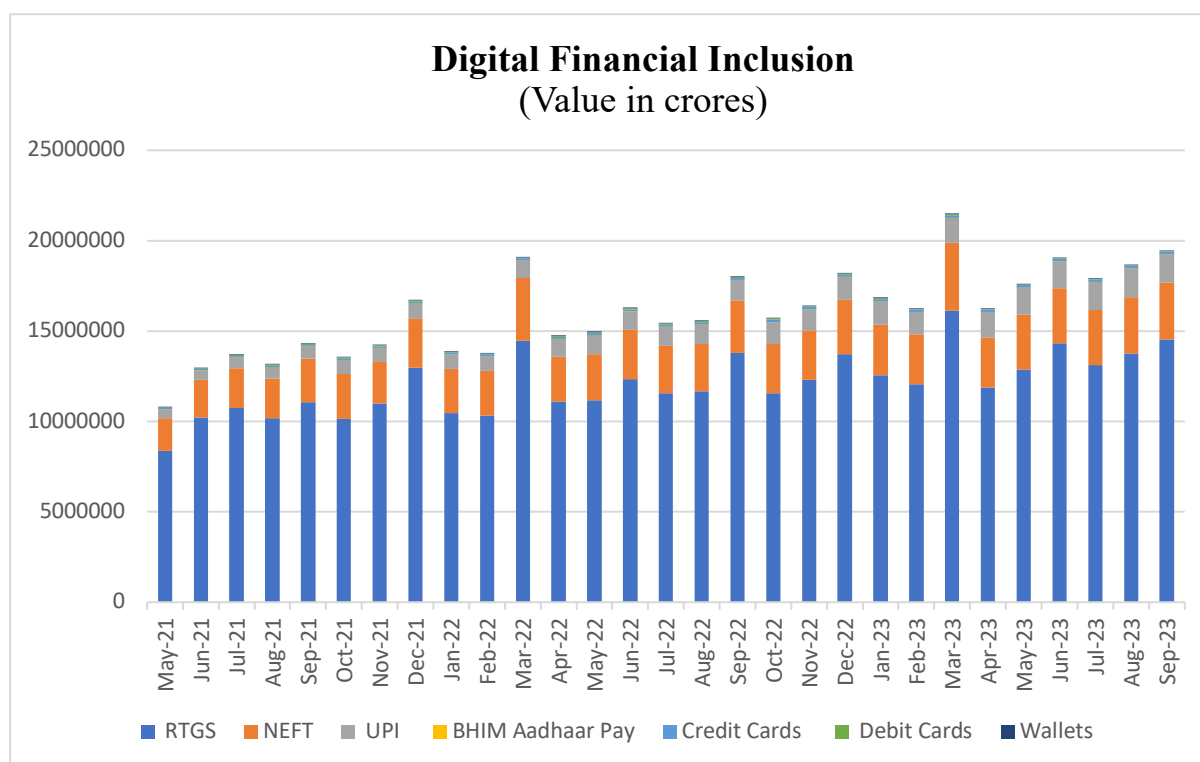


Figure 2.6 Transaction Value Trends across Digital Payment Platforms

2.5.5 Indicators of Financial Depth in India

Financial depth measures the size of the financial system relative to the economic growth (GDP) of a country. Domestic credit to the private sector and liquid liabilities as a percentage of GDP showed an upward trend, particularly after 2000, as displayed in Figure 2.7. The growth rate of non-food gross domestic credit exhibited fluctuations over the years, reflecting expansions and contractions in bank lending, as shown in Chapter 5 (Figure 5.1). Domestic credit to the private sector faced a marginal decline due to the dot-com bubble burst in 2002 and the global financial crisis in 2008, which adversely affected the international markets. In 2010, private credit was 50% of GDP, representing a significant role of private funding in boosting India's GDP. Further, it was recorded at 50.14% in 2021, after a decline from 54% owing to the spread of COVID-19. However, the credit growth rate has become stagnant since 2010, despite continued economic growth.

The average money supply growth rate was 8-10%, which grew to 12-15% as a result of Nationalization. M3 as a percentage of GDP has been experiencing a significant rise over the years. India experienced an average M3 growth rate of 14.3% between 2000 and 2016 (Soltani, 2024). M3 was reported at 87% of GDP in 2021 and grew at a rate of 10.5% between 2016 and

2023. Considering the higher demand for economic expansion in India, there is a rising demand for the money supply. Notably, in the aftermath of COVID-19, there was a steep rise in the M3-to-GDP ratio. In 2020, the RBI infused liquidity worth ₹12.8 trillion (RBI, 2022). Also, the Liquidity Adjustment Facility (LAF) stood at ₹3.43 lakh crore in 2020 and rose to ₹5.47 lakh crore in 2021, reflecting the surplus liquidity from forex purchases. The rising M3-to-GDP ratio highlights the important role of monetary expansion in maintaining liquidity and economic recovery during the crisis period.

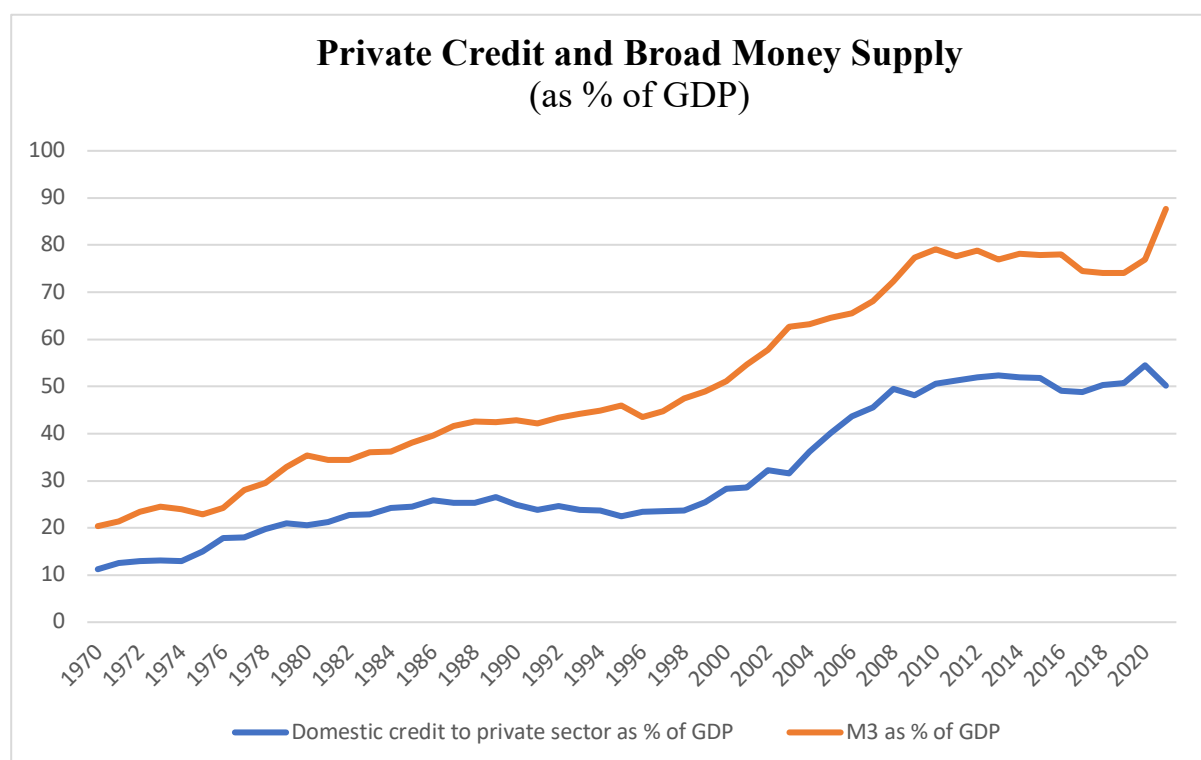


Figure 2.7 Evolution of Private Credit and Broad Money (1970-2020)

Market capitalization, often known as market value, is the share price times the number of outstanding shares. The market capitalization of all the listed domestic companies has grown over the last 15 years, as displayed in Figure 5. In 2007, the market capitalization nearly doubled, accounting for 160% of the GDP. The investor's wealth surged by \$970 billion. This was followed by a sudden crash of 50% due to the global crisis. The pre-COVID market capitalization of each major index was \$2.16 trillion. In the early months of 2020, BSE and NSE traded at their highest levels, 12,362 and 42,273, respectively. The market crashed in April 2020 (Kumar & Kumara, 2020). Recently, it stood at 113% of the GDP in 2021, a significant rise from 68% in 2011.



Figure 2.8 Market Capitalization of Listed Domestic Companies (2000-2022)

2.5.6 Financial system stability

The government takes preventive measures to ensure the stability, transparency, and growth of the banking system in the economy. Growing NPA significantly impacts the efficiency of the banking system. In 1996, the NPA peaked at 15.7%, and commercial banks and public sector units (PSUs) were badly affected, with the NPA at 17.8%. Private and foreign banks also experienced a steep rise during this period. To address this issue, the RBI initiated the Asset Quality Review in 2015 to analyze the quality of assets.

Figures 2.9 and 2.10 present the trends in gross and net NPAs across different categories of SCBs. The gross and net NPAs recorded a significant decline from 2018-19. The total gross NPA in 2012 stood at 1.42 lakh crore, while it was 10.39 lakh crore in 2017-18. Further, it declined to 5.71 lakh crore. The percentage of NPA in total assets was recorded at 1.7% in 2011-12, increased to 6.8% in 2017-18, and then further declined to 2.4% in 2022-23 (Sarkar, 2025). The figure clearly explains the current phase of the NPAs, with both the PSUs and commercial banks peaking at 14.6% and 11.2%, respectively. According to the RBI, the gross NPAs as a percentage of the banking sector stood at 7.5%.

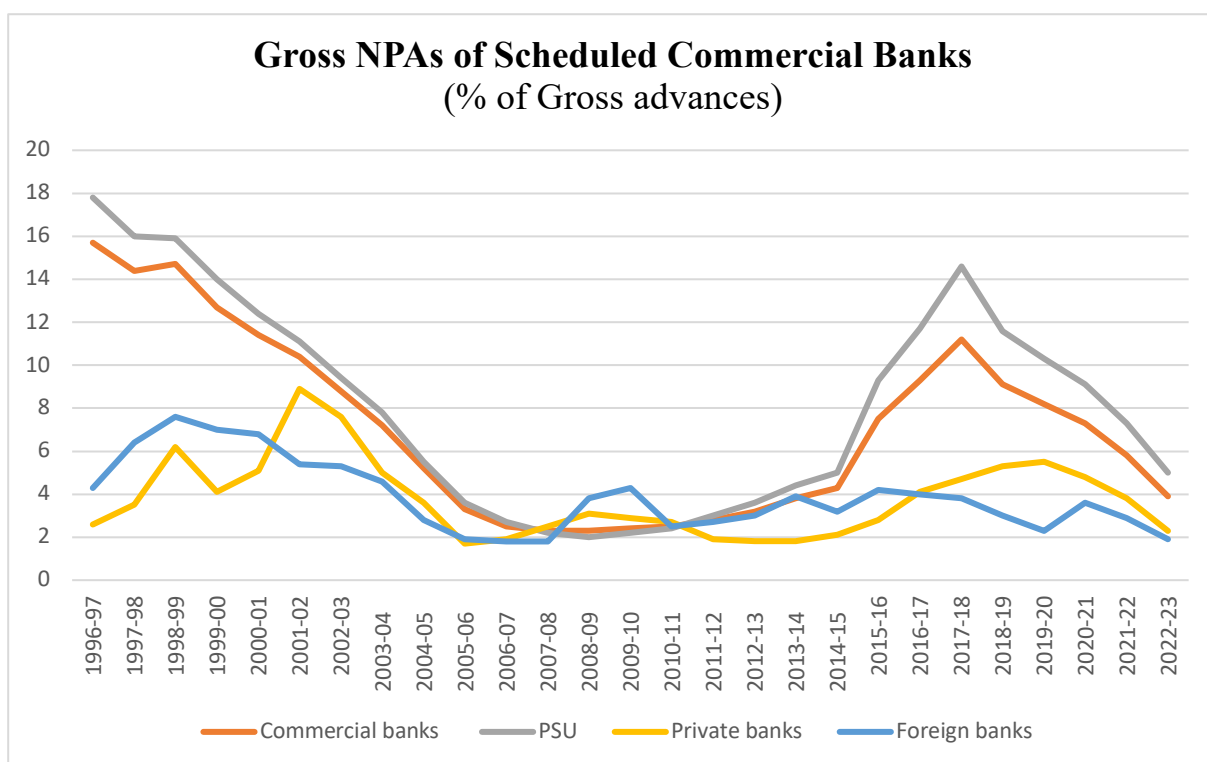


Figure 2.9 Bank Group-Wise Gross NPAs in India (1996-2022)

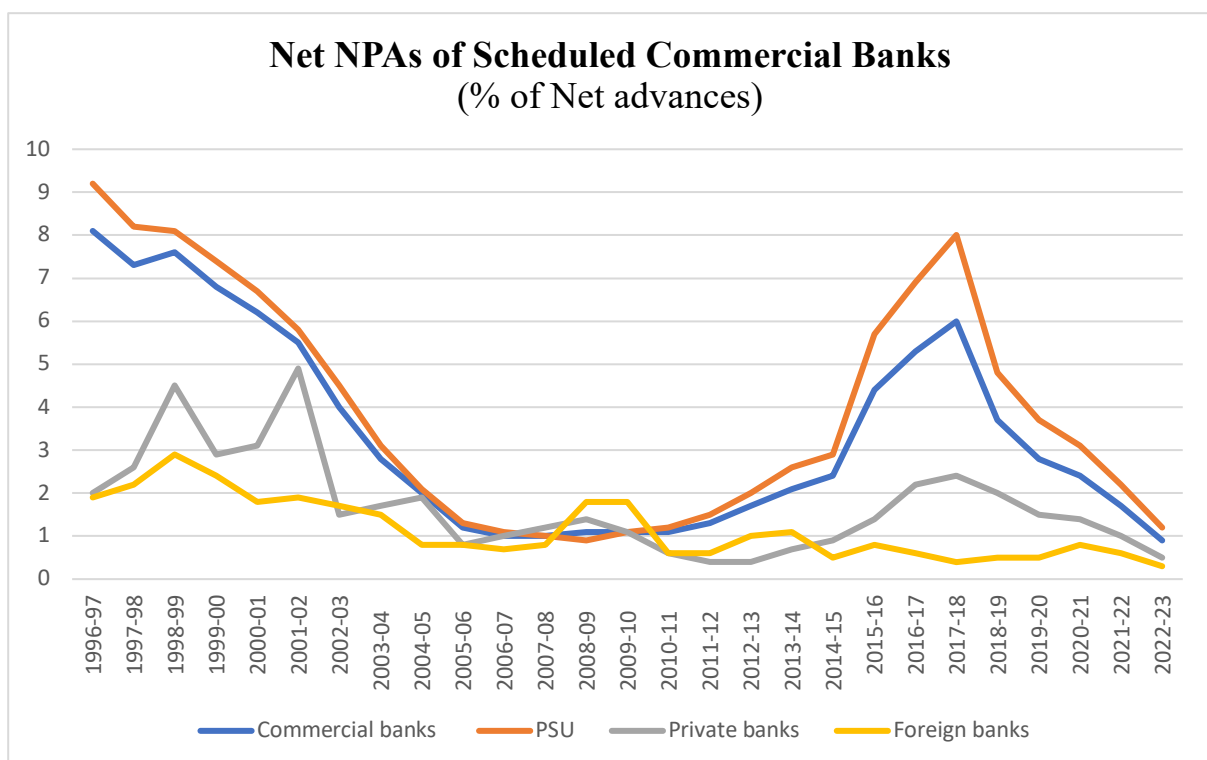


Figure 2.10 Bank Group-Wise Net NPAs in India (1996-2022)

The PSUs (Public Sector Units) contribute more than three-fourths of the total NPAs in India. PSUs provide 20% of the credit to the infrastructure and industrial sectors, a heavy lending sector. These sectors are contributing to the default of loans and advances, and private banks limit their credit lending to medium- and large-sized industries (Das, 2021).

As financial access and depth indicate, the important role of the financial system is in fueling investment, productivity, and expansion across sectors. The indicators of financial development—bank credit, broad money supply, market capitalization of domestic listed companies, growing market, and easy access to credit with digital transformations—have experienced significant growth over the years and contribute to GDP growth. However, despite financial progress, to achieve long-term stability, India has to address the following challenges to build a more robust financial system.

2.6 Challenges

1. The global financial crisis of 2008 represents the ongoing engagement of banks in credit creation during times of crisis. In 2014, public sector banks sourced up to 70% of the total credit to the real economy. While lending from private banks also increased during this period, the major challenge faced by the RBI was the rising number of non-performing assets (NPAs) in the banking sector. The RBI prioritized these issues, and throughout the process of identifying asset quality, the review that led to the decline in credit, public bank lending collapsed. Many major PSUs like Bank of Baroda (Rs 3,230), PNB (Rs 5,376), and IDBI (Rs 1,376) recorded losses in the year 2016, which caused NPAs to increase in 2017-18 by almost 80%.
2. Self-employed women's associations (SEWA banks) were established in 1974 and have been providing microfinance to people living in rural areas since then (Saleh & Ahmad, 2023). They charge a higher interest rate, ranging from 12% to 30% on the principal amount, unlike other banks, which charge between 8% and 12%. Moreover, 70% of late payments were recorded, which limits working capital and profits. Furthermore, these banks depend on commercial banks for financing services, making them highly dependent on other banks.
3. The Infrastructure Leasing and Financial Services Ltd. (IL&FS) is a large NBFC, expanding its credit facilities to network businesses, mainly infrastructure projects, and has financed projects worth 1.8 lakh crore. But IL&FS accumulated outstanding debt worth Rs 91,000 crore by 2018, of which Rs 57,000 crore was owed to public banks. Due to a lack

of funds, IL&FS couldn't meet its obligations and even failed to repay banks. This short-term funding shortage in 2018 caused a liquidity crisis in NBFCs. Similarly, Dewan Housing Finance Corporation (DHFL) reported a loss of Rs 2,223 crore in 2019 and owed Rs 1 lakh crore to banks and investors. It was claimed that company investors were involved in a Rs 3,000 crore scam. These scams caused a credit crunch in the economy, and the net value of mutual funds was also impacted, resulting in a total outflow of Rs 1.7 trillion (Agarwal, 2023), raising doubts about the viability of NBFCs.

4. NBFCs are struggling to recover from the 2018 and 2019 credit crunch caused by the IL&FS and DHFL defaults, as well as COVID-19. This has led to the shutdown of most NBFCs and an increase in NPAs. The adverse impact on GDP has been significant, falling from 6.1% in 2018-19 to 4.2% in 2019-20. No passenger cars were sold during the COVID-19 period, causing no growth in the car industry (Sengupta, Son, & Vardhan, 2022). MSMEs, which were funded by NBFCs. The Atmanirbhar Bharat, or Self-Reliant India, fiscal package was announced by the finance minister in 2020, including a liquidity scheme worth Rs 750 billion.
 - Rs 300 billion liquidity scheme to invest in graded debt papers.
 - Rs 450 billion partial credit guarantee scheme.
5. With the rise of digital payment systems, there is a need for data related to consumer protection and cybersecurity. Many complaints were lodged against digital platforms during the COVID period, totalling 2,500, which highlights the necessity to regulate excessive financial inclusion and credit under insufficient supervision. Moreover, rural mobile internet penetration also remained low, with only 38% in 2022.
6. The gross expenditure on research and development (R&D) stood at Rs 104,864 crore in 2016-17 and Rs 127,381 crore in 2021, nearly doubling from 2011. However, it remained a very small fraction of GDP, accounting for only 0.7%, compared to China's 2.3% and the USA's 2.8% (Das G. , 2019), which contributed to low productivity in the manufacturing sector. This highlights the need for private sector investment in productive channels.
7. According to the IMF reports, there is a downward trend in private investment from 21% in 2022-23 to 13% in 2023-24. Although private investment has increased in value terms, but declined as a percentage of GDP. This fall is mainly associated with the fall in machinery and equipment, which can be due to the slowdown in consumption growth; businessmen are reluctant to expand. Also, private corporate and household investment declined to 10% in 2020-21 from 12% in 2015-16. Furthermore, FDI-to-GDP also fell from

6.55% in 2020 to 2% in 2023, reflecting the impact of India's protectionist policies that tend to discourage foreign investment.

8. According to the Federal Reserve Bank, central banks and governments need to know when the economy is overheating or slowing down; this critical assessment is required. However, it's difficult to get real-time data, particularly on complex indicators like potential output and the output gap. Recent shifts in economic trends have caused investors not to always move to other investments, creating a disconnect between business and financial cycles. Because of this, the central bank finds it harder to decide if inflation is demand-driven or supply-driven.
9. Despite the fastest-growing economy, the rate of reduction in national poverty is not proportionate to GDP growth. In 2018, only 50% of the population participated in the labor force, out of which 81% were employed in the unregulated sector, causing high wealth inequality. While 10% of Indians own 80% of the wealth, this causes poverty, crime, dissatisfaction, and low economic development.

2.7 Conclusion

This chapter highlights the progress and gaps within India's financial system. The financial indicators, such as bank credit, money supply, and market capitalization as a percentage of GDP, have progressed over the years, indicating financial deepening, and the macroeconomic indicators—GDP, services, and gross fixed capital formation—have shown a significant increase. However, rising NPAs, inequality in the distribution of income, decline in private investment, and other gaps remain key concerns. Despite these challenges, financial development has played a crucial role in channelling savings into effective investments. This foundational understanding supports the positive influence of financial development in promoting India's economic growth.

Chapter III

REVIEW OF LITERATURE

Financial development and economic growth are two firmly integrated concepts essential for an economy's growth and development. The development of the financial sector includes the banking sector and the capital market. (Schumpeter, 1911) emphasized the importance of financial services in innovation and growth. In 1991, financial liberalization reforms were introduced to promote financial stability and growth, efficient allocation of resources, and ensure financial stability (Gopinath, 2007). These reforms aimed at improving the efficiency, profitability, and productivity of financial services. (King & Levine, 1993), revealed a positive and significant relationship between the different indicators of financial development and economic growth in 80 countries during the period 1960-89. Financial development also supports investments and growth by reducing the cost of external finance, as revealed by (Rajan & Zingales, 1996). They investigated the impact of the financial sector on the growth of different US industries, especially those that heavily rely on external finance, for the period 1980-1990. The findings suggest that finance is necessary for sector expansion, particularly in innovation and capital-intensive industries. Also, the economic growth of a country refers to the sustained increase in gross domestic product (GDP), which is a key indicator of a country's economic health. Various economic indicators, such as capital formation, access to credit, technological advancement, human capital development, and efficient resource allocation, influence GDP. (Levine, 2004) emphasized the importance of well-functioning financial systems in promoting economic activity and growth. It is strongly advocated that a developed financial sector, characterized by efficient intermediation, strong legal frameworks, and effective regulatory systems, ensures better credit access for individuals and firms. They encourage growth by easing information and transaction costs and thereby ensuring minimum risk and efficient allocation of resources.

This chapter deals with the extensive literature review on different financial development indicators and economic growth. The previous literature lists the prominent contributions in the context of this study, which helped us to identify the research gaps and frame the objectives of our research, thereby providing novelty to this research. Accordingly, a section-wise literature review is presented below, structured around each objective of this study.

3.1 Review of Banking Credit and Economic Growth

The debate on the finance-growth relationship has been ongoing, with (Schumpeter, 1911) a view on finance's role in facilitating new entries into the circular flow through start-ups. Before independence, private sector investments in India's primary sector were unprofitable due to seasonal fluctuations, colonial policies, and low profitability, necessitating the establishment of financial institutions that could cater to the needs of the agricultural sector. In 1948, the Industrial Finance Corporation of India (IFCI) was established as the country's first Development Finance Institution (DFI), followed by the Industrial Credit and Investment Corporation of India (ICICI) in 1955 and the Industrial Development Bank of India (IDBI) in 1964. The primary aim of these banks was to provide financial assistance to the Indian agrarian sector and industries for their short-term and long-term requirements, with a special focus on infrastructure and key manufacturing projects. After World War II, economic growth became the primary objective, and the Solow growth model analyzed the need for capital, output, and labor. After the 1991 reforms, these institutions transformed into commercial banks to promote competition, global integration, and financial stability. Several studies in the literature, such as (Schumpeter J. , 1934) & (Rousseau, 2000) believed in finance's role in economic growth, emphasizing the importance of financial integration, capital optimization, and credit mobilization.

India is a transitional economy where credit availability plays an integral role in economic growth. Credit simply refers to the borrowing and lending of funds between individuals, businesses, and financial institutions. Banks offer credit to various sectors, such as industrial, agricultural, and household, which helps fund their consumption needs and has a significant impact on the economy. (Stiglitz, 1993) emphasized the importance of credit availability, particularly for developing countries. Domestic credit by private banks facilitates economic growth by providing individuals and businesses with the necessary funds for investment and consumption, as suggested by (Beck T., 2000). Entrepreneurs need access to finance to start or expand their businesses, invest in new technologies, and hire more workers. Domestic credit was estimated to be 50% of GDP in 2021, compared to 54.7% in 2020. Not only does access to finance matter, but the cost of credit influences consumer spending patterns and investment decisions. When credit is easily accessible and affordable, consumers and businesses tend to spend and invest more, driving up aggregate demand and fueling economic growth. Conversely, during periods of credit tightening or high interest rates, borrowing becomes more

expensive, leading to reduced spending and investment, which can dampen economic activity. (McKinnon, 1973) highlighted the role of financial repression and the impact of interest rate controls on economic growth. He argued that when interest rates were artificially suppressed, savers received low returns on their deposits, leading to the misallocation of resources. According to him, financial repression, which includes policies such as interest rate ceilings and directed credit programs, inhibits financial intermediation and hampers the efficient allocation of capital. He was a strong supporter of liberalizing interest rates and reducing financial repression to promote economic development.

Some studies showed a nonlinear relationship between financial development and economic variables. (Robinson, 1956) believed that “where enterprise leads, finance follows,” while (Patinkin, 1965) argued that real economic variables were independent of monetary and financial variables. (Lucas, 1998) and (Stern, 1989) believed that financial development was an “overstressed” indicator of growth, diverting from other major policies. (Van Wijnbergen, 1983) and (Buffie, 1984) suggested that higher risks lead to more economic growth. (Adusei, 2013) investigated the impact of financial liberalization on Ghana’s economic growth. The study employed FEOLS and the ECM approach on annual data from 1970 to 2010, which found an insignificant relationship between the variables. However, this was confirmed by GMM, which also revealed that financial development indicators undermine Ghana’s economic growth, possibly due to the presence of financial instability. Efficient allocation of resources could reduce risks and lower economic growth. However, when credit expands, the return on projects decreases, leading to a reduction in productivity growth (Stephen G. Cecchetti, 2019). Additionally, several works of literature have indicated that bank credit served as an indicator of financial instability.

(Duican & Pop, 2015) analyzed the role of bank credit on Romania’s economic growth during the period 2005-2014. The findings revealed that a one-unit increase in credit caused a 1.47-unit rise in GDP. (Akpanung & Babalola, 2012) investigated the relationship between banking credit and Nigeria's economic growth during the period 1970-2008 by employing the Granger test and Two-stage Least Squares (TSLS). The Granger test revealed a unidirectional relationship from GDP to private credit. While interest rates negatively impacted GDP. In addition, TSLS revealed a positive and significant bank credit coefficient, suggesting a positive influence of credit on growth. (Joseph, 2020) confirmed the long-run relationship between bank credit and Tanzania's economic growth during the period 1993-2017 with the help of the Vector

Error Correction Model (VECM); however, the Granger test revealed no relationship between credit and growth.

Various studies conducted in the Indian context highlight the significant relationship between bank credit and economic growth. (Chakraborty, 2008) analyzed the impact of financial sector development on economic growth in India from 1993 to 2005, employing the interpolation method. This paper's findings suggested a positive significance of the investment-output ratio on the real rate of growth, indicating that the transmission of credit and reform policies influenced investment and economic growth positively. Moreover, they argued that long-run economic growth fosters the financial sector by increasing the demand for real economic activities, thereby promoting economic growth. Furthermore, (MacDonald & Xu, 2022), a recent study, examined the importance of credit growth, capitalization of private banks with lower non-performing loans, and improvement in balance sheets during periods of low economic growth. They argued that higher credit growth promotes capital formation and facilitates easy fund lending at low interest rates, leading to higher economic growth over the medium term. (Balasubramanian, 2022) revealed a short-run and long-run relationship between long-term credit and economic growth in India with the help of the ARDL mechanism. Also, there was a long-run impact of long-term credit on industrial output. Furthermore, the Granger test revealed that credit Granger-causes economic growth. In contrast, (Krishnankutty, 2011), using a panel data analysis, focused on the relationship between bank credit and economic growth in the context of Northeast India from 1999 to 2007 and found that bank credit didn't influence economic growth in different segments of Northeast India owing to default in payment and the absence of awareness by authorities.

Additionally, (Jotwani, 2015) investigated a unidirectional causal relationship between bank credit and economic growth in India from 1972 to 2012. Bank credit led to economic growth; however, economic growth had no such effect on bank credit. (Singh, Pemmaraju, & Das, 2016) investigated the effects of bank credit on different sectors of the economy during the years 1973-2014, and an aggregate analysis was also conducted for the period 1951 to 2014. The annual data on sectoral banking credit, industrial, agricultural, and services were utilized. Industrial credit was further divided into mining, quarrying, manufacturing, and others. Johansen's co-integration test revealed that there was a long-term relationship between variables till 1992. However, there existed a long-term relationship between the variables in the manufacturing sector. Additionally, GDP Granger-caused credit in the short-run at both the

sectoral and aggregate levels. Furthermore, (Mohanty, Kumar, & Patra , 2016) investigated the credit growth nexus at the state level for the period 2001-2014, covering 21 states. They studied the causal relationship between them using the Kao residual co-integration test, which established a long-run relationship between bank credit and economic growth. Also, a bidirectional relationship was confirmed by the Dumitrescu-Hurlin panel test. Their research concluded that bank credit, capital outlay, and development expenditures had a favorable impact on growth rates. Table 3.1 presents the panel and cross-sectional studies on the credit-growth nexus.

Table 3.1 Panel and Cross-Sectional Studies on Bank Credit and Economic Growth

Authors	Country /Region	Methodology	Periods	Key findings
(Khaled, Samer , & E, 2006)	11 Arab countries	Hausman's test	1980-2001	No significant relationship between indicators of financial development and growth rate of GDP per capita
(Bist, 2018)	16 low-income countries	Pedroni panel co-integration and OLS	1995-2014	Positive impact of financial development on economic growth
(Guru & Yadav, 2019)	BRICS	System GMM	1993-2014	The banking sector and stock market development complement each other in stimulating growth.
(Abbas, Afshan, & Mustifa, 2022)	44 and 42 middle-income countries	Panel ARDL and Granger causality	1995-2018	The financial development contributes to economic growth.
(SIRISANKAN AN & KANANURAK , 2022)	140 sample countries	Income decomposition, two-step estimation, and multiple linear regression	2000-2018	Financial development contributes to economic growth.

More research was carried out across different country panels. (Gregorio & Guidotti, 1995) found a long-run positive relationship between financial development and economic growth in a large cross-country panel, while it was negative in panel data for Latin America. (Bloch, 2003) examined the cross-country positive relationship between financial development and economic growth in East Asian countries. They utilized the bank credit to the private sector and GDP from the period 1960-1990. The findings emphasized the bidirectional relationship between financial development and economic growth, and also structural factors that affect economic growth. (Abbas, Afshan, & Mustifa, 2022) investigated 44 and 42 lower-middle- and upper-middle-income countries from 1995 to 2018, revealing a long-run relationship between the variables, particularly a more pronounced impact on middle-income countries. The Granger causality test revealed a bidirectional relationship between them.

However, financial booms are not always beneficial (Cecchetti & Kharroubi, 2012), revealing that financial development pulls productivity growth. (Wen, Mahmood, Khalid, & Zakaria, 2022) identified a negative relationship between financial development and economic growth across 120 countries by employing the System GMM technique from 1997 to 2017. Financial development boosted economic growth up to a certain limit, which they called the threshold limit, after which an increase in financial development could lead to inflation in the economy. (Arcand, Berkes, & Panizza, 2015) explored 100 upper- and middle-income countries from 1960 to 2010 and found a vanishing effect of financial development on economic growth when credit to the private sector reached 100% of GDP. (Shen & Lee, 2006) demonstrated an inverse U-shaped relationship between the variables in Ghana. (Law & Singh, 2014) investigated that financial development was not necessarily good for economic growth. (Samargandi, Fidrmuc, & Ghosh, 2015) and (Matei, 2020) found an inverted U-shaped relationship, suggesting policymakers should prioritize quality financial development over quantity to avoid its adverse effects. (Lay, 2020) examined the non-linear credit-to-GDP ratio impact on the economic growth of 20 advanced countries during the period 1870-2013. Using a dynamic threshold panel model, they found a threshold around 135% of credit-to-GDP. These findings suggest that credit above this threshold negatively affects GDP, suggesting a statistically significant U-shaped relationship between them. This indicates that credit expansion does not necessarily translate into growth uniformly; its effectiveness depends on the allocation and quality of credit.

Similarly, (Ho & Saadaoui, 2022) determined whether a threshold effect exists in the credit-growth nexus in the ASEAN countries for the period 1993 to 2019. This study identified a threshold at 96.5%; if the ratio is $\leq 96.5\%$, bank credit positively and significantly influenced economic growth; however, if it is $> 96.5\%$, credit showed a positive but insignificant effect on growth. They emphasized that it depends on the structural characteristics of a country. When credit is allocated toward more productive firms, it boosts growth, while if it goes to households, growth weakens.

The above-mentioned literature suggests that numerous studies have been published on the relationship between banking credit and economic growth. It reveals a mixed relationship, with some suggesting a positive long-term link, while others indicate limited or no relation. However, limited attention has been given to the interaction of non-food credit, GDP, and lending rates at the state level. Based on this discussion, the current study aims to examine the relationship between bank credit and economic growth among 32 Indian states using panel ARDL estimation, extending the analysis to the national level as well. It also seeks to analyze credit growth rate trends across states and their implications for growth.

Thus, the literature reviewed forms the formulation of the first objective: *to determine the relationship between bank credit and economic growth in India*. Further, to study the financial development and growth nexus, it is important to study other important indicators of financial development and their impact on economic growth.

3.2 Review of Broad Money Supply and Economic Growth

The classical dichotomy suggests that the money supply only affects monetary variables like money wages, nominal GDP, and prices. However, real variables such as real output, real wages, and employment are independent of monetary variables. Nonetheless, Monetarists and Keynesians reject the classical dichotomy. Keynesians argue that the money supply can influence GDP through changes in interest rates, and they believe that monetary policy alone is insufficient; fiscal policy is also necessary for spending in the public and private sectors to ensure stability and growth. They also contend that inflation arises from market imbalances. Monetarists believe that the supply of money is a significant factor driving growth. If there is money available in the market, the aggregate demand for goods and services increases, leading to higher employment and economic growth.

Several studies across different countries have established a positive relationship between money supply and economic growth. (Robert Nizhegorodtsev, 2015) found a long-term positive relationship between money supply and economic growth in BRICS and growing Asian countries, identifying a threshold beyond which an excessive money supply causes inflation, an issue already faced by PIIGS countries. Using the pooled mean group (Chaitip, Chokethaworn, Chaiboonsri, & Khounkhalax, 2015), a study was conducted on the influence of money supply (M1 and demand deposits) on the economic growth of the AEC open region for the period 1995. A positive long-run relationship between money supply and economic growth was concluded, while demand deposits showed a negative impact. (Mahara, 2021) employed the ARDL mechanism and found that there was a long-run relationship among money supply, capital expenditure, and Nepal's economic growth and a unidirectional relationship from money supply and capital expenditure to real economic growth.

In the context of India, the empirical literature explores the dynamics between money supply, inflation, exchange rate, and GDP with distinct conclusions and policy implications. (Mishra, Mishra, & Mishra, 2010) examined the dynamics among money supply, output, and price for the period 1950-51 to 2008-09. VECM results confirmed the presence of a long-run relationship between the variables. Additionally, the Granger test confirmed the bidirectional relationship between money and output and unidirectional causality from price to money supply and output. (Sharma, Kumar, & Hatekar, 2010) confirmed a short-run unidirectional causality: money supply caused IIP. (Behera, 2016) found a long-run relationship between money supply, exchange rates, and India's GDP between the period 1975-2012 using VECM. The impulse response showed that GDP positively responded to growth in the money supply. Inflation negatively affected India's GDP during the period 1972-73 to 2007-08, as indicated by (Salian & Gopakumar, 2009). The interesting finding was that the sensitivity of inflation to a change in growth is higher than the sensitivity of growth to inflation. (Rajeshwari, 2018) employed an Engle-Granger two-step modelling to investigate the relationship among money supply, GDP, and the price level CPI. The period for the study was 1971 to 2015. The cointegration test revealed a long-run relationship between money supply, CPI, and GDP. The ECM test confirmed no short-run relationship among the variables.

However, (Sabade, 2014) argued that in developing and underdeveloped countries, which have not achieved the level of full employment, it is not necessary that monetary tightening helps control inflation. In the case of India, monetary tightening measures caused GDP to fall by 5%

and increased unemployment during the period 2011Q1 to 2012Q3. “Monetary tightening can push the economy into inflation, but liberal monetary policy cannot get the economy out of it.” Similarly, (Agarwal & Shah, 2019) focused on the fact that inflation targeting in developing countries has reduced inflation, raised growth rates, and reduced debt; they also argued that low inflation may cause slower growth. However, the IT sector did not succeed in reducing inflation within the targeted range. India adopted an inflation target of 4% with a band of (+/- 2), and subsequently the annual inflation decreased from 5.8% in 2014-15 to 3.6% in 2017-18, while output declined later on post 2016. (Hossain & Maitra, 2019) examined a positive and significant short-run and long-run relationship between money supply and real income, as well as a negative long-run impact of interest rates. (Maitra, 2020) further revealed that money supply and exchange rate had a positive impact on GDP, while the interest rate had a negative relationship with GDP. (Kaur & Sunanda, 2020) established that monetary policy influenced growth in both the short and long-run, and GDP was dependent on all these variables: repo rate, reverse repo rate, unemployment, and FDI. (SAHOO & SAHU, 2023) employed a multivariate VAR model and observed that money supply negatively affected industrial production in the long-run. The Granger test confirmed a unidirectional relationship from money supply to industrial production, implying the existence of a short-run relationship. (Kumar P., 2023) investigated the influence of money supply on aggregate demand using the SVAR model during 1998-2019. The findings suggested that monetary policy influenced output primarily through the asset price channel; however, the credit and exchange rate channels appeared to be neutral. (Zaerpour, 2023) emphasized the important role of money supply in promoting financial stability and sustainable economic growth in India. Additionally, highlighting the importance of continuous monitoring and adaptation to ensure money supply growth.

While broad money has been found to exert a positive influence on economic growth, several studies have suggested a weak or insignificant relationship. (Simasiku, 2022) examined the relationship between bank credit and Namibia’s economic growth by employing the ARDL approach on quarterly data for the period 2008Q1 to 2020Q4. The findings revealed no long-run relationship between the variables. However, the Granger causality test found a unidirectional relationship from real economic growth to broad money supply. Furthermore, (Gachugu & Luseno, 2023) investigated the relationship between financial deepening and Kenya’s economic growth during the period 1985-2020. The money supply served as a proxy for financial deepening with the help of a bivariate autoregressive model. The results revealed

a negative impact of money supply on economic growth in the long-run. With a one-unit rise in money supply, there's a decline of 0.3215 units of economic growth.

Table 3.2 displays a selection of empirical literature where the findings indicated either a limited short-term influence or no long-term relationship. Some studies also found a negative long-term relationship between the money supply and GDP.

Table 3.2 Studies reporting mixed relationships between Money Supply and Economic Growth

Authors	Country /Region	Methodology	Periods	Key findings
(Alfawwaz, 2012)	Jordan	ECM and Granger Causality Test	1976-2009	There was no short-run and long-run relationship between money supply and economic growth.
(Omodero, 2019)	Nigeria	OLS and regression	2009-2018	Negative and insignificant relationship between money supply and GDP.
(Ewinetu, 2021)	Ethiopia	Vector Autoregressive model	2002-2017	No long-run relationship existed between money supply and GDP, but only a short-run one.
(SAEED, 2022)	Ghana	VECM	1980-2020	There was no long-run relationship between money supply and economic growth; however, a short-run relationship was observed.
(Madurapperuma, 2023)	Sri Lanka	Multivariate Autoregressive	1990-2021	The findings concluded a negative long-run effect of money supply and inflation on economic growth; however, a short-run effect existed.

Recent studies employed various innovative methodologies to better understand the interrelationships between different variables. (Buthelezi, 2023) explored the relationship

between money supply and economic growth in South Africa during the period 1990 to 2021 using the TVP-VAR model. They observed that a trade-off between the variables occurred only when monetary policy was used to stabilize inflation and growth. Using the MS-BVAR model, (Rich, 2022) demonstrated the importance of monetary intervention in the US for recovering from the financial crisis, highlighting that incorporating regime switches in monetary policy provided a realistic model for evaluating the effects of monetary policy. (Berger, Karlsson, & Osterholm, 2023) used BVAR models to investigate the relationship between money supply and inflation in the euro area and the USA from 1962 to 2022. The results confirmed a weak relationship after 1980 but indicated a strong one after 2020. (Polat, 2025) revealed that policy rates were not the primary tool for monetary policy in Turkey during the period 2005 to 2018. With the help of the FAVAR model, he concluded that liquidity management, macroprudential policies, or credit-based treatment worked better in the case of the Turkish economy.

This extensive literature highlights that the relationship between GDP, M3, and CPI varies across different periods and countries due to different economic, behavioral, and political elements. Some of the literature suggested that inflation below 8% slightly positively impacted growth. However, above 8%, it dampened growth, according to (Sarel, 1996), using data from 90 countries for the period 1970-90. (Fischer, 1993) suggested that money supply and inflation were closely connected, and the money supply directly influenced economic growth (Bhunia, 2016). Similarly, (Dornbusch, Fischer, & Startz, 1996) showed a positive relationship between growth and inflation, as increased aggregate demand is a major driver of high inflation. Whereas (Younus) found a non-linear relationship between inflation and Bangladesh growth during the period 1976-2012. The inflation threshold in Bangladesh lies within the range of 7-8%, and he found a similar threshold of 7.31 with the help of OLS. (Mohaddes & Raissi, 2014) found that Indian states with inflation above 5.5% had significant inflation-growth threshold effects, and found a negative relationship between CPI and GDP growth among 14 states. (Das & Loxley, 2015) found a positive relationship between inflation and GDP up to 23%, suggesting a very high critical value for Asia, Latin America, and the Caribbean. (Nizhegorodtsev & Goridko, 2015) identified a non-linear relationship between money supply and economic growth among BRICS and growing Asian countries. They suggested a threshold level of the monetary growth ratio, which causes inflationary pressure in the economy, already experienced by PIIGS countries. (Dholakia, 2020) suggested that promoting economic growth requires maintaining inflation within a threshold. Also, he further advised that the threshold

inflation rate depends on policy parameters like FD/GDP and CAD/GDP, and accordingly provided a whole range of threshold estimations. Expansionary monetary policy often aims to reduce loan costs, encouraging investment and spending (Mahara, 2021). (Dinh, 2019) found that a continuous increase in the money supply caused long-term inflation, with no short-run impact in Vietnam and China during the period 2012-2016. The government should take necessary action to control inflation and stimulate economic growth.

There are several studies carried out to identify the threshold, where inflation above a critical point negatively affects economic growth. (Kannan & Joshi, 1998), (Singh, 2010) explored the growth-inflation trade-off in India and found that inflation above 6% affected GDP and suggested maintaining an inflation rate under 6% to ensure healthy output and growth levels. Since 2016, the RBI has adopted flexible inflation targeting. MPC members (Dholakia, Chander, Padhi, & Pratap, 2021) suggested that India's threshold inflation level is approximately 6%. If the inflation target is below the critical value, then it becomes difficult to achieve the potential output, leaving the economy in disequilibrium (Nayak, 2021). The RBI kept the repo rate unchanged at 6.50%, while the CRR was reduced by 50 bps to 4%. The MPC emphasized promoting growth without lowering inflation. They highlighted the importance of maintaining price stability and forecasted inflation at around 4.5%, which later increased to 4.8% due to rising retail prices.

Therefore, the study attempts to investigate the relationship between GDP and Broad Money Supply (M3) while controlling for variables such as Consumer Price Index (CPI) and Call Money Rates (IR). The key novelty of the study lies in combining the structural break analysis with the inclusion of dummy variables in the ARDL framework, providing an understanding of how money supply interacts with growth during periods of economic shocks.

Thus, the extensive literature led to the formulation of the second objective: *to determine the relationship between broad money supply and economic growth in India*. Additionally, another important aspect of financial development is the capital market, and the following section highlights the capital market and its impact on economic growth.

3.3. Review of the Stock Market and Economic Growth

Since the financial sector is broad and comprises financial institutions and financial markets, its growth is not measured by a single indicator. Many economists have focused on the stock market development and its impact on the real economy. Several studies have suggested a

positive and significant impact of the stock market on the real sector of the economy. Empirical studies by (Atje & Jovanovic, 1993), (Levine & Zervos, 1998) suggested a positive and robust impact of the stock market on economic growth, capital accumulation, and productivity. (Greenwood & Smith, 1997) suggested that large stock markets reduced transaction costs, reducing the cost of mobilization of savings and facilitating productive investments. (North, 1991) argued that the development of the stock market reduced the cost of transferring ownership rights, thereby enhancing institutional efficiency and thus growth.

Several disagreements on the positive impact of the stock market on the real economy also exist. (Mayer, 1988) argued that stock markets, even if large, do not significantly contribute to corporate finance, particularly when compared to banks and internal funds. (Stiglitz, 1985) emphasized that capital control and greater liquidity may reduce investors' ability to monitor firms and weaken corporate governance, thereby hampering firm performance and growth. (Shleifer & Summers, 1988) contended that the stock market mechanism may not always lead to economic growth; with weak legal protection, it may lead to short-term gains but long-term breaches of trust, productivity, and ultimately economic inefficiency. (Shleifer & Vishny, 1986) argued that a stock market facilitates corporate takeovers, causing short-term gains and volatility, ultimately leading to overall slow economic growth. (Levine R., 1991) argued that the stock market creates credit and makes investments less risky by allowing investors to buy and sell anytime and providing long-term capital to companies. It accelerates growth in two ways: first, by allowing the transfer of ownership of firms without affecting their operations, and second, by allowing the diversification of risk effectively. However, it may not always be beneficial for long-term economic growth. (Devereux & Smith, 1994) suggested that international risk sharing through the stock market leads to reduced savings and slow growth because it diversifies income risk. (Demirgüç-Kunt & Levine, 1996) proposed a broad indicator of the stock market and financial intermediaries. First, a high rate of return on stocks encourages investments; however, it may reduce savings and advance future consumption by decreasing present consumption, reducing the overall money supply in the economy, and consequently hindering capital accumulation. Second, high liquidity induces investors to invest but simultaneously discourages savings, causing a significant impact on savings and investment in the economy. Third, it focuses on short-term gains; more liquidity allows investors to trade their equity, bearing fewer transaction costs, but low accountability leads to economic inefficiency.

Particular emphasis was given to the country-specific studies, such as (Kirankabes & Basarir, 2012), which investigated the positive and significant impact of the stock market index ISE 100 on Turkey's economic growth, using VECM across the period 1998:1–2010:12. The Granger causality test reported a unidirectional relationship from the ISE index to GDP. (Qamruzzaman & Wei, 2018) employed ARDL methodology and confirmed the existence of a long-run relationship between the financial development indicator, the stock market and Bangladesh's economic growth in 1980-2016. (Hoque, Yakob, & Kruse, 2017) investigated the relationship between stock market development and Malaysia's economic growth from 1981 to 2016, employing ARDL bounds tests, the Granger causality test, and multivariate regression. The ARDL test revealed a positive short-run and long-run relationship between stock market development and economic growth, further confirmed by the bounds test. Moreover, the Granger test confirmed the presence of a unidirectional relationship from stock market development to economic growth. Similarly, (Chikwira and Mohammed 2023) utilizing VAR, reported a positive and statistically significant influence of the stock market on Zimbabwe's economic growth from the period 2013 to 2022; however, the coefficient was weak.

In developed countries, the stock market has become increasingly pivotal in mobilizing savings and facilitating effective investments. (Pan & Mishra, 2018) investigated the impact of the stock market on the economic growth of China during the period of crisis, 2007-2012. The ARDL analysis revealed a smaller magnitude but a negative effect of the share market on economic growth, suggesting signs of external turbulence. Toda Yamamoto's causality test indicated that economic growth caused development in China's stock market. (Demir 2025), with the help of OLS and panel VECM, found a positive short-run bidirectional relationship between the stock market and economic growth only in high-income countries. A unidirectional relationship was observed between the variables in both low- and middle-income countries.

Apart from country-specific studies, regional efforts like the proposed African Monetary Union (AMU) provided a broader picture of monetary integration and its macroeconomic impact. (Tachiwou, 2010) examined the relationship between stock market development and economic growth in the AMU during 1995-2006. The study used two indicators of stock market development: size and liquidity. The ECM results confirmed the positive influence of stock market development on economic growth in both the short-run and the long-run.

The stock market and monetary aggregate are often viewed as important drivers of fluctuations in economic growth, particularly in emerging countries like India. (Paramati and Gupta 2011)

examined the relationship between the monthly indicators like the index of industrial production (IIP), BSE, and NSE and quarterly GDP from April 1996 to March 1999. Findings revealed a bidirectional causality between IIP, BSE, and NSE. While GDP exhibited a unidirectional relationship with only NSE, no relationship was observed between GDP and BSE. The ECM bound test and Engle-Granger residual test confirmed a long-run relationship between stock market development and economic growth. (Palamalai and Prakasam 2014) revealed a long-run relationship and bidirectional causality between the stock market and GDP between June 1991 and June 2013 with the help of ARDL bound testing and the Granger test, consistent with the findings of (Vinayaranjan P, Rao and M Sravani 2022). (Pandey and Shettigar 2017) found a long-run relationship between monetary supply and IIP during the post-liberalization period. Similarly, (Misra 2018) also confirmed a long-run causality between IIP, BSE Sensex, and money supply, based on VECM results. (Ghosh and Chhaochhoria 2020) investigated various stock market indicators and their impact on GDP at constant prices. With the help of ARDL bound testing, they found that lagged market capitalization had a positive influence on GDP, suggesting that the stock market had no contemporaneous impact on economic activity. However, in the later period, it led to an increase in new listings, businesses, firms, and investments. (Sultana, Sharma, & Akheel, 2021) reported a positive influence of stock market indicators on GDP during the period 2003 to 2017, using VAR, aligning with the findings of (K, 2024). (Keswani, Puri, & Jha, 2024) conducted a cointegration analysis and found a significant long-run relationship between Indian stock prices and GDP.

While the above literature has explored the long-term effects of the stock market and economic growth, it often treats financial variables as a trend. However, the stock market exhibits inherent cyclical behavior, particularly with fluctuations that may lead or lag business cycles. Previous literature suggested a dynamic interaction between financial markets and business cycles. (Hamilton & Lin, 1996) used a bivariate model with an unobserved component and revealed that economic recessions caused volatility in the stock market, which further helped in identifying turning points in real economic activity. (Chauvet 2001) reported a significant role of financial cycles in driving fluctuations in economic output, especially during periods of economic fluctuations. (Raunig & Scharler, 2010) argued that stock market volatility influenced the real economy not only by capital accumulation but also via investor confidence. The uncertainty in the stock market caused a slowdown in aggregate demand. (Ma & Zhang, 2016), also confirmed that fluctuations in financial markets contributed to fluctuations in economic output; booms in equity prices often led to economic expansion.

Table 3.3 presents the cross-country and panel research on stock market fluctuations and their impact on real economic activity.

Table 3.3 Cross-Country/Panel literature on Stock Market and Economic Growth

Authors	Country/Region	Period.	Methodology	Key findings
(Avouyi-Dovi & Matheron, 2003)	France, Italy, USA, Germany, UK	1970-1990	Turning point, cyclical components	There was no strong relationship between stock prices and real activity in the short-run, except in the USA. However, in the long-run they appeared to influence each other.
(Sharma C. , 2008)	Argentina, Bangladesh, Brazil, China, Egypt, India, Indonesia, Malaysia, Mexico, Pakistan, Philippines, South Africa, Sri Lanka and Russian Federation	1990-2006	Pedroni Cointegration Tests and DOLS	No relationship was found between the stock market's size and liquidity and economic growth.
(Choudhry, Papadimitriou, & Shabi, 2016)	USA, Canada, Japan, and the UK	1990:01-2011:12	Non-linear bivariate	Bidirectional relationship between stock market volatility and business cycles.
(Adam & Merkel, 2019)	USA	1955Q1-2014Q4	Dynamic stochastic model	Productivity shocks caused stock/real booms followed by busts.
(Prudente de Alcântara e Silva & Giorno, 2025)	Brazil	1996-2023	Wavelet Methodology	Stock market cycles anticipated business cycles during the financial crisis period, while business cycles lead during non-economic shocks like COVID-19.

In contrast, (Jawadi, Ameer, Bigou, & Flagellet, 2022), found an important role of business cycles, particularly in the USA during the period of boom, in forecasting financial cycles, which is in line with empirical observations (Yan and Huang 2020) (Qu 2024). While (Vatsa P. B., 2024) reported that stock markets are procyclical in the USA and lag industrial production by approximately 1-3 months.

This study initially carries out a linear analysis, focusing on key indicators: BSE and NSE, crude oil, and the index of industrial production (IIP). Additionally, given the limited existing literature related to the non-linear dynamics between the stock market and economic growth in the Indian context using high-frequency monthly data, this study further explores the *relationship between the combined market capitalization of BSE and NSE and economic growth* using threshold regression.

Furthermore, another important aspect of the finance-growth nexus is determining the financial cycles and their interaction with business cycles.

3.4. Review of Financial Cycles and Business Cycles in India

Earlier contributions by (Schumpeter, 1911) emphasized the role of financial development in promoting economic growth by encouraging innovation, supporting research and development and motivating new entries. Several existing empirical studies, such as (McKinnon, 1973), (Goldsmith, 1969), (Gregorio, 1999) (Levine, 1997), (Arteta, Eichengreen, & Wyplosz, 2001), (Edison, Levine, Ricci, & Slok, 2002), supported the significant role of financial development in economic growth. Beyond the long-run relationship, recent research has focused on the cyclical behavior of financial and macroeconomic indicators. Financial cycles, particularly credit cycles, have attracted attention from policymakers and researchers after the financial crisis. Additionally, this literature addresses the characteristics of financial cycles, their duration and their impact on economic growth.

Financial cycles have different characteristics that set them apart from traditional business cycles in terms of their duration, amplitude, and severity. (Adrian & Shin, 2008) highlighted the positive relationship between monetary policy and financial stability. They argued that financial institutions buy more during booms and sell more during busts, amplifying financial cycles. While business cycles have been extensively discussed in the literature, financial cycles are still a work in progress and have recently gained attention. Business cycles are associated with financial cycles (Claessens, Kose, & Terrones, 2011A), and their theories helped us understand financial cycles. This study investigated the interaction between business and financial cycles in 44 countries for the period 1960:1 to 2007:04. The findings revealed that financial cycles tend to be longer and deeper than business cycles and more pronounced in developing countries than in developed economies. Moreover, financial downturns were associated with slower output growth, confirming the leading role of financial fluctuations in

determining business cycles. (Borio 2012), one of the most influential works emphasized the role of credit and asset prices in economic fluctuations. He highlighted how financial booms, particularly those driven by credit, often lead to economic expansions.

The dynamic interactions between business cycles and financial cycles are important for the estimation of recessions and recoveries. (Sanvi & Matheron, 2005) explored the limited link between stock prices and real activity, except in the USA, highlighting the importance of the financial cycle and business cycle in strengthening the effectiveness of monetary policy. (Claessens, Kose, & Terrones, 2011 B) explored the interactions between financial cycles-credit, house, and equity prices- and found a strong relationship between them in 21 advanced OECD countries during the period 1960:1-2007:04. The findings revealed that equity and house price cycles were more pronounced than credit cycles. Moreover, the credit and equity cycles were more synchronized. Moreover, credit and housing cycle interactions had amplified financial cycles, and evidence suggested that global downturns in credit and equity markets tend to be deeper than other contractions. (Rünstler & Vlekke, 2016) explored the interaction between business and financial cycles in the USA, UK, Spain, Italy, France, and Germany using the multivariate structural time (MST) model for the period 1973Q1-2014Q4. The findings revealed longer cycles for credit and housing, with a length of 15 years, except in Germany, which experienced short-lived fluctuations. Moreover, the findings suggested a systemic relationship between financial cycles and business cycles, particularly at medium-term frequencies, not just short-run fluctuations. (Ma & Zhang, 2016) highlighted that financial cycles had a significant role in business cycles in the USA, UK, China, and Japan. The findings showed that financial cycle shocks drove major fluctuations in macroeconomic variables, particularly during times of financial instability.

(Dees, 2016) investigated the impact of fluctuations in financial variables on the real economic activity of 38 countries during the period 1987 to 2013. The study used Global VAR (GVAR) modelling, and the findings suggested that credit and house prices were important indicators of business cycles, largely explaining fluctuations; however, they had not increased since the global crisis. The international transmission of financial shocks had a significant and persistent impact on business cycles. (Beirne, 2019) explored the dynamic interaction between business cycles and financial cycles in 38 advanced and developing economies between the period 1970Q1 and 2018Q3, employing a Christiano-Fitzgerald band-pass filter methodology to extract the cyclical components. (Jawadi, Ameer, Bigou, & Flagellet, 2022) constructed

composite indicators of financial and real business cycles using PCA and demonstrated that real economic activity contains significant predictive information for financial cycles, particularly during the expansionary phase. (Tsiakas & Zhang, 2023) investigated the direction of the relationship between business and financial cycles in G7 countries: the USA, the UK, Canada, France, Italy, and Germany. The VAR results indicated a positive relationship between the business and financial cycles in G7 countries from 1962 to 2019. While the Granger test confirmed the bidirectional relationship between them, the USA, being the global leader, influences the business cycles of the other countries.

Various econometric tools have been employed to examine financial cycles, including traditional methods and turning point analysis. (Burns and Mitchell 1946), proposed a phase-centric approach to identifying the business cycles, focusing on the peaks and troughs. It allows us a better understanding of fluctuations and complexity in economic activity. (Bry & Boschan, 1971) (Harding & Pagan, 2002), documented that financial cycles tend to be longer and deeper than business cycles, characterizing them as medium-term cycles, as explained in the literature. Since financial variables exhibit different frequencies and durations, there is a need for appropriate statistical filter methods. The unobserved component model has been employed earlier by (Aikaman, Nelson, & A.G.Haldane, 2010). (Galati, Hindrayanto, & Koopman, 2016) observed that financial cycles, overall, had longer and greater amplitudes than business cycles.

Moreover, advanced methodologies like bandpass filters, spectral analysis, and unobserved components have been used to capture the deviations from the trend. Two commonly used methods for estimating cyclical behavior are the Hodrick-Prescott filter and the bandpass filter. The HP filter, introduced by (Hodrick & Prescott, 1981), separates the series into trend and cycle components. Conversely, the BP filter, proposed by (Christiano & Fitzgerald, 2003), functions as a two-sided moving average filter, effectively smoothing out fluctuations and underlying cycles and trends. Recent studies analyzing the dynamics between stock markets and business cycles increasingly employed advanced techniques like STL decomposition, wavelet analysis, and time-frequency domain approaches. The findings concluded that equity cycles in developing economies tend to be more useful in predicting financial cycles than credit and house price cycles. This highlights the importance of incorporating equity market dynamics when assessing financial stability and monitoring cyclical fluctuations. Table 3.4 outlines the country-specific panel research related to business and financial cycles.

Table 3.4 Country-Specific Literature Related to Business and Financial Cycles

Authors	Country/Region	Methodology	Period	Findings
(KARAGOL & DOĞAN, 2021)	Turkey	Bry Boschan, HP Filter and Hacker and Hatemi J 2006	1998Q1-2014Q4	There was a significant co-movement between business and financial cycles, particularly during the period of downturn. The causality test confirmed that financial cycles caused business cycles in Turkey.
(Paramaiah, Long, & Motelle, 2021)	Lesotho	Concordance Index	1976-2019	The findings revealed no co-movements between business and financial cycles in Lesotho.
(Impavido, 2024)	Kazakhstan	HP Filter and CUSUM Test	1990s-2023Q4	Financial cycles had a persistent and increasing impact on business cycles; moreover, the impact was similar during both the expansion and contraction phases.
(Magubane, 2024)	South Africa	Dynamic conditional correlation approach	1975Q1-2023Q4	Strong synchronization and positive correlation among financial cycle indicators, while weak co-movement was observed between business and financial cycles.

In India, studies like (Behera & Sharma, 2019) examined financial indicators' characteristics during the quarterly period between 1960:Q1 and 2018:Q4. The study employed three methods: turning point analysis, spectral analysis, and bandpass filters on variables such as credit, equity prices, house prices, and real exchange rates. The findings suggested the existence of financial cycles as an early indicator of financial instability and weakening of growth in India. Also, the duration and length of financial cycles were found to be more pronounced than business cycles. The contribution of housing prices also increased in the 2000s as an indicator of financial cycles. (Aravalath, 2020) using wavelet-based and Toda-Yamamoto causality tests, reported that financial cycles led to business cycles and that financial cycles were larger than business

cycles during the period Q1:1991 to Q4:2019. The financial cycles in India lasted for 12 years, and expansion and contraction lasted 6 years. These findings coincide with those of (Kumar, Ansari, & Paramanik, 2020). This study explored the business and financial cycles during the period 1996Q1 to 2018Q3, employing the Christiano-Fitzgerald filter technique. The Granger causality confirmed that the financial cycle caused business cycles in both the medium and long-run. The cyclical interactions between money supply and output have also been given attention. (Banerjee, Basu and Ghate 2020) found a positive influence of monetary shocks on output, as confirmed by (Goyal and Kumar 2018). (Ghate, Pandey and Patnaik 2012) suggested that developed economies adopted counter-cyclical monetary policy, while developing countries, such as India, employed pro-cyclical policies, thereby amplifying business cycles.

Additionally, (Paramanik, Bhandari, & Kamaiah, 2021) based on the VAR model, indicated a strong interdependency between real and financial markets during the period 2003-2020, emphasizing the importance of economic uncertainty and the presence of a bidirectional relationship between financial cycles and real market cycles. Conversely, (Saini, Ahmad, & Bekiros, 2021) found that the business cycle led to the credit cycle in India at both aggregate and sectoral levels. Furthermore, the duration of the business cycle was approximately 4 years, whereas the credit cycle lasted about 3 years. Also, they appeared to be procyclical, particularly during the period of crisis. However, at the sectoral level, some sectors showed countercyclicality. Similarly, (Kumar, Kumar and Prakash 2022) confirmed a close and bidirectional linkage between credit, investment, and the output cycle.

Several studies have examined the impact of global financial cycles on the domestic economy. (Cerutti, Claessens, & Andrew, 2017) analyzed the role of global financial cycles in shaping capital flows across 85 countries over the period Q1 1990 to Q4 2015. Using panel regressions, national capital flow equations, and event studies, the study found that global financial cycles did not explain capital flows. However, their impact was observed on other variables such as credit and house prices. Similarly, (Silvia & Hélène, 2021) reported that shifts in monetary policy led to movements in global financial variables, causing reduced asset prices, credit, and a slowdown in global capital flow. The results highlighted the dominant role of the USA's monetary policy in driving global financial cycles.

In contrast, the empirical studies emphasized the pro-cyclical nature of fluctuations in the capital market and economic activity, while some theories suggested a limited relationship between them. Like (Mankiw 1989), argued that fluctuations in economic activity were the

result of technological change rather than monetary variables. Similarly, (Sanvi and Matheron 2005) revealed a weak link between stock prices and real activity, except in the USA. Their findings suggested a limited co-movement between the financial market and business market, particularly in the short-run. (Ahmad and Sehgal 2017) observed a limited interdependence between financial and business cycles in the SAARC region. (Adam & Merkel, 2019) suggested that the fluctuations in stock prices were largely belief-driven in the USA and did not always reflect economic change. However, such fluctuations were found to influence output, although the effects were not always sustainable.

Although prior studies focused on credit and investment behavior, limited research examined the cyclical dynamics of financial indicators and economic growth. The present study focuses on *determining the financial cycles in India*, incorporating credit, the credit-to-GDP ratio, and construction GDP. Other macroeconomic indicators, like GDP, broad money supply, and gross fixed capital formation, are also included. With the help of the Hodrick-Prescott filter, the study aims to examine the turning points and movement between these cycles. Additionally, lead-lag analysis and SVAR are also carried out to assess the dynamic interactions among the credit, investment and GDP cycles.

3.6 Conclusion

This chapter reviews existing research on the relationship between various indicators of financial development and economic growth. Although a comprehensive literature review already exists, most studies primarily focus on national-level analysis, often overlooking *credit-led growth at the state level*, particularly in the context of India. Moreover, limited attention has been given to how financial development and economic growth interact during periods of *economic disruptions*. Addressing these gaps, the present study adopts a methodologically advanced approach that goes beyond simple time-series and linear analysis. This study employs *panel ARDL, threshold regression and SVAR* to examine the structural and dynamic interactions between financial development and economic growth. In addition, it also incorporates an analysis of *financial cycles and business cycles* to examine how cyclical fluctuations interact with economic growth. Overall, these objectives aim to analyze the role of financial development in driving economic growth over time, across financial markets, and across different regions.

Chapter IV

RESEARCH METHODOLOGY

The study aims to investigate the relationship between financial development and economic growth in India. It specifically identifies the key determinants of financial development and their impact on economic growth. Therefore, an appropriate methodology and econometric tools were carefully designed to provide a clear framework and capture the dynamics among financial development indicators and economic growth. The study utilized time series data from 1980 to 2021 to analyse both short-term and long-term dynamics during the pre- and post-liberalisation periods. Data were sourced from reputable databases like RBI, IMF, and MOSPI to ensure credibility and consistency. This chapter outlines the sample size, variable definitions, sources, model specifications, and various methodologies with residual testing to form the foundation of the empirical analysis.

Section 4.1 discusses the data utilized in the study, including the time frame and key variables employed in the research. Each variable is defined along with its sources. The period of study was chosen to reflect long-term trends, structural shifts, and crises in the Indian financial system.

Section 4.2 describes the methodology employed, beginning with preliminary analysis. This included unit root tests and cointegration tests, forming the basis of the statistical tools used. Given the mixed order of integration $I(0)$ and $I(1)$, the autoregressive distributed lag (ARDL) model was applied, followed by residual diagnostic tests. The Granger causality test and the Dumitrescu-Hurlin panel causality test were employed to examine the direction of relationships among the variables. Threshold regression was also employed to investigate the impact of stock market development on economic growth, which varies across different regimes, allowing for nonlinear effects.

Additionally, the Hodrick-Prescott filter was used to extract cyclical components from the data. Cross-correlation analysis was conducted to understand whether financial indicators could predict economic slowdowns. Finally, SVAR was employed to analyze the structural relationships between cyclical variables and to assess the financial-real economy transmission mechanism.

4.1 Data

This section outlines the data used in the study, along with its sources and definitions. The focus is on India, and the indicators used are selected based on empirical literature and their relevance to the financial development and economic growth relationship.

4.1.1 Period of the Study

In the late 1990s, India underwent economic reforms aimed at liberalizing and globalizing the economy. During this period, fiscal and monetary policies experienced significant changes. The present study used annual and monthly data to analyze the relationship between financial development indicators and economic growth in India. For chapters such as banking credit, money supply, and financial cycles, annual analysis from 1980 to 2021 was employed to capture long-term trends.

While a sub-national analysis of bank credit and economic growth was also conducted, using data from 2000 to 2021, due to limited data availability. Additionally, to examine the highly volatile stock market, monthly data from April 1996 to December 2021 were utilized to identify short-term fluctuations, co-movements, and volatility patterns. This time framework encompasses all the major economic events that occurred, including financial liberalisation, financial economic crises, and the COVID-19 pandemic.

4.1.2 Variables of the Study

The present study utilized a broad dataset of macroeconomic and financial variables to analyze the multi-dimensional relationship between financial development and economic growth. GDP and IIP served as the dependent variables for different objectives. Financial development was measured by non-food gross bank credit, total bank credit from SCBs, broad money supply, and stock market capitalization (BSE and NSE). Capital formation (GFCF) is a key component that significantly influences economic growth; therefore, it was also included as a proxy for investment activity.

Table 4.1 shows the financial development indicators and macroeconomic variables used in the study for all objectives, along with their sources and definitions. The variables are organised objective-wise for clarity.

Table 4.1 Description of Variables

Symbols	Variables	Definition	Source
NFGBC	Non-Food Gross Bank Credit	Credit extended by financial institutions to individuals and businesses other than food procurement.	RBI Database
AGRICRED	Agricultural Credit	It includes farm credit (short-term and medium-term crop loans), agriculture infrastructure, and ancillary activities.	RBI Database
BANK C	Total Bank Credit by SCBs	Aggregate amount of funds available for individuals and business through loans and advances.	RBI Database
GDP	Gross Domestic Product at Constant Prices	Monetary value of final goods and services.	RBI Database/MoSPI
M3	Broad Money Supply	Currency held by the public + net time deposits of all commercial banks.	OECD
MCBSE	Market Capitalization of Bombay Stock Exchange	Value of a public company in the stock market, depending on the current share price and outstanding shares.	RBI Database
MCNSE	Market Capitalization of National Stock Exchange	Value of a public company in the stock market.	RBI Database
IIP	Index of Industrial Production	It measures the general level of industrial activity.	MoSPI
HOUSE PRICES	Construction GDP	It measures the total value of the related construction related activities.	RBI Database
GFCF	Gross Fixed Capital Formation	It represent the total investment in the fixed capital assets.	World Bank

Additionally, control variables such as lending rate, call money rate, consumer price index, and crude oil were included. Table 4.2 presents these control variables, along with their definition and sources. These variables captured the effects of monetary policy, inflation trends, and global shocks on India's economic growth. The data for these variables were obtained from various sources, such as the RBI, OECD, MoSPI, and IMF. These variables have been selected based on their empirical contribution to growth.

Table 4.2 Description of Control Variables

Symbols	Variables	Definition	Source
LR	Lending Rate	Rate at which commercial banks lend money to borrowers.	RBI Database
CPI	Consumer Price Index	An increase in the price level of goods and services over a period of time.	OECD
IR	Call Money Interest Rate	Interest at which short-term funds are borrowed and sold overnight.	RBI Database
Brent	Brent Crude Oil Price	International benchmark prices of Brent crude.	IMF

4.2 Methodology

This section outlines the empirical strategy used to examine the relationship between financial development and economic growth. A combination of different time-series econometric techniques was employed based on the nature of the data. The following methods have been selected to capture both short-term and long-term dynamics, as well as potential structural shifts, in India.

4.2.1 Data Transformation

- (a) **Spliced Index:** To ensure data continuity and comparability, the splicing technique was used. It combines two overlapping index series to get a longer index series. It's primarily done to increase the number of observations and the degrees of freedom (Hill & Fox, 1997).

The data on GDP in India is available for different base years; these values were spliced to create a consistent series using 2011-12 as the base year.

- (b) **Log-Linear Transformation:** The key economic and financial variables were transformed into a log-linear form by applying natural logarithms to both sides.

$$\log Y_t = \log \alpha + t \cdot \log \beta + \log \mu_t$$

Where $\log Y_t$ represents the natural log of GDP, $\log \alpha$ is the intercept, and $\log \beta$ is the slope coefficient.

4.2.2 Correlation

This method analyzes the relationship between the variables. It's a statistical measure used to determine whether a relationship exists between the variables; however, it does not establish a causal relationship.

- (a) **Positive correlation:** An increase or decrease in one variable causes an increase or decrease in the other variable.
- (b) **Negative correlation:** An increase in one variable causes a decrease in the other variable and vice versa.
- (c) **Zero correlation:** An increase or decrease in one variable has no impact on the other variable. The relationship varies from $r = +1$ to -1 ; the former indicates a strong positive relationship, the latter indicates a strong negative relationship, and 0 indicates no relationship.

4.2.3 Unit Root Test

It's one of the fundamental concepts in econometrics for measuring whether time series data remains constant over time. However, many variables exhibit linearity due to the trend, making them non-stationary; that's why it's imperative to check their stationarity properties. If a time series is stationary, the mean and variance are constant. There are several methods to conduct a unit root test.

(a) **Augmented Dickey-Fuller (ADF) test**

One of the widely accepted and used tools to measure the stationary properties of a variable. The ADF test examines whether the unit root of the series follows a random walk, implying

the changes from one period to another are unpredictable. It adds lagged differences of the dependent variable, and autocorrelation can be controlled by adding the lags.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^p \delta_i \Delta y_{t-i} + e_t$$

Where α is the constant term.

βt : It is a trend.

γ : Is the coefficient of the lagged value to be tested for the presence of a unit root.

e_t : Error term

Δy_t : It is the first difference of the series.

If the p-value is less than the critical value, the null hypothesis is rejected, indicating the series is stationary. However, if the p-value is greater than the critical value, we fail to reject the null hypothesis, implying that the series is non-stationary.

(b) **Phillips-Perron (PP) test**

The PP test employs non-parametric statistical methods to detect autocorrelation and heteroskedasticity in the error term. It's similar to ADF but doesn't include first differences or lagged terms. This method is particularly used for non-normal data and examines a unit root to rectify the problem of heteroskedasticity and autocorrelation in the variables.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + e_t$$

It assumes that the error term is stationary, even if it's correlated or heteroscedastic. This implies that errors can be correlated. The ADF test assumes that the error terms are free from autocorrelation and heteroskedasticity.

4.2.4 Cointegration

Cointegration analysis examines the long-run relationship between the variables. It helps determine if the stationary series are cointegrated to maintain a long-run equilibrium. There are several methods to run the cointegration test.

(a) **Engle-Granger Test:** It is the first method introduced to test cointegration and the quickest one. The only drawback with this test is that it's limited to bivariate analysis. Another test, which is an improvement of the Engle-Granger test, is the Phillips-Ouliaris test.

- (b) **Phillips-Ouliaris test:** It offers more robustness against autocorrelation and heteroskedasticity. It can identify whether one time series is influenced by others. Another widely recognized statistical tool to check for cointegration, and an improvement over both the Engle-Granger Test and Phillips-Ouliaris Test, is the Johansen Cointegration Test.
- (c) **Johansen Cointegration Test:** This test was developed by Johansen (1980, 1981). This test is used on time series data, allowing estimation of multivariate variables. The ranks of the coefficient matrix determine the number of cointegrating variables. There are two subsets under this: the trace statistic and the maximum eigenvalue. Trace statistics test the null hypothesis that the number of cointegrating vectors is less than or equal to 1. While the maximum eigenvalue tests the null hypothesis that the number of cointegrating vectors is r against the alternative $r+1$.
- (d) **Pedroni Cointegration Test:** This is the panel cointegration test (Pedroni, 2004), an extended version of the Engle-Granger Test, which allows for heterogeneity in the model and tests the null hypothesis of no cointegration. This test accounts for seven different statistics categorized under within-dimensions (panel statistics) and between-dimensions (group statistics). If the Pedroni majority test rejects the null hypothesis, this indicates that there is a long-run relationship between the variables.

4.2.5 Granger Causality Test

The Granger causality test was introduced by (Granger, 1969) and is widely used to analyze the causal relationship between variables. It examines whether lagged values of one variable predict the future values of other variables and helps in identifying the direction of the relationship.

$$GDP_t = c_1 + \sum_{i=1}^p \alpha_i GDP_{t-i} + \sum_{j=1}^p \beta_j FD_{t-j} + e_t$$

Where

α_i = lagged GDP coefficients

β_j = lagged financial development coefficients

p = number of lags

A p-value below the significance level of 0.05 indicates the existence of a causal relationship, rejecting the null hypothesis. The test results in four possible outcomes depending on the direction:

- (a) **Unidirectional causality (from financial development to economic growth):** If financial development Granger-causes economic growth, implying that the past value of financial development can predict future GDP growth, the supply-leading hypothesis.
- (b) **Unidirectional causality (from economic growth to financial development):** If economic growth causes financial development, implying that expansion in growth influences financial development, the demand-following hypothesis.
- (c) **Bidirectional causality:** If there exists a bidirectional relationship between financial development and economic growth, this implies that there is a two-way relationship; both variables influence each other.
- (d) **No causality:** No causality indicates that both variables are independent and there's no predictive power.

4.2.6 Dumitrescu-Hurlin Panel Causality Test

The Dumitrescu-Hurlin panel causality test, introduced by (Dumitrescu & Hurlin, 2012) is used to examine causality in panel data, allowing for both cross-sectional relationships and heterogeneity. The test has been widely used for panel data (Lopez & Weber, 2017).

$$GDP_{i,t} = \alpha_i + \sum_{k=1}^k \gamma_{ik} GDP_{i,t-i} + \sum_{k=1}^k \beta_{ik} FD_{i,t-j} + e_{i,t}$$

Where

γ_{ik} = lagged GDP coefficients

β_{ij} = lagged financial development coefficients

k = number of lags

This assumes there can be causality for some individuals, not for all. The null hypothesis is as follows:

$$H_0: \beta_{iK} = \dots = \beta_{iK} = 0$$

While the alternative hypothesis is:

$$H_1: \beta_{1i} = \dots = \beta_{iK} = 0$$

$$\beta_{1i} \neq 0 \text{ or } \dots \dots \text{ or } \beta_{iK} \neq 0$$

This implies there is causality for at least one individual, and the null hypothesis implies there is no simple Granger causality between the variables.

4.2.7 Autoregressive Distributed Lag Model

The study applied the ARDL (Autoregressive Distributed Lag Model) model, a well-known approach (Pesaran, Shin, Smith, & J, 2001), to estimate the relationship among these variables, considering both the long-term and short-term dynamics. The dependent variables' current values depend on their lagged values and other independent variables' current and past values (Kripfganz & Schneider, 2018).

The model is applicable when the variables have different orders of integration. The ARDL model has its advantages over the traditional approaches. It accommodates the mixture of I(0) and I(1) variables, performs well even when the sample size is relatively small and estimates both the short-run and long-run dynamics.

The general form of the ARDL model for $t = 1, 2, \dots, T$ periods and $I = 1, 2, \dots, N$ groups,

$$Y_{it} = \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta GDP_{t-i} + \sum_{i=1}^p \beta_{2i} \Delta FD_{t-i} + \beta_3 GDP_{t-1} + \beta_4 FD_{t-1} + \lambda D_t + e_{it}$$

Where

Δ represents the first difference, how past variables' values define the current value of GDP. GDP_{t-1} , and FD_{t-1} , which are the lagged values of variables representing long-run relationships. e_{it} is the error term, and λD_t is the dummy variable used for the structural shocks. In this approach, a bound test is performed to estimate the long-run relationship. The null hypothesis implies that the coefficient of lagged variables $H_0 = (B_3 = B_4 = 0)$. Two bounds of critical values are computed. The upper bound is I(0), and the lower bound is I(1). If the F-statistic exceeds the upper critical value, then we reject H_0 . This implies that there exists a long-run relationship between the variables. If the F-statistics fall below the lower critical bound values, we accept H_0 , which implies there is no relationship between the variables (Chandio, Jiang, & Rehman, 2019).

The regression only estimates the short-run relationships, neglecting long-run behaviour. The ECM (Error Correction Mechanism) helps in distinguishing short-run effects from long-run equilibrium (Nkoro & Uko, 2016). The term ECT (Error Correction Term) defines how much time an economy takes after short-run shocks to reach equilibrium. ECT_t , is defined as

$$ECT_{t-1} = GDP_{t-1} - (\beta_4 FD_{t-1})$$

The statistical significance and negative sign of $\alpha_1 ECT_{t-1}$ confirm the presence of a long-run relationship between the variables, implying how much the economy's disequilibrium is being corrected. If ECT_{t-1} is zero or insignificant; this suggests there is no long-run relationship, and the economy does not restore equilibrium.

$$Y_{it} = \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta GDP_{t-i} + \sum_{i=1}^p \beta_{2i} \Delta FD_{t-i} + \beta_3 GDP_{t-1} + \beta_4 FD_{t-1} + \alpha_1 ECT_{t-1} + \lambda D_t + e_{it}$$

4.2.8 Jarque-Bera (JB) normality test

(a) **Skewness:** It represents the asymmetrical distribution in the sample. A normal distribution is free from skewness, as it's symmetrical on both sides. If the given distribution is shifted to the left with its tail on the right, it's often called positively or right-skewed. If the distribution is shifted to the right with a tail on the left, it's called negatively or left-skewed. Two popular methods to measure it are Pearson's mode skewness and Pearson's median skewness.

$$\text{Pearson Mode Skewness: } \frac{\bar{X} - M_0}{s}$$

Where $\bar{X}$ is the mean value,

M_0 is the mode, and

s is the standard deviation.

$$\text{Pearson Median Skewness: } \frac{3\bar{X} - M_d}{s}$$

Where M_d is the median value. In positive skewness, the mean value is greater than the median, while in negative skewness, the mean value is less than the median value.

(b) **Kurtosis:** defines whether the tails of the distribution consist of extreme values, basically quantifying the heaviness of the distribution tails. This helps identify potential issues in the dataset. It explains the peakedness in the data, the degree to which the data is concentrated around the mean.

$$\text{Kurtosis} = \frac{\sum_{i=1}^N (Y_i - \bar{Y})^4 / N}{s^4}$$

Where s is the standard deviation, $\bar{Y}$ is the mean, and n is the number of observations.

The medium-tailed kurtosis is called mesokurtic, a thin-tailed one is called platykurtic, and a fat-tailed one, more peaked, is known as leptokurtic.

(c) Jarque-Bera (JB) test: It determines whether the data is normally distributed with the help of skewness and kurtosis. This test follows a chi-square distribution with two degrees of freedom.

$$JB = n \left(\frac{s^2}{6} + \frac{(k-3)^2}{24} \right) \text{ where } s \text{ represents skewness and } k \text{ is the kurtosis.}$$

If the JB statistic is different from that of chi-squared, we reject the null hypothesis, implying the data is not normally distributed.

4.2.9 Breusch-Godfrey Serial Correlation LM Test

Autocorrelation is a phenomenon where the error term of one variable in one time period is correlated with the error term of another variable in another period. If correlation exists, it can lead to biased t-statistics and p-values. To detect autocorrelation at higher lags, the Breusch-Godfrey LM test is conducted.

H_0 : There is no autocorrelation.

H_1 : There is autocorrelation.

If the p-value is greater than the 0.05 significance level, fail to reject the null hypothesis. This confirms that there is no autocorrelation in the model. If the p-value is smaller than the 0.05 significance level, reject the null hypothesis and conclude that there is autocorrelation in the model.

4.2.10 Breusch-Godfrey Heteroskedasticity Test

This test is used to check whether the residuals are heteroscedastic, indicating that the residuals do not have equal variance. This violation of the linear regression model's assumption leads to biased results. The test examines whether the variance of the error from regression is dependent on the values of the independent variables.

H_0 : The variance is constant.

H_1 : The variance is not constant.

If the p-value is greater than the 0.05 significance level, fail to reject the null hypothesis. This confirms the presence of homoscedasticity in the model. If the p-value is smaller than the 0.05 significance level, reject the null hypothesis and conclude that heteroscedasticity is present in the model.

4.2.11 Ramsey RESET test

The Ramsey RESET test expands the set of explanatory variables by adding their powers, like cubes or squares, and checks if these additional terms improve the model specification. This test relies on the F-statistic.

$$F = \frac{(SSR_{restricted} - SSR_{unrestricted}) / q}{SSR_{unrestricted} / (n - k - q)}$$

Where q is the number of variables added

n = sample size

k = number of parameters in the original model

The hypothesis to be tested is as follows:

H₀: the original model is correctly specified

H₁: The original model is not correctly specified.

If the p-value is greater than the 0.05 significance level, fail to reject the null hypothesis. This confirms the model is correctly specified. If the p-value is smaller than the 0.05 significance level, reject the null hypothesis and conclude that the model is mis-specified.

4.2.12 CUSUM and CUSUM Square

A CUSUM (cumulative sum) and CUSUM square (CUSUMQ) test are performed to ensure the structural stability of the regression model. It's employed to detect any structural breaks in the regression model, reflecting any economic or policy change.

While the CUSUM test examines the parameter's stability, CUSUMQ helps in detecting stability in the variance.

$$CUSUM_Y = \sum_{i=k}^t e_i, \text{ for } t = k + 1, \dots, T$$

Where k is the number of estimated parameters.

If the CUSUM line stays within the positive and negative deviations or near the zero line, then the model is correctly specified and stable. However, if it deviates from the bound values, it suggests unstable coefficients or a structural break.

4.2.13 Threshold regression

The threshold regression model is a non-linear model proposed by (Hansen, 1999), where the relationship between the dependent and independent variables depends on whether the threshold variable crosses the threshold or critical point. The threshold variable can be an external variable or the lagged values of the dependent variable. The data can switch multiple regimes defined by a threshold estimator.

The general form of the Threshold regression model can be written as:

$$Y_t = \alpha_1 + \beta_1 X_t + \varepsilon_t, \quad \text{if } Z_t \leq \gamma$$

$$Y_t = \alpha_2 + \beta_2 X_t + \varepsilon_t, \quad \text{if } Z_t > \gamma$$

Where,

Y_t = Dependent variable IIP

X_t = Market capitalization

Z_t = threshold variable Market capitalization

γ = threshold value

α_1, α_2 = intercept term for each regime

ε_t = error term

Z_t is the threshold value that divides the samples into different regimes or groups. γ is the unknown threshold value, but it will be estimated. Regime one is defined as the subset of observations in which the value of being Z_t is less than the threshold γ . Similarly, regime two is defined as the subset of observations that Z_t is greater than or equal to γ .

4.2.14 Hodrick-Prescott Filter

The Hodrick-Prescott filter is an econometric tool introduced by Hodrick and Prescott in 1981. It is the most popular econometric model to separate the series into a long-term trend and a

cyclical component, presenting deviations from the trend. It is a linear filter that requires the specification of a smoothing parameter denoted by λ , lambda. It helps in determining the smoothness of estimated trends and varies according to the duration of the data.

$$Y_t = \tau_t + c_t + \varepsilon_t$$

$$\min_{\tau_t} \sum_t (Y_t - \tau_t)^2 + \lambda \sum_t (\tau_{t+1} - 2\tau_t + \tau_{t-1})^2$$

The series Y_t denotes the observed time series decomposed into three components: a long-term trend (τ_t), (c_t) a cyclical component, and (ε_t) error components. This filter operates by minimizing the sum of squared deviations of the original series from its trend as well as the curvature of the estimated trend. The cyclical component is calculated as the difference between the actual series and the trend.

$$y_t - \tau_t$$

The filter assumes linear growth of the series, so logged values of variables are used. The choice of λ depends on the frequency of data. (Hodrick & Prescott, 1981) originally proposed a value of $\lambda = 1600$ for quarterly data. They suggested that the smoothing parameter should be calculated as the ratio between the variables' cyclical component and that of the trend component (Monahov, 2023).

$$\lambda = \frac{\sigma^2_{cyclical}}{\sigma^2_{trend}} = \frac{5^2}{\left(\frac{1}{8}\right)^2} = 1600$$

For yearly data, no specific λ value is recommended. It is often selected from the range of {6.25, 100, 1600}. (Baxter & King, 1999) used a value of 10, while (Backus & Patrick, 1992) suggested a value of 100, which was suitable for their analysis. (Ravn & Uhlig, 2002) suggested that if the HP filter quarterly value of 1600 was correct, then the other value, λ , should be computed by this rule:

$$\lambda = 1600 \cdot p_q^4$$

Where p_q = number of periods per quarter

Based on this rule, for monthly data, $p=3$, then $\lambda = 1600 \cdot 3^4 = 129600$. A value of zero λ means that the output of the HP filter matches the input series exactly. The trade-off between the two

is governed by the smoothing parameter λ ; the higher the value, the smoother the estimated trend.

4.2.15 Cross-Correlation (Lead and Lag Relationship)

Cross-correlation analysis measures the interaction between cyclical components of dependent and independent variables. It explains a lead-lag relationship: Lag refers to the impact of a variable's past values on the current value of another variable, and lead measures the influence of a variable's current values on future movements of the other variable.

$$R_{xy}(\tau) = \sum_t x(t) \cdot y(t + \tau)$$

Where, $R_{xy}(\tau)$ = cross-correlation function at lag τ

$X(t)$ and $Y(t)$ = time series

τ = time lag

A positive value $R_{xy}(\tau)$ suggests an association between the two variables, and a negative value indicates an inverse relationship between them. Any correlation $r \geq 0.20$ is considered meaningful. This is a threshold based on commonly used benchmarks in previous financial studies.

4.2.16 Structural Vector Autoregression (SVAR)

The Structural Vector Autoregression (SVAR) framework imposes theoretical restrictions motivated by theory to identify structural shocks and trace high-frequency impulse responses from the system. The study employed SVAR to examine the cyclical independencies among the variables during the period of economic shocks. GDP was the dependent variable, and NFGBC and GFCF were the explanatory variables

$$GDP = f(NFGBC, GFCF) \dots\dots\dots 1$$

To estimate the model, equation 1 was transformed into an econometric equation as follows:

$$GDP_t = \alpha_0 + \alpha_1 NFGBC_t + \alpha_2 GFCF_t + \beta \varepsilon_t \dots\dots\dots 2$$

GDP serves as a dependent variable, which is a function of explanatory variables and structural shocks, depicted by $\beta \varepsilon_t$.

α_0 is the constant term,

α' s which are the parameters to be estimated.

(a) Vector Autoregression Framework

The VAR is a multivariate time series framework in which each endogenous variable is expressed as a function of its own lagged values and lagged and current values of other endogenous variables.

$$Y_t = (y_{1t}, \dots, y_{2t}, \dots, y_{kt}) \dots\dots\dots 3$$

Where K denotes the number of endogenous variables

A VAR of order (p)- the process with lags can be illustrated in equation 4:

$$y_t = A_1 y_{t-1} + \dots A_p y_{t-p} + u_t \dots\dots\dots 4$$

Where,

A_i : are (K×K) coefficient matrices,

y_t : contains all the endogenous variables.

u_t : represents a vector of white noise error terms such that $E(u_t) = 0$ and $\text{Var}(u_t) = E(u_t u_t^T) = \Sigma_u$

The VAR framework relies on several key assumptions, including the stationary property of the variables, the linear relationship among them, and the constant variance-covariance of the error term.

(b) Structural Vector Autoregressive Model

To analyze the contemporaneous relationship between the variables, the reduced-form VAR(p) can be expressed in structural representation.

$$y_t = A_1^* y_{t-1} \dots A_p^* y_{t-p} + \beta \varepsilon_t \dots\dots\dots 5$$

$$y_t = A^{-1} A_1^* y_{t-1} + \dots A^{-1} A_p^* y_{t-p} + A^{-1} \beta \varepsilon_t \dots\dots\dots 6$$

Where,

ε_t : denotes the vector of structural shocks.

A and β capture the contemporaneous and short-run coefficients, respectively.

(c) Structural Impulse Response Function and Variance Decomposition

The structural impulse response functions (SIRF) are used to trace the dynamic effects of one variable impacting other variables in the model, assuming other shocks are constant. For example, a shock to NFGBC illustrates how this would impact output and investment. Whereas Variance decomposition further quantifies the proportion of forecast error variance in each variable due to shocks; for instance, it reveals the importance of NFGBC shocks in explaining variations in GDP. The reduced-form Vector Moving Average representation derived from the inversion of a stationary VAR:

$$y_t = A_1^{-1}(L) \varepsilon_t \dots\dots\dots 7$$

Where,

y_t : contains the endogenous variables.

$A_1^{-1}(L)$: illustrates the transmission of shocks across different lags.

ε_t : error term

We define $A^{-1}(L) = \phi(L)$ and obtain a process expressed as a linear combination of the past innovations by the WOLD representation:

$$y_t = \phi(L)u_t = \sum_{h=0}^{\infty} \phi_h u_{t-h} \text{ where } \phi_0 = I_m \dots\dots\dots 8$$

To identify the unobservable structural shocks ε_t from the observable reduced-form residuals in the SVAR representation, identifying restrictions are imposed. The SVAR model is specified as follows:

$$A_0 y_t = \sum_{i=1}^p A_i^* y_{t-i} + \beta \varepsilon_t \quad \varepsilon_t \sim N(0, I_m) \dots\dots\dots 9$$

Where,

A_0 : (m*m) represents the contemporaneous effects matrix

A_i^* : (m*m) denotes the lagged coefficient matrix

B : (m*m) captures the short-response matrix.

From the reduced form, $u_t = A^{-1}\beta\varepsilon_t$

And the associated variance-covariance matrix $u_t = A^{-1}BB^T A^{-T}$

Following (Johansen, 1995), (Amisano & Giannini, 1997), (Lutkepohl & Kratzig, 2004), and (Lutkepohl, 2005), the exact identification of a structural model requires imposing restrictions:

$$\frac{k(k-1)}{2} \dots\dots\dots 10$$

Given that the model incorporated three variables, both short-run and long-run restrictions were imposed to capture the immediate effect as well as the persistent effects.

4.3 Conclusion

This chapter outlined the comprehensive data set and econometric tools and methodology employed in the study to examine the relationship between financial development and economic growth. Various diagnostic tests and stability tests were conducted to ensure the model's stability and the validity of the research findings. The methods were carefully chosen depending on the stationary properties of the variables. The ARDL and panel ARDL frameworks were employed as the primary tools to examine the short-run and long-run relationships between the variables, given the non-stationary properties of the variables. Threshold regression was conducted to capture the nonlinear relationship between the stock market size and industrial production. Finally, SVAR was employed to investigate the structural relationship between the business and financial cycles. The following chapter applies these methodologies to present the empirical results and their interpretations.

Chapter V

THE SHORT-RUN AND LONG-RUN IMPACT OF BANK CREDIT ON ECONOMIC GROWTH

5.1 Introduction

The financial and banking sectors are the key drivers of the economy's growth. The relationship between financial development and economic growth has been a subject of empirical research in emerging and developed economies following the (Schumpeter J. , 1912) innovation theory. In India, the bank-based financial system plays a crucial role in driving economic growth. (Levine R. , 1997) and (Beck, Demirgüç-Kunt, & Levine, 2001) argued that a well-developed financial system, particularly efficient banks, provides credit to individuals, businesses, organizations, and the government for both investment and consumption purposes, which ultimately leads to economic growth. The banking sector in India has undergone significant changes since the post-liberalization era. Before 1990, growth was highly unstable and unreliable, as asserted by (Panagariya, 2004). However, in 1991, the Indian government adopted reforms, which motivated the entry of private and foreign banks. These policies led to more stable and sustainable growth from 1992 onwards (Subramaniam, 2004). Commercial banks are the major source of credit and the fastest-growing financial intermediaries in India, generating income for the banks.

However, between 2000 and 2010, increased bank credit led to inflation, which forced the RBI to increase the rate of interest. Despite this, the banking sector continues to play a crucial role in financial deepening and economic development. It facilitates credit availability and affordability, particularly for SMEs. In the pre-reform period (1972-1989), average economic growth was 4%, and bank credit as a share of GDP was 17%. In the post-reform period (1990-2013), economic growth increased to 6%, and bank credit as a share of GDP increased to 34%. A closer look shows that from 1990 to 1997, GDP averaged 5% while bank credit accounted for 21% of GDP. This improved to 6% growth and 28% credit from 1998 to 2004, and further to 8% growth and 50% credit from 2005 to 2014 (Mohanty, Kumar, & Patra, 2016). Since then, there has been a constant increase in bank credit and economic growth, indicating a close relationship between the two, aligning with the findings of (Pradhan, 2009), who found a

bidirectional relationship between financial development and economic growth in India, particularly banking sector development and growth. Similarly, (Sehrawat & Giri, 2015) confirmed a long-run relationship between both the bank-based and market-based indicators and economic growth, supporting the supply-lead hypothesis. However, in the recent period from 2014 to 2021, the credit levels remained consistent at 50-55%, and the growth rate experienced fluctuations owing to policy and global factors.

Over the years, government incentives such as priority sector lending (PSL) norms, the Kisan Credit Card scheme, and MUDRA Yojana have been implemented to bridge the credit gap for underprivileged sectors. These schemes focused on providing credit to MSMEs and women entrepreneurs, enhancing access to financial services. Under these incentives, credit of Rs ₹18.39 lakh crore has been provided to 34.93 crore accounts. In 1969, the RBI mandated that 40% of average net bank credit (ANBC) or credit equivalent off-balance sheet (CEOBS) be allocated to the priority sectors encompassing agriculture, MSMEs, housing, education, and social infrastructure. In 2020, the RBI announced funding support to start-ups and 7.5% of the ANBC or CEOBS, whichever is higher, to microenterprises. In 2021-22, total PSL by SCBs stood at ₹42.6 lakh crore, with ₹14.25 lakh crore to agriculture and ₹5.97 lakh crore to MSMEs. Since digitalization has boomed in the economy, credit cards and digital transactions have experienced a sudden rise, causing an increased demand for bank credit and a higher level of consumption, ultimately driving the economy.

Many existing studies in India focus on national-level aggregates, overlooking regional disparities. This highlights the need to understand the effectiveness of the distribution of bank credit among states and its impact on their economic growth. This study aims to explore the sub-national relationship between banking credit and economic growth, utilizing a panel data set of 32 states. In addition to this, this study re-examined the impact of non-food gross bank credit (NFGBC) as a proxy for bank credit and priority sector lending, particularly agricultural credit, on economic growth at the national level. Analyzing this relationship at both the national and sub-national levels can be used as an essential gauge to guide further policies with a significant impact on the nation's economic growth and credit distribution.

The rest of the chapter is structured as follows: Section 5.2 outlines the objectives and hypotheses, followed by an analytical framework in Section 5.3. Section 5.4 presents the empirical results and a detailed discussion of the time series and state-wise panel analysis. The chapter concludes with a summary of key findings.

5.2 Objectives and Hypotheses

The chapter addresses two primary objectives, and these are as follows:

O_{1A}: To examine the dynamic relationship between non-food gross bank credit (NFGBC) and economic growth (GDP) at the national level in India.

The related hypotheses are

H_{1a}: There is no significant long-run relationship between non-food gross bank credit and GDP.

H_{2a}: Agricultural credit has no significant long-run impact on GDP.

H_{3a}: There is no significant relationship between lending rates and GDP.

O_{1B}: To identify if the long-run relationship exists between bank credit and GDP among Indian states.

The related hypotheses are

H_{1b}: There is no co-movement between bank credit growth and GDP growth at the state level.

H_{2b}: There is no significant long-run relationship between bank credit and GDP across Indian states.

H_{3b}: Bank credit does not cause GDP in Indian states.

5.3 Analytical framework

This section outlines the time framework, variables, and econometric methodology utilized for the national and sub-national analyses guided by the differences in variables and time structure.

Aggregate Credit Growth Relationship (National-Level Analysis)

The national-level analysis for the annual period 1980 to 2021 employed the non-food gross bank credit (NFGBC) as an indicator of bank credit, which refers to the loans provided to industries, services, and personal loans, and GDP spliced at the 2011-12 base year. Agricultural credit (Agri), serving as a proxy for priority sector lending, was incorporated, reflecting the direct flow of credit to the underdeveloped sector of the economy. The lending interest rate was included as a control variable, which reflects the cost of credit. Given the mixed order of integration among the variables, the autoregressive distributed lag (ARDL) model was employed.

State-Level Credit Growth Relationship (Sub-National Analysis)

The sub-national analysis utilized the period 2001 to 2021, given the data constraints; for some states, the credit data was not available before 2000. Banking credit by scheduled commercial banks, as an indicator of bank credit and state GDP, was spliced at the 2011-12 base year. The study covered 32 Indian states and Union territories, based on the availability of data. The lending interest rate was also incorporated. Due to the different stationary properties, some variables were $I(0)$ while others were $I(1)$. The analysis employed the panel ARDL methodology, capturing within-state and cross-sectional dynamics among the variables.

5.4 Empirical Results and Discussion

This section presents the empirical findings on the short-run and long-run relationship among bank credit, GDP, and lending interest rates. It begins with examining the stationarity properties of the variables. The ECM and long-run results were further estimated and discussed in the subsequent sections.

(A) Aggregate Credit Growth Relationship Results

5.4.1 Trends in GDP Level and Non-Food Gross Bank Credit

Figure 5.1 depicts the annual growth rate trends between GDP and the NFGBC over the study period. A clear co-movement was visible between these two macroeconomic indicators. Credit growth experienced more volatility, spiking above 20%, while GDP growth also experienced volatility, but it was less pronounced. The sharp decline in credit and GDP growth was associated with the major economic events and the crisis that occurred. Both credit and GDP significantly fell in 1991, with GDP falling to 1.1%, marked by the balance of payments deficit and the liquidity crunch (NagaRaj). GDP experienced a slowdown in the early 2000s due to the effects of the dot-com bubble burst. Earlier, due to the internet, many new start-ups were founded, taking advantage of new opportunities. Many investors put their money in large amounts. However, later they got to know about the real profitability of the companies. These companies were not generating profits, causing major shocks in the stock market (Kalinić , 2024).

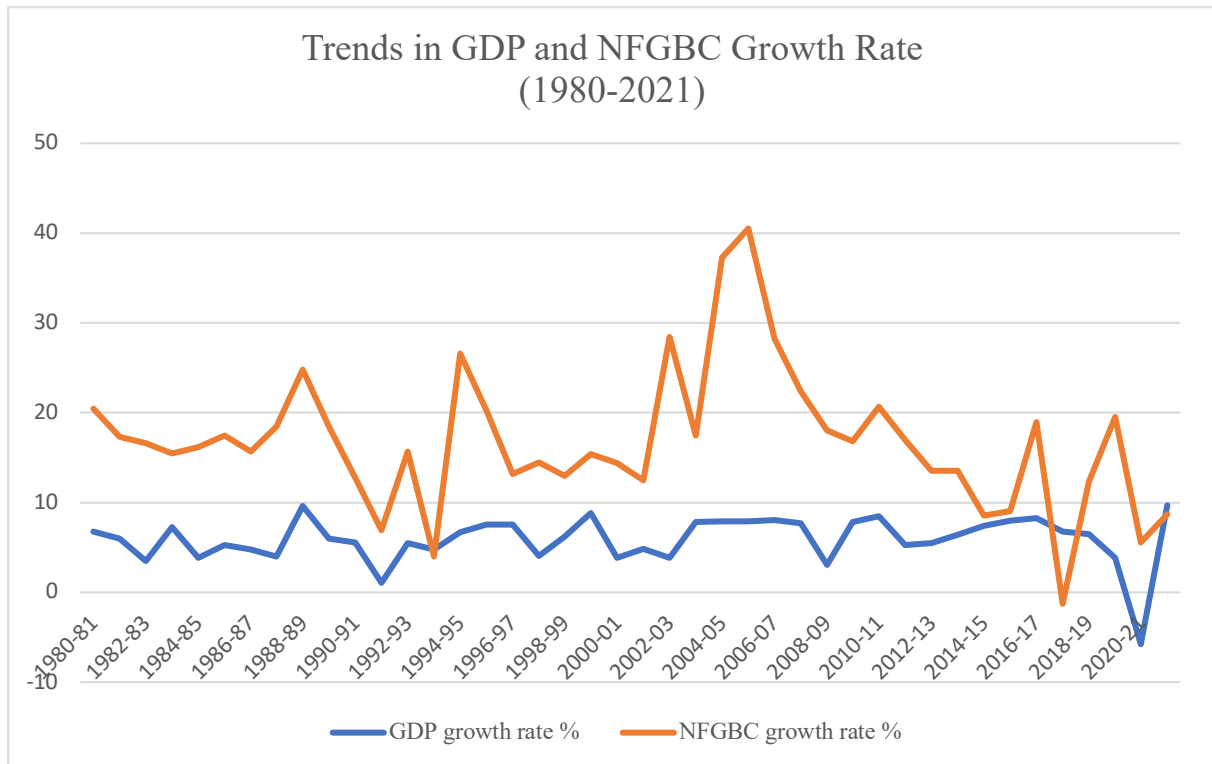


Figure 5.1 Trends in GDP and NFGBC Growth Rate (%)

The NFGBC experienced a substantial increase in non-food credit, with approximately 40% of the growth. The total bank credit by SCBs increased by ₹218,623 crores, with NFBC increasing by ₹213,464 crores (Reddy, 2005). In contrast, this increase didn't persist, and credit growth subsequently fell, facing a sharp downturn in 2018 due to the liquidity crisis of non-banking financial companies. Similarly, COVID-19 caused the sharpest decline in GDP, by -5.7%, followed by a strong rebound. Overall, the period of credit expansion followed by an increase in GDP growth indicates that credit availability influences real economic activity, highlighting a close relationship at an aggregate level.

5.4.2 Unit Root Test

It is a common practice in time-series analysis to perform a unit root test to examine the stationarity property of the variables. Models computed with non-stationary series face the problem of spurious regression (DEMİRKALE1, & OJAGHLOU, 2025).

Table 5.1 presents the results of the unit root test using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, using EViews 12.

Table 5.1 Unit Root Test Results

Augmented Dickey-Fuller*				
Variables	Level		1st Difference	
	Constant	Constant & Trend	Constant	Constant & Trend
GDP	0.448	-1.983	-5.819***	-5.789***
NFGBC	-0.874	-2.207	-4.093**	-4.136**
Agri	-0.206	-2.504	-3.020**	-2.959
Lending R	-0.654	-3.900**	-3.900**	-6.300***
Phillips-Perron				
Variables	Level		1st Difference	
	Constant	Constant & Trend	Constant	Constant & Trend
GDP	0.436	-2.033	-5.819***	-5.772***
NFGBC	-0.803	-1.333	-4.257***	-4.295***
Agri	-0.638	-1.534	-3.000**	-2.938
Lending R	-0.901	-3.900**	-9.271***	-9.933***

Note: ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

The results indicated that all variables except the lending rate were integrated of order one, i.e., $I(1)$, suggesting that GDP, NFGBC, and Agri variables were non-stationary at level but became stationary at their first difference according to both the ADF and PP tests. However, the lending rate was stationary at level. Hence, the ARDL model was appropriate for determining the short-run and long-run dynamics among these variables.

5.4.3 Autoregressive Distributed Lag Model (ARDL)

The ARDL model was estimated under the assumption that variables could be either endogenous or exogenous. The model focused on GDP as the dependent variable and NFGBC, agriculture, and lending rates as regressors. The number of lags was selected by the Akaike information criterion. The AIC criterion suggested the ARDL (1, 2, 2, 0) model.

Table 5.2 Short-Run Coefficients and ECM

Dependent variable: GDP

Model: (1, 2, 2, 0)

Huber-White-Hinkley Heteroskedasticity-consistent standard errors and covariance.

Variables	Coefficient	Std. Error	t-statistics	p-value
ΔGDP (-1)	0.747	0.104	7.125	0.0000
NFGBC	0.111	0.083	1.329	0.1934
NFGBC (-1)	-0.158	0.136	-1.159	0.2552
NFGBC (-2)	0.150	0.112	1.334	0.1918
Agri	-0.131	0.104	-1.263	0.2157
Agri (-1)	0.324	0.189	1.718	0.0958
Agri (-2)	-0.201	0.122	-1.637	0.1117
Lending R	-0.001	0.002	-0.810	0.4240
ECM (-1)	-0.252	0.051	-4.919	0.0000

R-squared 0.999

Adjusted R-squared 0.999

F-statistics 5029.01

Prob (F-statistic) 0.0000

To ensure robustness, the ARDL model (1, 2, 2, 0) was estimated using Huber-White standard errors due to the presence of heteroskedasticity, and the results are presented in Table 5.2. The estimated ARDL model indicates that the current GDP exhibited a strong relationship with its lagged value, with a positive coefficient of 0.747 and significance at the 1% level. While the NFGBC had a weak short-run relationship with GDP. Even at lag 2, the coefficient remained positive but was not significant, which indicated a delayed and weak credit growth relationship. Agriculture credit showed a strong and positive impact on GDP in its 1st lag with a coefficient of 0.324; however, the coefficient was insignificant. Moreover, at lag 2, it turned negative but remained insignificant, indicating inefficiencies and misallocation of credit. Likewise, the lending rate was found to be negative yet statistically insignificant. The ARDL model had an adjusted R-squared value of 0.99, indicating a very high level of fit. Further, the F-statistic was statistically significant at the 1% level. The AIC criterion was -4.52 and log likelihood 99, indicating a well-fitting model.

Finally, the ECM representation indicated that the system corrected its previous year's disequilibrium at a speed of 25% within one period of time, moving towards long-run equilibrium, and the coefficient was statistically highly significant at the 1% level.

Table 5.3 Long-Run Coefficients

Dependent variable: GDP

Variables	Coefficient	Std. Error	t-statistics	p-value
NFGBC	0.408	0.155	2.630	0.0132
Agri	-0.032	0.163	-0.201	0.8416
Lending R	-0.006	0.0077	-0.881	0.3848
C	-0.0839	0.359	-2.336	0.0261

The long-run findings presented in Table 5.3 revealed that NFGBC exerted a positive and statistically significant influence on GDP, with a coefficient of 0.40. This suggests that with a 1% change in bank credit, GDP increased by 40%, highlighting the effective role of bank credit in stimulating long-term economic growth. Agriculture credit had a negative and insignificant influence on GDP, implying structural inefficiencies and credit misallocation. Similarly, the lending rate had a negative and insignificant effect on GDP in the long-run.

Table 5.4 ARDL Bound Test

F- Bounds Test		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Signify.	I (0)	I (1)
		Asymptotic: n= 1000		
F- statistic	4.287	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	40	Finite Sample: n= 40		
		10%	2.592	3.454
		5%	3.1	4.088
		1%	4.31	5.544

The bounds test findings presented in Table 5.4 revealed that the computed F-statistic value was 4.28, which was above the upper-bound critical values at both 5% (4.08) and 10% (3.45) significance levels; however, there was no cointegrating relationship at 1%.

This led to the rejection of the null hypothesis of no cointegration relationship at the 5% and 10% levels, suggesting the existence of a long-run relationship among the selected variables, which was also confirmed by the ECM.

5.4.5 Residual Diagnostic Tests

To ensure the robustness of the ARDL model, a series of residual diagnostic tests was conducted. These tests include the LM serial correlation test, the heteroskedasticity test, the Jarque-Bera normality test and the Ramsey RESET test.

Serial Correlation Test

Firstly, with the help of the Breusch-Godfrey LM test, the study tested whether the residuals exhibited autocorrelation.

Table 5.5 Breusch-Godfrey Serial Correlation LM Test

Null hypothesis: No serial correlation at up to 2 lags		
Alternate Hypothesis: Serial correlation up to 2 lags		
Statistics	Coefficient	p-value
F-statistic	1.6000	0.2192
Obs*R-squared	3.9752	0.1370

The findings in Table 5.5 indicate that residuals obtained from the ARDL model were free from correlation in the residuals up to 2 lags. The F-statistic (1.60) with a p-value of 0.2192 and observed R-squared of 3.97, with the associated p-value of 0.1370, imply that the model was free from serial correlation.

Breusch-Pagan-Godfrey Heteroskedasticity Test

To examine the presence of heteroskedasticity, the Breusch-Pagan-Godfrey test was employed to determine if the residual variance was dependent on the independent variables.

Table 5.6 Breusch-Pagan-Godfrey Heteroskedasticity Results

Null hypothesis: Homoskedasticity		
Alternate Hypothesis: Heteroskedasticity		
Statistics	Coefficient	p-value
F-statistic	2.663	0.0237
Obs*R-squared	16.295	0.0383
Scaled explained SS	11.620	0.1689

The results presented in Table 5.6 indicate that residuals from the ARDL (1, 2, 2, 0) model were not free from heteroskedasticity. The F-statistic and observed R-squared p-values were below the significance level; however, the scaled explained SS exceeded the significance level. This implied the rejection of the null hypothesis. Consequently, robust standard errors (White-Huber heteroscedasticity-consistent estimators) were applied to correct for any biased results.

Jarque-Bera Normality Test

The Jarque-Bera normality test was conducted to check if the observations were normally distributed. The null and alternative hypotheses are as follows:

H_0 : The data are normally distributed.

H_1 : The data are not normally distributed.

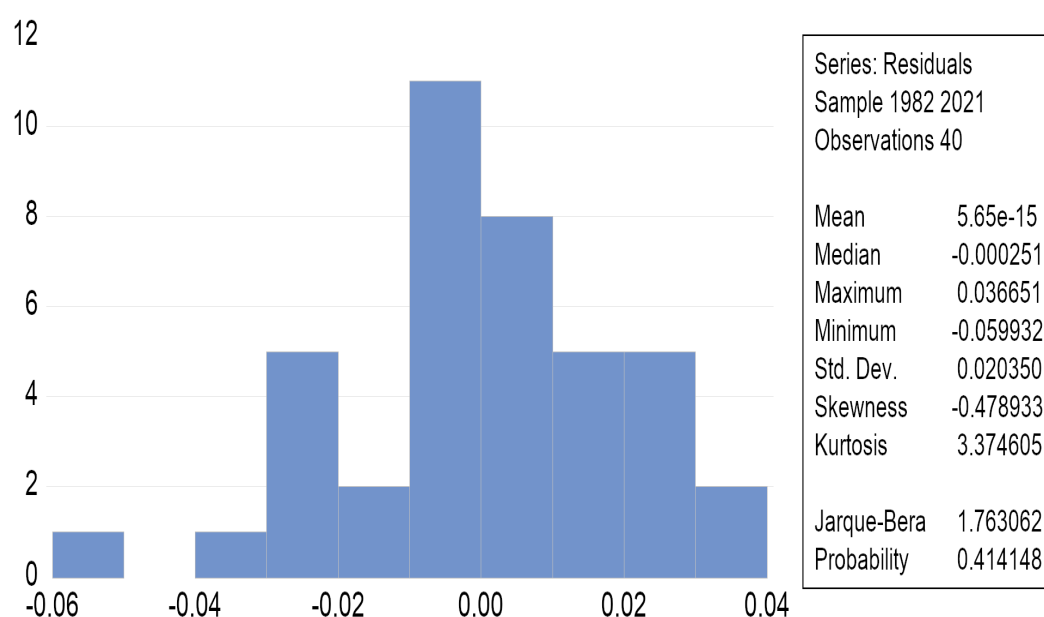


Figure 5.2 Residuals Normal Distribution

The JB test confirmed that residuals were normally distributed; skewness (-0.47) and kurtosis (3.37) were close to the expected values of 0 and 3, respectively, and the JB statistic value of 1.76, with the associated p-value of 0.41, suggested that the null hypothesis couldn't be rejected, implying residuals followed a normal distribution.

Ramsey RESET test

This is the most common test used to find if the model suffers from misspecification, omitted variables, and incorrect functional form, proposed by (Ramsey, 1969).

H_0 : The model is correctly specified.

H_1 : The model is not correctly specified.

Table 5.7 Ramsey RESET Test

	Value	df	p-value
F-statistics	0.442	30	0.6616
T-statistics	0.195	(1, 30)	0.6616
Likelihood ratio	0.259	1	0.6103

The results presented in Table 5.7 indicate that the model was free from any misspecification. Both the F-statistics and t-statistics confirmed that the p-value of 0.6616 was greater than the 5% level of significance; therefore, the null hypothesis couldn't be rejected, implying no specification bias. The acceptance of the null hypothesis confirms that one variable can be explained by the other, implying a strong correlation between them.

5.4.5 Stability Tests

A CUSUM and CUSUM square test were performed to ensure the structural stability of the regression model. Figure 5.3 indicates that residuals were lying within 5% critical bounds, implying the stability of the parameters of the estimated model.

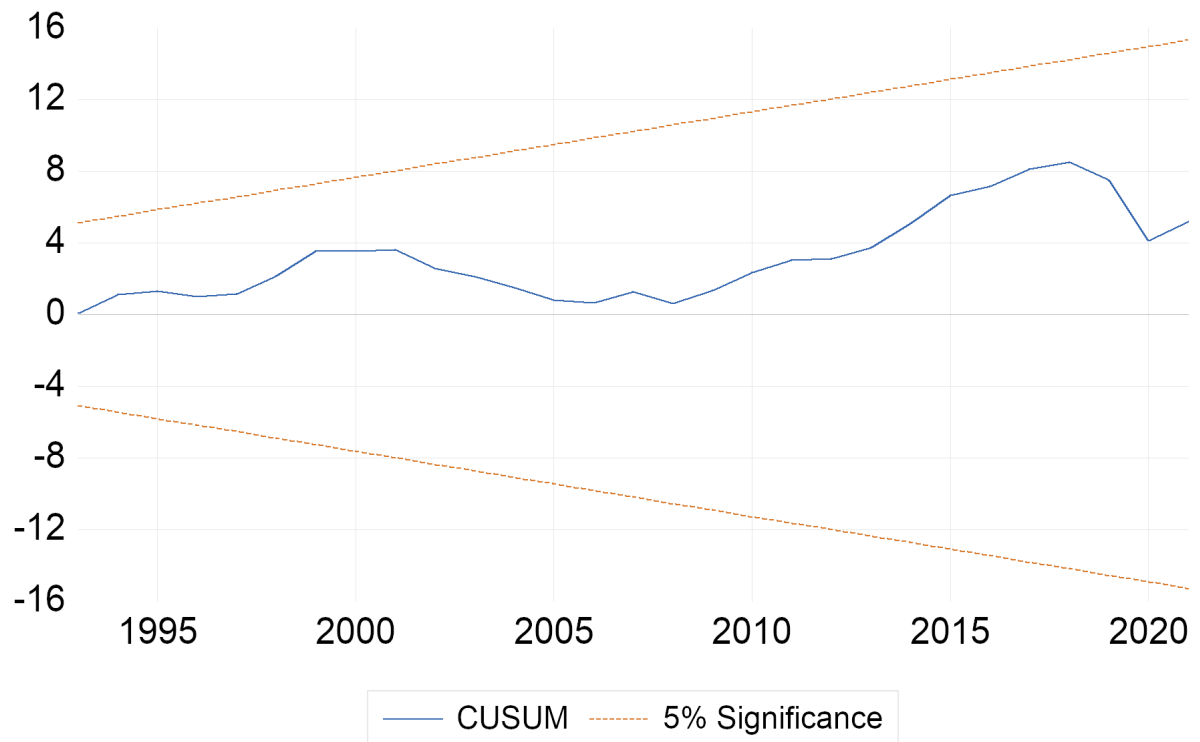


Figure 5.3 CUSUM Test

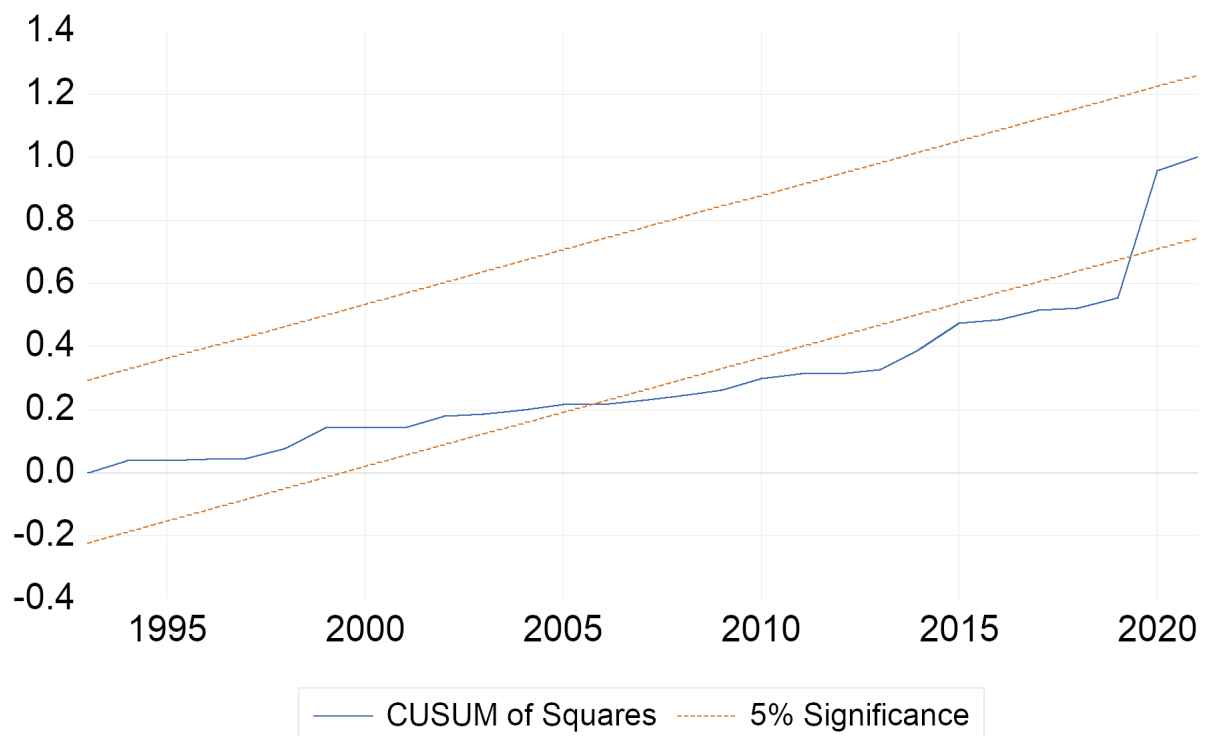


Figure 5.4 CUSUMQ Test

Figure 5.4 presents the CUSUM square test; the results showed some deviation, particularly after 2006, indicating some structural instability, aligning with the disruption caused by the

financial crisis of 2008 and COVID-19. However, the lines reverted within the bounds after some time. Overall, it confirmed that the model was structurally stable.

(B) State-Level Credit Growth Relationship Results

This section presents the relationship between the total bank credit by SCBs and the GDP of the 32 states.

5.4.6 Regional Trends in Credit and GDP Growth Rates

In the year 2020-21, fiscal disparities were observed between the credit distribution and GDP share in the states, as reported in Table 5.8. Maharashtra's economic growth (13%) was relatively stable over the period and accounted for 29% of the total credit by SCBs.

Table 5.8 Top 5 State Shares in GDP and Bank Credit %

States	% of India's GDP	% of Total Bank Credit
Maharashtra	13	29
Tamil Nadu	8	9
Karnataka	8.1	7
Gujarat	8	5
Uttar Pradesh	8.7	4.8

The northern region is among the largest regions in India, comprising states like Haryana, HP, J&K, Punjab, Chandigarh, Rajasthan, and Delhi. It revealed a significant co-movement between credit and GDP. However, Tamil Nadu accounted for a higher proportion of formal credit relative to its output. Similarly, Karnataka, with an 8.1% share in the GDP, received 7% of the total bank credit. While Gujarat contributed 8% to the GDP, its relative credit share was lower, reflecting medium credit penetration. Likewise, Uttar Pradesh also accounted for relatively less credit. Interestingly, Delhi commanded a high share of credit at 11.9%, indicating high credit exposure. These results highlight the credit-output disparities, with Maharashtra dominating as the financial hub of the country.

Northern Region

To investigate whether the bank credit expansion contributed to the state GDP, this study computed the growth rate of credit and GDP region-wise by computing the % change in values. Figure 5.5 captures the co-movement between credit and GDP. This visual representation provided insights into whether the increased bank credit promoted the GDP growth rate of the particular region during the period 2001 to 2021. Delhi contributed 3.6% of India's GDP after 1991. This region contributed 26% of the national GDP in FY 2012-13, as per the KPMG-CII report. The results revealed that credit growth in the northern region was highly volatile, with increased credit growth until 2006 reflecting expansionary credit facilities.

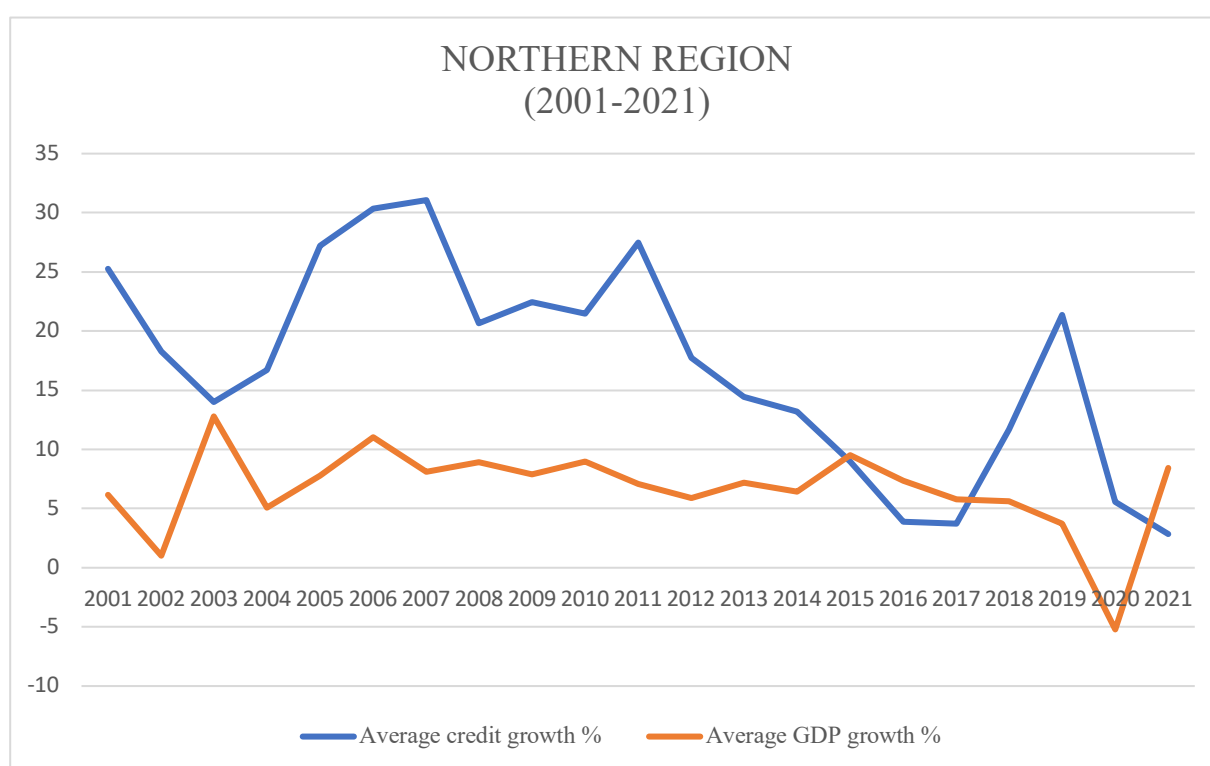


Figure 5.5 Northern Region—Average Credit and GDP Growth Trends

Notably, the credit growth started declining post-2012 and continued to experience fluctuations thereafter. However, a sharp increase in 2019 was observed, possibly due to the credit injection in the economy to overcome the COVID-19 pandemic. Moreover, the GDP growth rate remained relatively stable over the years, except for volatility caused by the dot-com bubble burst and a sharp decline in economic growth because of the COVID-19 pandemic, followed by a steep recovery. Furthermore, a similar trend between credit and output growth was observed during the period 2001-2002, when both variables experienced a decline. In the period

2004-2007, both exhibited an upward trend, implying economic growth supported by credit expansion. During 2008-12, the variables experienced similar co-movement; after that, the variables started deviating. Overall, the findings concluded that credit positively contributed to the northern region's GDP; however, its contribution was limited.

North-Eastern region

The north-eastern region comprises Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura. Figure 5.6 illustrates limited co-movement between bank credit growth and economic growth during the early 2000s. However, credit growth exhibited a sharp surge but did not influence economic growth. Moreover, the fluctuations in credit growth were more pronounced than those of GDP growth.

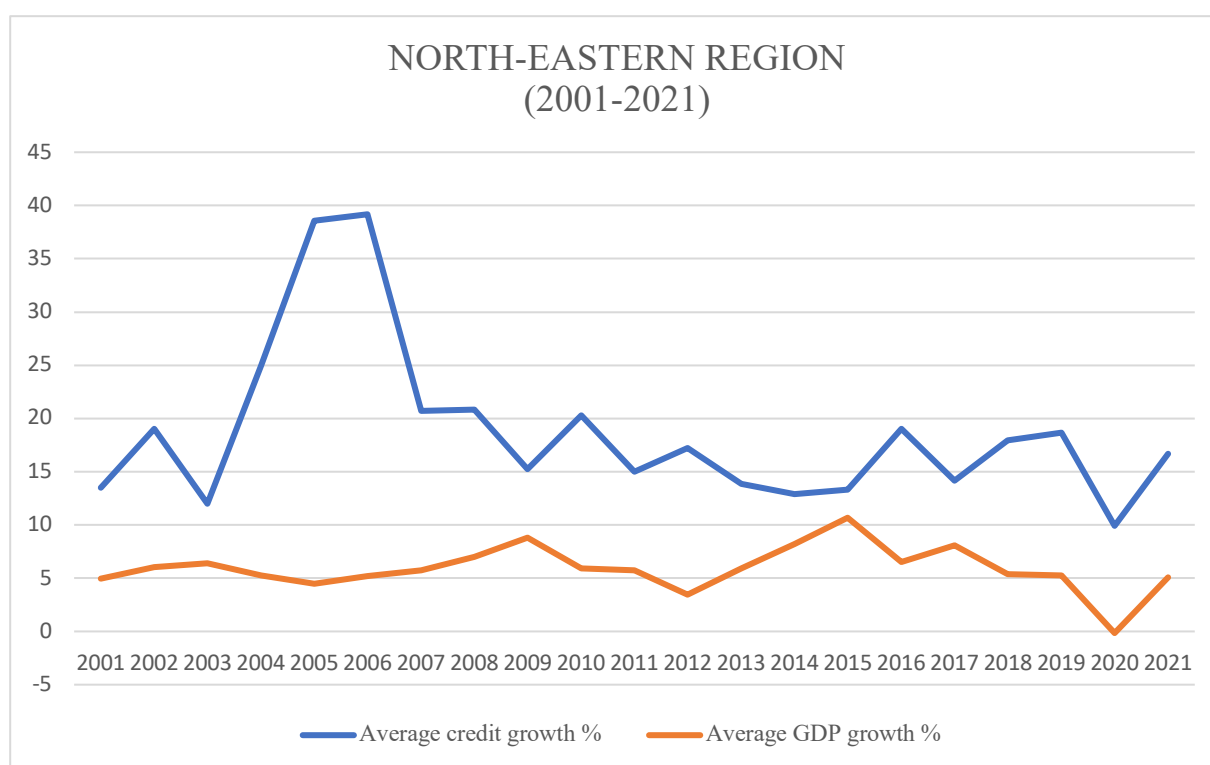


Figure 5.6 North-Eastern Region—Average Credit and GDP Growth Trends

The temporary credit growth surge in 2004-05 was possibly due to the rise in credit in Meghalaya and could also be attributed to a low base year in the previous year. The growth rate in this region was relatively low, up to 5.2% over 8 years. Particularly, Assam and Manipur experienced low growth because of poor agricultural and industrial performance. Moreover, the credit penetration was also low due to the limited absorptive capacity of these regions

(Mohanty, 2011). Post-2015, both variables exhibited similar co-movements, experiencing mild fluctuations. When credit declined, GDP also declined. However, when credit recovered in 2016, GDP also experienced a recovery. Moreover, both credit growth and economic growth experienced sharp fluctuations due to the COVID-19 pandemic.

Eastern Region

Figure 5.7 presents the Eastern region, which consists of six states: Bihar, Jharkhand, Odisha, Sikkim, West Bengal, and the Andaman and Nicobar Islands. The volume of bank credit in the Eastern region was relatively low in the early 2000s, with the credit-to-deposit ratio at 44.1% relative to other regions (Rajesh & Das, 2020). However, banking access and usage of its services had significantly improved after 2005. During the early 2000s, both average credit growth and GDP growth rate displayed co-movement with a lagged response.

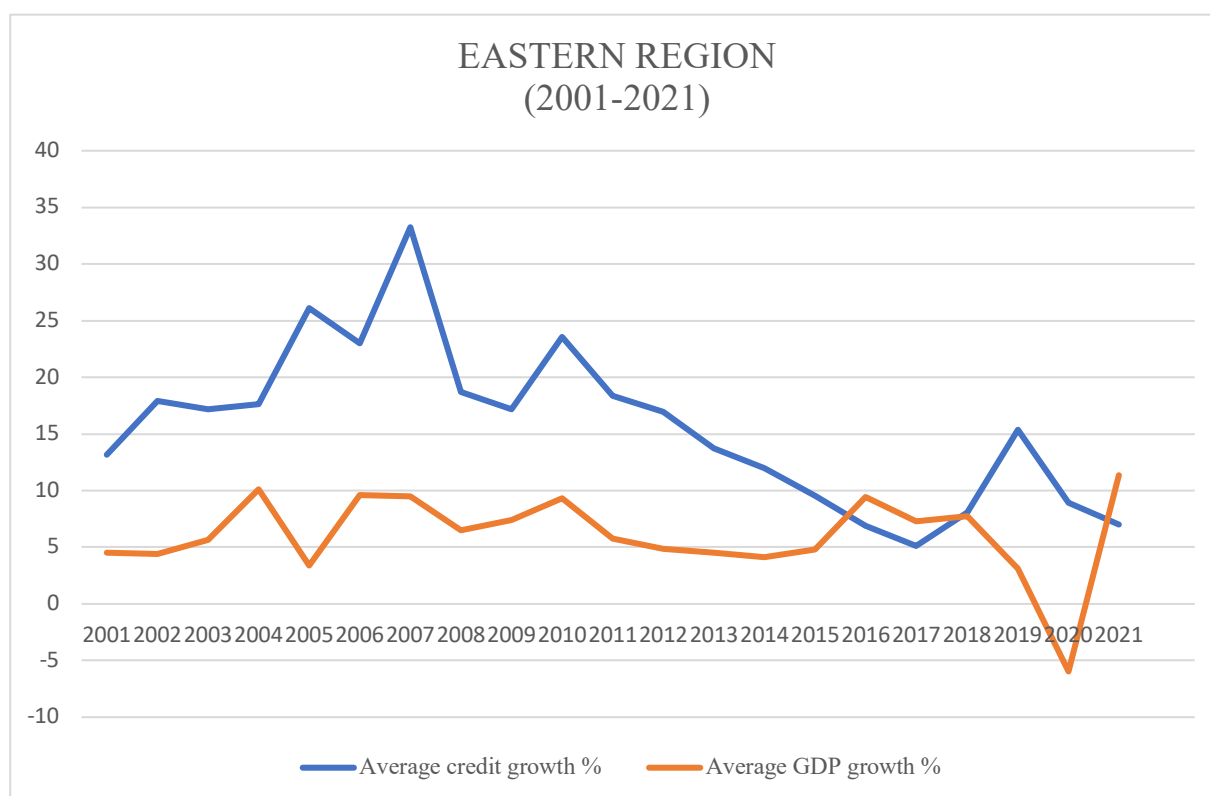


Figure 5.7 Eastern Region—Average Credit and GDP Growth Trends

In the year 2003, economic activity increased, and credit growth followed it. This suggested a lead-lag relationship, where economic activity preceded shifts in the credit growth rate. Such alignment indicated that growth in real activity drove a credit surge in these regions. West Bengal, being the fourth largest state in terms of economic growth, had the highest bank credit

volume, with a consistent and increasing trend over the years. However, post-2010, credit growth experienced a gradual decline, although GDP growth remained stable. Interestingly, credit growth improved in 2019, possibly due to the liquidity programs introduced by the RBI to overcome the NBFC crisis in 2018. The results indicated mixed patterns, with some periods showing variable positive movements, while other periods showed them deviating, suggesting a weak or unstable long-run relationship between the variables, implying that credit growth does not always proportionally translate into GDP growth.

Central Region

The central region encompasses Chhattisgarh, Madhya Pradesh, Uttar Pradesh, and Uttarakhand, which experienced increasing industrial growth over the past two decades, as illustrated in Figure 5.8. A strong upward movement was witnessed in credit growth, peaking in 2006, followed by fluctuations. GDP growth also experienced an upward trend, possibly due to an increasing and significant credit distribution, reflecting consistent economic development, effective financial services, and diverse financial infrastructure.

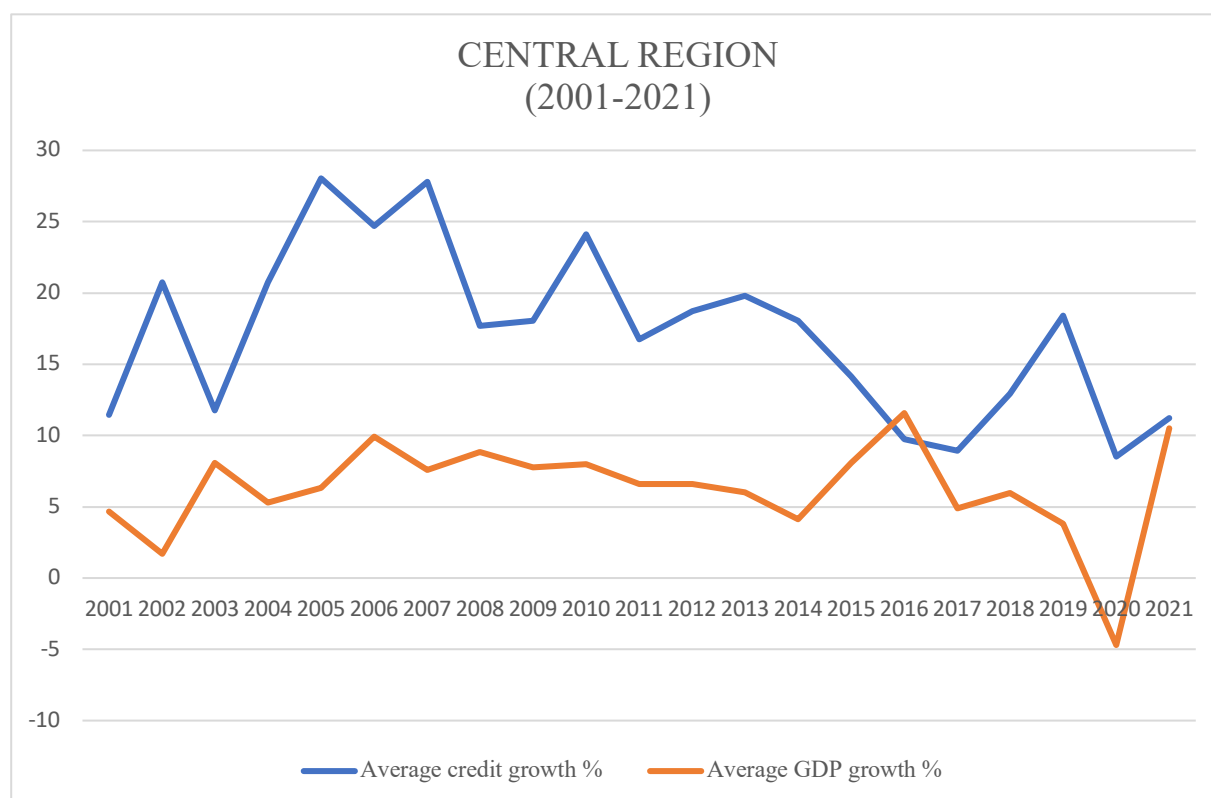


Figure 5.8 Central Region—Average Credit and GDP Growth Trends

During the period 2007-14, credit growth was more pronounced than that of GDP growth, indicating some similar movements. However, credit growth experienced a substantial decline post-2012, while GDP growth remained stable and surpassed credit growth in 2016. Interestingly, in 2019, the regions experienced a significant increase in credit growth, which could be attributed to the incentives taken by the RBI, like bank recapitalization, which caused a temporary boost in credit growth. Both the credit and GDP growth trends exhibited a significant decline because of the worldwide lockdown in 2020, causing close movements during the period of economic crisis.

Western Region

Figure 5.9 presents the Western region, comprising states like Maharashtra, Gujarat, and Goa, which together account for nearly a quarter of India's GDP, with Maharashtra being the highest-performing state (Schorsch, 2015). GDP growth was relatively consistent over the years, although it remained minimal. According to the RBI, credit growth experienced a substantial increase after 2004, particularly driven by Maharashtra.

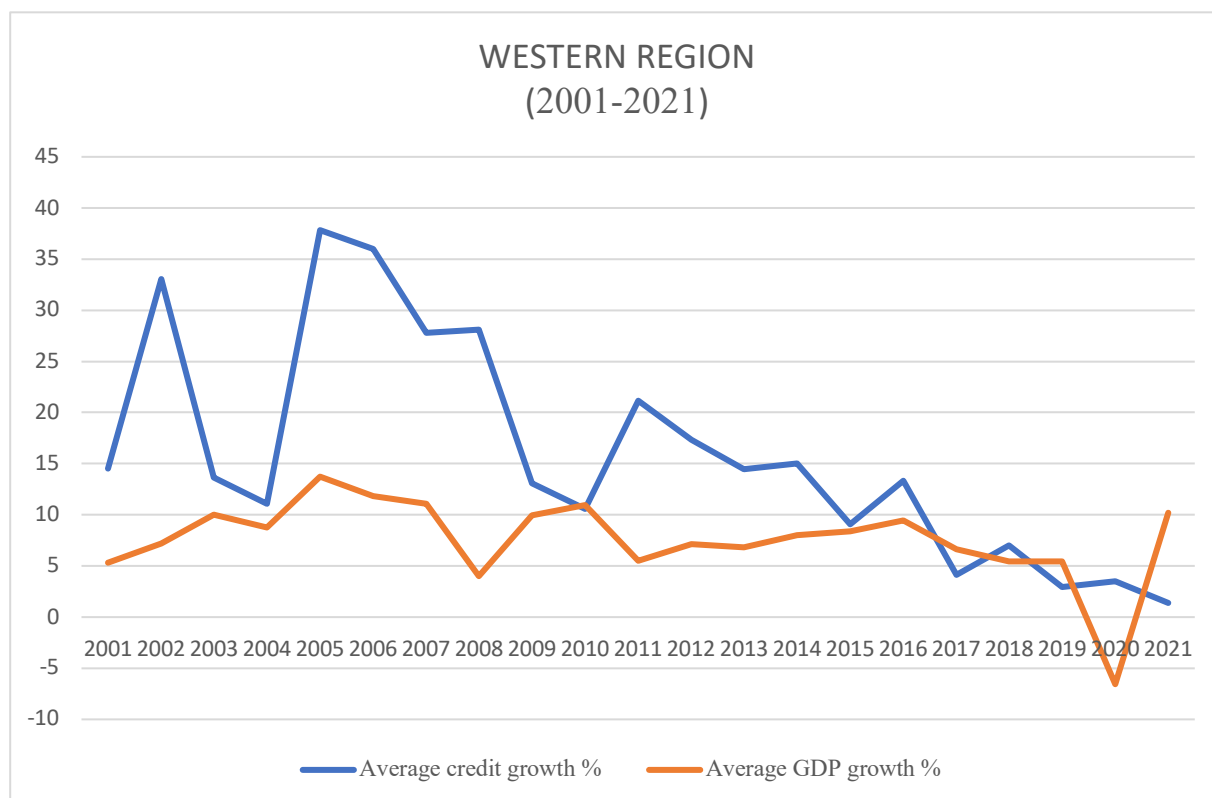


Figure 5.9 Western Region—Average Credit and GDP Growth Trends

A pattern of short-run co-movement was observed between the variables from 2001 to 2004, suggesting that a consistent rise in banking credit was associated with industrial development and economic advancement. However, the volatility in banking credit was more pronounced than in economic growth, indicating that credit responded more sensitively to the economic and financial conditions during this period.

Furthermore, between the years 2004 and 2008, both variables experienced the same movements; when credit decreased, GDP also decreased, indicating that credit led growth. A sharp dip was experienced in 2008 owing to the global financial crisis, followed by a rebound. However, the trend diverged post-2010; credit growth started falling, while economic growth experienced a gradual rise and continued to rise. The impact of COVID-19 was visible on economic growth, followed by a subsequent increase; however, the decline in credit growth was not pronounced. This indicated that the impact of credit on economic activity was not immediate and uniform across the years.

Southern Region

The southern region comprises more developed states like Andhra Pradesh, Kerala, Karnataka, Tamil Nadu, Lakshadweep, Pondicherry, and Telangana. Tamil Nadu and Karnataka are leading the economic growth, accounting for 30%. During the early 2000s, particularly from 2001 to 2005, both experienced an upward trend in growth rates, as outlined in Figure 5.10. Credit growth experienced a surge, which probably caused GDP to rise in the subsequent period. Credit growth peaked around 2006, which marked the period of infrastructure development and efficient financial intermediation. Karnataka and Tamil Nadu emerged as homes for the Information technology industries.

The increase in GDP growth rate was constant and significant in the states of Karnataka, Kerala, and Tamil Nadu, highlighting their developed financial infrastructure and stabilized economic activity. However, the credit growth subsequently declined after 2011, following the asset quality review, while the GDP growth rate experienced fluctuations. The overall results suggested that in the later years, from 2015 to 2018, both variables diverged, moving in opposite directions. Notably, credit and economic growth declined sharply in 2020 due to the economic slowdown caused by the COVID-19 pandemic.

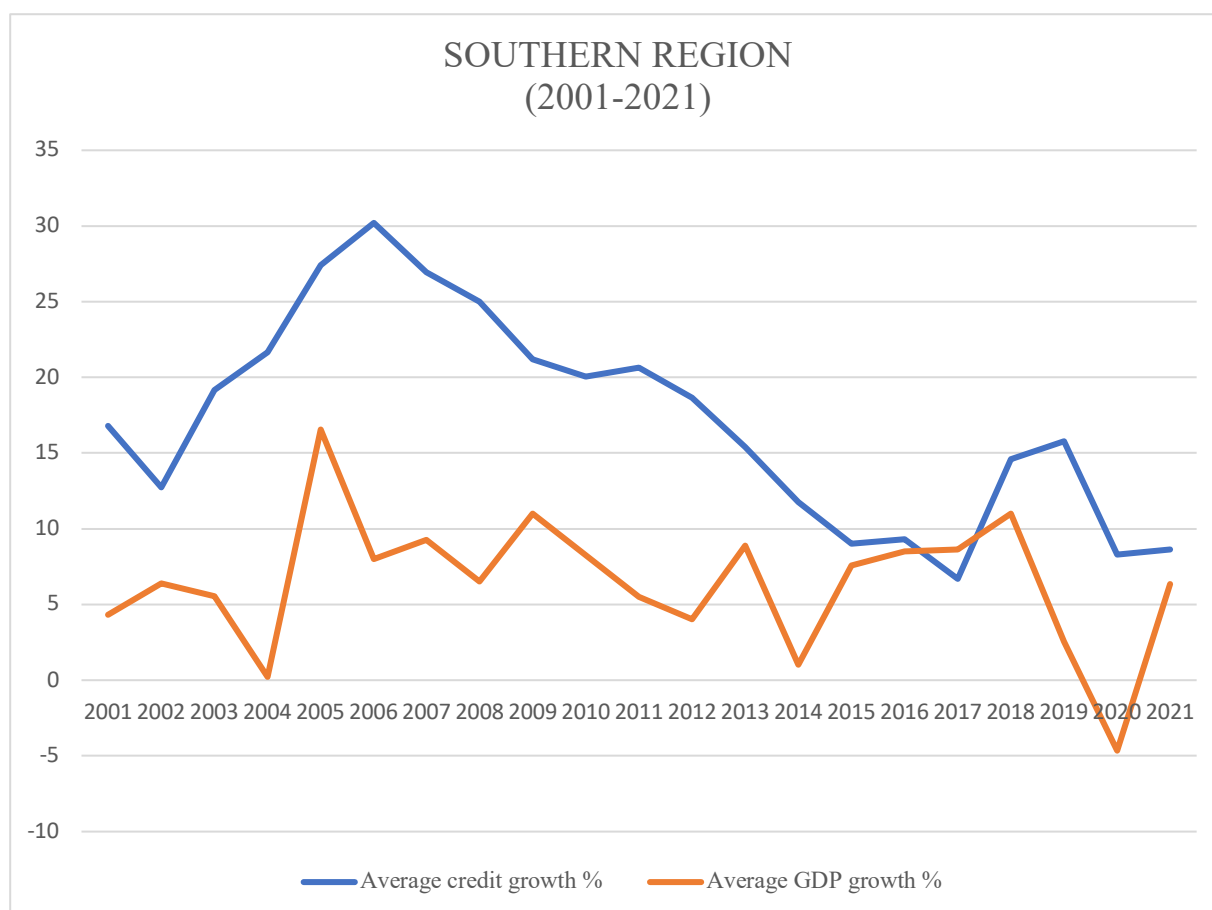


Figure 5.10 Southern Region—Average Credit and GDP Growth Trends

The visual analysis of average credit growth and GDP growth revealed a mixed, region-specific relationship. While regions such as the Eastern and Western areas moved closely together in the early 2000s, some regions exhibited a lagged relationship. Additionally, many regions experienced a gradual decline in credit growth after 2011, accompanied by a weak and synchronized link between credit and GDP growth. In contrast, the decline during 2008 and 2020 affected both credit and GDP growth rates; India's GDP declined to 6.7% in 2008-09. This suggests that during economic shocks and crises, both variables tend to synchronize.

5.4.7 Unit Root Test

The findings of the unit root tests presented in Table 5.9 indicate that four panel unit root tests were employed, i.e., Levin, Lin, and Chu (LLC); Im, Pesaran, and Shin W-stat (IPS); ADF; and PP Fisher. Based on these tests, bank credit was stationary at level, indicating integration of order zero. Although GDP was stationary at level according to the Levin test, other tests

suggested GDP became stationary after first differencing, considering it to be integrated of order one.

Table 5.9 Unit Root Test Results

Series (Level)	Levin, Lin, Chu t^*		Im, Pesaran, and Shin W-stat		Order of Integration
	t-statistics	p-value	t-statistics	p-value	
GDP	-9.219	0.0000	-1.447	0.1256	I(0)
Bank C	-12.50	0.0000	-1.89	0.0290	I(0)
Lending R	3.98	1.0000	4.10	1.0000	NS
First difference					
GDP	0.662	0.7462	-6.28	0.0000	I(1)
Bank C	-1.89	0.0290	-2.32	0.0099	I(0)
Lending R	-13.11	0.0000	-8.39	0.0000	I(1)
Series (Level)	ADF Fisher chi-square		PP Fisher chi-square		
GDP	71.90	0.2327	77.74	0.1160	NS
Bank C	128.5	0.0000	199.14	0.0000	I(0)
Lending R	14.88	1.0000	15.38	1.0000	NS
First difference					
GDP	160.3	0.0000	632.5	0.0000	I(1)
Bank C	87.24	0.0283	200.73	0.0000	I(0)
Lending R	182.0	0.0000	348.3	0.0000	I(1)

Furthermore, the lending interest rate was not stationary at the level and became stationary after first differencing across all four tests, suggesting integration of order one. The panel unit root test confirmed that variables were I(0) and I(1). A mixed order of integration allowed the use of the ARDL technique.

5.4.8 Dumitrescu-Hurlin Panel Causality Test

The study has also incorporated the (Dumitrescu & Hurlin, 2012) causality test to examine the direction of the relationship among the variables between the years 2001 and 2021. Under this test, both the cross-sectional relationship and heterogeneity are taken into consideration, and

this technique can be used even if the variables have no cointegration. It has been widely used in the literature (ERATAŞ, 2014)_(Küçüksakarya, 2021). Table 5.10 indicates bidirectional causality between bank credit and GDP among Indian states, with the coefficient being statistically significant at the 1% level. This supports the idea that financial development and economic growth are mutually reinforcing. The lending rate caused GDP; however, the coefficient was significant at the 10% level, indicating a weak impact. While GDP caused lending rates at the 1% significance level, implying that economic growth influences monetary indicators.

Table 5.10 Dumitrescu-Hurlin Panel Causality Test Results

Direction of causality	W-statistics	Z-statistics	p-value	Significance
Bank C→ GDP	6.227	3.694	0.0002	*** (1%)
GDP→ Bank C	16.234	18.136	0.0000	*** (1%)
Lending R→ GDP	2.381	-1.855	0.0635	*(10%)
GDP→ Lending R	11.19	10.867	0.0000	***(1%)
Lending R→ Bank C	4.617	1.137	0.1701	NS
Bank C→ Lending R	12.22	12.354	0.0000	***(1%)

Interestingly, there was no causal relationship observed between interest rates and bank credit. However, there was a unidirectional relationship from bank credit to lending rates, the coefficient being significant at the 1% level. This implies that bank credit influences lending rates; increased liquidity demand causes interest rates to rise and vice versa.

5.4.9 Optimal Lag Length

Table 5.11 shows the different test statistics used to select the optimal lag length in the estimation of the panel ARDL model. Among all the criteria, SC and HQ were prioritized to select the optimal lag length, and they suggested 2 optimal lags. Moreover, this was an annual study; two lags were sufficient to understand the dynamics among the variables.

Table 5.11 Optimal Lag Length Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-2043.08	NA	0.593	7.992	8.017	8.002
1	578.53	5202.27	2.20e-05	-2.213	-2.113	-2.174
2	635.07	111.52	1.82e-05	-2.398	-2.224*	-2.330*
3	649.65	28.589	1.78e-05	-2.420	-2.172	-2.323
4	659.85	19.889	1.78e-05	-2.425	-2.102	-2.298
5	682.96	44.758*	1.68e-05*	-2.480*	-2.082	-2.324

* Indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

5.4.10 Panel ARDL

To test the existing long-run and short-run cointegrating relationship between GDP, bank credit, and interest rates, the pooled mean group (PMG) method was performed in the study. The panel ARDL model was estimated using 2 lags, as determined by the optimal lag length.

Table 5.12 Short-Run Coefficients and ECM

Dependent variable: GDP

Δ - First Difference

Variables	Coefficient	t-statistics	p-value
Δ GDP(-1)	-0.021	-0.500	0.6170
Δ Bank C	0.002	0.093	0.9254
Δ Bank C(-1)	-0.250	-6.289	0.0000
Δ Lending R	-0.001	-0.799	0.4247
Δ Lending R(-1)	-0.001	-0.751	0.4528
ECM (-1)	-0.257	-7.52	0.0000

Root MSE 0.034

Log Likelihood 1219.9

AIC -2.957

In the short-run, past GDP had no meaningful impact on current GDP, as shown in Table 5.12. It had a negative effect in the current period with a coefficient of -0.021, although the coefficient was statistically insignificant. Moreover, the change in GDP in the current period was positively influenced by the change in bank credit; however, the variable was not statistically significant. This indicated that credit expansion did not immediately translate into real activity across the states. However, the lagged bank credit was negative and significant, implying that banking credit in the previous period had a contractionary impact on GDP. Furthermore, the lending rate and lagged lending rate were negative and insignificant, indicating no influence of the previous year's interest rate on GDP.

The coefficient of ECM(-1) was -0.25 and statistically significant at the 1% level, as shown in 5.13, confirming a long-run stable equilibrium. This indicated that approximately 25% of the disequilibrium from the initial period was corrected in the current period, confirming a moderate speed of adjustment.

The root MSE and AIC indicated the efficiency of the model, with low values suggesting that the model fits the data well. Moreover, the log-likelihood was relatively high, highlighting how well the model explained the observed data.

Table 5.13 Long-Run Coefficients

Dependent variable: GDP

Variables	Coefficient	t-statistics	p-value
Bank C	0.362	44.821	0.0000
Lending R	0.013	0.005	0.0112
C	0.261	6.345	0.0000

The results in Table 5.13 revealed a positive and highly significant long-run relationship between bank credit and GDP. The results indicated that a 1% increase in real bank credit was associated with a 0.36% increase in GDP across the states. The coefficient was statistically significant at the 1% level, suggesting an important role of banking credit in driving real

economic growth. Furthermore, the lending rate exhibited a positive relationship with GDP. However, the magnitude was small, with a coefficient of 0.013, and statistically significant at the 5% level, suggesting that higher interest rates may reflect improved financial system real economic activity in the long-run. This positive relationship aligns with the findings of (Lee & Wener, 2018), who found a constant positive relationship between interest rates and nominal GDP in Japan, the UK, Germany, and the USA, with interest rates following GDP growth.

The long-run or cointegrating relationship between GDP and other variables can also be ascertained by the corresponding sign and statistical significance of the error correction term (ECM). Thus, there existed a long-run relationship between GDP, bank credit, and lending rates.

5.4.11 Residual Diagnostic Test

The residual diagnostic test was also performed on the panel data. The null and alternative hypotheses are as follows:

H_0 : The data are normally distributed.

H_1 : The data are not normally distributed.

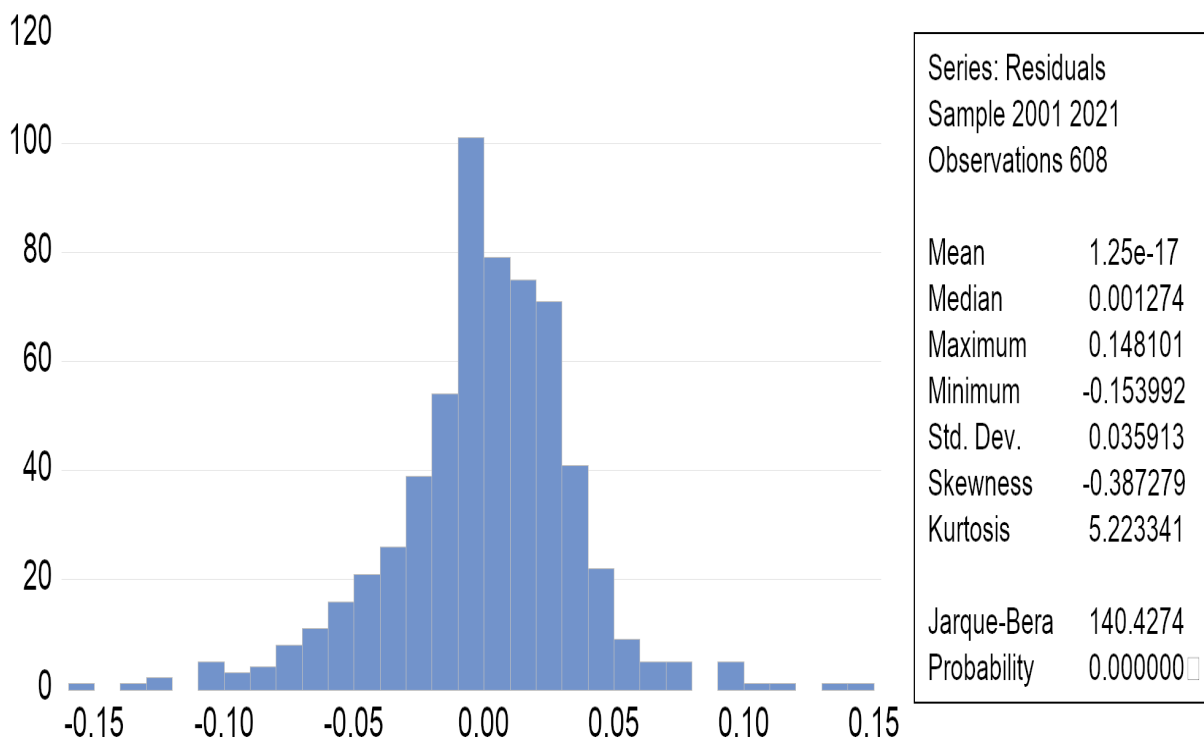


Figure 5.11 Residuals Normal Distribution

The histograms of residuals in Figure 5.11 provide evidence of non-normality in the residuals. The skewness of -0.38 confirmed mild negative skewness, indicating that the residuals were slightly left-skewed, with the left tail longer and flatter. Moreover, kurtosis (5.222), with a value greater than 3, indicated that the distribution had heavier tails and sharper peaks, suggesting the presence of extreme positive and negative events.

The Jarque-Bera of 140.42 with a probability value of 0.0000 indicated that residuals were not normally distributed. The residual testing confirmed that the observations were slightly skewed, with a leptokurtic distribution indicating mild deviation from normality.

5.5 Conclusion

This paper attempted to analyze the long-run relationship and short-run dynamics between bank credit and economic growth from 1980 to 2021. The annual data on real GDP, lending interest rate, NFGBC and bank credit were obtained from various reports of the RBI's Handbook of Statistics on the Indian Economy and Handbook of Statistics on the Indian States. The credit-GDP relationship was examined at an aggregate level, using the ARDL framework, as the unit root test indicated that the variables were a combination of $I(0)$ and $I(1)$. The ARDL model revealed that GDP was significantly influenced by its past values. While NFGBC, agriculture credit and lending rate did not show any meaningful impact on GDP in the short-run. The long-run estimates revealed a positive and significant influence of NFGBC on GDP; agriculture credit and lending rate remained statistically insignificant. The ECM results implied that 25% of the disequilibrium in the previous period was corrected in the previous period, indicating a moderate speed of adjustment. Moreover, the bound test also confirmed the existence of a long-run cointegrating relationship among the variables. The model was free from the problem of serial correlation; however, there was a presence of heteroskedasticity, and to overcome that, the White-Huber heteroskedasticity-consistent estimator was computed. Additionally, the residuals were normally distributed and stable. CUSMUQ showed some instability after 2006, due to the structural shocks experienced by India.

The paper extended the literature on the nexus between bank credit, economic growth, and interest rates in India's 32 states from 2001 to 2021. The results revealed regional credit disparities among the states, highlighting different levels of financial infrastructure and banking facilities. Maharashtra accounted for 29% of the total credit while contributing 13% to the total GDP. Regional credit and GDP growth patterns highlighted the credit-absorbing

capacity of different regions. The patterns suggest that during the period of disruptions, credit and GDP align. Furthermore, the unit root test revealed mixed order of integration; therefore, the panel ARDL was conducted. Additionally, the Dumitrescu-Hurlin panel test revealed a bidirectional causal relationship between bank credit and GDP. While GDP and bank credit had a causal relationship with lending rates. Panel ARDL revealed a negative short-run impact of bank credit 1st lag on GDP, while the lending rate remained insignificant. ECM indicated that 25% of the errors were corrected in the current period. However, there was a positive and significant long-run impact of bank credit on GDP. The bound test also confirmed the presence of a long-run relationship among the variables.

Overall, the findings suggested a weak short-run relationship between bank credit and economic growth; however, the long-run relationship remained positive and significant at the 1% level, highlighting the important role of credit in sustaining long-term economic growth. The ECM indicated the speed of adjustment; nearly 25% of the disequilibrium was corrected in both models. Lending rates were insignificant at the national level, while positive and significant in the long-run at the state level. Overall, the study suggests that bank credit can be a catalyst for economic growth in India.

Chapter VI

THE SHORT-RUN AND LONG-RUN IMPACT OF MONEY SUPPLY ON ECONOMIC GROWTH

6.1 Introduction

Monetary policy is a tool used by central banks to control liquidity in the economy by adjusting the money supply through open-market operations, as highlighted by (Kapur & Patra , 2012). The RBI raises or lowers the discount rate and manages reserve requirements. There are several monetary transmission mechanisms, such as traditional methods, i.e., interest rate channels and a bank lending channel, through which it is transmitted into the real economy (MATHAI). During periods of economic slowdown, central banks adopt an expansionary monetary policy by reducing interest rates. In contrast, during high inflation, a contractionary monetary policy is implemented by raising interest rates, making borrowing expensive, and reducing demand. Traditional theories suggest a constant positive relationship between money supply and growth, with a long and lagged relationship in the real sector. The short-run impact on the financial markets is due to changes in interest rates. However, some studies suggest the relationship between them varies depending on the economic conditions.

Irving Fisher believed that with every increase in the money supply, general prices increase, keeping output stable. Similarly, Milton Friedman argued that inflation is a monetary phenomenon and is present everywhere, emphasizing that increases in prices are correlated with increases in the money supply. (Savita, 2015), revealed the negative influence of an increased money supply in India on prices, particularly when the GDP doesn't increase in the same proportion as the demand for goods, causing inflation. These findings align with (Amaral, Dyhoum, Abdou, & Alijohani, 2022), who documented the negative impact of continuous expansion in the money supply on the price level. However, Karl Marx viewed money as a medium of exchange, and inflation is also caused by contradictions within the capital system and credit. In 2016, the MPC introduced a flexible inflation-targeting framework (FITF) when inflation was ranging between 8-12%, and an inflation target regime of 4 ± 2 was adopted and is subject to revision every 5 years. Monetary policy and economic growth are closely related concepts, aiming to promote economic growth while managing inflation and business cycles.

Monetary policy should focus on price stability, which does not mean prices remain unchanged, but rather that there should be country- and cycle-specific approaches.

In the late 1990s, India underwent economic reforms aimed at liberalizing and globalizing its economy. During this period, fiscal and monetary policy underwent major changes. The monetary aggregates M2 and M3 represent broad measures; however, M3 comprises M1 and M2. Given this, M3 has been chosen as the main indicator of monetary policy. This study examines the dynamic relationship between M3 and GDP using the ARDL approach from the period 1980 to 2021. The study incorporated control variables like the Consumer Price Index (CPI) as a measure of inflation and call money interest rates (IR) as a proxy for interest rates. The variables used were log-transformed real GDP, M3, CPI index, and interest rates %, along with dummy variables to better understand how these variables interact during periods of fluctuations and shocks.

The rest of the chapter is structured as follows: Section 6.2 outlines the objective and hypotheses of the study, followed by the GDP and M3 trends in Section 6.3. Section 6.4 provides evidence and estimated parameters from the ARDL model, followed by residual diagnostic tests. The discussion and conclusion are presented in Section 6.5.

6.2 Objectives and hypotheses

O₂: To determine the relationship between broad money supply (M3) and economic growth (GDP).

Hypotheses:

H_{2a}: There is no long-run relationship between M3 and GDP.

H_{2b}: The impact of M3 on GDP growth is not linear during the period of economic shocks and crises.

H_{2c}: Inflation (CPI) has no significant effects on GDP.

H_{2d}: Inflation (CPI) has no significant effects on GDP during structural instability.

H_{2e}: Interest rates do not have a more direct impact on GDP across the sample.

H_{2f}: The financial crisis of 2008 has no short-run significant effects on GDP.

H_{2g}: The COVID-19 pandemic has no short-run impact on GDP.

6.3 Empirical Results and Discussions

This section presents the short-run and long-run dynamics and major findings from the Autoregressive Distributed Lag Model (ARDL). Further, dummy variables were used to find the relationship between the variables during the 2008 financial crisis and the COVID-19 period.

6.3.1 Trends in Broad Money Supply and Economic Growth

Figure 6.1 illustrates the recent trends in the growth rates of GDP and M3 variables, highlighting the key effects of economic events and policy changes. The trends revealed a visible co-movement between the variables, indicating a very close relationship between them. During the expansion, both exhibited an upward trend, while declining during the period of contraction until 2007. M3 growth was volatile in the early 1990s, often driven by credit expansion, and this trend persisted till 2004, reflecting slow GDP growth, adjustments in monetary policy, and external shocks. After this, it declined in 2008 due to external shocks tied to the global financial crisis. Demonetization in 2016 led to a period of decline because of liquidity constraints with the withdrawal of ₹500 and ₹1,000 notes, which accounted for 86% of the currency in circulation. Despite returning 99% of the money to the central bank, it caused a temporary shortage (Chanda & Cook, 2022). The purpose of this action was to curb black money and promote digital transactions. The growth rate of M3 fell from 12.94% to 6.8%; since then, it has followed a declining trend (Purohit, 2022).

It was interesting to note that after the economy's collapse in March 2020, M3 initially fell before rapidly expanding, highlighting the RBI's policy response. The RBI injected liquidity into the system and implemented less stringent loan requirements. There was a 6.7% increase in the M3 growth rate, marking the highest growth in seven years. This was a temporary rise due to an excessive withdrawal of cash to meet basic needs during the lockdown. Additionally, central banks allowed lenders to offer a delay on loan repayments and interest payments until August 2020. M3 remained almost stagnant afterwards due to the slowdown in bank deposits, causing a decline in surplus liquidity (2022).

Additionally, GDP exhibited relatively less pronounced fluctuations. In 1991, it sharply declined because of the BOP crisis. Similarly, due to the dot-com bubble bust in 2000, major companies incurred losses; those lacking sustainable business models and profitability, and

about 48% of the companies that were ICT and internet-based survived. Even some India-based companies faced several challenges, like Satyam Infoway, Rediff.com, etc (AngleOne).

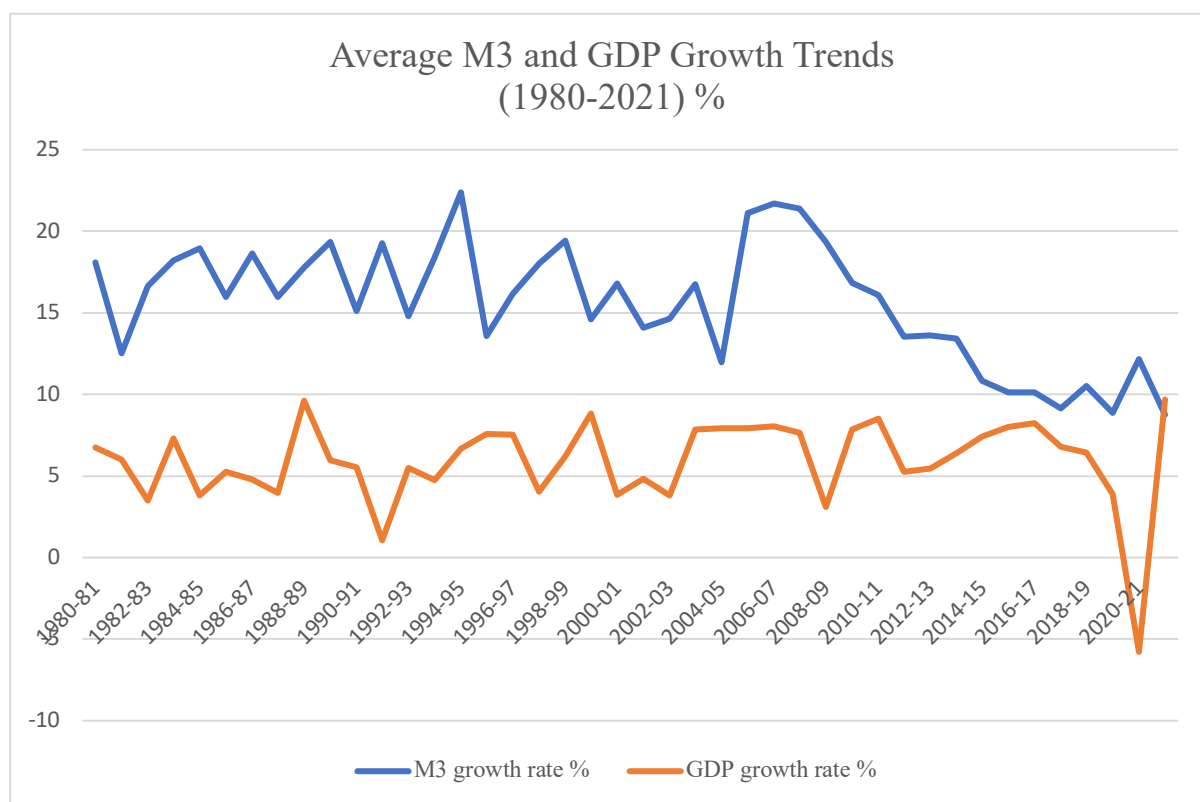


Figure 6.1 Trends in M3 and GDP Growth Rate (%)

Similarly, in 2002, policy changes or government changes caused a decline. Afterwards, it showed stable growth until 2008, after which the financial crisis caused GDP to decline. However, the impact on India was not as severe as it was on other economies. The GDP growth rate fell from 9% per annum to 6.8%. Automobiles, textiles, gems, and other export-oriented industries saw a significant decline. There was a rise in unemployment in the textiles, leather, and jewelry sectors (Bose, 2021). The most significant contraction occurred in 2020 as a result of COVID-19, causing the GDP growth rate to decline to -5.7%. Following the crash, there was a rebound in GDP as economic activities resumed.

6.3.2 Unit root test

Two unit root tests were employed, i.e., Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP). The results presented in Table 6.1 indicate that the variables were $I(0)$ and $I(1)$ according to the ADF and PP tests.

Table 6.1 Unit-Root Test Results

Augmented Dickey-Fuller*					
Variables	Level		1st Difference		Order of Integration
	Constant	Constant & Trend	Constant	Constant & Trend	
GDP	0.448	-1.983	-5.819***	-5.789***	I(1)
M3	-2.364	1.124	-1.141	-2.644	NS
CPI	-1.875	-2.076	-3.744**	-3.004	I(1)
Interest R	-2.742*	-3.833**	-5.833**	-5.889***	I(0)
Phillips-Perron					
Variables	Level		1st Difference		
	Constant	Constant & Trend	Constant	Constant & Trend	
GDP	0.436	-2.033	-5.819***	-5.772***	I(1)
M3	-2.622*	1.656	-2.867*	-4.292**	I(1)
CPI	-2.046	1.790	-3.765**	-4.037**	I(1)
Interest R	-2.541	-3.759**	-12.297***	-12.446***	I(0)

Note: ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Both the ADF and PP Fisher tests found that GDP and CPI were stationary at the first difference. However, the PP test revealed that M3 was stationary at the first difference and borderline at level. The interest rates were found to be stationary at both levels and the first differences. Some of the variables were I(0), and others were I(1), allowing us to use the ARDL technique.

6.3.3 ARDL Model

The study employed the ARDL to examine the relationship between GDP, M3, CPI, and interest rates. The estimation was done at the aggregate level to better capture the dynamics among the

variables across the period, accounting for major reforms and structural shocks. The model was estimated with 1 lag, as suggested by the AIC criterion.

Table 6.2 Short-Run Coefficients and ECM

Dependent Variable—GDP

Selected Model: ARDL (1, 1, 0, 0)

Variable	Coefficient	t-statistic	Prob
GDP (-1)	0.804	13.676	0.0000
M3	-0.250	-1.149	0.1645
M3(-1)	0.393	1.958	0.0582
CPI	-0.135	-2.100	0.0429
Interest R	-0.007	-0.531	0.5983
ECM (-1)	-0.195	-5.126	0.0000

R-squared 0.999

Adjusted R-squared 0.999

F-statistics 7274.5

Prob (F-statistic) 0.0000

The results outlined the short-term dynamics between GDP and its determinants, as shown in Table 6.2. A positive short-run relationship was observed between current GDP and its lag at the 1% significance level, implying that a 1% increase in lagged GDP led to an 80% increase in current GDP. Similarly, M3 and GDP exhibited a negative relationship; however, the coefficient was insignificant. While the lagged M3 reflected a positive influence on GDP, implying delayed effects, it had weak statistical significance at the 10% level. According to the Keynesian view, a higher money supply reduces interest rates and thus encourages consumption and investment. Furthermore, CPI had a negative and significant influence on GDP. However, no significant relationship was found between interest rates and GDP.

Finally, the corresponding sign and statistical significance of the ECM confirmed the long-run or cointegrating relationship between GDP and other variables. The coefficient of the ECM (-0.195) showed a negative and highly significant value at the 1% significance level, implying that after a short-run shock, the economy deviated from the long-run equilibrium at the rate of 19%, indicating a long-run relationship between the variables.

Table 6.3 Long-Run Coefficients

Dependent variable: GDP

Variables	Coefficient	t-statistics	p-value
M3	0.731	4.512	0.0001
CPI	-0.693	-2.703	0.0456
Interest R	-0.003	-0.522	0.6010
C	7.994	7.364	0.0000

The long-run results in Table 6.3 indicate that M3 positively influenced GDP; with a one-unit increase in M3, GDP increased by 0.731 units. The coefficient was statistically significant at the 1% level, indicating a strong long-run correlation between them, consistent with the results of (Pavithra, 2023). Conversely, CPI exhibited a negative and significant relationship with GDP, suggesting that inflation beyond a particular threshold causes a decline in GDP (Srinivas). Similarly, a negative and expected sign was observed between interest rates and GDP; however, it was not statistically significant (Bhat & Laskar, 2016).

Table 6.4 ARDL Bound Test

F- Bounds Test		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Significance	I (0)	I (1)
		Asymptotic: n= 1000		
F- statistic	4.717	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	41	Finite Sample: n= 40		
		10%	2.592	3.454
		5%	3.1	4.088
		1%	4.31	5.544

The F-bound test was conducted to test the cointegration among the variables. The results in Table 6.4 revealed that the value of the F-statistic (4.717) exceeded the upper limit at the 5% significance level.

Consequently, the null hypothesis of no co-integration was rejected, implying that all the variables were associated together in the long run or had a stable long-run relationship. Also, confirmed by a negative and statistically significant ECM.

6.3.4 Residual Diagnostic Tests

The diagnostics and stability tests on the ARDL model (1, 1, 0, 0) were also conducted to ensure the efficiency of our findings.

Serial LM Correlation Test

The Breusch-Godfrey LM test was employed to test whether the residuals exhibited autocorrelation, as presented in Table 6.5.

Table 6.5 Breusch-Godfrey Serial Correlation LM Test

Null hypothesis: No serial correlation at up to 2 lags		
Alternate Hypothesis: Serial correlation up to 2 lags		
Statistics	Coefficient	p-value
F-statistic	0.461	0.6343
Obs*R-squared	1.175	0.5724

The calculated p-value for both the F-statistics and the observed R-squared was greater than 0.05, implying there was no autocorrelation up to 2 lags. This suggests that the results obtained from the ARDL model were not spurious.

Breusch-Pagan-Godfrey Heteroskedasticity Test

The results displayed in Table 6.6 indicate that the model was free from heteroscedasticity. The p-values of the F-statistic and observed R-squared were higher than 0.05.

Table 6.6 Breusch-Pagan-Godfrey Heteroskedasticity Results

Null hypothesis: Homoskedasticity		
Alternate Hypothesis: Heteroskedasticity		
Statistics	Coefficient	p-value
F-statistic	2.309	0.0649
Obs*R-squared	10.169	0.0706
Scaled explained SS	18.512	0.0024

The higher p-values implied that the null hypothesis couldn't be rejected, suggesting no evidence of heteroskedasticity in the model.

Jarque-Bera Normality Test

Figure 6.2 shows that the data were not normally distributed, with a significant p-value at the 1% level. This was further supported by skewness (-1.27), indicating a left-skewed distribution. Similarly, kurtosis (5.995) suggested the presence of outliers and extreme values in the distribution.

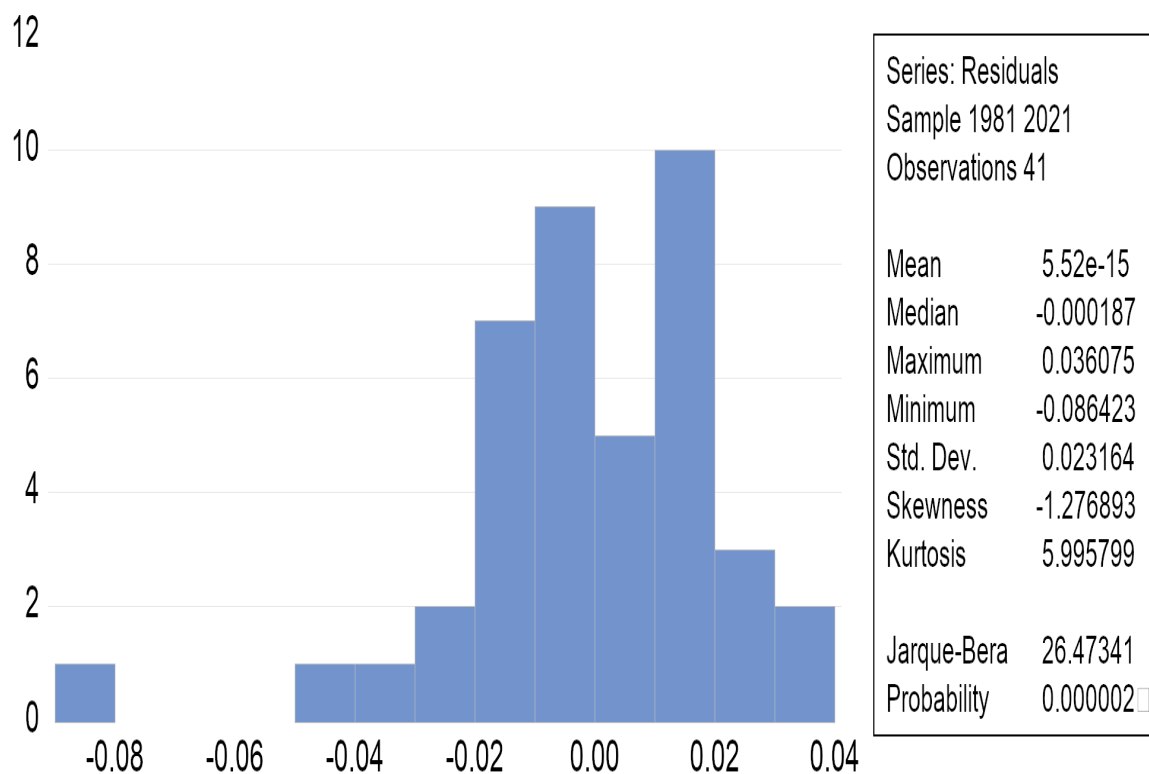


Figure 6.2 Residuals Normal Distribution

6.3.5 Stability Tests

A CUSUM and CUSUM square test were performed to confirm the stability of the model. The hypotheses are as follows:

H_0 : There is no structural change in the parameters.

H_1 : There is a structural change in the parameters.

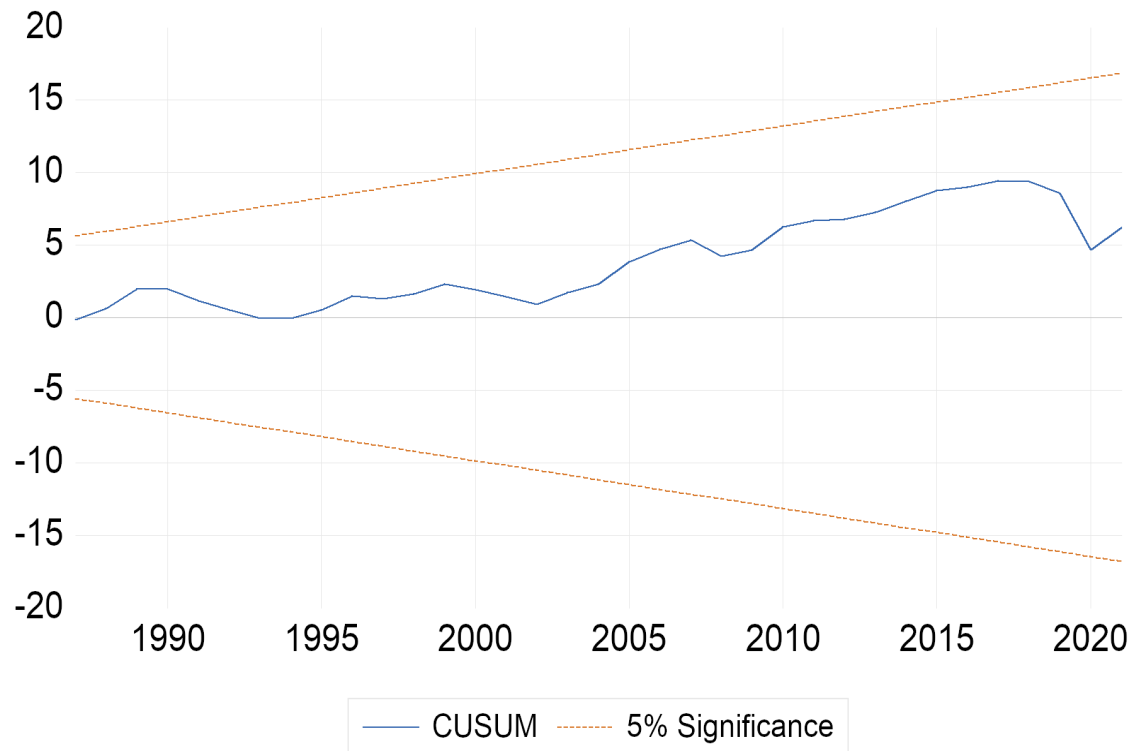


Figure 6.3 CUSUM Test

Figure 6.3 indicates that the CUSUM line remained between the two critical lines at a 5% significance level, implying that the null hypothesis of no structural change in the parameters could not be rejected, suggesting the ARDL model was structurally stable.

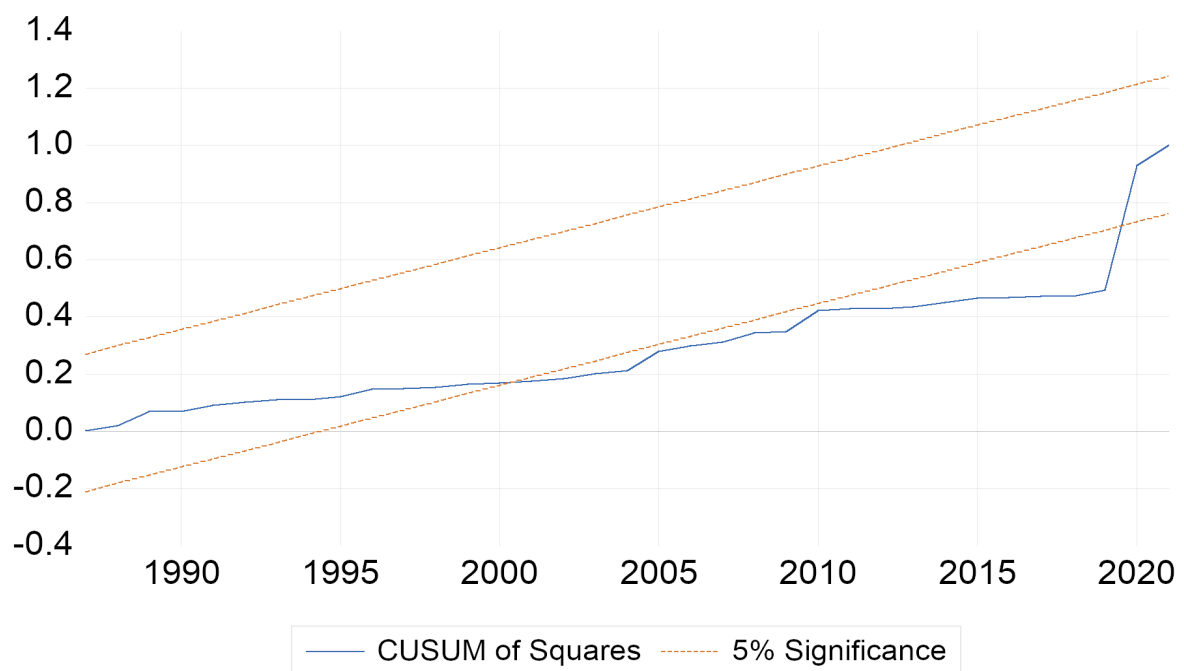


Figure 6.4 CUSUMQ Test

However, the CUSUM of the test square displayed in Figure 6.4 indicated a notable fluctuation beginning around 2001. Particularly, fluctuations were observed in 2008 and 2020 because of the global financial crisis and the COVID-19 pandemic, respectively.

6.3.6 Dummy Variable Specifications for Crisis Period

In response to the instability captured in the CUSUM of squares, two dummies for the crisis periods were introduced to examine the short-run effects of the structural breaks on the dynamics among the variables.

If Year = 2008, then $D1 = 1$.

and 0 otherwise,

If Year = 2020, then $D2 = 1$.

and 0 otherwise,

This period was challenging for the Indian economy due to the 2008 financial crisis, which was triggered by the collapse of Lehman Brothers, a major US investment bank, causing an adverse effect on the Indian stock market. Capital flows were severely impacted because of the large withdrawals of capital from Indian markets, increasing from 3.1% in 2004-05 to 9.3% in 2007-08. Commodity prices, including oil, and overall food prices increased, causing WPI inflation to spike to 12.8% in 2008. To counteract the negative effects of the crisis, the RBI implemented three measures: tax relief to boost demand, increased public expenditure to create employment opportunities, and monetary easing to facilitate credit and finance (Bajpai, 2010). This period marked a slowdown in industrial and financial growth, resulting in a structural breakdown.

Economic growth collapsed in March 2020 to -24.4% due to the major shock caused by COVID-19, followed by a further decline of 7.4%. The overall contraction rate in India was 7.4% (in real terms), far exceeding the declines in other economies. GDP declined by 3.3% in emerging economies and 2.2% in developing economies (Dhingra & Ghatak, 2021). Major economic sectors, including agriculture, industry, and employment, were affected. 35% of the MSMEs closed due to the extended lockdown and lack of demand. 13 million people lost their jobs, causing high unemployment (Ramakumar & Kanitkar, 2021).

Unemployment rose from 7.9% to 12% during the second quarter of 2021, and individual income dropped by 40%. Due to high prices, the demand for essential commodities declined. “Consumer sentiments have been hit hard during the second wave” (Das, 2021), leading to a

shortage of aggregate demand. COVID-19 significantly affected the tourism and military sectors. According to IATO, these industries faced a loss of about 85 billion rupees due to travel restrictions (Upadhyay, 2021).

6.3.7 Short-run ARDL model with Dummies

A short-run aggregate analysis with the inclusion of two dummies was conducted to examine the relationship between macroeconomic variables in the crisis period.

Table 6.7 Short-Run Coefficients and ECM

Dependent Variable—GDP

Selected Model: ARDL(1, 0, 0, 0, 0, 1)

Variable	Coefficient	t-statistic	Prob
GDP (-1)	0.928	28.553	0.0000
M3	0.075	2.888	0.0068
CPI	-0.089	-2.099	0.0435
Interest R	-0.001	-1.115	0.2727
D1 (2008)	-0.046	-2.548	0.0156
D2 (2020)	-0.117	-6.261	0.0000
D2 (-1)	0.027	-1.538	0.1335
ECM (-1)	-0.071	-26.222	0.0000

The short-run findings shown in Table 6.7 revealed that lagged GDP had a strong impact on itself, suggesting that output dynamics were largely influenced by its past values. Similarly, M3 had a positive and significant impact on GDP, with a coefficient of 0.075 and statistically significant at the 5% level, reflecting the positive impact of monetary expansion on GDP during the shocks. Several studies in the literature suggested that monetary policy played an important role in countering the effects of COVID-19 by easing monetary conditions through large amounts of credit injections and reducing repo rates in March 2020 (Behera, Gunadi, & Rath, 2023) (Chakraborty & S, 2022).

The CPI coefficient (0.089) exhibited a negative and significant relationship with GDP, indicating that inflation during the uncertainty period created a contractionary influence on

GDP. Interest rates, however, exhibited a negative but insignificant relationship with GDP. The crisis dummy D1 (2008) also negatively impacted GDP, with a significant coefficient reflecting the global trends of output loss due to the financial crisis. In contrast, D2 (2020) was stronger and significant, highlighting a severe impact on India's economic growth. Lagged D2 had a positive but insignificant impact on GDP. Lastly, the ECM coefficient was negative and significant, indicating that deviations in GDP caused by shocks adjusted back towards equilibrium at the speed of only 7%, which can be expected due to slowdowns and uncertainties in the economy.

6.3.8 Jarque-Bera Normality Test

Figure 6.5 shows that the residuals were normally distributed, with a p-value of 0.98. The skewness and kurtosis statistics also confirmed that the residuals were normally distributed.

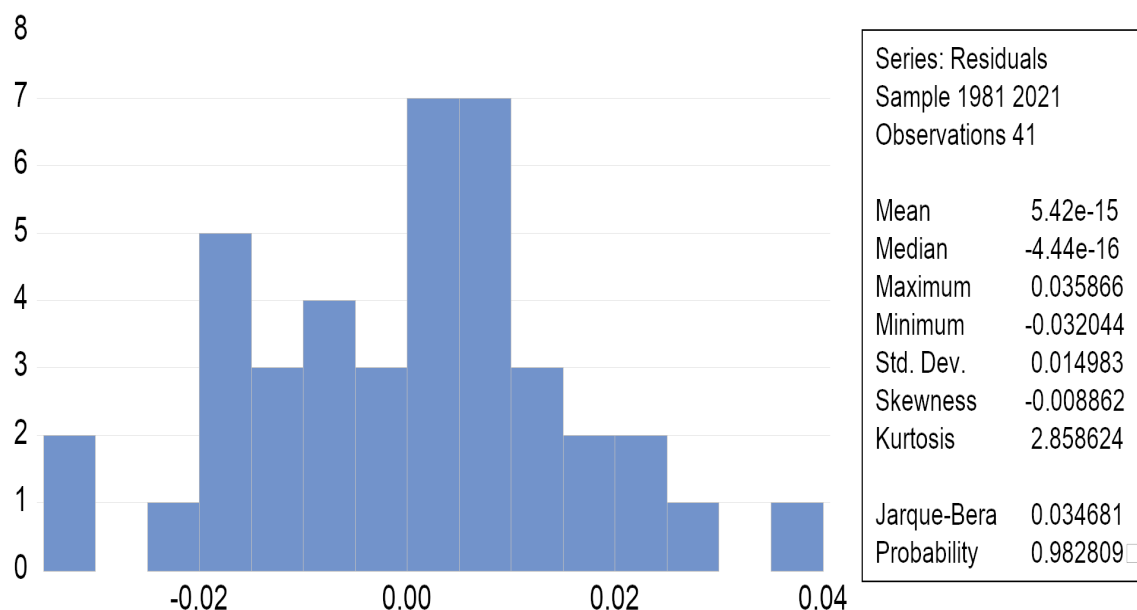


Figure 6.5 Residuals Normal Distribution

6.4 Conclusion

The study used the econometric ARDL method to explore the dynamics among GDP, M3, CPI, and interest rates during the annual period from 1980 to 2021. The data for GDP, M3, and interest rates were obtained from the report of the RBI Handbook of Statistics and the CPI Index 2015 from FRED. The findings imply that money supply is a key driver of economic growth in developing countries like India, aligning with the findings of (AlHarbi, Sbeiti, &

Ahmad, 2024); however, it depends on the economic conditions. The positive and consistently significant coefficient of M3 in both the short-run and long-run implies that higher liquidity in the economy influences growth. Inflation showed a detrimental impact on economic growth since high prices reduce purchasing power and aggregate demand. India's flexible inflation targeting, adopted in 2016 by the RBI, recommends a target of 4% and a tolerance band of 2%; above this, inflation can affect output. Therefore, this study suggests maintaining inflation under this limit. Moreover, interest rates were also negatively associated with growth; however, they had no significant impact. The ECM and bound tests confirmed the long-run relationship among the variables. Also, there was no problem of serial autocorrelation, and the model was well-established. Moreover, the results of the CUSUM test revealed that the graphs did not exceed the critical bound lines at a 5% significance level. This suggests that findings from this model were consistent and reliable. However, the CUSUM of squares test detected some instabilities, motivating us to explore the short-run effect of major economic crises on GDP.

To account for these breaks, the study incorporated two dummies for 2008 and 2020. Re-estimating the ARDL short-run model, the findings indicated a consistent positive influence of M3 on GDP, reflecting its linear effect on growth, with the coefficient improving, affirming the Keynesian perspective. In contrast, CPI continued to negatively impact GDP, supporting the idea that a rise in prices during shocks affects GDP. The dummies for both 2008 (D1) and 2020 (D2) exhibited a negative and significant impact on economic growth, supported by the macroeconomic trends. Importantly, the ECM was low, at 7%, reflecting that the economy takes time to return to the equilibrium path during the period of uncertainty. Furthermore, the JB test confirmed that residuals were normally distributed. The study findings align with the monetarists' view that changes in monetary variables influence real variables.

The only challenges any central bank faces are inflation and liquidity. RBI manages liquidity in the system using tools such as the continuous development of the call money market and reductions in the repo rate, reverse repo rate, cash reserve ratio, and statutory liquidity ratio to control the money supply. Therefore, the study suggests that managing M3 is essential for maintaining a stable GDP. Additionally, it's important to keep inflation and interest rates below the threshold level.

Chapter VII

STOCK MARKET DYNAMICS AND ECONOMIC ACTIVITY

7.1 Introduction

Financial development and economic growth are deeply interconnected. An efficient financial system, encompassing both money and capital markets, contributes to macroeconomic stability stabilizing and ensuring long-term growth, as suggested by (King & Levine, 1993). (Johnson, 1983) argued, “The stock markets are a complex of institutions and mechanisms through which funds for purposes longer than one year are pooled and made available to businesses, government, and individuals and through which instruments already outstanding are transferred”. A well-functioning stock market reflects investors’ positive confidence in future economic prospects and often serves as a predictor of real economic fluctuations and business cycles. According to (Fischer & Merton, 1984), stock market movements have historically preceded six out of the last ten recessions, indicating the potential role of the stock market in determining recessions. Consequently, the stock market is a leading indicator of real economic growth, reflecting investors' expectations regarding future corporate profits and earnings. Evidence from the historical crises suggests that the stock market exhibited an increasing trend while the real economy was in recession, predicting turning points in business cycles (Management, 2009). In the Indian context, the Bombay Stock Exchange (BSE), established in 1875, is Asia’s oldest stock exchange and among the ten oldest globally, with a market capitalization of \$1.7 trillion. The National Stock Exchange (NSE) was founded in 1992 in Mumbai and has a market capitalization of \$1.65 trillion with 2166 companies listed as of December 2023 (Mahajan, 2023). Given the central role in India’s financial system, both indices were incorporated to examine the linear and nonlinear dynamics between the stock market and real economic activity.

The Index of Industrial Production is widely recognized as a key indicator of business cycles. Previous studies have employed IIP to capture fluctuations in real economic activity (Chitre, 2001). Although the contribution of IIP to GDP has declined over time, it continues to play an important role in identifying cyclical variations in growth. Additionally, the availability of

monthly and quarterly data makes IIP suitable for assessing and forecasting economic conditions (Mohanty, Singh, & Jain, 2003). During periods of economic expansion, profits are expected to rise, accompanied by an increase in stock market prices. However, an economic slowdown triggers asset liquidation, causing a decline in stock market prices.

India's GDP growth rate started declining after 2017 from 8.17% to 7.17%; afterwards, it continued to experience a downward trend. The slowdown in growth further intensified due to the COVID-19 pandemic, declining to 4.43%, compared to around 7% in the pre-pandemic (Surya, 2024). The stock market also witnessed a downturn during this period. Periods of crisis are generally associated with low investments, as consumers feel fear of declining economic activity, dampening their confidence. However, (Shankar & Dubey, 2021) reported a positive effect of crisis conditions on trading volume due to low market fluctuations. The stock market emerged as a hotspot for investors due to the low prices and the expectations of high future returns. Additionally, (Schrunk, 2024) highlighted the significant role of expansionary monetary policy and changes in interest rates during the COVID-19 pandemic.

(Meshram & Jadhav, 2020) asserted that the stock market played an important role in the overall development of the economy. The developed capital market provides access to global funds. It provides a platform for investors interested in buying and selling listed securities. By reducing interest rates, the demand for money increases, and investors invest in the economy, which causes stock prices to increase. The financial crisis of 2008 increased the volatility of the stock market due to global trends (Mandal & Bhattacharjee, 2012). This highlights the importance of analyzing the effects of the global market on Indian financial markets. Hence, the study incorporated crude oil prices as a global indicator to investigate the impact of global volatility on the Indian economy.

7.2 Objective and Hypotheses:

The following objective is addressed in this chapter:

O₃: To examine the relationship between the combined market capitalization of NSE and BSE and India's economic growth.

The related hypotheses are

H_{3a}: There is no significant long-run relationship between combined stock market capitalization and economic growth.

H_{3b}: Crude oil has no significant impact on India's economic growth.

H_{3c}: COVID-19 has no significant short-run and long-run impact on economic growth.

H_{3d}: There is no nonlinear relationship between market capitalization and economic growth.

7.3 Data and Variables

The monthly data on the stock market capitalization (BSE and NSE) and growth indicator (IIP) were sourced from the RBI "Handbook of Indian Economy". The data on the global indicator crude oil were obtained from the International Monetary Fund (IMF), from April 1996 to December 2021. The General Index of Industrial Production (IIP) was employed as a proxy for GDP because of the unavailability of GDP monthly data. IIP captures the growth of industrial output and, therefore, serves as a leading indicator for real economic activity. The IIP in the pre-independence era was released by the Central Statistical Organization as a monthly series in 1931, and is now released by the Ministry of Statistics and Programme Implementation (MoSPI), through its National Statistics Office (NSO). IIP reflects sudden changes and fluctuations in electricity, manufacturing and mining, capturing the shifts in the demand and supply chain (Vatsa, Basent, Mixon Jr, & Upadhyaya, 2024). Researchers have widely used IIP to study the short-run dynamics, business cycles, investment decisions and policy impact (Avyukt, 2018). Additionally, crude oil was used to investigate whether global shocks have a transmission effect on India's growth.

The total market capitalization was derived by aggregating the market capitalization of BSE and NSE. Given the high-frequency data, dummies were introduced to capture the effect of the dot-com bubble burst, the global financial crisis, and COVID-19, which was quite evident. Moreover, the threshold regression was included to examine whether the relationship between the Indian stock market and economic growth changes across different regimes.

If the month is March 2001, then $D1 = 1$.

and 0 otherwise,

If the month is October 2008, then $D2 = 1$.

and 0 otherwise,

If the month is April 2020, then $D3 = 1$.

and 0 otherwise,

These monthly dummies were incorporated, keeping in mind the economic shocks given their adverse impact on India's economic growth during that particular month.

7.4 Empirical Results and Discussion

This section examines the relationship between the total market capitalization and economic growth. Additionally, this also presents the findings of threshold regression capturing the nonlinear regimes of the stock market and output relationship.

7.4.1 Unit Root Test

The unit root test presented in Table 7.1 employed the ADF and PP tests. The results revealed that the variables were I(0) and I(1), indicating mixed order of integration.

Table 7.1 Unit Root Test Results

Augmented Dickey-Fuller*					
Variables	Level		1st Difference		Order of Integration
	Constant	Constant & Trend	Constant	Constant & Trend	
IIP	-1.528	-0.955	-5.965***	-6.119***	I(1)
Market Cap	-0.311	-2.368	-15.808***	-15.785***	I(1)
Crude oil	-2.019	-2.350	-13.075***	-13.064***	I(1)
Phillips-Perron					
Variables	Level		1st Difference		
	Constant	Constant & Trend	Constant	Constant & Trend	
IIP	-1.305	-5.991***	-54.114***	-71.839***	I(0)
Market Cap	-0.239	-2.564	-15.868***	-15.847***	I(1)
Crude oil	-1.734	-1.963	-12.809***	-12.793***	I(1)

Note: ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

According to the ADF test, all variables were I(1); they were stationary in first differences. However, the PP test revealed that the total market capitalization was stationary at both levels and in first differences. At the same time, the other variables remained stationary in first differences, supporting the use of the ARDL model.

7.4.2 ARDL Model

The study employed the ARDL model to determine the dynamics among IIP, total market capitalization, and crude oil. Given the monthly analysis, 4 lags were used to capture the relationship and delayed impact of the stock market on industrial production. With the presence of structural shocks, the dummies were also included to capture their short-run and long-run effect on industrial output.

Table 7.2 Short-Run Coefficients and ECM

Dependent Variable—IIP

Selected Model: ARDL (4, 0, 2, 1, 0, 3)

Variable	Coefficient	t-statistic	Prob
IIP(-1)	0.268	4.782	0.0000
IIP (-2)	0.452	8.066	0.0000
IIP (-3)	0.249	4.303	0.0000
IIP (-4)	-0.145	-3.378	0.0008
Market Cap	0.052	4.739	0.0000
Crude oil	0.044	1.545	0.1231
Crude oil (-1)	-0.109	-2.364	0.0187
Crude oil (-2)	0.070	2.327	0.0206
D1	0.051	1.190	0.2349
D1 (-1)	-0.062	-1.434	0.1525
D2	0.033	0.765	0.4447
D3	-0.888	-19.110	0.0000
D3 (-1)	-0.095	-1.446	0.1490
D3 (-2)	0.348	5.597	0.0000
D3 (-3)	0.337	5.577	0.0000
ECM (-1)	-0.175	-5.906	0.0000

R-squared 0.9897
Adjusted R-squared 0.9891
F-statistics 1856.4
Prob (F-statistics) 0.0000

The results reported in Table 7.2 demonstrated a consistent positive relationship between current output and its own lagged values up to 3 lags, with coefficients statistically significant at the 1% level. However, the coefficient at lag 4 became negative but still significant, indicating that lagged industrial output influenced current IIP, followed by moderation. Similarly, total market capitalization and IIP exhibited a positive relationship; the coefficient was significant at the 1% level, indicating IIP's positive response to stock market conditions. Furthermore, crude oil had no immediate effect on IIP, while its lag had a negative and significant effect on IIP. Moreover, crude oil at lag 3 turned positive and significant, reflecting cost-push pressures followed by production adjustments. However, no significant impact of the dot-com bubble burst, D1, was found on IIP, indicating no short-run delayed impact as well.

Similarly, the global financial crisis D2 had no significant impact on IIP, implying Indian economic activity remained unaffected by the crisis. However, a significant impact was observed in the stock market, with the Sensex declining by 1408 points, or 7.45%, during the financial crisis. In contrast, COVID-19 severely impacted output, also confirmed by the negative value of D3. It caused a sharp decline in IIP from 51.8 in March to 27.4 in April, the sharpest decline in India's industrial history (Varghese & Chandramana, 2022). This collapse, however, was short-lived, followed by a recovery. The recovery was captured through the lag 2 and 3, which were statistically significant and positive. These lagged dummies allowed us to capture the transmission effects of these shocks over several months.

Finally, the ECM confirmed the long-run and cointegrating relationship between IIP, the stock market, crude oil and dummy variables. The coefficient of the ECM (-0.175) was negative and statistically significant at the 1% level, indicating that after a short-run disequilibrium, the economy returned to long-run equilibrium at the rate of 17%, confirming a long-run relationship among the variables. The model demonstrated goodness of fit with an adjusted R-squared of 0.9891. Moreover, the F-statistic of 1856.4 also confirmed that the model was stable with a statistically significant p-value.

The long-run findings in Table 7.3 revealed that total market capitalization positively and significantly influenced IIP; with a one-unit increase in total market capitalization, IIP

increased by 0.300 units. This indicates a strong long-run relationship between the stock market and output, aligning with the results of (Mohanty & Roy, 2023).

Table 7.3 Long-Run Coefficients

Dependent variable: IIP

Variables	Coefficient	t-statistics	p-value
Market Cap	0.300	16.501	0.0000
Crude oil	0.032	0.858	0.3911
D1	-0.060	-0.171	0.8638
D2	0.192	0.763	0.4455
D3	-1.694	-2.643	0.0087
C	4.280	29.242	0.0000

However, crude oil had no significant long-run impact on India's output (Ingole, 2023). Additionally, there was no evidence of a significant impact of the dot-com and financial crises on IIP. However, a strong negative effect of COVID-19 was observed, justifying the large coefficient.

Table 7.4 ARDL Bound Test

F- Bounds Test		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Significance	I (0)	I (1)
		Asymptotic: n= 1000		
F- statistic	4.882	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	305	Finite Sample: n= 80		
		10%	2.303	3.154
		5%	2.55	3.606
		1%	3.351	4.587

The bounds test was conducted to confirm the existence of a long-run relationship among the variables. The results in Table 7.4 revealed that the F-statistic of 4.882 exceeded the upper limit

at all significance levels. Hence, the null hypothesis of no cointegration was rejected, confirming the existence of a long-run stable relationship between IIP and all the selected explanatory variables.

7.4.3 Residual Diagnostic Tests

Several diagnostic and stability tests were performed to ensure the robustness and reliability of the ARDL findings.

Serial LM Correlation test

The calculated p-value for both the F-statistic (0.630) and the observed R-squared (1.335) was higher than 0.05, as presented in Table 7.5. Thereby rejecting the alternative hypothesis and confirming that there was no autocorrelation up to 2 lags.

Table 7.5 Breusch-Godfrey Serial Correlation LM Test

Null hypothesis: No serial correlation at up to 2 lags		
Alternate Hypothesis: Serial correlation up to 2 lags		
Statistics	Coefficient	p-value
F-statistic	0.630	0.5329
Obs*R-squared	1.335	0.5130

Breusch-Pagan-Godfrey Heteroskedasticity Test

The results displayed in Table 7.6 indicate that the p-values of the F-statistic and observed R-squared were statistically insignificant.

Table 7.6 Breusch-Pagan-Godfrey Heteroskedasticity Results

Null hypothesis: Homoskedasticity		
Alternate hypothesis: Heteroskedasticity		
Statistics	Coefficient	p-value
F-statistic	0.594	0.8790
Obs*R-squared	9.122	0.8710
Scaled explained SS	10.344	0.7979

The findings indicated that no heteroskedasticity was present in the model, and residual variance remained constant. Moreover, the p-value of scaled SS was also insignificant. Thereby, the finding failed to reject the null hypothesis of homoscedasticity, suggesting that the residuals were homoscedastic.

Jarque-Bera Normality Test

The Jarque-Bera test was employed to examine the nature of the distribution of the variable's values, as shown in Figure 7.1.

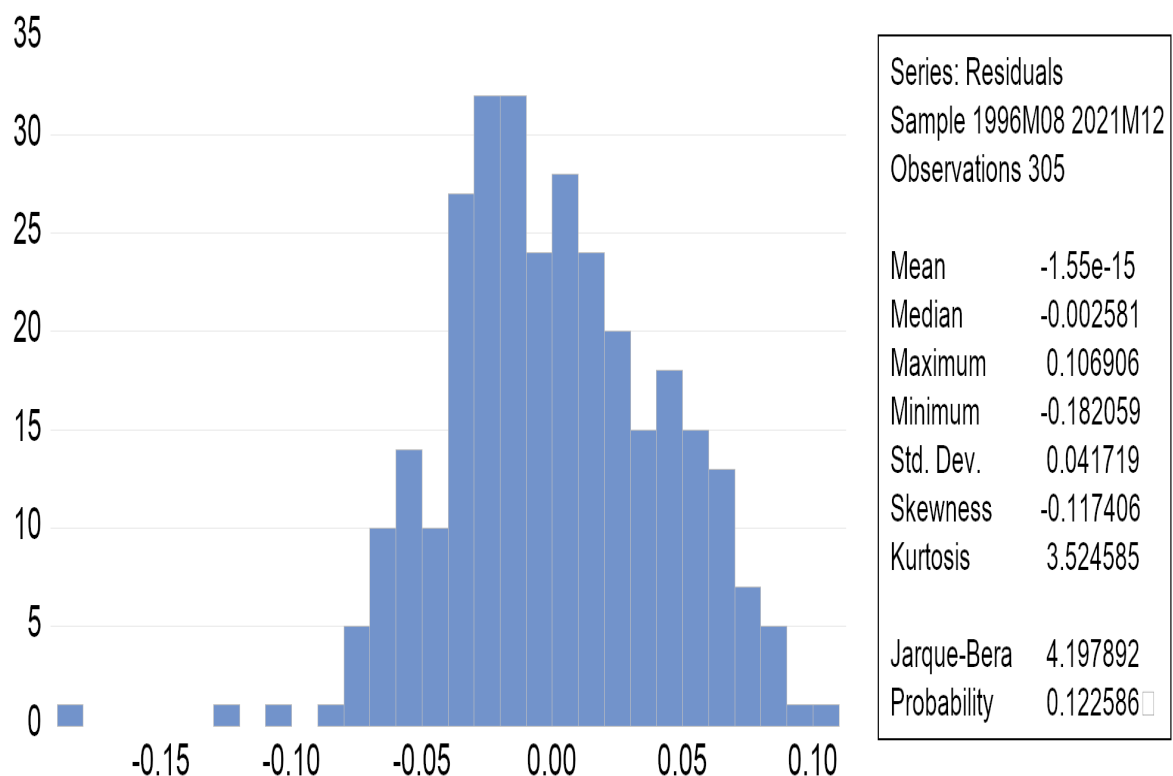


Figure 7.1 Residuals Normal Distribution

The JB statistic of 4.197 confirmed that the data were normally distributed, with the p-value statistically insignificant. This was further supported by skewness (-0.117), indicating slightly left-skewed residuals. Similarly, a kurtosis of 3.524, slightly greater than 3, suggested slightly heavier tails, confirming that the model was free of outliers. Overall, the findings confirmed that the residuals were normally distributed.

7.4.4 Stability Tests

To examine the stability of the model, the CUSUM and CUSUM square tests were employed.

CUSUM test

H_0 : There is no structural change in the parameters.

H_1 : There is a structural change in the parameters.

Figure 7.2 shows that the CUSUM line remained between the two critical lines at a 5% significance level, indicating that the null hypothesis of stable parameters couldn't be rejected, confirming the stability of the ARDL model. This further validates the findings of the estimated short-run and long-run ARDL.

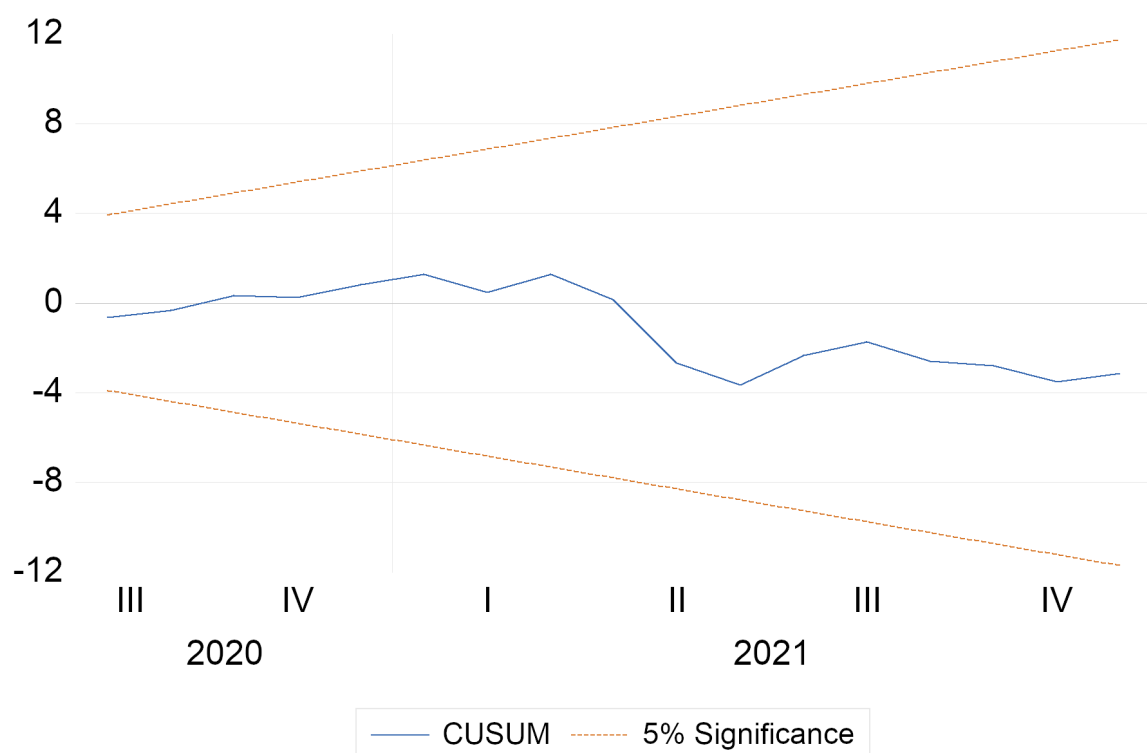


Figure 7.2 CUSUM Test

As indicated in Figure 7.3, the CUSUMQ line remained within the upper and lower critical bounds, ensuring the stability of the model. However, the results were concentrated over the period 2020-2021, due to the monthly data. This period was mainly affected by COVID-19, but the inclusion of a dummy variable significantly captures its impact on IIP. These structural breaks and dummies were appropriately captured in their impact on output, ensuring the reliability of the model. The stability in the CUSUM and CUSUMQ tests confirmed that the model performed in a stable way, adjusting for these shocks.

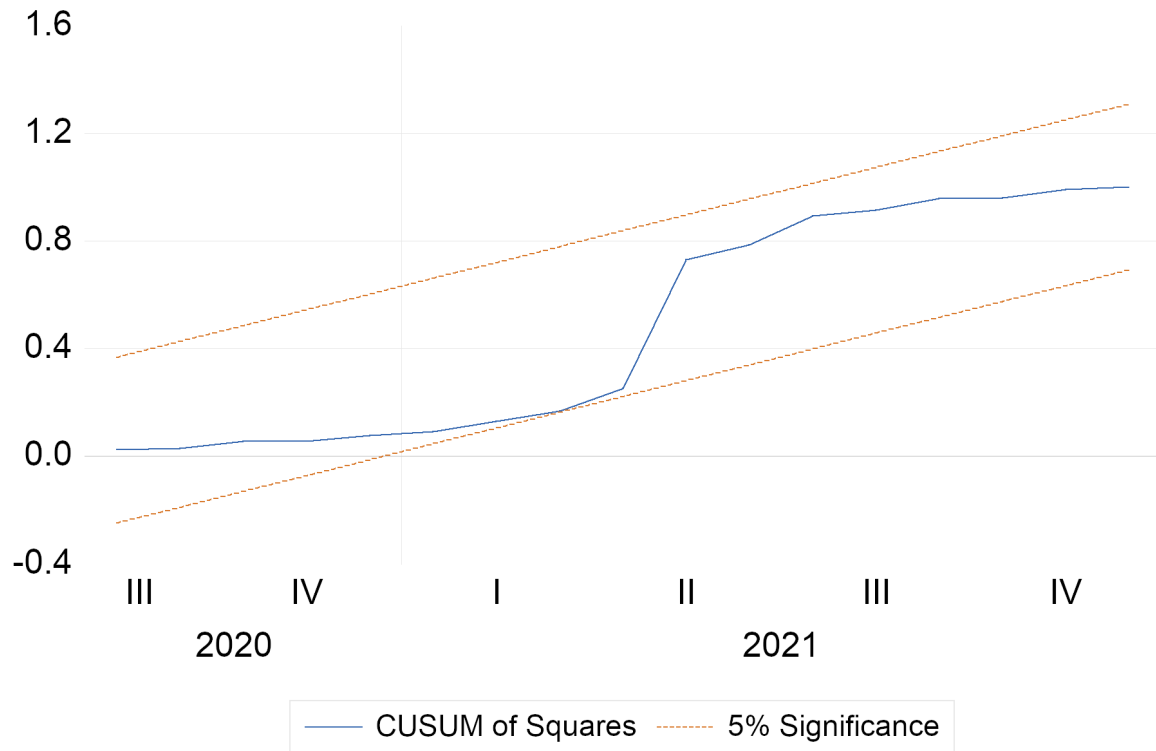


Figure 7.3 CUSUMQ Test

While the ARDL model captured the short-run and long-run dynamics between the stock market and economic activity under the assumption of a constant economic state, financial markets are often volatile in nature, and the stock market growth relationship tends to vary across regimes. To understand these dynamics, the study further employed the Threshold Regression model.

7.4.5 Threshold Regression

The switching regression model allows parameters to change depending on the regime, capturing non-linear behavior. (Hansen, 1999) argued that such models are commonly applied in economics because the real economy and financial markets interact nonlinearly due to investors' sentiments, liquidity constraints and regime-dependent behavior. Building on this regime-dependent relationship, (Bhattacharya & Bhattacharya, 2022) showed that the relationship between the stock market and macroeconomic indicators is not consistent across market conditions. Motivated by these insights, this study incorporated a discrete threshold regression model, which simply divides the sample into distinct regimes based on whether the threshold variable crosses an unknown threshold value. This model allowed the study to

examine the impact of the stock market on IIP across the distinct periods of low and high fluctuations.

Table 7.7 Threshold Regression Estimates

Variables	Coefficients	Std. Error	P-value
Market Cap < 11698.76			
Market Cap	4.79E-05	1.42E-05	0.0008
C	3.2742	0.1334	0.0000
11698.76 <= Market Cap < 22016.76			
Market Cap	7.35E-06	4.33E-06	0.0909
C	3.7890	0.0661	0.0000
22016.76 <= Market Cap < 81466.53			
Market Cap	7.17E-06	4.92E-06	0.0000
C	3.9013	0.0179	0.0000
81466.53 <= Market Cap < 146930.1			
Market Cap	3.93E-06	4.28E-07	0.0000
C	4.1112	0.0511	0.0000
146930.1 <= Market Cap < 275389.3			
Market Cap	-4.26E-07	1.05E-06	0.6853
C	4.8197	0.2018	0.0000
275389.3 <= Market Cap			
Market Cap	1.12E-07	9.51E-08	0.2414
C	4.8221	0.0337	0.0000

R-squared 0.9607

Adjusted R-squared 0.9592

Log likelihood 331.8539

F-stat 0.0000

A threshold regression was used to identify a threshold range for market capitalization and its effect on IIP, as shown in Table 7.7. The results revealed six different regimes where IIP responded to market capitalization in varying ways. In the low market capitalization regime, IIP responded positively and significantly to increased stock market returns. After a slight increase in market capitalization, the IIP coefficient increased significantly but then became

insignificant. When the market reached a moderate size, the impact became strong and significant. Furthermore, as the market size expanded substantially, the impact remained positive and significant, though it was low in magnitude. However, in the high market capitalization regime, fluctuations in the stock market did not lead to meaningful changes in industrial output. At the highest regime, the coefficient turned positive but remained insignificant. The findings imply that the stock market impacts IIP when its size is relatively small, and as the size expands, this influence becomes stronger but eventually fades out at a very high level of market capitalization due to high volatility and investor sentiment.

7.5 Conclusion

The dynamic nature of the financial market highlights its sensitivity to booms and busts. The financial crisis of 2008 and the recent COVID-19 pandemic have made it essential to examine both the linear and nonlinear relationship between the Indian stock market and real activity (IIP). Subsequently, three dummy variables were introduced to capture the effects of the dot-com bubble burst (D1), the financial crisis (D2) and COVID-19 (D3). This study used high-frequency monthly data from April 1996 to December 2021. The linear relationship was analyzed with an ARDL model, using 4 lags, which revealed a significant short-run relationship between the stock market and IIP, reflecting the positive impact of the stock market on IIP. In contrast, IIP was largely explained by its past values. Crude oil exhibited a mixed relationship: it exerted a negative effect at lag 1, while showing a positive effect at lag 2. Regarding structural shocks, D1 and D2 were insignificant, whereas D3 had a strong short- and long-run negative impact on IIP. The long-run estimates confirmed the persistent positive influence of the stock market on IIP, while crude oil had no lasting effect. The ECM and bound tests verified a valid long-run relationship among the variables. The diagnostic tests confirmed that the model was free from autocorrelation and heteroskedasticity, indicating well-behaved residuals. Moreover, the residuals were normally distributed. The CUSUM and CUSUMQ tests confirmed the model's stability; variance instability was absorbed by including dummy variables. The threshold regression also confirmed the positive and significant relationship between IIP and market capitalization; low growth rates were associated with higher industrial output, and gradually the effect declined as the market size expanded. These findings highlight the non-linear and regime-specific interactions between the financial market and the real economy.

Chapter VIII

EXAMINING THE FINANCIAL CYCLES IN INDIA

8.1 Introduction

The method of estimating the business cycle and implementing a policy framework for monitoring and controlling GDP fluctuations is a well-established practice conducted by various international agencies. However, the examination of the financial cycle and its influence on the economy gained policymakers' attention after the 2008 financial crisis. Business cycles analyze the economy's condition from the expansionary to the contractionary phase. The expansion phase is marked by increased economic activity and high growth rates. Contraction phases see a slowdown in economic activity. In contrast, financial cycles involve growth in asset prices and credit. As proposed by (Borio C. , 2012), "self-reinforcing interactions between perceptions of value and risk, attitude towards risk, and financing constraints, which translate into booms followed by busts." Financial cycles relate to trends in indicators such as bank credit, credit-to-GDP ratio, equity prices, effective exchange rate, and asset prices. Movements in stock, bond, and foreign exchange markets are influenced by a combination of various economic factors such as policies, government interventions, speculation, and expectations about future conditions. The credit-to-GDP ratio's deviation from its long-term trend serves as an early warning indicator for financial crises. The large gaps signal a bank crisis or disruptions (Szemere, 2016).

Hyman Minsky, in his "financial instability hypothesis," defined three stages of financial instability. During the period of Hedge, cash flows are sufficient to repay the debt and interest, commonly known as the recovery stage. Recovery leads to increased credit demand, asset price booms, and increased national income, causing firms to depend more on external sources for capital formation and ultimately increasing the debt burden. To avoid these burdens, firms borrow additional funds, defining this as the speculative stage. Finally, during the Ponzi stage, firms are unable to meet both the interest and principal amounts, causing increased debt burden, financial stress, asset liquidation, and declining asset prices, which results in a recession. A credit rise stimulates the demand for houses, causing asset price growth. As a result, increased mortgage values reduce demand, reversing the process. These self-reinforcing interactions

cause disruptions. (Borio & Disyatat, 2011) discussed a 'policy drift,' where a prolonged period of low-interest rates encourages borrowing and subsequent demand for money, which results in increased prices of houses, shares, and other assets, causing financial stress and obligations.

The key differences between business and financial cycles are, first, that financial cycles explain the expansions and contractions in the financial markets, while business cycles represent the fluctuations in real economic activity. Second, financial cycles tend to be more volatile than business cycles and larger in amplitude. Third, the length of the cycle varies between 8 and 20 years or so. Fourth, the business cycle does not drive financial cycles, but only during the period of booms, busts, and disruptions (Filardo, Lombardi, & Raczko, 2019). These features should not be interpreted as suggesting any absence or weak relationship between financial cycles and business cycles. The empirical literature has produced mixed results, with some supporting the positive relationship.

Several studies have contributed to the empirical study of financial cycles. (Behra & Sharma, 2019) explored the interactions between financial cycles and non-performing assets to examine uncertainties. There was a rise in non-performing assets (NPA). As of March 31, 2018, the total volume of gross NPA in the economy stood at Rs 10.35 lakh crores. About 85% of these NPAs were from loans and advances of public sector banks. NPAs of banks had expanded from 2.3% of total loans in 2008 to 9.3% in 2017, with it standing at 8.2% in March 2020. According to ICRA, gross and net NPAs were expected to increase to 10.1-10.6% and 3.1-3.2%, respectively, by March 2021. Simultaneously, there was a decline in GDP at (2011-12) prices from 8.17% to 7.17% in 2017, then 6.12% in 2018 and 4.5% in Q2 (2019-20) from 5% in Q1. The GDP for the entire financial year (2020-21) contracted by 8%, marking a historic downturn in the Indian economy, attributed to the nationwide lockdown in response to the COVID-19 pandemic (Paul, 2018).

Besides credit and money supply, capital formation also contributes significantly to economic stability and financial development. Gross capital formation refers to the additional fixed assets, like plants, machinery, roads, railways, infrastructure, schools, hospitals, and commercial and industrial buildings. It also includes net changes in the level of inventories in the economy. (Kendrick, 1961), (Kuznets, 1965), and (Solow, 1957) argued that capital formation, technical progress, and labor are the three main sources of economic growth. Increased GFCF encourages more employment opportunities and enhanced economic growth. There has been a persistent decline in GFCF as a percentage of GDP since the 2008 crisis.

According to the World Bank, in 2020, India's GFCF accounted for 28.1% of GDP and 29% in fiscal year 2021, indicating a gradual recovery post-COVID. These uncertainties drew attention to examining the interactions between business and financial cycles, while incorporating important macroeconomic indicators such as investment and the broad money supply. To further examine these interactions, a Structural Vector Autoregression (SVAR) framework was applied to capture the structural dynamics among credit, investment and business cycles.

The paper's structure is as follows: Section 8.2 presents the objectives and hypotheses addressed in this chapter. Section 8.3 presents the data and variables utilized. Section 8.4 presents the findings obtained from the estimation, followed by conclusions in Section 8.5.

8.2 Objective and Hypotheses

The following objective is addressed in this chapter:

O₄: To examine the existence of financial cycles in India and their relationship with business cycles.

The related hypotheses are

H_{4a}: Financial cycles measured through non-food gross bank credit (NFGBC), credit-to-GDP ratio, and construction GDP (house prices proxy) do not exhibit cyclical components.

H_{4b}: The financial cycles do not differ significantly in duration or amplitude from business cycles.

H_{4c}: Credit cycles are not synchronized with business cycles.

H_{4d}: Credit cycles do not lead business cycles.

H_{4e}: There is no structural relationship among credit, investment and business cycles.

8.3 Data and variables

This study was conducted utilizing annual data spanning from 1980 to 2021 at the aggregate level. Non-food credit (NFGBC), which represents credit extended to agriculture, industry, services, and personal loans, as well as its impact on economic growth (GDP), was examined as a primary indicator to analyze the interactions between credit and the business cycle. Other financial indicators suggested in the literature, such as (a) the credit-to-GDP ratio, which indicates the proportion of credit relative to the size of the economy, and (b) construction GDP

to represent the fluctuations in house prices, the annual data on the house price index was not available; however, it showed a strong positive relationship with the quarterly index available (Behra & Sharma, 2019). To capture potential synchronization credit-business, the study additionally incorporated various macroeconomic factors as relevant indicators, like (c) broad money (M3) as a proxy of money supply in the economy: as changes in money supply influence credit availability and economic growth, and (d) gross fixed capital formation (GFCF) to capture investment activity; a higher level of investment indicates increased demand for credit and potential economic growth. The annual data employed in this study were collected from the World Bank database and the RBI.

Investment cycles play a crucial role in India for understanding credit cycles and business cycles, as they reflect fluctuations in economic activity and serve as key drivers of growth. Food credit and non-food credit are widely used to measure credit expansion in the economy, with non-food credit representing credit to various sectors; therefore, it is considered a proxy for the credit cycle (Banerjee, 2011) (Saini, Ahmad, & Bekiros, 2021). GDP represented the business cycle (Thomson & Vuuren, 2016). Nominal GDP was used to calculate the credit-to-GDP ratio to ensure consistency with credit, as both were adjusted for inflation, following the suggestion by the BIS. Economic turning points were identified through peaks and troughs, indicating the highest and lowest levels of economic activity achievable under current economic conditions (Jonung & Fregert, 2010). GFCF was employed to capture long-term trends and cyclical movements in investment.

8.4 Empirical Results and Discussions

This section characterizes the financial indicators and macroeconomic variable cycles derived using the Hodrick-Prescott filter and financial and business cycle interactions to examine if the fluctuation in financial indicators predict downturns in economic growth. The HP filter decomposes the series into trend (long-term) and cyclical component (short-term movements).

8.4.1 Characteristics of cycles

The graphs present the characteristics of cycles, including the number of peaks, troughs, cycle duration, the longest cycles (peak to peak or trough to trough), all the major events that happened and their amplitude (magnitude of deviation from trend) and the slope (if expansions

or contractions have a steeper slope). This study employed $\lambda=100$, as suggested for an annual data (Backus & Patrick, 1992).

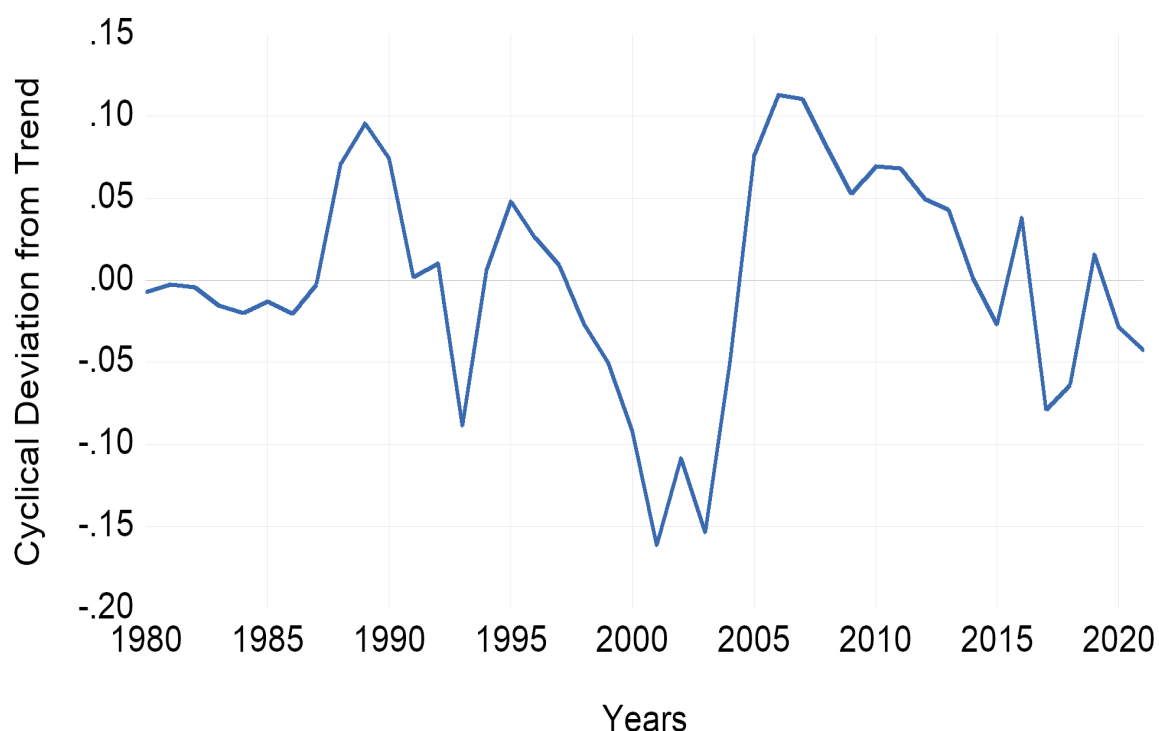


Figure 8.1 Non-Food Gross Bank Credit (NFGBC) Cycles

It was observed that during the period, NFGBC exhibited 8 peaks and 8 troughs, corresponding to 7 expansions and 7 contractions, as displayed in Figure 8.1. The longest cycle lasted for 10 years, from 2006 to 2016 (peak to peak). Initially, NFGBC experienced a continuous decline until 1985. In 1990, there was an increase in credit linked to an early phase of financial reforms and increased investment activities. However, there was a significant decline in NFGBC in 1993, which could be due to the tightening of monetary policy or a policy change.

The post-1990 period marked a significant economic slowdown, resulting in a rise in NPAs within the banking sector. The largest cycle with a high amplitude of 0.2093 was observed, indicating a sharp decline between the years 1995 and 2001. The total bank credit increased by 14.6% in 2003-04 and approximately 15% of GDP between 2003 and 2007 (Shah, 2015). RBI introduced an inflexible exchange rate, which caused a decline in the interest rate level (Zeileis, Shah, & Patnaik, 2010), causing a credit boom in the economy.

Similarly, an amplitude of 0.2744 between 2003 and 2006 reflected significant expansion; both expansion and contraction exhibited significant fluctuations. Interestingly, during the 2007

global financial crisis, NFGBC exhibited a sustained decline. While a peak was observed in 2016, there was a growth of 8.6% in April, possibly because of increased demand, as there was a cut in the repo rate to 6.50% from 6.75% and further to 6.25% in 2016. However, the increase was followed by a sharp decline to 3.3% in 2017, which was the lowest in the last decade (Bureau, 2017).

Furthermore, demonetization and COVID-19 caused a sharp decline as well. The NFGBC growth declined to 6% in 2019-20 from 13% in 2018-19. However, it was a short-lived collapse followed by a quick recovery with an average growth of 8.7% in 2021-22 (RBI, 2020). Notably, the expansions had a steeper slope than the contractions, indicating that expansions grew more than contractions, which aligns with a typical feature of financial cycles.

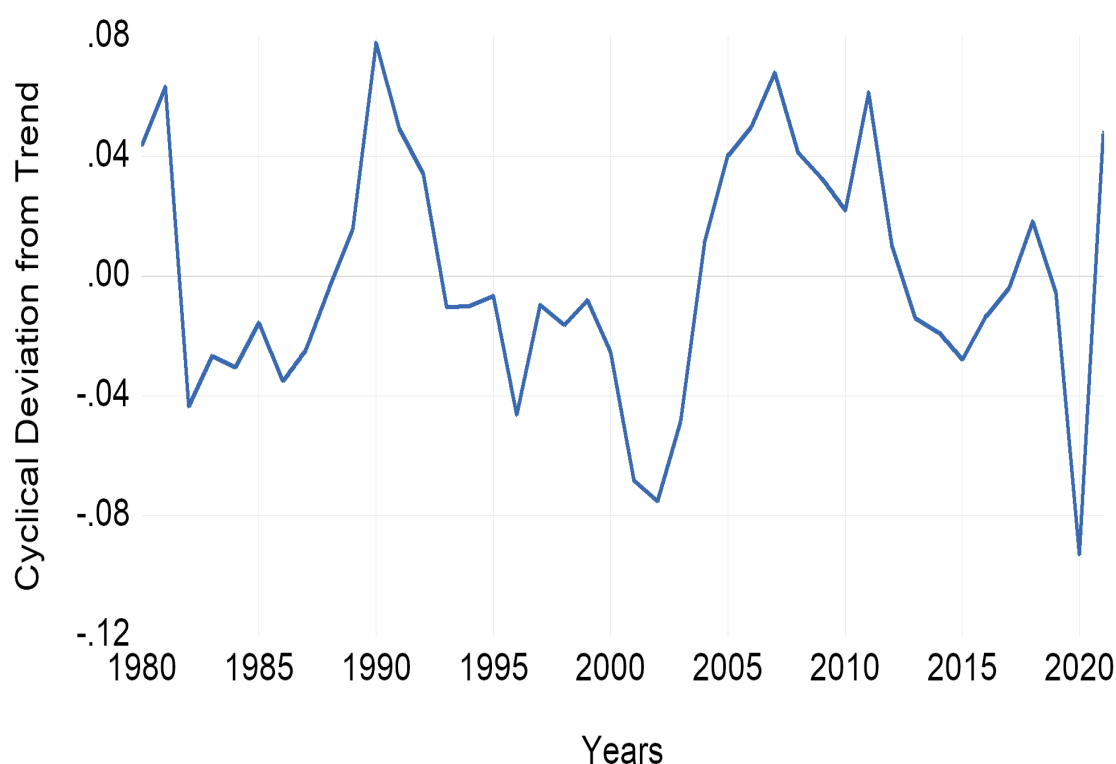


Figure 8.2 House Price Cycles

Over the years, house prices, proxied by construction GDP, displayed 7 peaks and 9 troughs, a complete cycle, along with 6 expansions and 6 contractions as outlined in Figure 8.2. The real estate market experienced negative growth in the 1980s and 1990s due to low demand for houses, particularly due to bureaucracy, high interest rates, and the land tenure system. The real estate market picked up only after the financial reform in 1991, and even the highest peak occurred in 1991 as well, when the credit boom boosted the economy and property prices went up before declining due to the BOP crisis. Post-crisis, it started to rebound, followed by a

gradual decline. The longest cycle (peak to peak) in construction GDP was observed for 17 years, between 1990 and 2007. The most significant expansion occurred between the years 2002 and 2007, with an amplitude of 0.148.

However, the largest contraction occurred between 2018 and 2020, with an amplitude of 0.1113. Finally, the contractions had a steeper slope than the expansions, reflecting real estate market sensitivity to the shocks.

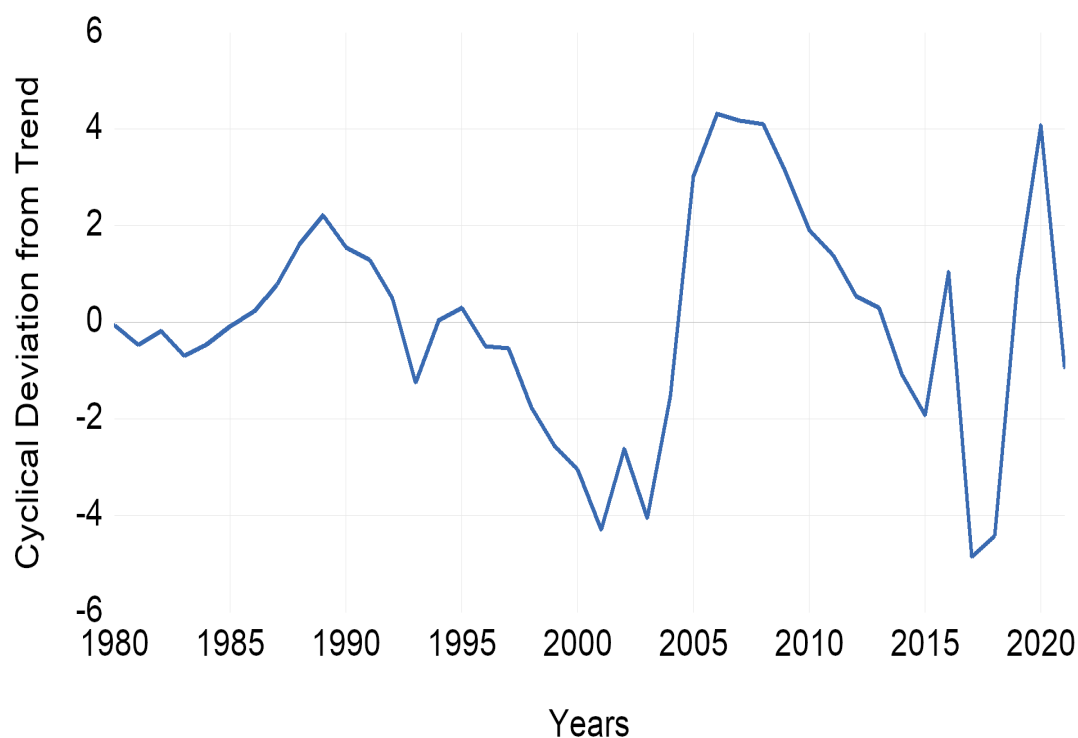


Figure 8.3 Credit-to-GDP Ratio (CGR) Cycles

The cyclical component of the credit-to-GDP ratio, as shown in Figure 8.3, exhibited 7 peaks and 7 troughs, along with 7 expansions and 6 contractions. The peaks indicated the phase of excessive credit growth relative to GDP, a period of credit expansion. The trough reflected the period of economic distress; the credit-to-GDP ratio was lower. The average peak-to-peak cycle was nearly 6 years; however, the longest cycle was observed between the period 2006 and 2016, lasting for 10 years. This period marked a continued decline in the ratio post the financial crisis, where credit declined disproportionately to GDP. Also, with the rise in NPAs in 2012, particularly in public sector banks, there was a sharp decline in banking credit. The contraction phases exhibited an amplitude of -6.2% from 2006 to 2015, indicating a significant decline.

Notably, the most significant expansion occurred during the period 2017 to 2020, with a high amplitude of 9.0%, possibly due to stabilization after demonetization and a push in bank credit, reflecting the positive impact of improved financial conditions on economic activity, particularly during the period of instability. A sharp contraction occurred in 2020 due to COVID-19. Moreover, the slope revealed steeper expansions than contractions. These cycles illustrate that credit moves in a wave-like manner; more credit can lead to inflationary pressures, and less credit can affect economic growth.

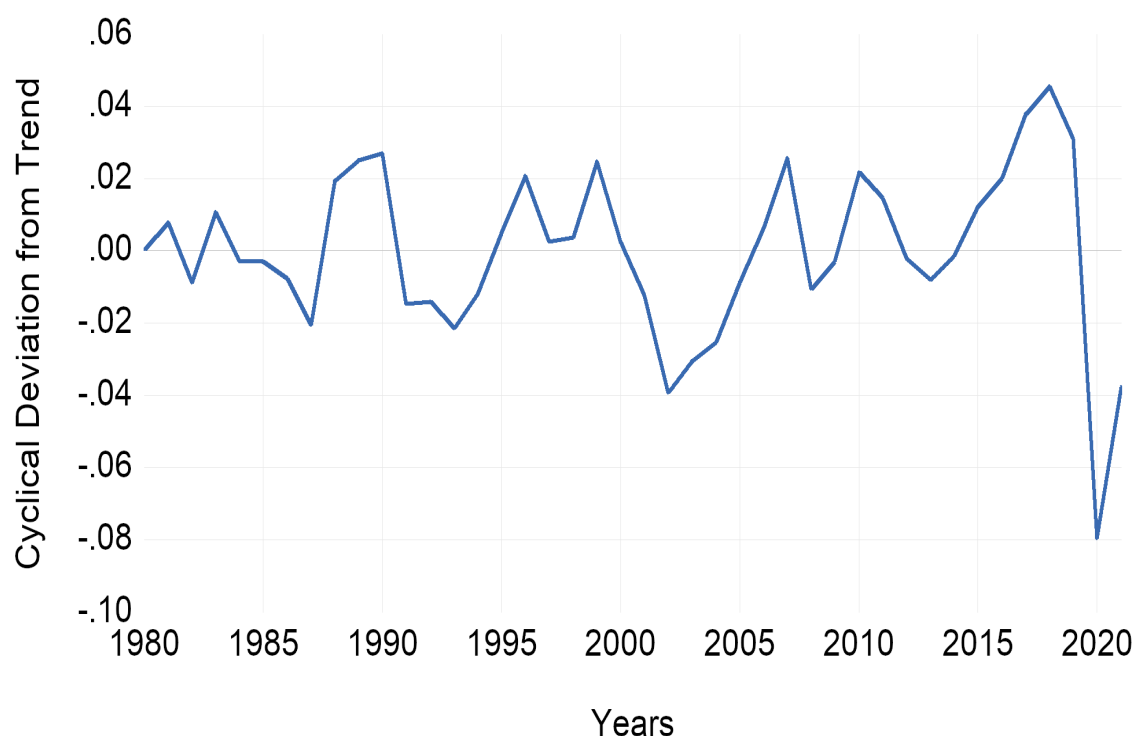


Figure 8.4 Gross Domestic Product (GDP) Cycles

Figure 8.4 indicates that over the sample period, GDP showed 9 peaks and 9 troughs, a complete business cycle, corresponding to 8 expansions from trough to peak and 9 contractions from peak to trough. According to the economic survey of 1998-99, the slowdown in GDP growth in 1998 was due to the decline in agricultural growth, contracting to 1.0% after 9.6% in 1996. Additionally, the longest cycles in GDP lasted over 8 years (peak-to-peak) between 2010 and 2018, with an average business cycle of 4.63 years. The most significant downturn in GDP occurred in 1991, attributed to the BOP crisis, when the Government of India faced challenges in servicing external debt due to a decline in foreign exchange reserves. The decrease in global economic growth between 2000 and 2005 was linked to events such as terrorist attacks, the collapse of the dot-com bubble, fluctuating oil prices, and reduced investments. An expansion of 0.649 amplitude was observed between the years 2002 and 2007.

Additionally, agricultural production was impacted by drought in 2002-03, causing a decline in agricultural and allied output by 7%, thereby reducing GDP growth from 5.8% in 2001-02 to 4%. The decline in 2008-09 was due to the global financial crisis, which caused high fluctuations in economic activity. The GDP growth declined to 7.9% in the first quarter of 2008-09 (Thomas), and yearly growth declined to 6.80% in 2008-09 from 9.30% in 2007-08 (Bajwa, 2012).

However, GDP experienced a phase of expansion in 2018-19, possibly due to the subsiding of the effects of demonetization and increased economic activity. In 2020, an exceptional event occurred due to COVID-19, causing the most severe contraction in GDP, with an amplitude of 0.1250 between 2019 and 2020, capturing the peak-to-trough. The GDP growth rate declined to -7.7% from 6.1% in 2019-20 (Sinha, 2024). Furthermore, the trough had a steeper slope than any of the identified peaks. This suggests that the change in GDP in a contraction phase tends to be sharper and more sudden, while recoveries are relatively more gradual.

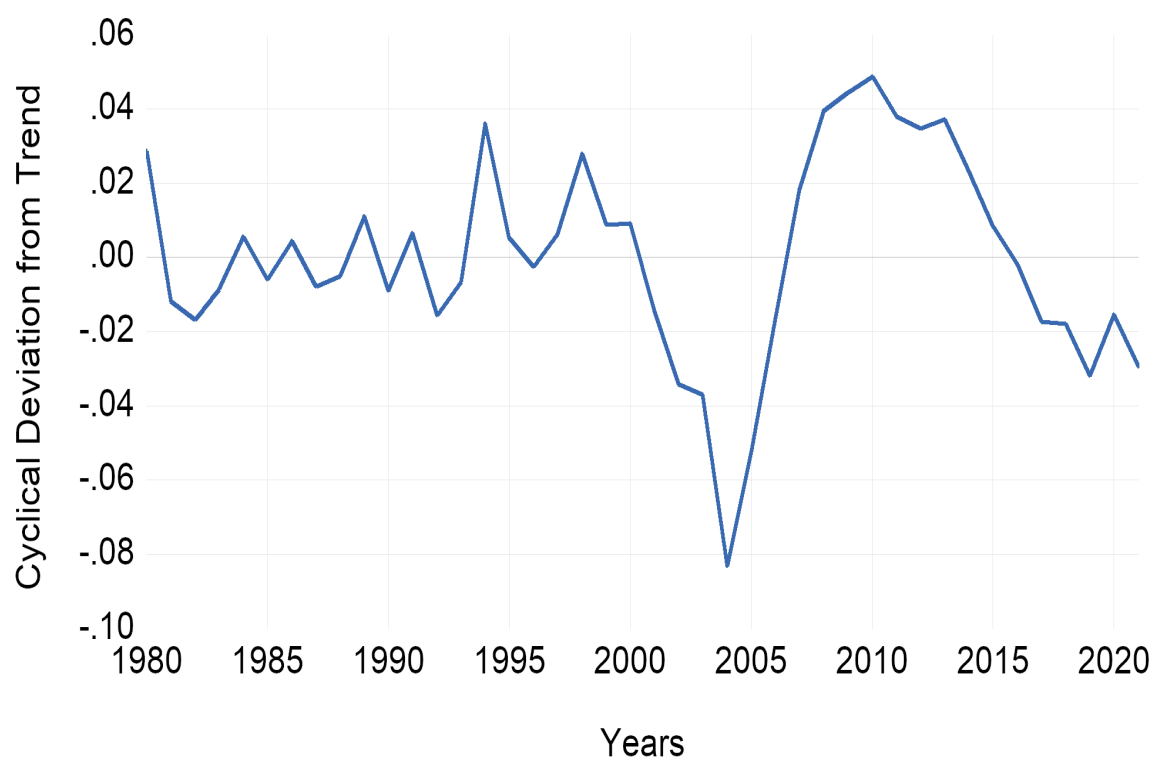


Figure 8.5 Broad Money Supply (M3) Cycles

Figure 8.5 shows the fluctuations in the money market with 9 peaks and 8 troughs, along with 8 periods of expansion and 7 periods of contraction. From 1998 to 2010, there were significant fluctuations in the length of cycles, with the longest cycle (peak to peak) spanning 12 years. There was an increase in M3 due to economic liberalization in 1991, as the economy opened

up, leading to increased banking facilities and capital inflows. However, in 2004, there was a significant decline in M3, possibly due to changes in the government that impacted economic policies, including fiscal and monetary policy. This reflected the slow increase in M3, leading the HP filter to detect this as a cycle. The largest cycle, a contraction with an amplitude of 0.0923, was exhibited, while an expansion was observed between 2004 and 2010, with an amplitude of 0.132, contributed by the large capital inflows. The RBI took necessary measures between October 2008 and April 2009 to increase liquidity. The repo rate and reverse repo rate were reduced to 4.75% and 3.25%, respectively (Mohanty D. , 2009), maintaining financial stability. From 2013 onwards, there was a persistent decline in M3, which might be due to inflationary pressures in the economy.

Additionally, growth in M3 was supported by deficit financing, contributing to its expansion. However, M3 declined during the period of demonetization in 2016, as a significant portion of currency became invalidated, and there was a temporary shortage of physical cash. Furthermore, COVID-19 led to a decline in M3, reducing money circulation and increasing hoarding of money. It's worth noting that the contractions had a larger slope than the expansions, aligning with typical economic behavior, where downturns tend to be sharper and recoveries more gradual.

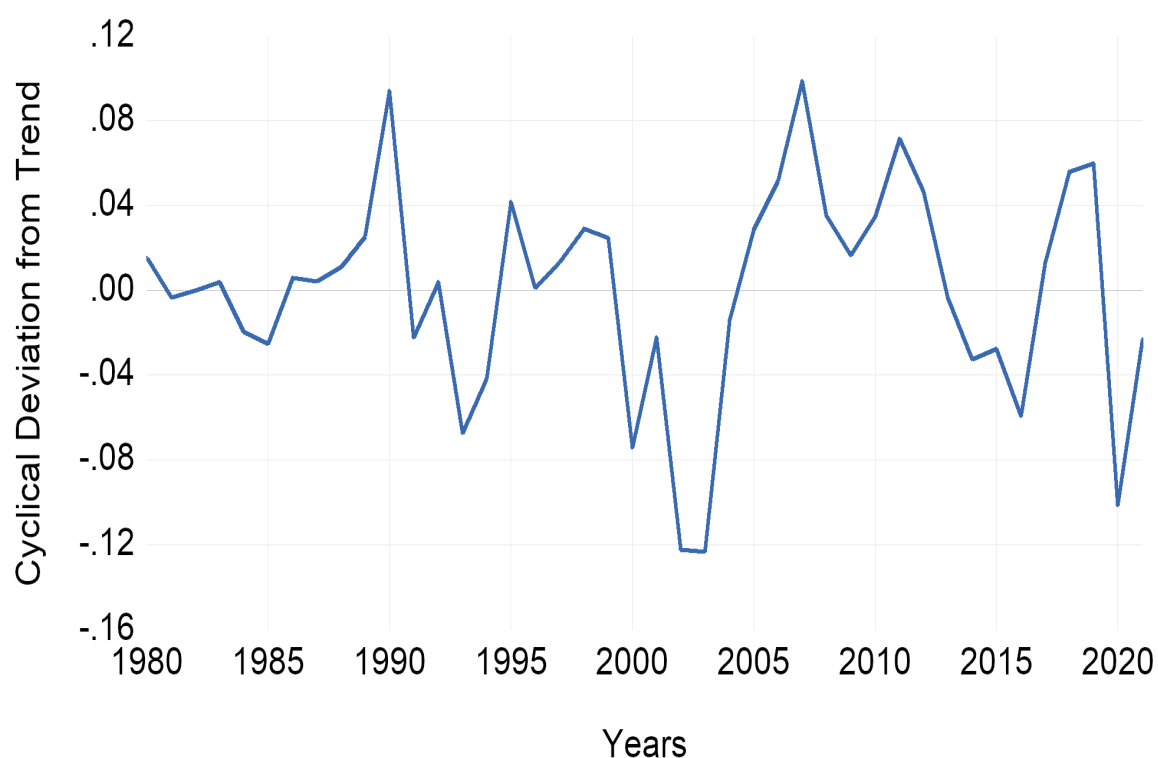


Figure 8.6 Gross Fixed Capital Formation (GFCF) Cycles

Gross Fixed Capital Formation (GFCF) in Figure 8.6 exhibited 10 peaks and 11 troughs in its cyclical pattern, with 10 complete expansions and 10 contractions. Between 1983 and 1990, the longest cycle (peak to peak) was observed for 7 years, with an average cycle duration of 4.2 years. In the 1990s, there was a sharp decline in GFCF, possibly due to the BOP crisis. However, moderate growth was observed between 1993 and 1995. The National Stock Exchange was established in 1992 to promote FDI in various sectors. Deregulation of interest rates also facilitated easy access to credit and capital, leading to a rise in GFCF.

However, there was a decline in GFCF between the years 1999 and 2003, which was likely caused by economic downturns, government policy shifts, and global and domestic uncertainties. The largest cycle was observed between 2002 and 2007 with an amplitude of 0.2210, reflecting the most expansionary investment phase. However, it didn't last long; investment declined due to the financial crisis. The government implemented various monetary and fiscal measures to counteract the effects of the financial crisis, which positively influenced GFCF. Demonetization marked a sharp decline in GFCF, followed by a rebound, and similarly, COVID-19 also led to a sharp decline in GFCF, with a high amplitude of 0.1614 from 2019 to 2021. Furthermore, the peak exhibited a larger slope than any of the troughs identified, indicating a faster and steeper rise in GFCF compared to contractions.

8.4.2 Synchronization of GDP Cycles with Other Economic Indicators

For a better understanding of the interaction among the variables, the co-movement between the business (GDP) and credit (NFGBC) was evaluated by combining their cyclical components. The strong co-movement among these variables indicated the interdependencies between the real and the financial sectors and how these variables interacted during the period of disruptions and crises. While the credit-to-GDP ratio and construction GDP were not taken into consideration due to the inherent overlap.

Furthermore, to examine the factors that cause fluctuations in business cycles, the study combined the cyclical components of money and investment cycles with business cycles. Also, the lead-lag relationship was examined to check the potential causality among the variables. Figure 8.7 shows a comprehensive cyclical pattern of financial cycles through credit and their interactions with business cycles, revealing a visible co-movement between business and financial cycles.

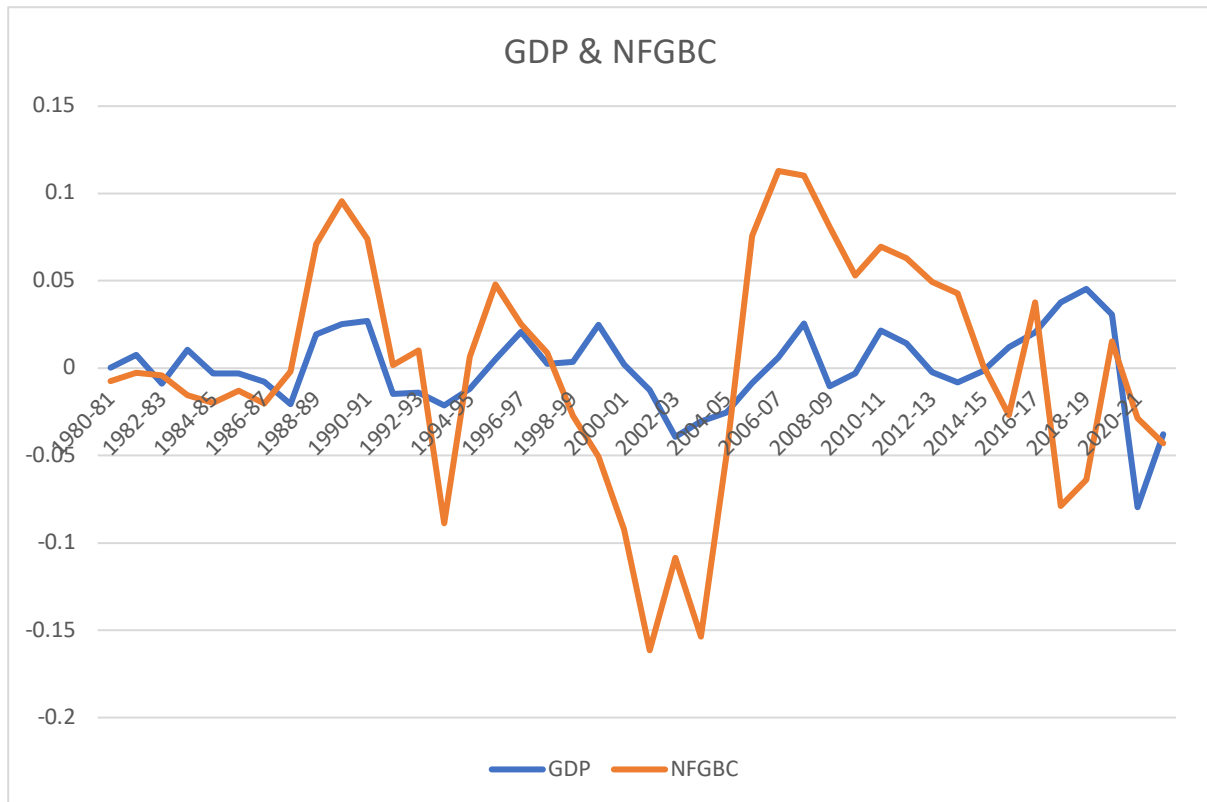


Figure 8.7 Co-movement between GDP & NFGBC Cycles

The credit cycles were more pronounced and volatile than those of business cycles, supporting the results of (Behera & Sharma, 2022). NFGBC experienced a sharp downturn in 1994, indicating a period of slow growth. The business cycles showed the same signs and similar changes as the credit cycles, both exhibiting upturns in 1990 and similar downturns. The financial crisis led bank credit to decline to 17.5% from 23% in 2008-09. The recoveries in credit cycles caused an increase in economic growth during the period 2004- 2010, indicating that credit expansions influenced real economic growth and indicating the interconnectedness between the two variables. Credit growth reached its highest in 2005, with a 20.5% increase in the credit growth rate, followed by a rise in GDP.

Interestingly, during the period of crisis, both variables declined together, with credit cycles experiencing a sharper decline than business cycles. (Borio C. , 2012), one of the most influential works emphasized the role of credit and asset prices in economic fluctuations. He highlighted how financial booms, particularly those driven by credit, often lead to economic expansions. Therefore, credit cycles precede economic growth in India.

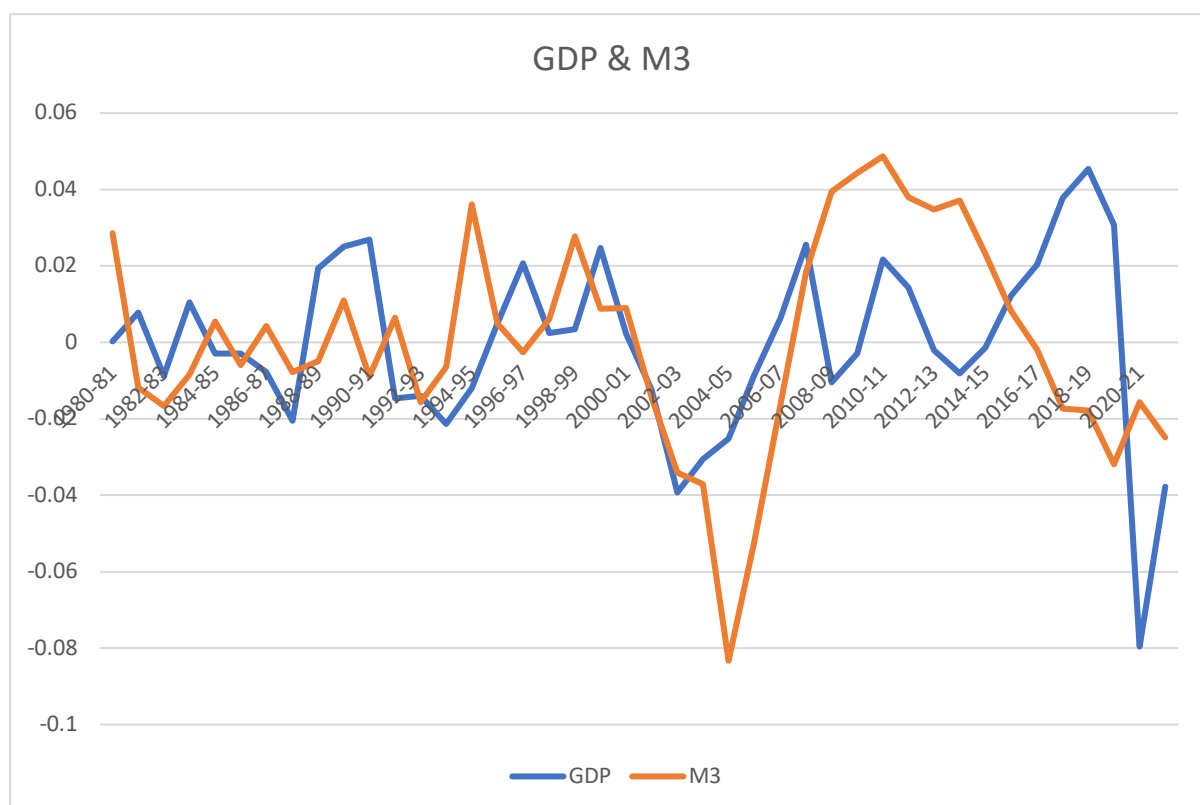


Figure 8.8 Co-movement between GDP & M3 Cycles

The cyclical interactions displayed in Figure 8.8 indicate the relationship between money supply and output. In 1980, GDP increased while money cycles experienced a sharp downturn. Both cycles moved in a similar direction, indicating a strong relationship between the money market and real output; however, the fluctuations in the money market were pronounced.

A lead-lag relationship was observed. Before reforms in 1991, the GDP led changes in money supply; the relationship was reversed, and monetary expansion then started preceding economic growth. Moreover, both cycles were synchronized during the period of disruption; these variables acted as procyclical (Saini, Ahmad, & Bekiros, 2021). The impact of the global financial crisis was more noticeable on GDP than on the money supply.

Additionally, a significant shift occurred due to demonetization, leading to a sudden decline in M3, which was followed by a decline in GDP attributed to the COVID outbreak, followed by a rise, while M3 continued to decline. Despite these differences, money supply remained an important indicator of growth, as reflected in the interconnectedness shown in the graph, as confirmed by (Goyal & Kumar, 2018).

Similarly, (Banerjee, Basu, & Ghate, 2020) found a positive and persistent influence of monetary shocks on output rather than interest rate shocks. (Ghate, Pandey and Patnaik 2012) suggested that developed economies use counter-cyclical monetary policy, while developing countries, such as India, employ pro-cyclical policies, which amplify business cycles. These findings suggest that growth effects of monetary conditions depend not only on the availability of liquidity but also on the effectiveness of monetary transmission and the prevailing economic cycle.

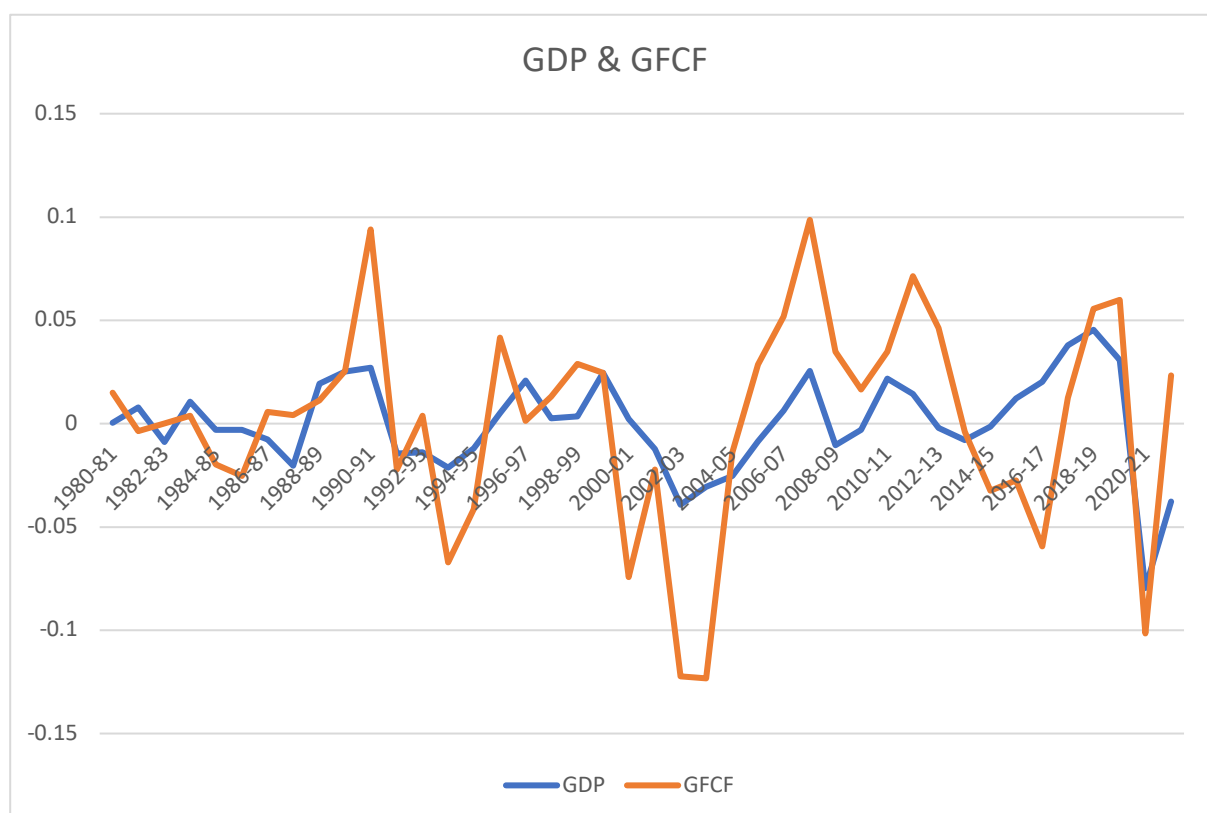


Figure 8.9 Co-movement between GDP & GFCF Cycles

The cyclical co-movement showed a strong parallel movement between the business and investment cycles, as reflected in Figure 8.9. During the period of upturns in investment cycles, business cycles were also rising, indicating a high interdependence. However, during periods of downturn like the 2008 crisis, investment cycles exhibited sharper contractions than those of business cycles, reflecting their procyclical nature. Also, the upturns were more pronounced than those of business cycles, reflecting their sensitivity to credit, interest rates and external shocks. According to the Economic Survey 2008-09, the growth in GFCF declined to 8.2% in 2008 from 12.9% in 2007. Moreover, both variables experienced continuous co-movements and a similar decline during the COVID-19 outbreak, followed by an upturn.

8.4.3 Cross-Correlation Results (Lead and Lag Relationship)

The lead-lag relationship was analyzed to capture the cross-correlation among the cyclical variables.

GDP and credit (NFGBC)

The lag column indicated that NFGBC led GDP, where past values of NFGBC explained the current value of GDP, as shown in Table 8.1. Lead, on the other hand, indicated that GDP led NFGBC. The results revealed at lag 0 that both variables moved in the same direction, suggesting a contemporaneous relationship between credit and GDP.

Table 8.1 Lead-Lag Relationship between GDP and NFGBC

GDP, NFGBC (-i)		GDP, NFGBC (+i)	
i	lag	i	lead
0	0.3490	0	0.3490
1	0.2996*	1	0.1585
2	0.2851	2	-0.1575
3	0.2299	3	-0.3511
4	0.0699	4	-0.3533

Note: Lead-lag correlations were computed up to 10 lags. Only the first few meaningful coefficients were shown.

* Denotes the peak coefficients

The lag values showed that NFGBC led GDP by approximately 1 to 3 years, with the highest coefficient of 0.2996 at lag 1. At lag 2 (0.2851) and 3 (0.2299), NFGBC continued to lead GDP, with high positive coefficients. This suggests how financial dynamics or shifts predict economic activity. However, the lead column showed a significant contemporaneous relationship; after that, it declined and turned negative at lags 3 and 4. These findings suggest that credit drives economic growth, aligning with (Chauvet, 2001) highlighting that financial

cycles play a significant role in driving fluctuations in economic output, especially during periods of economic instability.

GDP and broad money supply (M3)

The lag and lead columns in Table 8.2 indicate that M3 led GDP by about 1 year, with the highest coefficient at lag 1 (0.2726). This suggests that liquidity impacts economic growth after a short delay. Beyond this, no strong or significant relationship was observed between them. While GDP also led M3 by 1 year, indicating predictive power, the relationship remained positive, however weak, afterwards and even turned negative, showing that there were no strong cyclical co-movements between them after 1 year.

Table 8.2 Lead-Lag Relationship between GDP and M3

GDP, M3 (-i)		GDP, M3 (+i)	
i	lag	i	lead
0	0.2445	0	0.2445
1	0.2726*	1	0.2702
2	0.1595	2	0.1181
3	0.1058	3	0.0300
4	0.1042	4	-0.0822

Note: Lead-lag correlations were computed up to 10 lags. Only the first few meaningful coefficients were shown.

* Denotes the peak coefficients

GDP and gross fixed capital formation (GFCF)

A strong contemporaneous relationship was observed between GDP and GFCF, as shown in Table 8.3, indicating the immediate influence of GFCF movements on GDP. The lag column revealed that GFCF led GDP by almost 1 year with a coefficient of 0.2107, after which the relationship became negative.

Table 8.3 Lead-Lag Relationship between GDP and GFCF

GDP, GFCF (-i)		GDP, GFCF (+i)	
i	lag	i	lead
0	0.6638	0	0.6638
1	0.2107	1	0.2940*
2	-0.0864	2	0.0085
3	-0.1449	3	-0.3237
4	-0.0035	4	-0.3706

Note: Lead-lag correlations were computed up to 10 lags. Only the first few meaningful coefficients were shown.

* Denotes the peak coefficients

The lead column showed that a peak coefficient was observed at lag 1 (0.2940); when GDP moved, the GFCF followed the same direction, suggesting GDP led GFCF by 1 year. Notably, after lag 1, an inverse relationship between them was observed, with the highest coefficient at lag 4 (-0.3706).

8.4.4 Structural Vector Autoregression (SVAR)

While correlation and lead-lag relationships provide insights into the co-movement among these variables, they do not reveal the structural transmissions. Therefore, Structural Vector Autoregression, commonly known as SVAR, was used to investigate the structural dynamics among business cycles (GDP), credit cycles (NFGBC), and investment cycles (GFCF). M3 was excluded from the SVAR model to prevent multicollinearity, ensuring reliable estimation among these variables.

The SVAR model enables the identification of both contemporaneous and lagged relationships by imposing restrictions based on economic reasoning. The model assumed that bank credit responded to its own shocks, while investment responded to its own and credit shocks. Furthermore, GDP responded to shocks from both credit and investment.

8.4.4.1 Optimal Lag Length Criterion

Five criteria were used to determine the optimal lag length for the model: AIC, FPE, HQ, LR, and SC. Most of these criteria indicated 2 lags as the optimal lag length, as shown in Table 8.4.

Table 8.4 Optimal Lag Length Criteria

Endogenous variables: NFGBC, GFCF and GDP

Exogenous variable: —C

LAG	Log L	LR	FPE	AIC	SC	HQ
0	224.31	NA	2.36e-09	-11.349	-11.221	-11.303
1	245.304	37.675	1.28e-09	-11.964	-11.452*	-11.780*
2	256.591	18.521*	1.15e-09*	-12.081*	-11.185	-11.760
3	265.755	13.629	1.17e-09	-12.090*	-10.810	-11.630

* Indicates the lag order selected by the criterion.

Therefore, the 2-lag SVAR model was selected to capture the dynamics and relationship among the variables.

8.4.4.2 Short-run SVAR estimates

To capture the contemporaneous relationships among credit, investment, and GDP cycles, a short-run recursive model was estimated.

Estimated S-Matrix

Model: $e = Su$ where $E[uu'] = 1$

The Structural VAR is just identified

$$S \begin{bmatrix} \text{variables} \\ NFGBC \\ GFCF \\ GDP \end{bmatrix} \begin{pmatrix} \varepsilon^{NFGBC_t} & \varepsilon^{GFCF_t} & \varepsilon^{GDP_t} \\ 0.0449 *** & 0 & 0 \\ 0.0233 *** & 0.0357 *** & 0 \\ 0.0051 * & 0.0105 *** & 0.0159 *** \end{pmatrix}$$

NFGBC was assumed to be only affected by itself and was not affected by the shock from the other variables in the model. The shocks to NFGBC positively and significantly influenced investments, indicating that credit is a key driver of investments in India. Additionally,

investments positively and substantially responded to its shocks. Similarly, GDP positively responded to credit and investment shocks. Moreover, it also responded to its own shocks.

8.4.4.3 Long-run SVAR estimates

Model: $e = \Phi \cdot F_u$ where $E[uu'] = 1$

The Structural VAR is just identified

$$F \begin{bmatrix} \text{variables} \\ NFGBC \\ GFCF \\ GDP \end{bmatrix} \begin{pmatrix} \varepsilon^{NFGBC_t} & \varepsilon^{GFCF_t} & \varepsilon^{GDP_t} \\ 0.1351 *** & 0 & 0 \\ 0.0753 *** & 0.0260 *** & 0 \\ 0.0080 ** & 0.0125 *** & 0.0135 *** \end{pmatrix}$$

The long-run SVAR results revealed that shocks to NFGBC had a positive influence on themselves, with a coefficient of 0.1351 and statistical significance at the 1% level. The credit shocks had a pronounced influence on investments and GDP, indicating that credit expansions lead to capital formation and output growth. While GFCF and GDP were positively influenced by their own structural shocks. GFCF retained a long-run effect on GDP, confirming investment-led growth.

8.4.4.4 Long-run Impulse Response Function

Structural IRF traces the dynamic response of one variable to a one-unit innovation in other variables. Figure 8.10 shows that NFGBC resulted in an immediate positive impact from its own shocks in the short-run. Notably, investment shocks had a limited impact on credit. Similarly, GDP shocks had a small positive influence, which declined gradually, confirming that credit fluctuations were primarily self-driven and had a small and lagged influence on the investment and output shocks.

Similarly, GFCF initially responded positively to its own shocks, indicating investments were highly self-regulating. Investments positively reacted to credit shocks in the short-run, but the effect diminished as the horizon expanded. While GDP shocks had a very small impact on investments, implying that investment was influenced by credit shocks in the short-run and was also self-driven.

Additionally, the impulse response of GDP exhibited a sudden influence of its own shocks and a decline afterwards. GDP declined due to investment shocks in the short-run, suggesting that

GDP was sensitive to investment shocks. Moreover, credit shocks had a small but positive influence on GDP, suggesting their delayed impact on economic growth.

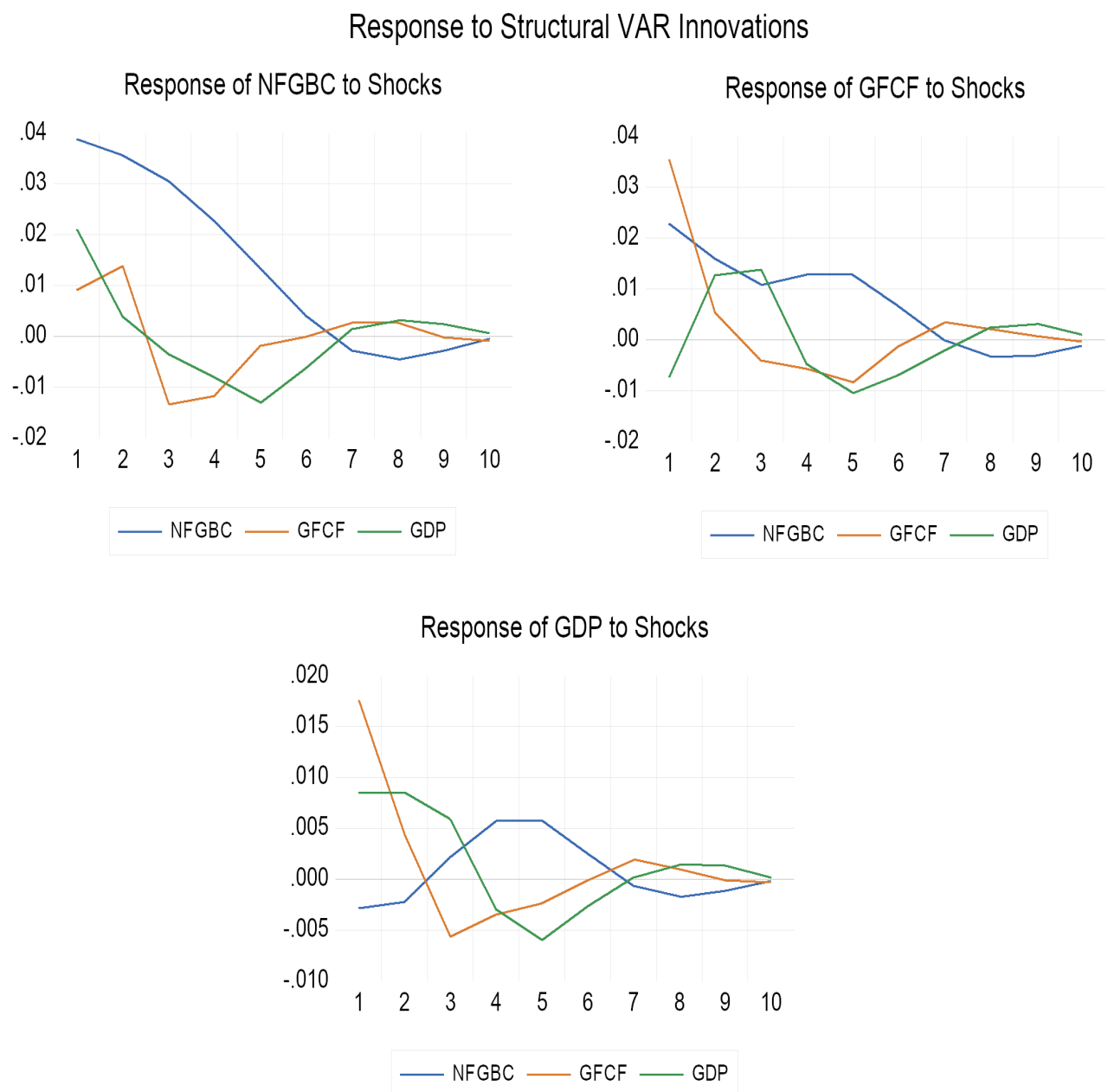


Figure 8.10 SVAR Impulse Response Function

8.4.4.5 Long-run Variance Decomposition

The SVAR variance decomposition illustrates the importance of an innovation or a shock in determining variations in the variables. NFGBC played a prominent role in explaining its forecast error as presented in Figure 8.11, accounting for 74% in the first period, 4% by GFCF,

and 21% by GDP shocks. Although cyclical movements in credit were primarily self-driven, their share declined marginally. GDP and GFCF together accounted for the remaining proportion of nearly 10% and 13%, respectively.

Investment variance was largely dominated by its own shocks, accounting for 68% in the initial period; however, it declined to 42% in the long-run. In contrast, credit share increased from 28% to 38%, highlighting investment cycles' sensitivity to fluctuations in credit. These findings indicate that credit not only fuels investments but also indirectly drives output growth.

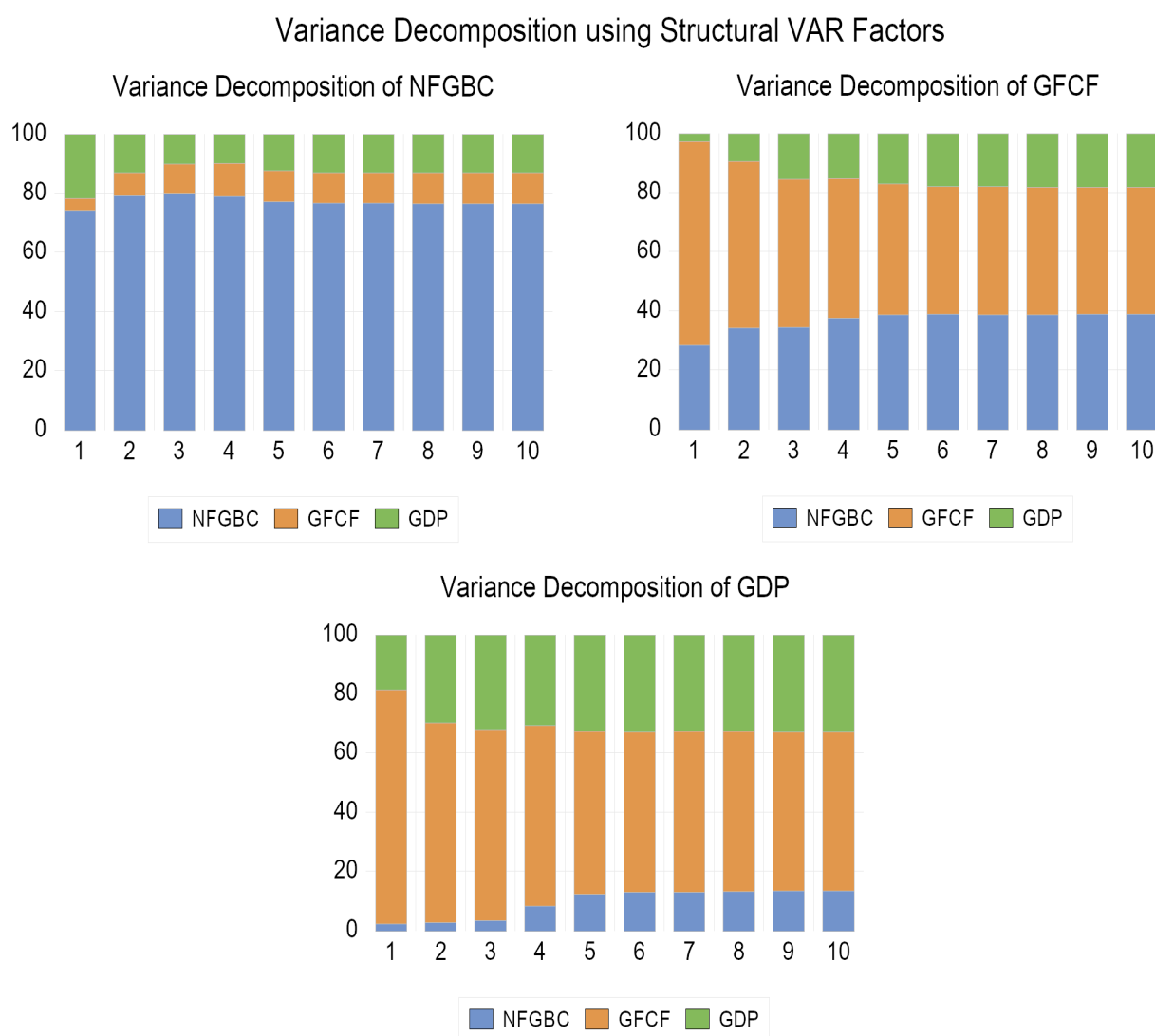


Figure 8.11 SVAR Variance Decomposition

Finally, the variance decomposition of GDP showed that investments had a major explanatory power of 79% in the first period. Over time, GDP was primarily driven by investments,

although its share declined to 53% in the long-run. Meanwhile, the role of credit gradually increased from 2% to 13% over the long-run, and GDP explained 18% to 32% of its own variations. These results suggest that GDP fluctuations in India are primarily driven by investment volatility, with credit playing a significant role.

8.5 Conclusion

This study examined the cyclical components of various financial and macroeconomic indicators. Using annual data from 1980 to 2021, the Hodrick-Prescott filter was applied to identify cycles. The financial market indicators, NFGBC, credit-to-GDP ratio, and construction GDP (house prices proxy), showed more pronounced cyclical fluctuations, aligning with existing literature. The findings revealed that GDP had 9 peaks and 9 troughs, with the longest cycle lasting from 2010 to 2018, totaling 8 years. Similarly, NFGBC demonstrated 8 peaks and 8 troughs, with the longest cycle spanning from 2006 to 2016, lasting 10 years. The construction GDP displayed 7 peaks and 9 troughs, with the longest cycle of 17 years from 1990 to 2007. The credit-to-GDP ratio showed 7 peaks and 7 troughs, with the longest cycle from 2006 to 2016, lasting 10 years. Additionally, M3 exhibited 9 peaks and 8 troughs, with the longest cycles of 12 years, from 1998 to 2010. Lastly, GFCF experienced 10 peaks and 11 troughs, with cycles lasting a total of 12 years from 1998 to 2010.

The findings indicated that both business and credit cycles closely followed each other. The synchronizations analysis also confirmed a positive and significant relationship between the variables. The credit market and GDP showed more frequent cyclical fluctuations, closely following each other with similar peaks and troughs. Moreover, the lead-lag relationship indicated that NFGBC led GDP by approximately 1 to 3 years, with the highest coefficient at lag 1. However, the M3 and GDP cycles appeared to be procyclical, moving in the same direction during the 2008 crisis and the COVID-19 pandemic. Additionally, the lead-lag relationship demonstrated that M3 led GDP by 1 year, with a bidirectional relationship where GDP also led M3 by 1 year. GFCF and GDP shared a positive relationship, confirmed by the strong co-movements observed between them. These synchronizations indicated that fluctuations in financial markets and macroeconomic variables exhibited procyclical behavior, influencing economic growth.

The SVAR analysis revealed a strong relationship among credit, investments and business cycle dynamics of the Indian economy. The impulse response function indicated that credit was the

most influential mechanism linking capital formation and economic growth. The variance decomposition further validated that investment cycles were heavily driven by the credit shocks, while GDP cycles were influenced by investment up to 80%. Collectively, these findings indicate that credit fuels investments, which further amplify economic growth. Overall, these findings confirm that financial cycles are longer than business cycles, and the close interlinkage among financial and business dynamics highlights the central role of financial development in shaping economic growth.

Chapter IX

CONCLUSION

Based on the findings across the stated objectives, this chapter offers final remarks by summarizing the key results and highlighting policy implications. It also discusses research limitations and future opportunities. The study examined the multidimensional relationship between various indicators of financial development and economic growth in India over the period 1980-2021. The data were collected from sources such as the RBI database, MoSPI, FRED, IMF and the World Bank.

This chapter is structured as follows: Section 9.1 presents the main findings of the study, discussed objectively. Section 9.2 revisits the objectives and explains how each was achieved through the acceptance or rejection of the hypotheses. Section 9.3 discusses the theoretical and practical implications of the findings, along with recommendations for policymakers to promote economic growth using financial development indicators. Finally, Section 9.4 outlines the research limitations and potential areas for further exploration.

9.1 Major Findings of the Study

Based on **Objective 1 (O1)**, the following findings summarize the relationship between banking credit, agricultural credit and economic growth at the national and subnational levels.

National level analysis (1980-2021)

- (a) **Short-run ARDL results** indicated that GDP was influenced by its lagged variables, while NFGBC and lending rate were statistically insignificant. While agriculture credit was found to be significant at the 10% level, implying a weak relationship.
- (b) **The long-run relationship** confirmed the significance of NFGBC in influencing GDP, while agricultural credit and lending rate remained insignificant. Moreover, the bound test also confirmed the presence of a long-run relationship, with the F-statistic being significant at the 5% level.
- (c) **ECM** indicated that approximately 25% of the disequilibrium was corrected in the annual period, moving towards the long-run equilibrium.
- (d) **Residual diagnostic tests** revealed that no autocorrelation was detected; however, there was a problem of heteroskedasticity; hence, White-Huber standard errors were used.

The data were normally distributed, and the model was correctly specified. The CUSUM test also confirmed the stability of the model. However, CUSUMQ showed some deviations reflecting structural breaks.

State-level analysis (2000-2021)

- (a) **Credit and GDP growth rates** indicated that these variables in all the regions moved together, particularly during the period of shocks and crises.
- (b) **Dumitrescu-Hurlin panel causality test** revealed a bidirectional relationship between banking credit and GDP at the 1% significance level. Moreover, a unidirectional relationship was observed from GDP to lending rates. Lastly, banking credit caused the lending rate to be significant at the 1% level.
- (c) **The Panel ARDL test** showed that lending rates had no significant short-run impact on GDP, while banking credit negatively influenced state GDP. However, the long-run test confirmed the positive relationship between banking credit and GDP, significant at the 1% level.
- (d) **ECM** indicated that any disequilibrium was corrected at the speed of 25%; the coefficient was significant at the 1% level, confirming the long-run relationship between the variables.
- (e) **Residual diagnostic tests** revealed that residuals were not normally distributed according to the Jarque-Bera test.

To meet **Objective 2 (O2)**, the ARDL model was employed to understand the dynamics between broad money supply and economic growth. Dummy variables were introduced due to instability captured in CUSUMQ associated with two major shocks: the 2008 financial crisis and COVID-19.

Aggregate period analysis (1980-2021)

- (a) **Short-run ARDL results** indicated that GDP was influenced by its lagged variables. While M3 was negative and insignificant, its lagged value was positive and significant at 10%, implying a weak short-run influence on GDP. CPI had a negative and significant impact on GDP. However, interest rates did not show any significant impact on GDP.
- (b) **The long-run relationship** confirmed the important role of M3 in influencing GDP, with a high positive and statistically significant coefficient at the 1% level. Moreover, CPI had a strong negative and significant effect on GDP, while the interest rate

remained negative but insignificant. Furthermore, a long-run relationship at the 5% level was confirmed by the Bound test F-statistic of 4.717.

- (c) **ECM** indicated a speed of 19% at which deviations were corrected annually, confirming a long-run relationship among the variables.
- (d) **Residual diagnostic tests** indicated no problems of autocorrelation and heteroskedasticity in the model. Although the residuals were not normally distributed, the model was correctly specified. The CUSUM test confirmed the model's stability, while the CUSUMQ suggested some instability in the variance.

Short-run analysis during the crisis period (1980-2021)

- (a) **Short-run ARDL** confirmed a consistent relationship between M3 and GDP even during the periods of economic shocks. Moreover, the lagged GDP had a significant positive influence on the current GDP. While CPI remained negative and significant, interest rates remained insignificant. The dummy variable for the 2008 financial crisis had a significantly negative impact on GDP. Additionally, the dummy variable for COVID-19 had a more pronounced negative effect on GDP.
- (b) **ECM** indicated the slow speed of adjustment during the period of crisis, with 7.1% of the disequilibrium corrected during each period.
- (c) **Residual diagnostic tests** revealed that residuals were normally distributed according to the Jarque-Bera test.

Furthermore, to achieve **Objective 3 (O3)**, a linear and nonlinear analysis was performed to examine the complex dynamics between the stock market and economic growth at a high frequency, using monthly data from April 1996 to December 2021.

Linear analysis (April 1996 to December 2021)

- (a) **Short-run ARDL results** revealed that IIP was primarily influenced by its own lagged value up to the third lag. Moreover, the total market capitalization was positive and statistically significant at the 1% level. The contemporaneous effect of crude oil was insignificant; however, the lagged one showed a negative and significant impact, while the third lag became positive and significant at the 5% level. The dummy variables for the dot-com bubble burst (D1) and the global financial crisis (D2) remained insignificant; however, COVID-19 (D3) showed a major contraction in industrial activity.

- (b) **The long-run relationship** confirmed a strong positive influence of the stock market on IIP, with the coefficient statistically significant at the 1% level, while crude oil, D1, and D2 remained insignificant. D3 exhibited the largest negative and significant long-run effect on IIP. Finally, the bound test, with a coefficient of 4.88 being statistically significant at the 5% level, confirmed the presence of a long-run relationship among the variables.
- (c) **ECM** indicated a 17.5% disequilibrium among the variables, corrected annually, achieving the long-run equilibrium.
- (d) **Residual diagnostic tests** revealed that the model was free from the problem of autocorrelation and heteroskedasticity. The data were normally distributed, and the model was correctly specified. The CUSUM test and CUSUMQ also confirmed the stability of the model, adjusted for the structural shocks.

Non-linear threshold analysis (April 1996 to December 2021)

- (a) **The threshold analysis** revealed six regimes where the relationship between the stock market and IIP performed differently depending on the market size. A positive and highly significant relationship between the stock market and IIP was observed at low and moderate levels of market capitalization. However, at a very high level, the effect became negative and statistically insignificant.

Lastly, to examine **Objective 4 (O4)**, whether financial cycles exist in India, the Hodrick-Prescott filter was carried out to extract the cyclical components of key financial indicators and macroeconomic variables using annual data from 1980 to 2021.

Annual cyclical analysis (1980 to 2021)

- (a) **Characteristics of variables** NFGBC experienced 8 peaks and 8 troughs, with the longest cycle lasting 10 years. Similarly, construction GDP exhibited 7 peaks and 9 troughs, and the longest cycle lasted for 17 years. Credit-to-GDP experienced 7 peaks and 7 troughs, and the longest cycle lasted for 10 years. While M3's longest cycles spanned 12 years, the GFCF cycle lasted 7 years. Finally, GDP displayed 9 peaks and 9 troughs, and the longest cycle lasted 8 years, with an average length of 4.63 years.
- (b) **Synchronization of variables** NFGBC and GDP cycles exhibited co-movement, particularly during the period of crisis and financial stress. Similarly, M3 and GDP cycles displayed a strong interconnectedness. In addition, GDP and GFCF cycles

exhibited a strong correlation, suggesting that investments played an important role in driving economic fluctuations.

- (c) **Lead-lag relationship** Credit cycles led GDP cycles by 1-3 years, with the strongest lead at 1 year. While M3 and GDP cycles exhibited a bidirectional relationship, with each variable leading the other by approximately 1 year. However, GDP cycles led GFCF cycles by 1 year.

Structural analysis (1980 to 2021)

- (a) **Long-run SVAR analysis** revealed clear structural dynamics among the variables. Shocks to NFGBC strongly influenced investment, and investment shocks emerged as the primary driver of GDP fluctuations.
- (b) **The impulse response function** indicated that credit acted as a leading indicator and investment as a transmission channel.
- (c) **The variance decomposition** demonstrated that credit and investment played a crucial role in shaping macroeconomic fluctuations in India.

9.2 Revisiting the Objectives

This section revisits the objectives and the key findings of the study and examines whether they have been achieved, followed by hypothesis testing. The study aimed to investigate the relationship between various indicators of financial development and economic growth during the period from 1980 to 2021.

Objective 1: To examine the relationship between the banking system credit and the real gross domestic product of India.

The first objective was to determine the relationship between banking credit and economic growth in India. To achieve this, the study employed both national data (1980-2021) and state-level data (2001-2021) using the ARDL and Panel ARDL models. The findings indicated a linear relationship between bank credit and GDP at the aggregate level and across all states, implying that bank credit can be used as a catalyst for economic growth. The ARDL results showed that the short-run relationship was mixed, suggesting that NFGBC influenced GDP with a lag. Furthermore, agricultural credit affected GDP in the short-run; no long-term relationship was observed. Similarly, the lending rate had no significant influence on GDP. The

ECM and bound test confirmed a long-run relationship between NFGBC and GDP. The model's robustness was supported by residual tests.

State-level GDP growth and credit growth rates demonstrated that bank credit affected GDP, particularly during periods of structural breaks across the regions. The long-run estimates also confirmed a positive and significant influence of bank credit on GDP. Interestingly, the lending rate had a positive impact on state GDP. The ECM and bound test confirmed the existence of a long-run cointegrating relationship among the variables. A bidirectional relationship between bank credit and GDP was observed. Residual analysis showed that the residuals were slightly skewed and not normally distributed. Therefore, the credit growth rate not only influences GDP but also acts as a stabilizer during periods of uncertainty.

Table 9.1 Hypotheses Testing for Objective 1 of the Study

Hypothesis	Findings	Result
There is no significant long-run relationship between non-food gross bank credit and GDP.	There was a positive and significant long-run relationship between NFGBC and GDP.	Rejected
Agricultural credit has no significant long-run impact on the GDP.	No relationship was found between agricultural credit and GDP.	Accepted
There is no significant relationship between lending rates and GDP.	Lending rate and GDP shared no relationship in both the short run and the long run.	Accepted
There is no co-movement between bank credit growth and GDP growth at the state level.	A similar movement was observed between the variables during the period of crisis.	Rejected
There is no significant long-run relationship between bank credit and GDP across Indian states.	There was a positive and significant long-run relationship between banking credit and states' GDP.	Rejected
Bank credit does not cause GDP in Indian states.	Bank credit Granger caused GDP at the 1% significance level.	Rejected

Objective 2: To determine the relationship between broad money supply (M3) and economic growth (GDP).

The second objective was to examine the relationship between M3 and GDP. The ARDL findings revealed that lagged GDP had a positive and significant influence on GDP in the short-run. While M3 influenced GDP with a lag. CPI was found to be negatively affecting GDP in both the short-run and long-run. Interest rates remained insignificant across the sample. However, the long-run estimates revealed a significant and positive impact of M3 on GDP. The model was free from the problem of autocorrelation and heteroskedasticity; however, the residuals were not normally distributed.

Table 9.2 Hypotheses Testing for Objective 2 of the Study

Hypothesis	Findings	Result
There is no long-run relationship between M3 and GDP.	A positive and significant long-run relationship was found between them.	Rejected
The impact of M3 on GDP growth is not linear during the period of economic shocks and crises.	The impact of M3 remained significant even during the period of crisis and structural shocks.	Rejected
Inflation (CPI) has no significant effects on GDP.	CPI negatively influenced GDP in both short-run and long-run.	Rejected
Inflation (CPI) has no significant effects on GDP during structural instability.	CPI remained negative and significant during the period of shocks.	Rejected
Interest rates do not have a more direct impact on GDP across the sample.	No significant relationship was observed between them.	Accepted
The financial crisis of 2008 and has no short-run significant effects on GDP.	A negative and significant impact was observed on GDP.	Rejected
The COVID-19 pandemic has no short-run impact on GDP.	A negative and highly significant impact was observed of pandemic on GDP.	Rejected

CUSUMQ showed instability during the crisis period; to account for the effects of these shocks, dummies for 2008 and 2020 were introduced. The global financial crisis of 2008 and COVID-19 had a significant negative impact on GDP. Moreover, the GDP-M3 nexus remained positive and significant, while CPI negatively affected GDP, and the interest rate remained insignificant. Thereby, a sustained growth in M3 can serve as a fundamental driver of economic growth, highlighting its importance in sustainable economic growth.

Objective 3: To examine the relationship between the combined market capitalization of NSE and BSE and India's economic growth.

The third objective was to determine the impact of stock market indicators on economic growth. Monthly data were utilized from April 1996 to December 2021. The total market capitalization was computed by simply summing the BSE and NSE market capitalization. Dummy variables for the major events were introduced to capture the effects of economic disruptions on growth. The short-run ARDL estimates with 4 lags revealed that lagged values of IIPs (proxied for GDP) positively influenced current output.

Table 9.3 Hypotheses Testing for Objective 3 of the Study

Hypothesis	Findings	Result
There is no significant long-run relationship between combined stock market capitalization and industrial activity.	A positive and significant long-run relationship was observed between the stock market and IIP.	Rejected
Crude oil has no significant impact on India's industrial activity.	No significant relationship was found between them.	Accepted
COVID-19 has no significant impact on the industrial activity.	A negative and large impact of COVID-19 on IIP was observed.	Rejected
There does not exist a nonlinear relationship between market capitalization and economic activity.	The threshold regression clearly showed regime-specific relationship between the stock market and IIP.	Rejected

Similarly, the stock market showed a highly positive and significant impact on IIP, indicating that the stock market leads industrial activity. While crude oil had mixed effects, D1(2001) and D2(2008) remained insignificant, and D3 (COVID-19) had a significant negative effect on IIP. The long-term estimates confirmed that the stock market positively influenced IIP, whereas D1, D2, and crude oil remained insignificant, and D3 had a prolonged negative impact. The negative coefficients reflected the extreme fluctuations in the early months caused by the pandemic in industrial activity. No autocorrelation or heteroskedasticity was detected; the model was stable according to both CUSUM and CUSUMQ tests. Additionally, threshold regression revealed that during low market capitalization, the relationship was the strongest between the variables; however, as market size expanded, the effect became statistically insignificant.

This non-linear pattern suggests that the growth effects of financial development may depend on the quality and the efficiency of financial intermediation rather than on financial expansion alone. At higher levels of financial development, inefficient allocation or deterioration in credit quality may weaken the growth-enhancing effects of finance. Thus, the threshold results provide support for interpreting the finance-growth relationship as conditional rather than uniformly positive.

Objective 4: To examine the existence of financial cycles in India

The final objective was to determine whether financial cycles exist in India and how they interact with business cycles. The study used various financial and macroeconomic indicators to examine their cyclical nature, employing the Hodrick-Prescott filter with lambda set to 100. Indicators such as NFGBC, credit-to-GDP, construction GDP, M3, GFCF, and GDP were analyzed.

The findings revealed that financial cycles were longer and more pronounced than business cycles (GDP). Specifically, NFGBC and M3 cycles revealed cycles lasting up to 10-12 years, while construction GDP experienced stronger and more prolonged fluctuations. Moreover, business cycles lasted for 8 years (peak to peak), with an average cycle of 4.63 years, consistent with the findings in the existing literature, highlighting the important role of financial conditions in shaping macroeconomic fluctuations. Thus, monitoring them provides useful information for identifying potential periods of financial stress.

Table 9.4 Hypotheses Testing for Objective 4 of the Study

Hypothesis	Findings	Result
Financial cycles measured through NFGBC, credit-to-GDP ratio, and construction GDP do not exhibit cyclical components.	All the variables exhibited different cyclical components.	Rejected
The financial cycles do not differ significantly in duration or amplitude from business cycles.	Financial cycles tend to be longer and sharper than the business cycles, reflecting high volatility in financial markets.	Rejected
Credit cycles are not synchronized with business cycles.	Both the variables exhibited co-movement indicating relationship between them.	Rejected
Credit cycles do not lead business cycles.	Credit cycles led business cycles, indicating fluctuation in the credit market precedes economic output.	Rejected
There is no structural relationship among credit, investment and business cycle.	SVAR revealed a strong structural linkages among credit, investment and business cycles.	Rejected

The cyclical components of NFGBC and GDP showed a strong interconnection, indicating that a recession in the credit market negatively impacted growth, while a period of expansion stimulated economic growth. This was further supported by the lead-lag relationship, with credit cycles leading up to 3 years. Similarly, M3 and GDP cycles exhibited a positive relationship, with M3 leading GDP by 1 year. Additionally, GFCF had a very strong impact on GDP, emphasizing its important role in stimulating economic growth. Furthermore, SVAR confirmed that fluctuations in credit and investment significantly influence GDP movements. Overall, financial cycles are present in India and are highly synchronized with business cycles. Productive investment serves as a crucial indicator of economic growth.

9.3 Theoretical Implications of the Study

The primary contribution of this thesis to the existing literature on the finance-growth nexus lies in its multidimensional evaluation of India's financial structure. It examines core

development indicators, such as banking credit, money supply, and stock market development, and their impact on economic growth. In the existing literature, these variables are studied in isolation, overlooking others. Moreover, by combining linear and non-linear approaches tailored to each objective, the findings offer several insights into the dynamic transmission channel of financial development onto India's economic growth trajectory. By utilizing the ARDL approach, the study establishes a positive long-run relationship between banking credit and GDP at both national and sub-national levels. These findings reconcile with Patrick's classic paradigms. In the pre-liberalization era, it mirrored a supply-leading hypothesis, where, due to financial reforms + financial deepening + institutional expansions + private banks + industrial expansions = economic growth. However, in the post-liberalization era, with increased growth, income, urbanisation, and digital infrastructure, the demand for financial services increased, which is consistent with the demand-following hypothesis and suggests financial development as a catalyst for long-term growth. Moreover, the panel causality test indicates a bidirectional relationship between them. This indicates that the credit-growth nexus in India is not unidirectional but mutually reinforcing. Despite regional disparities in credit distribution, bank credit and GDP growth rates moved in tandem. This highlights the crucial role of bank credit in stabilizing India's long-term growth.

Second, the consistent positive impact of broad money supply (M3) on India's GDP suggests that monetary expansion promotes real economic growth. This supports the view that liquidity expansion can stimulate investment and consumption. At the same time, the negative impact of inflation on economic growth highlights the adverse effects of persistent price pressures on purchasing power and investment. This finding supports the Monetarist view that inflation is a monetary phenomenon, and with the increase in money supply, inflation also rises, while a decrease in money supply leads to deflation. These findings highlight the importance of balanced monetary transmission to support sustainable economic growth.

Furthermore, the significant relationship between the stock market and real economic activity (IIP) provides strong evidence of the stock market as an effective channel for mobilizing long-term capital for investments. This confirms the presence of the supply-leading hypothesis in capital markets, where financial development precedes real economic growth. Furthermore, the findings align with the financial liberalization theory, which suggests that, particularly post-reforms, the role of the capital market has significantly improved with increased capital flows and long-term financing, complementing banking services. Importantly, threshold regression

highlights a state-dependent relationship between the stock market and economic growth, indicating that the stock market impact varies across the size of markets as well as expansionary and contractionary phases. This refines orthodox financial liberalization theory by proving that capital market impact on growth depends on the market size.

Finally, by utilizing HP filter to synchronize the cyclical fluctuations, this thesis provides a comprehensive view of the interaction of financial fluctuations with real economic activity across different phases. The findings align with the financial cycle theory and NBER view, confirming that financial cycles are more pronounced and longer than business cycles. Moreover, the analysis demonstrates the nonlinear finance-growth relationship, which varies across the periods of expansions and recessions. Crucially, SVAR findings prove that credit shocks in India are not neutral and instead trigger a long-run financial accelerator mechanism where credit shocks direct the real business cycle through the investment channel. This highlights the importance of financial development in stimulating growth during the period of crisis and disruption. Together, these theoretical insights provide a better understanding of the transmission of financial development to economic growth.

9.4 Practical Implications of the Study

Based on the study's findings, several policy implications are suggested for policymakers and the government of India. The results confirmed a long-term relationship between financial development and economic growth. Bank credit positively influenced India's GDP; despite the slowdown observed after 2012, the relationship remained positive. This indicates that policymakers can leverage bank credit as a catalyst for economic growth. Increased credit creates new opportunities, encourages productive investment, and boosts employment, ultimately driving growth. The consistent decline in credit growth after 2012, alongside the rise in NPAs and the twin balance sheet problem, was evident in the Indian financial system and provides an important context for interpreting the slowdown in credit growth. This suggests that credit should be channelled towards productive investment. Moreover, regional disparities in credit distribution across states were evident, as seen in the north-eastern states. The north-eastern states account for a relatively small share of GDP due to insufficient credit availability. This suggests that the government should focus on less developed regions and enhance financial inclusion in a state-specific manner to reduce inequalities. In states with relatively high agricultural dependence, the expansion of RRBs and other rural credit institutions can improve access to productive credit. In the North-eastern states, where physical banking

infrastructure remains relatively limited, digital infrastructure, including UPI and mobile banking, can partly offset geographical barriers to financial access.

The Modi government has introduced several credit schemes, such as the Kisan Credit Card in 2012 to fulfil the credit requirements of Kisans, the Pradhan Mantri Jan Dhan Yojana was launched in 2014 to expand access to financial services, and the Micro Units Development and Refinance Agency Banks in 2015 to provide easy credit to MSMEs. In light of empirical evidence, the study reinforces the need to strengthen more such initiatives to promote growth for both rural and urban people.

Regarding the money supply, it exerted a positive and significant impact on GDP, and this relationship remained stable even during periods of disruption, emphasizing its key role in stimulating economic growth. Policymakers should focus on maintaining adequate liquidity conditions; expansionary monetary policy helps reduce unemployment and supports economic growth. The importance of monetary policy has increased, particularly after the post-reform period, reflecting greater financial deepening. Additionally, the negative and significant impact of CPI on GDP indicates the need to strike a balance between growth and inflation trade-offs. Uncontrolled monetary policy can lead to inflationary pressures in the economy. Furthermore, the negative effects of dummy variables suggest that monetary policy can serve as a countercyclical tool during shocks, complementing fiscal stimulus.

Before the 1990s economic reforms, the development and growth of India were mainly financed through the banking sector. However, after the 1991 reforms, the approach shifted to capital market-based financing, providing long-term finance to not only the government but to the corporate sector as well. Positive and significant short-run and long-run coefficients for the stock market indicate an important role of the stock market in influencing industrial activity (IIP). This implies that policymakers can use the stock market as an early sign of a slowdown in economic growth. Therefore, a domestic investment atmosphere should be created for private investors to increase capital. Therefore, SEBI and RBI should monitor financial volatility and trends more closely and manage financial activities. In line with (Topcu & Gulal, 2020), particularly during times of crisis, it becomes imperative to intervene promptly and adopt an extensive policy to boost economic output. Digital platforms, mobile trading and Demat trading across rural areas should be strengthened to capture untapped savings and channelize them into productive investments. Policies such as long-term benefits against equity investment can encourage households to shift their savings into the capital market. Small

companies should be encouraged to invest in less advanced sectors to avoid competition and market saturation.

In light of rising digital financial platforms like UPI, mobile banking, and e-payments, India's financial payment system is evolving. These platforms have significantly reduced transaction costs and improved payment efficiency. These digital platforms can be utilized to improve access to financial services. Hence, policymakers should promote digital infrastructure by expanding broadband and internet penetration. Also, policymakers should enhance financial literacy and strengthen the cybersecurity framework.

Lastly, financial cycles were observed to lead business cycles in India, implying that credit expansions boost economic growth. RBI should strengthen counter-cyclical credit policies; during recessions, credit should be expanded, and during booms, it should be tightened to manage fluctuations. Since financial cycles are more pronounced than business cycles, macroprudential policies play a crucial role in preventing financial crises. An investment climate should be developed for both domestic and foreign investors. The counter-cyclical capital buffer should be strengthened during recessions, and excess capital should be released to absorb losses. Business cycles exhibited a significant positive correlation with investment cycles. Hence, the government should promote an environment for productive investment and infrastructure development. In conclusion, these findings provide valuable insight into how financial development promotes India's economic growth. Policymakers should focus on expanding credit and money supply, increasing investment, stabilizing the stock market, maintaining the inflation rate, promoting stability in the financial system, and efficiently allocating savings to promote long-term economic growth.

9.5 Limitations and Future Research Directions

This study has a few limitations, which provide directions for future research in the finance-growth nexus. First, the analysis excludes other indicators of financial development, such as the bond market, life and non-life insurance premiums, pension funds, and others. These indicators are important aspects of financial deepening, and excluding them may prevent a comprehensive understanding of the relationship between financial development and economic growth. Moreover, the study uses construction GDP as an indicator of housing activity. Construction GDP captures construction activity; it does not directly reflect movements in house prices. Future research can incorporate comprehensive and consistent house price data.

Second, the study is limited to India; including other countries could improve understanding of how the finance-growth nexus can be affected by global dynamics. Countries like the USA and China influence India's capital flow and trade patterns. Future research could involve a panel study across emerging economies and advanced economies to compare how strongly financial markets influence real economic output.

Although the study employs a wide range of econometric techniques, including ARDL, panel ARDL, threshold regression, lead-lag relationship, and SVAR, the empirical analysis mainly relies on annual data for most of the studies, while the stock market uses monthly data. Higher frequency data could better capture short-term fluctuations. Future studies can extend this analysis by incorporating quarterly or monthly macroeconomic data.

Additionally, the study can be extended to sectoral analysis to explore how fluctuations in monetary and financial markets affect different sectors of the economy. Moreover, the study also identifies structural breaks using dummy variables based on the most affected months and instability shown in CUSUMQ, rather than using structural break tests that could identify breaks endogenously. By employing structural break tests, studies can strengthen the analysis of crisis impacts and more precisely identify policy shifts. Furthermore, the financial and business cycle analysis is based on the HP filter technique, which smooths fluctuations, resulting in smaller coefficients. For future studies, methods such as wavelet analysis or Hamilton can be used for a better understanding of the complex relationship between financial development and economic growth.

9.6 Summary

This thesis provides a comprehensive view of the finance-growth nexus in India by combining indicators like banking credit, money supply and stock market development over the period 1980-2021. Based on the findings, it can be concluded that financial development promotes India's GDP, even during the period of disruption and shocks. The time series analysis confirms that credit, money supply and the stock market are the important drivers of economic growth. Furthermore, the identification of financial cycles' interaction with business cycles highlights the importance of macroprudential policies in ensuring economic stability.

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Appendix A (List of Publications)

S. No	Type (Year)	Title of the Paper, Name of the Journal, Year, Vol., pp	Journal/ Publisher	Impact factor is in SCI/SCIE /SSCI/AB DC List
1.	Research Article (2024)	Cyclical dynamics and co-movement of business, credit, and investment cycles: empirical evidence from India. https://doi.org/10.1057/s41599-024-03021-5 .	Humanities and Social Sciences Communications	SSCI Impact Factor- 3.7
2.	Research Article (2025)	Business and Stock Market Cycle Dynamics in India: A Monthly Analysis Using Turning Point and SVAR. https://doi.org/10.1177/21582440251392137 .	Sage Open	SSCI Impact Factor- 2.0

Ridhima Garg

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