SRI VENKATESWARA INTERNSHIP PROGRAM FOR RESEARCH IN ACADEMICS (SRI-VIPRA)

SRI-VIPRA

Project Report of 2023: SVP-2353

Title:

"How Stable is the Indian Banking System: An empirical approach"

IQAC

Sri Venkateswara College

University of Delhi

Benito Juarez Road, Dhaula Kuan, New Delhi

New Delhi -110021

SRI VIPRA PROJECT 2023
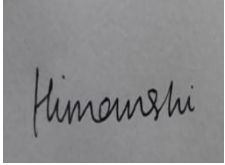
Title: How Stable is the Indian Banking System: An empirical approach

Name of Mentor: Mausumi Mohanty **Name of Department: Economics** **Designation: Assistant Professor**	

List of students under the SRIVIPRA Project

S.No	Photo	Name of the student	Roll number	Course	Signature
1		Ishita Garg	0521017	B.A. (Hons) Economics	*Ishita*

2		Disha Jindal	0521013	B.A. (Hons) Economics	
3		Prachi Gambhir	0521025	B.A. (Hons) Economics	
4		Raghav Puri	0521028	B.A. (Hons) Economics	
5		Devika Mishra	0521076	B.A. (Hons) Economics	
6		Shivangi Goel	0521039	B.A. (Hons) Economics	
7		Alok Kumar Kanojia	0521004	B.A. (Hons) Economics	
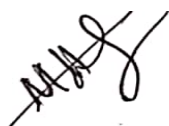
8		**Himanshi**	**1021051**	**BCom (Hons)**	
9		**Abhinav Mankotia**	**0521002**	**B.A. (Hons) Economics**	
10		**Anoushka Dhar**	**1721101**	**B.Sc. (Hons) Mathematics**	

Signature of Mentor

4

Certificate of Originality

This is to certify that the aforementioned students from Sri Venkateswara College have participated in the summer project SVP-2353 titled "How Stable is the Indian Banking System: An empirical approach".The participants have carried out the research project work under my guidance and supervision from 15th June 2023 to 15th September 2023. The work carried out is original and carried out in an online/offline/hybrid mode.

Signature of Mentor

Acknowledgements

6

TABLE OF CONTENTS

Abstract

The Global Financial Crisis of 2008 was a massive setback to the banking authorities all over the world who were of the mindset that the alterations in the interest rates alone are enough to uplift the crisis-hit economy. Hence little attention was paid towards regulation of the banking sector. Such a loose monitoring of the banking business during the years preceding the crisis led to a global crash, repercussions of which are being experienced till date by many developing economies. In response to recovery, there are many stringent bank regulatory measures being enacted by several economies. Such measures vary from early detection of crisis to a series of policy instruments which are exercised counter-cyclically hitting directly upon the bank balance sheets. All in all, the measures are designed essentially to map the status of the banking system and act pre-emptive. The present study is based entirely on one such approach in the context of the Indian Economy.

This research paper presents an innovative approach to gauge the stability of Scheduled Commercial Banks within the Indian banking sector, spanning from the first quarter of 2004 to the fourth quarter of 2022. The methodology involves the development of a comprehensive Banking Stability Index, which amalgamates five fundamental dimensions: Soundness, Asset Quality, Profitability, Liquidity, and Efficiency. These dimensions are meticulously selected, drawing inspiration from the well- established CAMEL framework, as prescribed by the Reserve Bank of India, which serves as the foundational framework for assessing banking stability.

The process of aggregating these dimensions is executed using a standardized approach, which ensures that each dimension is evaluated consistently and on an equitable scale. This standardized assessment culminates in the creation of a Banking Stability Map, which not only provides an insightful overview of the stability of individual banks but also unravels the intricate connections between financial markets and macroeconomic variables.

The paper adds to very important policy implications for the economy. As the Indian banking sector continues to evolve in response to economic shifts and regulatory changes, tools like the Banking Stability Index are crucial for regulators, policymakers, and market participants. They empower stakeholders with a deeper comprehension of the sector's performance, fostering informed decisions and proactive measures to ensure the ongoing stability and resilience of India's banking industry. This research sets a valuable precedent for the continuous monitoring and enhancement of the Indian banking system's stability, aligning with the nation's financial goals and aspirations.

The findings of the paper highlight that the Indian Banking sector is more risky in the profitability index. The paper concludes with some appropriate measures for enhancing the profitability dimension of the banking sector.

1. Introduction

The banking industry forms a major part of the financial sector of an economy. It plays a major role in the economic development of any country and provides major support at times of recessions and economic crises. But when banks are in crises, it may cause financial upheavals which can turn the whole economy upside down. As history witnesses, bank panics were the root cause of some of the major financial crises which have led economies into recession or depression.

The Global Financial Crisis of 2007-08 is one such crisis which brought the global financial system to the verge of collapse. The crisis initiated in the U.S. and was fuelled by rock-bottom interest rates and lax lending standards of banks which led to the formation of a housing bubble. When this bubble burst, banks were left with worthless investments in subprime mortgages. Several investment banks also collapsed during this time period. The Lehman Brothers was the biggest Bankruptcy reported in 2008. The crisis eventually spread worldwide

and led to a massive economic recession. People were left unemployed, lost their life-savings and their homes.

The onset of the 2007-2008 Financial Crisis can be traced back to the United States' concerted efforts to stimulate its housing market. As part of a broader strategy to invigorate the economy, the U.S. government initiated a deliberate reduction in interest rates. This tactical manoeuvre effectively lowered borrowing costs for individuals seeking mortgages, setting the stage for a surge in home purchases. Notably, even individuals with subpar credit histories, known as subprime borrowers, seized the opportunity to fulfill their homeownership aspirations.

During this period, the financial landscape witnessed the proliferation of complex financial instruments, notably Mortgage-Backed Securities (MBS) and Collateralized Debt Obligations (CDOs). These instruments, backed by pools of mortgages, were presented to investors as safe, low-risk assets. This perception was predicated on the belief that the real estate market, inherently anchored in physical assets, offered a secure investment haven.

As the demand for housing escalated in response to the favorable lending environment, property values began to soar well beyond their intrinsic worth. This phenomenon led to the emergence of a housing price bubble. Heightened by speculative fervor, it embodied a precarious situation wherein housing prices were detached from economic fundamentals.

The turning point arrived when the U.S. Federal Reserve, cognizant of the risk of inflation, embarked on a campaign to raise interest rates. This policy shift rendered the servicing of adjustable-rate mortgages increasingly burdensome for homeowners, precipitating a cascade of mortgage defaults and foreclosures. The deluge of homes entering the market resulted in a sharp and sustained depreciation of property values.

The repercussions of the bursting housing bubbles were acutely felt by investors holding MBS and CDOs, as the underlying mortgages plummeted in value. Many financial institutions that

had heavily invested in these complex securities found themselves reeling from staggering losses, with some teetering on the brink of bankruptcy.

The crisis unfortunately did not remain confined within national borders. Due to the interconnected nature of global financial markets, the shockwaves of this financial turmoil reverberated worldwide. Financial institutions abroad that had exposure to these toxic assets also incurred substantial losses, intensifying the crisis's global impact.

Consequently, what began as an attempt to bolster the housing sector and revitalize the U.S.

The economy ultimately spiraled into a catastrophic financial meltdown, colloquially referred to as the Great Recession. The profound economic consequences included widespread unemployment, a precipitous decline in consumer spending, a severe constriction of credit markets, and a protracted global recession that inflicted significant hardship on both developed and developing nations.

Developed and developing nations experienced the consequences of this crisis in markedly different ways due to their unique economic structures, financial systems, and policy responses. In developed nations, the GFC brought about a severe economic downturn. Countries such as the United States and various European nations found themselves in the grip of recession, with declining GDP, rising unemployment, and a sharp decrease in consumer spending. The crisis was particularly acute in nations heavily reliant on the financial sector, where institutions faced liquidity crises and some needed government bailouts to prevent systemic collapse. Consequently, these countries undertook substantial financial sector reforms. To counteract the economic downturn, expansive fiscal stimulus packages and monetary policy measures were implemented, including interest rate reductions and quantitative easing. Sovereign debt issues also plagued some developed nations, notably in Europe. Countries like Greece, Ireland, and Portugal grappled with soaring government debt levels, necessitating international bailouts and harsh austerity measures to restore fiscal

stability.

In contrast, developing nations faced their own set of challenges. While some managed to maintain relatively robust economic growth, others were vulnerable to the crisis due to factors like dependence on commodity exports and reliance on foreign capital inflows. The impact on trade was significant, with reduced demand for exports leading to trade imbalances and revenue shortfalls, especially in resource-dependent economies. Currency depreciation further complicated matters, affecting import costs and potentially leading to inflationary pressures.

Developing nations often had limited policy tools at their disposal to address the crisis compared to their developed counterparts. Their fiscal space was restricted, and their financial systems were less advanced, constraining their ability to respond effectively. However, some developing nations, particularly in Asia, demonstrated financial sector resilience honed through lessons learned from previous financial crises. Prudent banking practices and regulatory frameworks helped mitigate the impact to some extent along with international assistance from organizations like the International Monetary Fund (IMF) providing financial support and policy guidance to help these countries navigate the challenges.

While the global financial crisis wreaked havoc across the globe, India remained relatively unscathed. The reason for India's limited exposure to the crisis lay in its minimal operations outside its borders. The country had little to no involvement in foreign subprime mortgages, which insulated it from the direct impact of the crisis. Moreover, India boasted a robust banking system that ensured the careful verification of borrowers and their creditworthiness before extending loans. This prudent approach significantly limited the exposure of Indian banks to subprime lending. The strict provisioning requirements imposed on commercial banks also prevented the formation of a real estate price bubble. Key indicators of banking performance, such as the capital to risk-weighted asset ratio and asset quality, consistently adhered to prudential norms. Consequently, Indian banks maintained healthy balance sheets

that could withstand any potential stress. These pre-crisis macroprudential measures in India ensured the resilience of the banking system, enabling it to confront the crisis's impact effectively. Nevertheless, the Indian economy did experience a downturn subsequently, primarily due to its interconnectedness with the global economy concerning trade flows and investments.

The Reserve Bank of India (RBI) emerged as a guardian of India's financial stability and economic well-being. By implementing a series of risk mapping measures, the RBI sought to safeguard the nation's economic interests and maintain a resilient financial system.

At the core of the RBI's response to the GFC was its proactive stance on risk assessment and monitoring. The central bank diligently observed global financial developments, including the U.S. subprime mortgage crisis, to swiftly identify potential threats to India's financial system. This vigilance enabled the RBI to craft effective risk mitigation strategies. Recognizing the systemic risks posed by the GFC, the RBI introduced meticulous macroprudential regulations, aligning them with global standards. These regulations, tailored to address risks impacting the entire financial sector, ensured Indian banks maintained the resilience needed to withstand adverse events. The RBI also emphasized robust risk management within the banking sector, empowering banks to identify and mitigate potential risks effectively. Liquidity support measures, including open market operations and repo rate adjustments, bolstered financial institutions and averted liquidity crises. In foreign exchange markets, strategic intervention stabilized the Indian rupee, preventing economic uncertainty.

Heightened oversight and regulation ensured that banks adhered to prudential norms and robust risk management practices. Collaborating with other regulatory agencies, the RBI adopted a coordinated approach to tackle multifaceted challenges. Throughout the crisis, transparent communication with market participants and the public instilled confidence in India's financial system.

13

In the wake of the GFC, the need for a comprehensive measure like the Banking Stability Index became evident. The crisis exposed weaknesses in banking systems worldwide, leading to economic turmoil and severe repercussions for both developed and developing nations. To address such challenges, the Banking Stability Index was developed to assess key factors influencing a banking system's stability. These factors include capital adequacy, asset quality, liquidity, governance and risk management practices, and the effectiveness of regulatory oversight. By evaluating these aspects, the index helps gauge the banking sector's ability to absorb shocks, withstand economic downturns, and contribute to overall financial stability.

The Banking Stability Index is a critical tool in assessing and understanding the resilience and stability of a country's banking sector providing policymakers, regulators, and financial institutions with valuable insights into the vulnerabilities and strengths of the banking system, enabling them to make informed decisions to safeguard financial stability.

This paper aims to conduct an empirical assessment of the stability of the Indian Banking System. Through this analysis, we intend to uncover the specific factors that contribute to its resilience and identify areas where it may be facing challenges and vulnerabilities. By employing an empirical approach, we will delve into quantitative data and statistical methods to gain a deeper understanding of the Indian Banking System's overall stability.

The significance of this endeavor lies in its potential to provide valuable insights into what makes the Indian banking sector robust and where improvements or policy interventions may be needed to enhance financial stability, as well as fortify the sector against unforeseen challenges, thus ensuring its continued soundness in an ever-evolving economic landscape.[1]

2. Banking Structure in India

Numerous studies have attempted to investigate the significance of a country's financial

---

[1] Section sources: (Investopedia, 2023); (TOI Article, 2023); (Harvard Business Review, 2013)

structure on its economic growth. Some have suggested that financial structure may not significantly impact economic growth, while others have shown a definite connection between the composition of the financial system and growth. Notably, Rajan and Zingales (1998) made an observation that shifts the focus from the specific nature of the financial structure to the overall development level of the financial system, highlighting its crucial role in promoting growth.

In the context of this discussion, India stands out with its predominantly bank-oriented financial system. Over time, this banking structure has operated within a changing macroeconomic landscape. Various policy initiatives and reform measures have contributed to the increased robustness of the Indian banking system, enabling it to withstand adverse economic and financial conditions. This resilience was evident during the global crisis, where the Indian banking system remained relatively unscathed, serving as a testament to its increased strength.

India's banking system is notable for its distinctions from those of other Asian nations. These differences are rooted in the country's unique geographic, social, and economic characteristics. India's vast population, extensive land size, diverse culture, and significant income disparities, especially across regions, set it apart. While challenges like high illiteracy rates affect a significant portion of the population, India also possesses a considerable pool of skilled and technologically advanced talents.

The economic policy framework in India presents a blend of socialism and capitalism, with a clear emphasis on public sector investment. Unlike many other Asian economies that prioritize "export-led growth," India has adopted a growth-led exports approach, focusing on self-reliance through import substitution. These distinctive features manifest in the size, structure, and diversity of India's banking and financial sector.

To align the banking industry with state policy objectives, India initiated several

15

nationalization schemes in different phases (1955, 1969, and 1980). Consequently, Indian banks remained relatively isolated on the international stage, with only a few having a presence in global financial centers. This emphasis on domestic priorities, such as extensive branch expansion and the inclusion of more people in the banking system, contributed to this isolation. Additionally, the sector assumed a crucial role in supporting various economic sectors, including agriculture, small-scale industries, exports, and commercial banking activities, in developed centers like metropolitan and urban areas, as well as a limited number of semi-urban centers.

This international isolation of the Indian banking system was also influenced by strict branch licensing controls on foreign banks already operating in the country, as well as entry restrictions imposed on new foreign banks. These factors collectively shaped the unique landscape of India's banking.

2.1 Composition of Indian Banking Structure

The Indian Banking system comprises the following banks:

2.1.1 Reserve Bank of India

The Reserve Bank of India (RBI) is arguably the most crucial component of India's banking structure. It is an autonomous body that operates as the country's central bank, and its primary objective is to ensure financial stability in India. The RBI also acts as a regulatory body and formulates monetary policies that impact the economy.

2.1.2 Scheduled Commercial Banks

Scheduled Commercial Banks (SCBs) form an integral part of the Indian banking system. They are licensed to operate under the Banking Regulation Act, 1949, and are required to

maintain a minimum level of capital adequacy, as specified by the Reserve Bank of India (RBI). A major percentage of the country's commercial banking segment is under State control while the balance comprises private sector and foreign banks. The three types of SCBs in India are:

Public Sector Banks: These banks are owned and controlled by the government of India. They provide essential banking services to the public, especially in rural and semi-urban areas.

Private Sector Banks: These banks are owned and managed by private individuals or corporations. They offer personalized banking services to customers and are known for their customer-centric approach.

Foreign Banks: These banks have their headquarters in a foreign country but operate in India. They are subject to the same regulations and restrictions as Indian banks.[2]

2.1.3 Co-operative Banks

Co-operative banks are an integral part of the Indian banking system and are key to serving the banking needs of the rural and semi-urban areas. These banks operate on the principle of cooperation and are owned and managed by their members, who are also their customers.

2.1.4 Non- Banking Financial Companies (NBFCs)

Non-Banking Financial Companies (NBFCs) play an important role in India's financial system by catering to the needs of underserved segments of the population and providing a range of financial products and services to individuals and businesses that complement those offered by traditional banks. They play a crucial role in promoting financial inclusion and economic growth, but their operations are closely regulated by the RBI to maintain financial stability and protect the interests of consumers. One prominent example of a Non-Banking Financial Company (NBFC) in India is Bajaj Finance Limited. Bajaj Finance operates as a leading NBFC and is a subsidiary of Bajaj FinServ, one of India's well-known financial

---

[2] Refer to appendix for the list of Public and Private sector banks of India

services conglomerates.

3. Banking Supervision in India

The supervision and regulation of the Indian banking system are critical functions performed primarily by the Reserve Bank of India (RBI) in collaboration with other regulatory bodies. This comprehensive framework ensures the stability, integrity, and effectiveness of the banking sector in India.

The Reserve Bank of India (RBI) has followed a deliberate and cautious approach to banking liberalization in India, particularly since the economic reforms of the 1990s. These reforms ushered in a significant shift in the regulatory and supervisory framework for the banking sector. One of the early steps taken was the granting of operational autonomy to banks and financial institutions, allowing banks more flexibility in their day-to-day operations and decision-making. The 1990s saw a series of major structural and regulatory reforms aimed at transforming the banking sector. These reforms included:

Shift to Prudential Regulation: The regulatory focus shifted from microlevel intrusion to prudential regulation and supervision. This meant that regulators like the RBI began to emphasize the importance of sound risk management and financial stability in the banking system.

Interest Rate and Entry Deregulation: The interest rates on deposits and credit were deregulated, allowing market forces to determine these rates. This move aimed to enhance competition and efficiency in the banking sector. Entry restrictions on new banks were also eased to encourage competition.

Prudential Norms: Prudential norms and standards were introduced to ensure that banks maintained adequate capital, managed risks effectively, and followed sound lending practices.

Privatization: Some Indian banks were privatized during this period, leading to changes in

ownership and management structures.

Diversification: Banks were encouraged to diversify their activities, which expanded their scope beyond traditional banking services.

Apart from regulatory reforms, supervisory reforms were also introduced which led to evolution of the banking supervision framework in India and its alignment with international standards, particularly the Basel Committee on Banking Supervision (BCBS). When the BCBS came up with the Basel 1 Accord in 1988, RBI tried to base its supervisory and regulatory strategies on internationally adopted standards. The implementation of these new practices was carried out by RBI in a phased manner so that it complemented the economy's condition.

The Basel Committee on Banking Supervision (BCBS) is an international body that sets standards and guidelines for banking supervision and regulation. It was established by the central bank governors of the Group of Ten (G-10) countries in 1974 and is based in Basel, Switzerland. The BCBS operates under the auspices of the Bank for International Settlements (BIS) as a forum for central banks and supervisory authorities from around the world to exchange information and collaborate on international banking standards. Over the years, it has expanded its membership from G10 to 45 members from 28 jurisdictions. Commencing with the Basel Concordat, first issued in 1975, the Committee has established a series of international standards for bank regulation and supervision till date. [3]

The RBI has introduced these new supervisory and regulatory practices gradually to ensure their alignment with the prevailing conditions of the Indian economy. This gradual approach facilitated the banking sector's smooth transition to international standards, avoiding any abrupt disruptions.

3.1 Basel Norms

---

[3] Sources: (BIS website); (BCBS, 2012)

The Basel Committee on Banking Supervision (BCBS) has so far come up with three sequential banking regulation and supervision agreements called Basel I, Basel II and, most recently, Basel III. India, being the member of this committee, has been working on the implementation of these internationally accepted norms in phases.

3.1.1 Basel I

This is the first norm given by BCBS in 1988 and it focused on credit risk of financial institutions. It prescribes the minimum capital requirement of 8% of the Risk weighted assets (RWAs) for the banks. This ensures that banks have enough capital (Tier 1 and Tier 2) to meet unexpected losses. India adopted Basel I in 1999. RBI made it mandatory for every Scheduled Commercial Bank to maintain CRAR (Capital to Risk Asset Ratio) of 9%.

It also established the Board of Financial Supervision (BFS) within the central bank to enhance the supervision and regulation of banks and financial institutions. BFS played a pivotal role in developing and implementing prudential norms and standards aligned with best international practices.

3.1.2 Basel II

In 2004, BCBS published Basel II which was an update to the former accord. It took a three-pillar approach:

Minimum capital requirement: In addition to the credit risk, market risk and operational risk was also taken into account for Capital Adequacy purpose.

India adopted the Basel II framework in 2007, which introduced more advanced risk management practices. This framework emphasized a more comprehensive assessment of risks, including credit, market, and operational risks. Basel II aimed to enhance the stability and resilience of the Indian banking system by requiring banks to allocate capital based on their risk profiles.

3.1.3 Basel III

In 2010, Basel III guidelines were issued in wake of the 2007-08 Global Financial Crisis. The crisis revealed several weaknesses of the Banking system. The banks were under-capitalized, over-leveraged, and highly dependent on risky assets and could not build enough confidence in the public. Hence, the new guidelines aim to improve the resilience of banking system by focusing on four vital parameters:

Capital: A bank's CAR must be at least 10.5% of its RWAs. This can be bifurcated as total capital requirement of 8% and 2.5% Capital Conservation Buffer.

Leverage: The leverage rate is the ratio of a bank's Tier 1 capital to average total consolidated assets. It has to be at least 3%.

Funding: Liquidity Coverage Ratio (LCR) requires banks to hold high-quality liquid assets to deal with short term stress of cash flows. LCR is 100%.

Liquidity: Net Stable Funds Rate (NSFR) requires banks to maintain a stable funding profile in relation to their off balance-sheet assets and activities. The minimum NSFR requirement is 100%.

In line with the global trend, India began implementing the Basel III framework in phases from 2013 onwards. Basel III introduced more stringent capital requirements, enhanced risk management practices, and a focus on liquidity and leverage ratios to ensure the resilience of banks in times of stress. Stress testing became a crucial tool to evaluate banks' resilience to adverse economic scenarios and RBI adopted a risk-based supervision approach, allocating supervisory resources based on the risk profiles of banks.

India aligns well with the Basel capital framework, says the Basel Committee in its 2015 report. The assessment conducted by Regulatory Consistency Assessment Programme (RCAP), part of the Basel Committee, in 2019 praised that large exposure regulations in India are not only compliant with Basel framework but even stricter. However, not all of the Basel

norms have been implemented in India yet because of certain challenges they pose to Indian banks.[4]

3.2 Core Principles of Effective Banking Supervision and Their implementation status in India

Apart from the Basel Norms, Basel Committee on Banking Supervision (BCBS) in 1997 also came up with the 25 "Core Principles for Effective Banking Supervision" which were framed to guide the supervisory authorities of banks on minimum requirements for good supervision. Most of these principles were imbibed in India's banking regulatory and supervision framework even before these principles were kept forth by the committee. Here is implementation status of these Core Principles in India as of 1999:

Principle I: Framework and Coordination

The Reserve Bank of India Act, 1934, is entrusted with the sole responsibility of regulation and supervision of banks under the Banking Regulation Act, 1949. Both the regulatory and supervisory functions of RBI were earlier carried out through its Department of Banking Operations and Development (DBOD). RBI constituted the Board for Financial Supervision (BFS) under RBI (BFS) Regulations in 1994 to give undivided attention to the prudential supervision and regulation of banks, financial institutions and non-bank financial institutions in an integrated manner. DBOD continues to perform the regulatory function pertaining to banks. However, DOS has since been bifurcated into the Department of Banking Supervision (DBS) and Department of Non-Banking Supervision (DNBS). In November 1994, the BFS positioned a new strategy for on-site supervision of banks and a system of off-site monitoring, based on a quarterly reporting system.

---

[4] Section sources: (Investopedia, 2022); (Drishti IAS Report, 2020)

Principle-II: Permissible Activities

The permissible activities of a banking company are listed in Section 6(1) of the Banking Regulation Act, 1949 that allow banks to undertake both commercial banking and investment banking. Section 6(2) specifically prohibits a banking company from carrying on any form of business other than those referred to in Section 6(1).

Principle-III: Licensing of Banks

Section 22 of the Banking Regulation Act provides that a company intending to carry on banking business must obtain a license from RBI except such of the banks (public sector banks and RRBs), which are established under specific enactments. The RBI issues licenses only after "tests of entry" are fulfilled. These tests include minimum capital, ownership structure, bank's operating plans and controls, ability of the bank to pay its present and future depositors in full, quality of management and whether the licensing of the bank would be in the public interest.

Principle IV: Ownership Pattern

Banking supervisors must have the authority to review and reject any proposals to transfer significant ownership or controlling interests in existing banks to other parties. Section 12(2) of the Banking Regulation Act restricts shareholders in a banking company from exercising voting rights on poll in excess of ten per cent of the total voting rights of all the shareholders of the banking company.

Principle V: Acquisition & Investments

Banking supervisors must have the authority to establish criteria for reviewing major acquisitions or investments by a bank and ensuring that corporate affiliations or structures do

not expose the bank to undue risks or hinder effective supervision. Banks are allowed to set up subsidiaries and make significant investments only in companies that are undertaking business authorized under section 19(1) of the Banking Regulation Act.

Principle VI: Capital Requirements

Banking supervisors must set minimum capital requirements for banks that reflect the risks that the banks undertake and must define the components of capital bearing in mind its ability to absorb losses. The RBI has prescribed a minimum Capital Adequacy Ratio (CAR) of 8% to be maintained by banks on a solo basis as per Basel norms, covering both on and off-balance sheet items.

Principle VII: Loan & Investment Policy

An essential part of any supervisory system is the evaluation of a bank's policies and procedures related to the granting of loans and making of investments and the ongoing management of the loan and investment portfolios. Under Section 21 of the Banking Regulation Act, RBI has asked banks to lay down transparent policies and guidelines for credit dispensation in respect of each of the broad categories of economic activity. Similarly, RBI has issued guidelines on drawing up policies and procedures for managing investment portfolios.

Principle VIII: Asset Quality

Banking supervisors must be satisfied that banks establish and adhere to adequate policies, practices and procedures for evaluating the quality of assets and the adequacy of loan loss provisions and loan loss reserves. The RBI has laid down detailed guidelines on income recognition, asset classification and provisioning covering both on and off-balance sheet exposures in line with international standards.

Principle IX: Portfolio Concentration and Large Exposures

Banking supervisors must be satisfied that banks have Management Information Systems that enable management to identify concentrations within the portfolio and supervisors must set prudential limits to restrict bank exposures to single borrowers or groups of related borrowers.

Principle X: Connected Lending

In order to prevent abuses arising from connected lending, banking supervisors must have in place requirements that banks lend to related companies and individuals on an arm's- length basis, that such extensions of credit are effectively monitored, and that other appropriate steps are taken to control or mitigate the risks. Section 20 of the Banking Regulation Act prohibits loans and advances (other than for personal use) to directors or to any firm or company in which directors are interested or individuals in respect of whom any of its directors is a partner or guarantor.

Principle XI: Country and Transfer Risk

Indian banks having overseas operations are required to lay down internal guidelines on country risk management and fix limits based on risk rating of the country. Limits should also be fixed for a group of countries in a particular risk category subject to a maximum ceiling fixed by RBI.

Principle XII: Market Risk

RBI has powers under Section 35A of the Banking Regulation Act to impose specific limits and /or specific capital charge on market risk exposures as part of the general powers to issue directions to banks on any aspect of their functioning.

Principle XIII: Risk Management Process

The RBI has issued detailed guidelines to banks for putting in place an effective Asset-Liability Management (ALM) system with effect from April 1, 1999. The banks are expected to lay down policy on identification, measurement, monitoring and control of various kinds of risks such as liquidity risk, interest rate risk and currency risk and to review the policy from time to time to incorporate changes in business environment and the perception of the top management about the risks.

Liquidity Risk Management- All banks are required to maintain Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR). The RBI has powers to modify CRR between 3% to 20% and SLR between 25% to 40%. The RBI has advised the banks to monitor liquidity through maturity or cash flow mismatches. Future cash flows are to be bracketed in different time buckets. The banks are required to fix tolerance levels for various maturity mismatches depending upon the bank's asset – liability profile, extent of stable deposit base, nature of cash flows, etc.

Interest Rate Risk Management- The banks are expected to measure interest rate risk through traditional gap analysis supplemented by sophisticated techniques wherever possible. Each bank is required to set prudential limits on gaps for each time bucket considering total assets, earning assets and equity. The bank may fix a prudent level for earnings at risk (EaR) or Net Interest Margin (NIM). The RBI intends to move over to modern techniques of interest rate risk measurement like Duration Gap Analysis, Simulation and Value at Risk when banks acquire sufficient expertise and sophistication in collating requisite information.

Currency Risk Management- The banks are required to assign 100% risk weight to their open position limit in foreign exchange with effect from March 31, 1999. Besides, they are required to fix aggregate and individual gap limits for each currency with the approval of RBI.

They are required to adopt Value at Risk approach to measure the risk associated with forward exposures. The RBI monitors currency risk through a monthly return on maturity and positions for both on and off balance sheet items in foreign exchange.

Principle XIV: Internal Controls

Banking supervisors must determine that banks have in place internal controls that are adequate for the nature and scale of their business. These should include clear arrangements for delegating authority and responsibility, separation of the functions that involve committing the bank, paying away its funds, and proper accounts for its assets and liabilities reconciliation of these processes; safeguarding its assets; and appropriate independent internal or external audit and compliance functions to test adherence to these controls as well as applicable laws and regulations.

Principle XV: Know Your Customer

Banking supervisors must determine that banks have adequate policies, practices and procedures in place including strict 'Know Your Customer' rules that promote high ethical and professional standards in the financial sector and prevent the bank being used intentionally and unintentionally by criminal elements.

Principle XVI: Instruments of Supervision

An effective banking supervisory system should consist of some form of both on-site and off-site supervision. The main instrument of supervision in India is the periodical on-site inspection of banks that is supplemented by off-site monitoring and surveillance. Since 1995, on-site inspections are based on CAMELS (Capital adequacy, asset quality, management, earning, liquidity and systems and controls) model and aim at achieving the following

objectives:

- Evaluation of bank's safety and soundness

- Appraisal of the quality of Board and top management

- Ensuring compliance with prudential regulations

- Identifying the areas where corrective action is required to strengthen the bank

- Appraisal of soundness of bank's assets

- Analysis of key financial factors such as capital, earnings, and liquidity and determine bank's solvency

- Assessment of the quality of its management team and evaluation of the bank's policies, systems of management, internal operations and control

- Review of compliance with banking laws and regulations as well as supervisory guidance conveyed on specific policies.

Principle XVII: Supervisory Contact

Banking supervisors must have regular contact with bank management and thorough understanding of the institution's operations. Senior Executives at the Central Office of RBI meet annually top management of banks to discuss matters of supervisory concerns identified during on-site inspection. The overall CAMELS rating is communicated to the bank management. Supervisory concerns emanating out of off-site supervision are also communicated to banks on an ongoing basis.

Principle XVIII: Prudential Reports and Statistical Returns

Banking supervisors must have means of collecting, reviewing and analyzing prudential reports and statistical returns from banks on a solo and consolidated basis. Presently, RBI receives prudential reports and statistical returns from banks on a solo basis only. The off-site

supervisory returns received by RBI are used to prepare bank-wise, peer group-wise and sector-wide analysis reports, which are seen by the top management of RBI and matters of supervisory concerns emanating from such analysis are taken up with the banks.

Principle XIX: Independent Validation & External Audit

Banking supervisors must have a means of independent validation of supervisory information either through on-site examination or use of external auditors.

Principle XX: Consolidated Supervision

An essential element of bank supervision is the capability of the supervisors to supervise the banking group on a consolidated basis.

Principle XXI: Adequate Records & Financial Statements

RBI is committed to enhance and improve increasing the levels of transparency and disclosure in the annual accounts of banks. The formats for preparation of financial statements are prescribed under Section 29 of the Banking Regulation Act. It is mandatory for all the banks to get their annual accounts audited every year by statutory auditors appointed by the RBI or appointed with approval of RBI. The auditors are required to report whether the financial statements exhibit a true and fair view of affairs of the bank.

Principle XXII: Supervisory Intervention

Banking supervisors must have at their disposal adequate supervisory measures to bring about timely corrective action when banks fail to meet prudential requirements such as minimum capital adequacy ratios when there are regulatory violations or where depositors are threatened in any other way. In extreme circumstances this should include the ability to revoke the banking license or recommend its revocation.

Principle XXIII: Global Consolidated Supervision

Banking supervisors must practice global consolidated supervision over their internationally active banks, adequately monitoring and applying appropriate prudential norms to all aspects of the business conducted by these banking organizations worldwide, primarily at their foreign branches, joint ventures and subsidiaries.

Principle XXIV: International Coordination

A key component of consolidated supervision is establishing contact and information exchange with the various other supervisors involved (primarily host-country supervisory authorities). RBI maintains regular contact with overseas supervisors and also serves on important international forums connected with bank supervision. It was one of the non-G 10 member countries consulted in the Core Principles formulation exercise and is now represented on the Core Principles Liaison Group set up by the BCBS (Basel Committee on Banking Supervision). It has also been represented on key international forums of Central Bankers / Bank Supervisors such as the Working Group on Strengthening Financial Systems. Supervisory officials, during visits to foreign countries, generally call on the overseas supervisory authorities for exchange of views. While issuing a license to a foreign bank to open a branch in India, the RBI considers adequacy of supervisory and regulatory systems in existence in the home country. A system of exchange of information is being put in place.

Principle XXV: Host Country Obligations

Banking supervisors must require the local operations of foreign banks to be conducted to the same high standards as are required of domestic institutions and must have powers to share information needed by the home country supervisors of those banks for the purpose of

carrying out consolidated supervision. Country of origin does not confer any special status on foreign banks operating in India. They are generally subject to the same legislation and regulatory requirements as applicable to domestic banks. RBI has the necessary powers to share information with overseas supervisors. (RBI, 1999)

India had made substantial strides in aligning its banking supervision practices with the Core Principles of Effective Banking Supervision set forth by the BCBS. However, it was evident that there were areas, most notably resource allocation for supervision, which required continuous attention and improvement. The need for a robust macroprudential framework in India became increasingly apparent to not only bolster the effectiveness of banking supervision but also enhance the resilience of the banking system against emerging risks and challenges.

3.3 Implementation of Macroprudential Framework

Recognizing the importance of resource allocation and the evolving nature of global financial markets, India realized that it could benefit from further strengthening its supervisory capacity through a well-defined macroprudential approach, ensuring the long-term stability and soundness of its banking sector.

India had been actively utilizing macroprudential tools well ahead of the global financial crisis. These regulations helped the country to withstand the widespread effects of the crisis.

Traditionally, the Reserve Bank of India (RBI) has held a dominant position in formulating and executing macroprudential policies, given its role as the overseer of a significant portion of the Indian financial system. In 2004, for about a decade, financial stability was also added to its realm of responsibilities. After the global crisis, Basel 3 guidelines for banking supervision were issued. It was accompanied with some changes in institutional framework in India.

The Financial Stability and Development Council (FSDC) was set up in December 2010 and

it became the apex body concerned with financial stability in India. The RBI is a member of the FSDC along with the Securities and Exchange Board of India (SEBI), the Pension Fund Regulatory and Development Authority (PFRDA) and the Insurance Regulatory and Development Authority of India (IRDA). It has a Sub-Committee (FSDC-SC) which is headed by the Governor of the RBI. It functions as an entity responsible for determining macroprudential policies and tools for the entire banking system. Since India's financial system is dominated by banks and the Reserve Bank of India (RBI) oversees the regulation of both banks and other financial entities, the primary responsibility for determining macroprudential policy lies with the RBI. Macroprudential policies are regularly assessed through Financial Stability Reports (FSRs) which are issued biannually by RBI. These reports are later deliberated in the FSDC.

3.4 Macroprudential Tools

The main aim of the macroprudential tools is to address the risk resulting from the interdependence between different institutions and sectors; changes in credit supply during economic cycles and cross-border spillovers like the Global Financial crisis 2007-08. India has implemented many successful bank-specific macroprudential tools, like:

In the early 2000s, banks were instructed to create an Investment Fluctuation Reserve (IFR) of at least 5% of their investment portfolio. This was to provide the banks with cushion in hard times as IFR will maintain stable capital adequacy. The RBI has employed differentiated risk weights and provisioning criteria on different occasions to ensure the financial health of banks. Provisioning requirements for standard assets were raised several times before the crises in segments such as capital markets, retail loans and exposures to NBFCs.

A Loan-to-Value (LTV) cap refers to a maximum limit set by the lending institution on the Loan-to-Value ratio for a particular type of loan. It means that the lender will not provide a loan amount that exceeds a certain percentage of the asset's appraised value. It was in 2007

that the LTV cap was introduced for the first time in India. To prevent the housing sector from overheating, a combination of a cap on LTV ratios and a differentiated risk weight requirement for housing loans was implemented.

There are certain commodities and sectors which are sensitive to market fluctuations. Margin requirements were imposed as a safeguard in this case.

There is also a framework established for implementing the Countercyclical Capital Buffer (CCyB) and additional capital requirements for domestic systemically important banks (D-SIBs). The activation of the CCyB will only occur when deemed necessary based on prevailing circumstances. The indicators and thresholds governing the activation of the CCyB will be regularly evaluated and tested using empirical data, and the RBI may consider other indicators as well to support their decisions regarding CCyB activation.

RBI has also implemented Capital Flow Management Measures (CFMs) to mitigate the potential risks associated with volatile capital flows, which can have significant impacts on a nation's economy and financial stability. Caps have been placed on various sectors which receive foreign capital. These caps are sector specific caps, domestic entity-specific caps and restrictions on external commercial. (BIS, 2017)

The use of macroprudential tools is not one-size-fits-all and should be tailored to the specific circumstances of each country's financial system. The effectiveness of these tools depends on timely implementation, data quality, and the ability to respond flexibly to evolving risks. Overall, a well-designed and implemented macroprudential framework is an essential component of modern financial regulation.

In essence, the macroprudential framework and Basel norms share a common goal of ensuring financial stability. Basel norms provide the micro-level regulations that form the foundation of a bank's safety and soundness, while the macroprudential framework addresses systemic risks that could affect the stability of the entire financial system. Together, they contribute to a more

resilient and stable global financial landscape.

3.5 Camels Rating System

Due to the constantly changing global economic scenarios, mapping banking stability in an economy is of high importance. By assessing key stability indicators, regulators and policymakers gain insights into the robustness of the banking sector, which is the backbone of any modern economy. In an interconnected world, where financial shocks can quickly spread across borders, understanding and mitigating systemic risks are paramount to maintaining economic stability.

As a result, CAMELS rating was introduced in response to the need for a standardized and comprehensive approach to assess and monitor the stability of banks. It has since become a widely used tool in banking supervision, helping regulators and policymakers identify potential problems, enhance risk management practices, and maintain the stability of the financial system.

CAMELS Rating System is an international rating system used by regulatory banking authorities to rate financial institutions on the bases of six factors represented by the acronym: capital adequacy, asset quality, management, earnings, liquidity, and sensitivity. Each bank is given a score on each factor on the scale of 1 to 5. Score of 1 indicates strong performance of a bank while score of 5 shows its weakness.

Components of CAMELS Rating System

C — Capital Adequacy · A — Asset Quality · M — Management · E — Earnings · L — Liquidity · S — Sensitivity
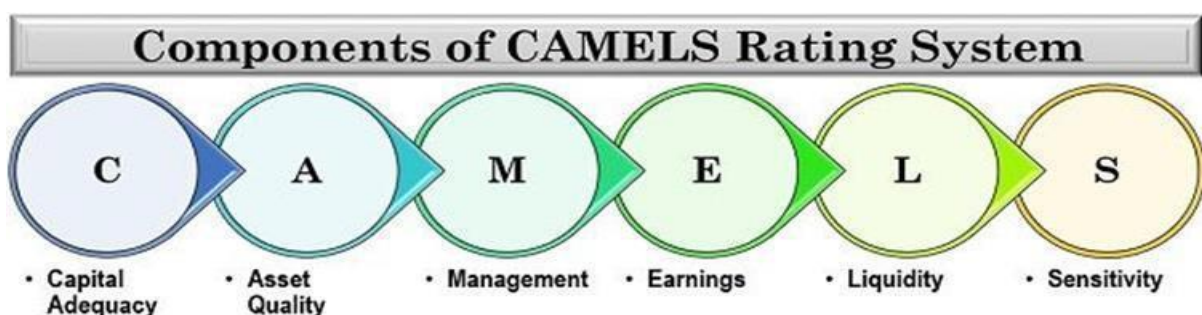
RBI has a prescribed way to supervise banks in India which has evolved over time. Bank supervisors collect on-site and off-site information to arrive at a composite score called 'supervisory rating' to assess the overall health of the banking sector. Following the recommendations of Padmanabhan Committee (1996) on the form of rating system suitable for India, RBI adopted 'CAMEL' system of supervisory rating based on the methodology followed for banking supervision in the US. The Committee adopted two separate models: CAMELS (Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, Systems & Control) for Indian banks and CACS (Capital adequacy, Asset quality, Compliance, and Systems & Control) for foreign based banks in India. 'S' i.e. Systems and Control was an additional dimension in India's CAMELS framework. Also, the CACS framework was modified to include 'L' which stands for liquidity and now the rating system for foreign based banks is CALCS. Subsequently, further modifications took place in this framework.

Under the CAMELS system in India, each component is rated on a scale of 1-100 such that as the score increases, the performance of the bank also increases. Each CAMELS parameter has sub-parameters whose weighted average is calculated to arrive at an aggregate score for each individual parameter. Each parameter is then awarded a rating from A to D (A – good , B – satisfactory, C – unsatisfactory, and D – poor). Annual Financial Inspection (AFI) is done for the on-site supervision and is primarily modeled around CAMELS framework. (RBI Report, 2012)

All countries around the globe use either CAMELS framework or similar risk assessment systems to ensure the safety and soundness of their banking sectors. While specific criteria and terminology may vary, the core principles of assessing capital adequacy, risk management, and other key factors remain consistent in promoting financial stability and protecting depositors and the broader financial system.

4. Banking Stability Index

The introduction of a Banking Stability Index stems from the recognition of the critical role that a stable banking sector plays in the overall health and resilience of an economy. The global financial crisis of 2007-2008 served as a stark reminder of the far-reaching consequences that can arise from a fragile banking system.

In the aftermath of the crisis, regulators, policymakers, and economists worldwide sought to develop more effective tools for evaluating and pre-emptively addressing vulnerabilities within the banking sector. It became evident that a comprehensive measure was needed to gauge the soundness and stability of banks, taking into account various crucial aspects, including capital adequacy, asset quality, management practices, earnings, liquidity, and sensitivity to market risk.

Recognizing that traditional financial indicators alone were insufficient to provide a complete picture of a bank's stability, experts turned to composite indices. These indices incorporate a broader range of quantitative and qualitative factors, providing a more holistic assessment. The development and deployment of Banking Stability Indexes represented a significant step forward in the field of financial stability analysis.

The Banking Stability Index (BSI) is a complex quantitative tool designed to assess and monitor the stability of a country's banking system. It relies on a combination of financial, macroeconomic, and regulatory indicators to provide a comprehensive overview of the health of the banking sector. By regularly monitoring the index, authorities can take pre-emptive measures to safeguard the stability of their banking systems and prevent financial crises. Additionally, investors and financial institutions may use these indexes to assess the risk associated with investing in or lending to banks within a particular country.

RBI also took an initiative to develop such an indicator for India by combining essential banking performance indicators. It developed a mechanism to prepare Banking Stability Map and Indicator. It was first published in the Financial Stability Report (FSR) of RBI issued in December 2010. In subsequent FSRs, the methodology was further refined.

In this paper, we will use this approach of the RBI to arrive at a Banking Stability Index. This Index evaluates the risk factors and the fundamental conditions that affect the banking sector in an economy. Further, we will construct a graphical representation of the results using the Banking Stability Map.

5. Variables, Dimensions and Methodology

5.1 Data

The required bank-level data on the financial variables used in the construction of the bank stability index is taken from the annual editions of the "Statistical Tables Relating to Banks in India", a publication by the Reserve Bank of India.

The sampled commercial banks include 25 public sector banks and 19 private banks operating in India over the period of 2004 Q1 to 2022 Q4.

5.2 Variables and Dimensions of the Bank Stability Index (BSI)

For the construction of the Bank Stability Index (BSI), we relied on the CAMEL framework as defined by the Reserve Bank of India. The total of 17 financial ratios is clubbed into five dimensions, namely Soundness, Asset Quality, Profitability, Liquidity and Efficiency of the Bank Stability Index.

Dimension	Ratios/ Indicators			
Soundness	CRAR #	Tier I capital to Tier II Capital #	Leverage Ratio Calculated as Total Assets to Capital and Reserves	
Asset Quality	Net NPAs to Gross Advances (%)	Gross NPAs to Gross Advances (%)	Sub-standard Advances to Gross Advances #	Restructured Standard Advances to Standard Advances
Profitability	Return on Assets#	Net Interest Margin #	Profit Margin #	
Liquidity	SLR to Total Assets #		Cash Funds to Total Assets #	Liquid Assets to Total Deposits #
Efficiency	Cost to Income	Business to Staff Expenses#		Staff Expenses to Total expenses

 # Negatively Related to Risk

Soundness

CRAR: Capital to Risk-Weighted Assets Ratio, also known as Capital Adequacy ratio, is calculated by dividing a bank's capital (both Tier 1 and Tier 2 capital) by its risk-weighted assets. The purpose of this calculation is to ensure that banks have a sufficient capital buffer to absorb losses in the event of financial distress or unexpected economic downturns.

Tier I capital to Tier II Capital: Tier I capital is the primary funding source of the bank and consists of shareholders' equity and retained earnings. Tier II capital includes revaluation reserves, hybrid capital instruments and subordinated term debt, general loan-loss reserves, and undisclosed reserves.

Leverage Ratio: Leverage Ratio assesses how much capital comes in the form of debt (loans) or the ability of a company to meet its financial obligations. It is calculated as Total Assets to Capital and Reserves.

Asset Quality

Net NPAs to Total Advances: A high level of Non Performing Assets (NPAs) suggests high probability of a large number of credit defaults that affect the profitability and net-worth of banks and also wears down the value of the asset. It can be calculated as Net NPAs / Total Advances.

Gross NPAs to Total Advances: GNPA stands for gross non-performing assets. GNPA is an absolute amount and tells you the total value of gross non-performing assets for the bank in a particular quarter or financial year. It can be calculated as Gross NPAs / Total Advances.

Sub- Standard Advances to Gross Advances: Any advance is a sub-standard asset if it remains outstanding or NPA for a period less than or equal to 12 months. The ratio is calculated as Sub- Standard Advances / Gross Advances.

Restructured Standard Advances to Standard Advances : Restructured Advances are assets which have an extended repayment period, reduced interest rate, converting a part of the loan into equity, providing additional financing, or some combination of these measures.

Profitability

Return on Assets (ROA): It measures how efficient a company's management is in generating profit from their total assets on their balance sheet. It is calculated as Net Income / Average Total Assets.

Net Interest Margin: It is a measure of the difference between interest paid and interest received, adjusted for the total amount of interest-generating assets held by the bank. It is calculated as (Interest Received - Interest Paid) / Average Invested Assets.

Profit Margin : It is calculated as (Revenue - Cost) / Revenue.

Liquidity

Liquid Assets to Total Deposits: Liquid assets are calculated through summation of the cash funds, dues and SLR approved securities of each bank. The ratio quantifies the proportion of a bank's readily available assets, such as cash and marketable securities, in relation to its total deposits. Adequate liquid assets mitigate the risk of a sudden liquidity shortage, preventing potential bank runs and maintaining depositor trust.

Cash Funds to Total Assets: It is a fundamental financial metric providing an insight into the company's liquidity and its ability to manage potential financial shocks. A well-maintained cash funds to total assets ratio supports the system's ability to facilitate lending and contribute to economic growth and acts as a safety cushion against unexpected changes in market conditions and depositor behavior.

SLR/Approved Securities to Total Assets: The SLR ratio mandates that commercial banks maintain a certain portion of their total assets in the form of approved liquid assets such as cash, gold reserves, government bonds and other RBI approved securities. This ratio thus provides valuable insight into the bank's stability as SLR securities are low-risk and government backed and are an essential indicator of the bank's compliance with regulatory norms.

Efficiency

Cost to Income: The cost-to-income ratio is a key financial metric used to assess the efficiency of a bank or financial institution. A lower cost-to-income ratio is generally indicative of greater efficiency because it suggests that a bank is able to generate more revenue relative to its operating expenses. It is calculated as operating expenses / operating income (net interest income + the other income)

Business to Staff Expenses: A higher ratio suggests that the bank is generating more business per unit of staff expenses, indicating greater efficiency in using its human resources. It is

calculated as Business (Credit + Deposits) / Staff Expenses.

Staff Expenses to Total expenses: It is calculated as Staff Expenses / Total expenses. A lower Staff Expenses to Total Expenses ratio generally suggests greater efficiency because it indicates that a smaller proportion of the organization's total expenses is devoted to staff-related costs.

5.3 Methodology

The index is calculated taking into account 5 major financial dimensions-

- Soundness
- Asset Quality
- Profitability
- Liquidity
- Efficiency

Under each of the dimensions, we take different indicators (ratios).

Steps for calculation of BSI:

1. First, we start with the ratios of a single dimension - say Soundness

2. We obtain data on each of the ratios under the Soundness index for each bank in the sample. For example, at first we take data of capital to risk weighted assets (CRAR) ratio, for all the banks in the sample over the period 2004Q1-2022Q3.

3. We then calculate the weighted average of the CRAR for each quarter for all the banks in the sample where weight assigned is the ratio of the Individual bank's asset to the total assets of the banking sector (i.e. all banks in the sample taken together). Here, we obtain a series of weighted average of the ratios (WAR) in this step.

4. In the next step, we standardize each of the WAR values in the series using a relative distance measure given by-

$$STANDARDIZED\ RATIO\ (SR) = \frac{[Value\ of\ the\ particular\ WAR - Minimum\ Value\ in\ the\ WAR\ series]}{[Maximum\ Value\ in\ the\ WAR\ series - Minimum\ Value\ in\ the\ WAR\ series]}$$

5. We repeat the above steps to calculate the WAR and SR for all the other ratios of the Soundness Dimension like Tier I to Tier II capital ratio and the leverage ratio

6. Next, we consider the CAMELS weight for CRAR, Tier I to Tier II capital ratio and the leverage ratio as assigned by the RBI's supervisory department.

7. To obtain the overall soundness index of the banking sector in a particular year, we calculate the weighted average of the SR for all the ratios where the weights are the respective CAMELS weight for each of the ratios.

For example,

$$SOUNDNESS\ INDEX_{20XXQX} = \frac{W_{CRAR20XXQX}*SR_{CRAR20XXQX} + W_{tier\ i\ to\ tier\ ii\ capital\ 20XXQX}*SR_{tier\ i\ to\ tier\ ii\ capital\ 20XXQX} + W_{leverage\ 20XXQX}*S}{W_{CRAR\ 20XXQX} + W_{tier\ i\ to\ tier\ ii\ capital\ 20XXQX} + W_{leverage\ 20XXQX}}$$

8. We continue the above steps for the rest of the years in the sample and obtain an overall soundness index for the sample years for each quarter.

9. We repeat the above steps for all other dimensions of the BSI and obtain an index each of Asset Quality, Profitability, Liquidity and Efficiency for the Indian Banking sector. The value of each of the indices lies between 0 (minimum) and 1 (maximum). A higher value of the index of a dimension in a particular year means risk emerging to the banking sector from that dimension is more as compared to the risk from other dimensions.

10. At last, to calculate the BSI, we take a simple average of all the dimensions over the sample period. (RBI Working paper, 2013)

6. Empirical Findings

In this section, we present a comprehensive analysis of bank stability dynamics, employing various graphical representations and quantitative metrics. We begin by elucidating the insights provided by the Bank Stability Map (Figure 1), followed by an examination of the temporal evolution of the Banking Stability Indicator Chart (Figure 2). Furthermore, we delve into the multidimensional analysis of key determinants, including Soundness, Efficiency, Liquidity, Profitability, and Asset Quality.

6.1 Bank Stability Map: Spatial Representation of Risk

The Bank Stability Map (Figure 1) offers a visual representation of the banking sector's overall condition over the study period. Through the depiction of the relative positions of the banking sector across quarters from Q1-2004 to Q4-2022, the map highlights a discernible outward expansion from the center. This spatial progression signifies an escalating trend of risk, as greater distance from the central point corresponds to heightened risk levels. The map serves as an effective tool for intuitively comprehending the changing risk landscape within the banking sector. We can see in the radar map that the liquidity index is getting close to 1 or approximately equal to 1. This means that the risk in the liquidity index is getting high/ close to 1 (away from the center signifies increase in risk).
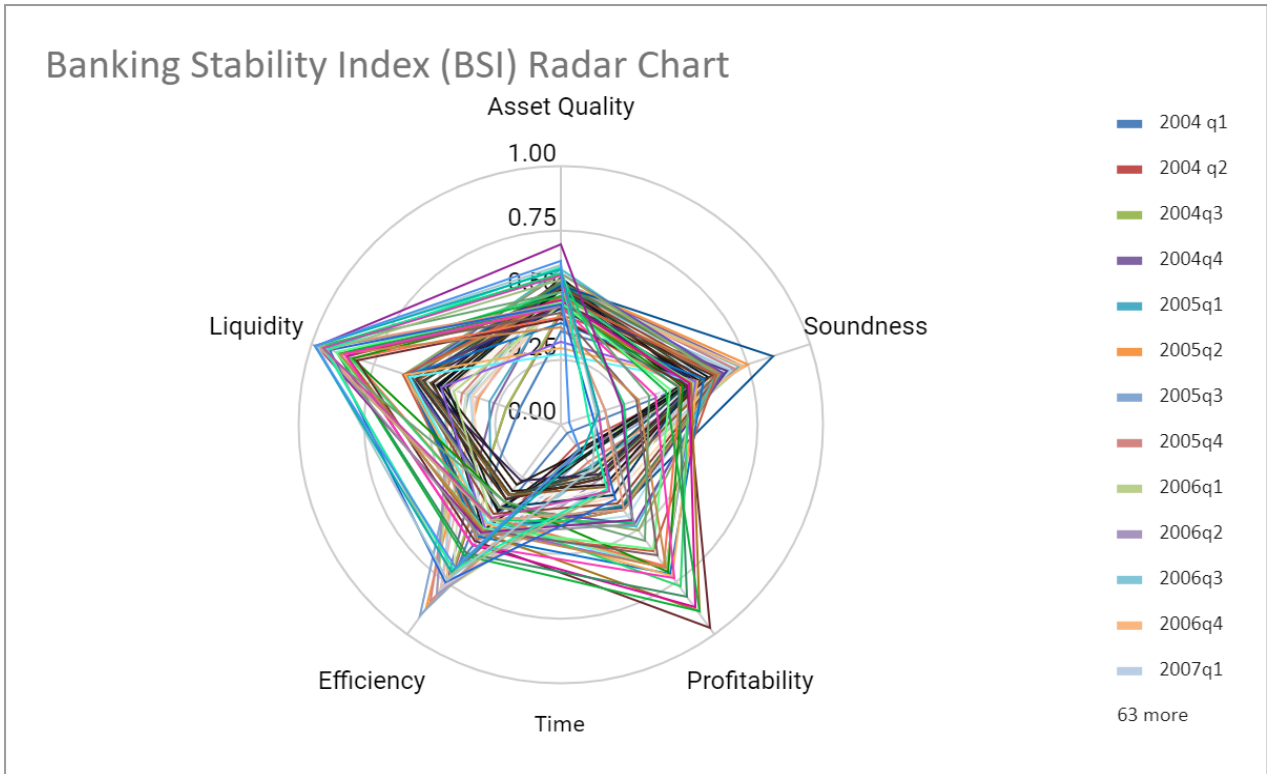
Figure 1

6.2 Temporal Evolution of Banking Stability
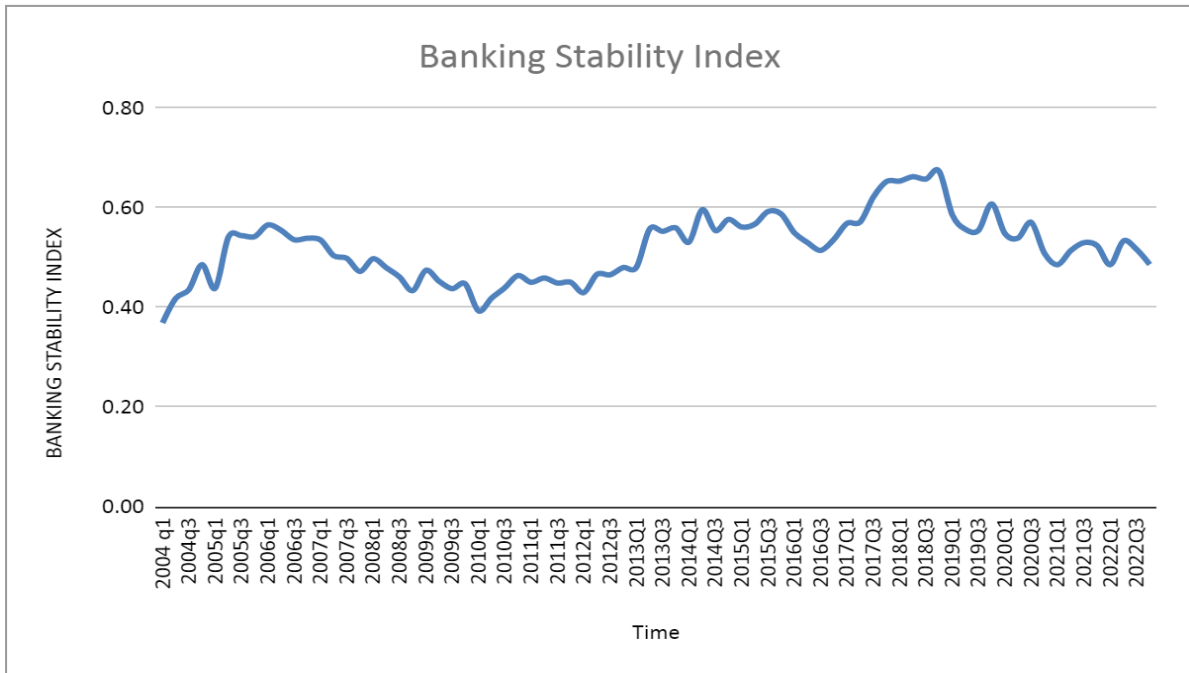
Figure 2

The Banking Stability Indicator Chart (Figure 2) provides a chronological assessment of bank stability trends. This chart, spanning the entire study duration, illustrates the trajectory of instability experienced by Indian banks. Notably, despite encountering shocks in 2018 and 2020, the stability of banks has demonstrated a consistent albeit gradual improvement. This temporal analysis underscores the sector's resilience and adaptability to adverse circumstances. During 2017 Q4 to 2019 Q1, the figure shows that there is a higher level which implies lower stability. The IL&FS crisis occurred in 2018, involving a conglomerate with a debt of Rs 1 lakh crore. To date, only Rs 55,000 crore of this debt has been resolved, leaving approximately 62% unresolved. This crisis triggered a funding drought, leading to a liquidity crisis in the NBFC and corporate sectors, resulting in the downfall of companies like DHFL and Reliance Anil Ambani groups. In future, it might cause a serious financial crisis in the Indian banking system. (ET Article, 2023)

6.3 Multidimensional Analysis of Determinants
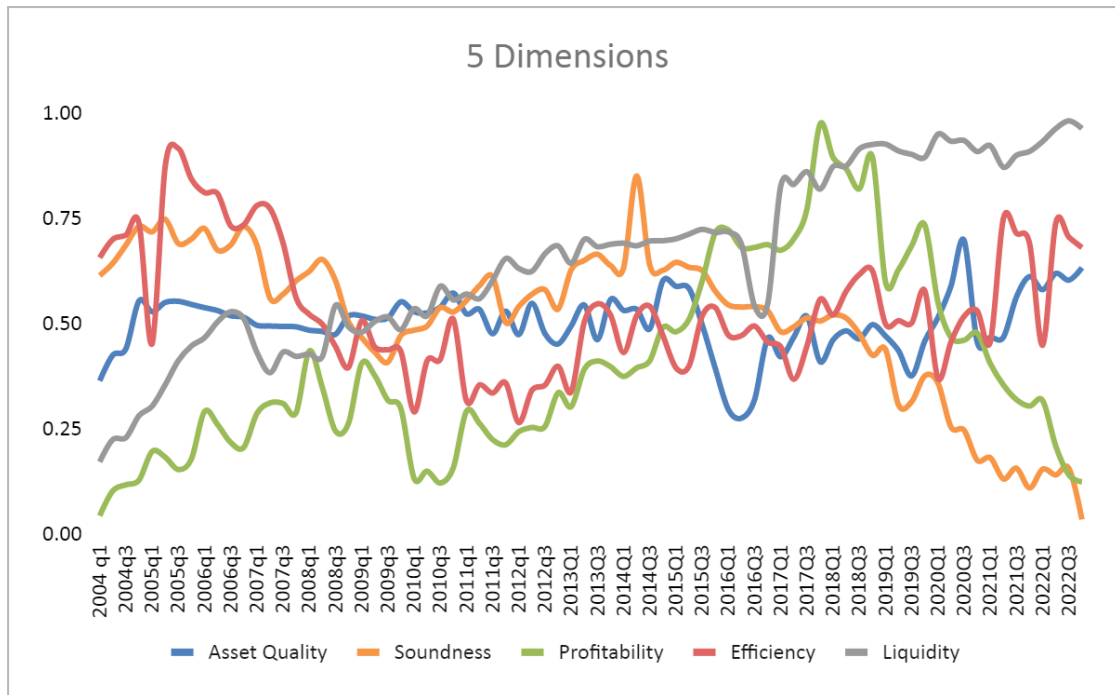
Figure 3

Our examination extends to a multidimensional analysis of the primary determinants of bank stability: Soundness, Efficiency, Liquidity, Profitability, and Asset Quality. Liquidity and Profitability emerge as consistently precarious factors, consistently maintaining a substantial distance from the central point throughout the study period. The Soundness factor exhibits an intriguing trend, experiencing an ascent in recent times, attributable to the challenges posed by economic downturns and elevated interest rates. The Efficiency factor, derived from cost-to-income ratios and business staff expenses, reveals a significant contributor to risk, indicative of cost-cutting measures adopted by entities within the banking sector. On the contrary, Asset Quality metric displays relative stability, attributed to proactive measures implemented in response to the 2008 financial crisis.

6.4 Results and Policy Implications
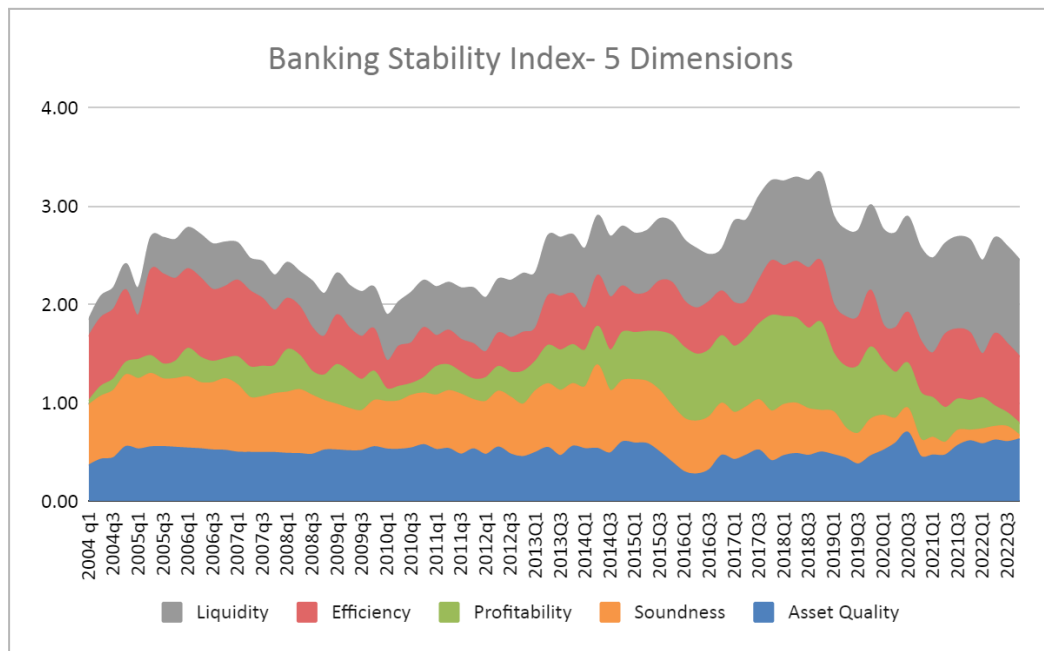
Figure 4

The study verifies empirically that the Indian banking sector is vulnerable in terms of the liquidity as well as profitability index. However, it is comparatively more stable in the rest of the dimensions. The above figure shows the variations in different dimensions over the sample period 2004Q1-2022Q4. The reason behind such a finding is also backed by certain evidence surrounding the banking operations in the Indian economy.

1. Improved liquidity index since 2017:

Since 2017, the liquidity index in Indian banks has shown a steady increase. One of the primary drivers of this trend has been the deliberate reduction in the Statutory Liquidity Ratio (SLR) by the Reserve Bank of India (RBI). The SLR is a crucial regulatory requirement, which dictates the portion of a bank's assets that must be held in highly liquid forms, such as cash, gold, or government securities. The reduction of SLR percentages has provided banks with more leeway to extend loans and invest in income-generating assets, contributing to

higher liquidity.

2. Higher Liquidity Risk since in 2022 Q4:

Notably, in 2022 Q4, the liquidity index reached a significant threshold of 0.98, signifying a substantial liquidity risk in the Indian banking sector. This peak in the liquidity risk is primarily attributed to the aggressive lending strategies adopted by banks, possibly fueled by the reduced SLR requirements. While enhanced liquidity can boost short-term profitability through interest income, excessive lending without due diligence can lead to a higher incidence of Non-Performing Assets (NPAs) and, consequently, increased liquidity risk.

3. Impact of NPA Crisis on Profitability:

The Non-Performing Asset (NPA) crisis that unfolded in the wake of the liquidity surge in 2017 has been a significant concern for Indian banks. When loans become NPAs, banks allocate provisions, which can have a detrimental effect on their profitability. The NPA crisis has led to a cautious approach by banks in terms of lending, impacting their profitability in the long term.

4. The management of Profitability risk in Indian Banks:

Profitability in Indian banks has been a subject of scrutiny since 2017, with fluctuations primarily driven by the NPA crisis and evolving economic conditions. In recent years, there has been a noticeable improvement in profitability, partly due to the rebounding economy and effective measures taken by banks to reduce NPAs. This is the reason why the profitability index shows a little improvement over the liquidity index in the empirical findings of the study. However, the connection between liquidity and profitability is undeniable. While ample liquidity can facilitate lending and generate short-term profits, overindulgence in lending, as witnessed in 2022 Q4, can expose banks to higher risks if borrowers default. This could, in turn, impact long-term profitability, particularly if provisioning requirements rise due to increased NPAs.

The findings of the study are a great input to the policy design of the Indian banking system. The risk landscape derived in the study will be a great help to the banking authorities to take pre-emptive measures and improve the liquidity and profitability ratios. The study will also add to the stream of anticipatory policy instruments that could be exercised by the RBI from time to time to prevent the liquidity and profitability risk. These insights are integral to shaping effective risk management strategies and informing prudent policy decisions within the financial domain.

7. Conclusion

In this research paper, we've established a crucial connection between the stability of the banking industry and overall financial stability. When the financial system remains stable over time, it contributes to the stability of banks. This, in turn, helps banks withstand economic shocks during crises, minimizing their impact and enabling the economy to recover quickly. When the broader economy is doing well, it also promotes the strength, efficiency, and profitability of the banking sector.

However, when the economy faces shocks or problems, such as a decrease in economic activity or an increase in non-performing assets (NPAs), these difficulties spill over into the banking sector. This results in reduced lending by banks and a decline in the quality of their assets. The extent to which these problems in the banking sector affect the broader economy depends on how well the banking sector can absorb these shocks.

The paper's main focus is on developing a banking stability indicator for India. This indicator is based on five key parameters that give us insights into how well banks are performing. It can serve as an early warning system, indicating potential issues in the banking sector. According to the data, there has been a slight increase in banking sector instability in recent times, in the liquidity as well as profitability dimension. It is worth noting that the banking

stability indicator currently stands at 0.52, compared to 0.75 in 2001-02. This suggests the need for precautionary measures to enhance the overall performance of the banking sector and implement appropriate regulatory actions.

Furthermore, the research indicates a decline in the banking stability Indicator has adverse effects on the real economy, and conversely, a slowdown in the real economy's performance negatively impacts the banking sector. These findings have significant policy implications, suggesting that policymakers should focus on strengthening the banking sector to enable it to withstand economic shocks. Building safeguards in the banking sector is essential to prevent a harmful feedback loop between the banking sector and the real economy, which could lead to the onset and worsening of a financial-crisis.

8. References

[1] ET Online. (2023, May 29). From Doom to Bloom: The turnaround story of Indian banks' bad loans and profits. Economic Times. https://economictimes.indiatimes.com/industry/banking/finance/banking/from-doom-to-bloom-the-turnaround-story-of-indian-banks-bad-loans-and-profits/articleshow/100588628.cms

[2] TimesofIndia.com. (2023, March 20). Explained: Why Indian banks remain strong and resilient despite global turmoil? Times of India. https://timesofindia.indiatimes.com/business/india-business/credit-suisse-ubs-takeover-silicon-valley-bank-first-republic-bank-indian-banks-indian-lenders-rbi/articleshow/98819500.cms

[3] Singh, M. (2023, March 19). The 2007–2008 Financial Crisis in Review. Investopedia. https://www.investopedia.com/articles/economics/09/financial-crisis-review.asp

[4] Chen, J., Clarke, C. (2022, April 27). Basel Accords: Purpose, Pillars, History, and Member Countries. Investopedia. https://www.investopedia.com/terms/b/basel_accord.asp

[5] Drishti IAS. (2020, August 12). Basel Norms. To The Point. https://www.drishtiias.com/to-the-points/paper3/basel-norms

[6] Gulati, R., & Singh, N. (2019). Analyzing bank stability in India: Evidence from 2007/08-2016/17. Journal of Applied Finance & Banking, 9(6), 101-125.

[7] BIS Working paper series No. 94, Monetary and Economic Department (Dec, 2017), Macroprudential frameworks, implementation, and relationship with other policies. https://www.bis.org/publ/bppdf/bispap94m.pdf

[8] Fox, J. (2013, November). What We've Learned from the Financial Crisis. Harvard Business Review. https://hbr.org/2013/11/what-weve-learned-from-the-financial-crisis

[9] Mishra, R. N., Majumdar, S., & Bhandia, D. (2013). Banking Stability - A Precursor to Financial Stability. RBI Working Paper Series (DEPR): 01/2013. Department of Economic and Policy Research.

https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=14916

[10] Reserve Bank of India. (2012, June). Review of Supervisory Processes for Commercial Banks: Report of the High-Level Steering Committee.

https://www.rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=663

[11] Basel Committee on Banking Supervision. (2012). Core Principles for Effective Banking Supervision. Bank for International Settlements.

https://www.bis.org/publ/bcbs230.pdf

[12] Reserve Bank of India. (1999). Core Principles of Effective Banking Supervision. Department of Banking Supervision Central Office.

https://rbi.org.in/upload/publications/pdfs/10115.pdf

[13] Rajan, R. G., & Zingales, L. (1998, June). Financial Dependence and Growth.

https://www.isid.ac.in/~tridip/Teaching/DevEco/Readings/07Finance/07Rajan&Zingales-AER1998.pdf

[14] Bank for International Settlements. (n.d.). History of the Basel Committee.

https://www.bis.org/bcbs/history.htm?m=3076

9. Appendix

9.1 List Of Banks

List of Private Sector Banks in India	List of Public Sector Banks in India
Axis Bank Limited	Allahabad Bank
City Union Bank Limited	Andhra Bank
CSB Bank Limited	Bank Of Baroda
DCB Bank Limited	Bank Of India
Federal Bank Ltd	Bank Of Maharashtra
HDFC Bank Ltd.	Canara Bank
ICICI Bank Limited	Central Bank Of India
Indusind Bank Ltd	Corporation Bank
Ing Vysya Bank Ltd	Dena Bank
Jammu & Kashmir Bank Ltd	Indian Bank
Karnataka Bank Ltd	Indian Overseas Bank
Karur Vysya Bank Ltd	Oriental Bank Of Commerce
Kotak Mahindra Bank Ltd.	Punjab And Sind Bank
Lakshmi Vilas Bank Ltd	Punjab National Bank
RBL Bank Limited	State Bank Of Bikaner And Jaipur
South Indian Bank Ltd	State Bank Of Hyderabad
Tamilnad Mercantile Bank Ltd	State Bank Of India
	State Bank Of Mysore
	State Bank Of Patiala
	State Bank Of Travancore

	Syndicate Bank
	UCO Bank
	Union Bank Of India
	United Bank Of India
	Vijaya Bank

9.2 BSI Calculations

Time	Asset Quality	Soundness	Profitability	Efficiency	Liquidity	BANKING STABILITY INDEX
2004 Q1	0.36	0.61	0.04	0.66	0.17	0.37
2004 Q2	0.42	0.64	0.10	0.70	0.22	0.42
2004Q3	0.44	0.69	0.12	0.71	0.22	0.43
2004Q4	0.55	0.73	0.13	0.74	0.27	0.48
2005Q1	0.53	0.72	0.20	0.45	0.28	0.43
2005Q2	0.55	0.75	0.18	0.87	0.33	0.54
2005Q3	0.55	0.69	0.15	0.92	0.37	0.54
2005Q4	0.54	0.70	0.18	0.84	0.40	0.53
2006Q1	0.54	0.73	0.29	0.81	0.42	0.56
2006Q2	0.53	0.67	0.26	0.81	0.44	0.54
2006Q3	0.52	0.69	0.22	0.73	0.46	0.52
2006Q4	0.51	0.73	0.20	0.73	0.45	0.53
2007Q1	0.50	0.69	0.29	0.78	0.38	0.53

2007Q2	0.49	0.56	0.31	0.77	0.33	0.49
2007Q3	0.49	0.57	0.31	0.69	0.38	0.49
2007Q4	0.49	0.60	0.29	0.56	0.36	0.46
2008Q1	0.48	0.62	0.43	0.52	0.37	0.49
2008Q2	0.48	0.65	0.35	0.50	0.36	0.47
2008Q3	0.47	0.60	0.24	0.44	0.48	0.45
2008Q4	0.52	0.50	0.26	0.40	0.43	0.42
2009Q1	0.52	0.47	0.40	0.51	0.43	0.46
2009Q2	0.51	0.43	0.38	0.44	0.43	0.44
2009Q3	0.51	0.41	0.32	0.44	0.46	0.43
2009Q4	0.55	0.47	0.30	0.43	0.43	0.44
2010Q1	0.53	0.48	0.13	0.29	0.47	0.38
2010Q2	0.52	0.49	0.15	0.41	0.45	0.41
2010Q3	0.54	0.54	0.12	0.41	0.51	0.42
2010Q4	0.57	0.53	0.16	0.51	0.48	0.45
2011Q1	0.52	0.55	0.29	0.32	0.50	0.44
2011Q2	0.53	0.59	0.26	0.35	0.49	0.44
2011Q3	0.48	0.61	0.22	0.33	0.53	0.43
2011Q4	0.53	0.50	0.21	0.36	0.57	0.43
2012Q1	0.47	0.54	0.24	0.26	0.55	0.41
2012Q2	0.55	0.57	0.25	0.34	0.55	0.45
2012Q3	0.47	0.58	0.25	0.35	0.58	0.45
2012Q4	0.45	0.53	0.33	0.40	0.60	0.46
2013Q1	0.49	0.63	0.30	0.34	0.57	0.47

55

2013Q2	0.54	0.65	0.39	0.50	0.62	0.54
2013Q3	0.46	0.66	0.41	0.55	0.60	0.54
2013Q4	0.56	0.64	0.40	0.52	0.60	0.54
2014Q1	0.53	0.63	0.37	0.43	0.61	0.51
2014Q2	0.53	0.85	0.39	0.52	0.61	0.58
2014Q3	0.49	0.64	0.41	0.54	0.62	0.54
2014Q4	0.60	0.63	0.49	0.47	0.61	0.56
2015Q1	0.59	0.64	0.48	0.39	0.62	0.54
2015Q2	0.58	0.63	0.51	0.40	0.63	0.55
2015Q3	0.50	0.63	0.60	0.52	0.63	0.57
2015Q4	0.39	0.58	0.72	0.54	0.62	0.57
2016Q1	0.29	0.54	0.72	0.47	0.62	0.53
2016Q2	0.27	0.54	0.68	0.47	0.60	0.51
2016Q3	0.32	0.54	0.68	0.49	0.48	0.50
2016Q4	0.46	0.53	0.69	0.46	0.43	0.51
2017Q1	0.42	0.48	0.67	0.44	0.83	0.57
2017Q2	0.47	0.49	0.70	0.37	0.84	0.57
2017Q3	0.52	0.51	0.77	0.45	0.85	0.62
2017Q4	0.41	0.51	0.97	0.56	0.82	0.65
2018Q1	0.46	0.52	0.89	0.52	0.86	0.65
2018Q2	0.48	0.51	0.87	0.58	0.86	0.66
2018Q3	0.46	0.48	0.82	0.62	0.89	0.65
2018Q4	0.50	0.42	0.90	0.62	0.89	0.67
2019Q1	0.47	0.44	0.60	0.50	0.90	0.58

2019Q2	0.43	0.31	0.63	0.51	0.89	0.55
2019Q3	0.37	0.31	0.68	0.50	0.88	0.55
2019Q4	0.46	0.38	0.73	0.58	0.87	0.60
2020Q1	0.51	0.36	0.55	0.37	0.98	0.55
2020Q2	0.59	0.25	0.47	0.46	0.97	0.55
2020Q3	0.70	0.25	0.46	0.52	0.98	0.58
2020Q4	0.46	0.17	0.48	0.53	0.95	0.52
2021Q1	0.47	0.18	0.40	0.46	0.97	0.49
2021Q2	0.47	0.13	0.35	0.75	0.92	0.52
2021Q3	0.56	0.16	0.32	0.71	0.94	0.54
2021Q4	0.61	0.11	0.30	0.69	0.95	0.53
2022Q1	0.58	0.15	0.32	0.45	0.95	0.49
2022Q2	0.62	0.14	0.21	0.74	0.98	0.54
2022Q3	0.60	0.15	0.14	0.70	0.99	0.52
2022Q4	0.63	0.03	0.12	0.68	0.98	0.49