

## Systematic Risk and Macroprudential Regulations: A Literature Review

**Eneisik Gogo Erasmus**

Department of Accounting

Rivers State University, Port Harcourt, Nigeria

[eneisikgogo@gmail.com](mailto:eneisikgogo@gmail.com)

DOI: 10.56201/jafm.vol.11.no3.2025.pg241.263

---

### Abstract

*This study explores the influence of systematic risk on macroprudential regulations. The increasing interconnectedness of financial markets and the potential for systemic risk to propagate through the financial system, understanding how macroprudential policies respond to such risks is crucial for financial stability. The study adopts exploratory research methodology, leveraging secondary resources including electronic journals, archives, published reports, academic journals, books, newspapers, magazines. This approach allows for a comprehensive examination of existing literature and empirical evidence. The findings show that systematic risk, emanating from various sources such as interconnectedness, concentration of exposures, and market volatility, poses significant challenges to financial stability. Macroprudential regulations, including capital adequacy requirements, liquidity ratios, and stress testing, play a critical role in mitigating systemic risk and enhancing the resilience of financial institutions and markets. The effectiveness of these regulations is influenced by factors such as regulatory frameworks, institutional arrangements, and market dynamics. The study concludes that macroprudential regulations are essential for managing systematic risk, there is a need for continuous evaluation and adaptation to evolving market conditions and risk factors. A proactive and dynamic approach to macroprudential policy-making is essential to address emerging systemic risks and maintain financial stability. Additionally, enhancing coordination and cooperation among regulatory authorities at both domestic and international levels is imperative to effectively address cross border systemic risks. The study recommended among others that policymakers and regulatory authorities enhance the granularity and effectiveness of macroprudential regulations to address specific sources of systematic risk. Fostering greater transparency and communication in the regulatory process enhance market confidence and facilitate the implementation of macroprudential measures.*

**Keywords:** Systematic Risk, Macroprudential Regulations, Financial Institution

---

### Introduction

Systematic risk, also known as market risk, is the possibility of experiencing losses due to factors that affect the entire financial system or market segments. Unlike idiosyncratic risk, which can be diversified away, systematic risk is inherent to the entire market or market segment. The global financial crisis of 2007-2008 highlighted the devastating impact of systemic risks and the interconnectedness of financial institutions and markets (Bernanke, 2010). It underscored the importance of understanding and managing systemic risks to prevent future financial crises. Macroprudential regulations emerged as a response to the financial crisis, focusing on the stability of the financial system as a whole, rather than the solvency of

individual institutions (Borio, 2003). These regulations aim to mitigate systemic risk by monitoring and addressing financial system vulnerabilities. Instruments of macroprudential policy include capital buffers, countercyclical capital requirements, and limits on loan-to-value ratios, among others (Financial Stability Board, 2011). The relationship between systematic risk and macroprudential regulations is complex. Macroprudential policies are designed to dampen the pro-cyclicality of the financial system and reduce the buildup of systemic risks (Galati & Moessner, 2013). However, the effectiveness of these policies in mitigating systemic risk is still a subject of ongoing research and debate. Some studies suggest that macroprudential tools can be effective in reducing systemic risk (Claessens, 2014), while others highlight the challenges of implementation and the potential for unintended consequences (Acharya, 2013). Given the critical role of financial stability in economic health and the potential catastrophic effects of systemic failures, this study aims to further investigate the dynamics of systematic risk and the efficacy of macroprudential regulations. By examining the mechanisms through which macroprudential policies can mitigate systemic risks, this research seeks to contribute to the development of more robust financial stability frameworks. The realization of the limitations of traditional microprudential regulation in preventing systemic crises led to the rapid development and global adoption of macroprudential policies. The term "macroprudential" was scarcely used before the 2007-2008 crisis but has since become central in discussions of financial regulation (Clement, 2010). These policies aim to address systemic risks that arise from the interconnectedness of institutions and markets and the cyclical nature of the financial system (International Monetary Fund, 2011). One of the theoretical foundations of macroprudential policy is the concept of externalities in the financial system. Financial institutions may not fully internalize the systemic risk their actions impose on others, leading to an underestimation and underpricing of risk during boom periods (Jeanne & Korinek, 2010). Macroprudential policies, therefore, seek to correct these market failures by imposing regulations that consider the broader financial system's health (Brunnermeier, 2009).

The implementation of macroprudential policies has varied globally, reflecting different financial system structures, legal frameworks, and lessons learned from past financial crises. Countries in Europe, Asia, and the Americas have adopted a range of tools, including countercyclical capital buffers, sector-specific capital requirements, and leverage ratios, to mitigate systemic risk (Committee on the Global Financial System, 2012). These tools aim to increase the resilience of financial institutions and reduce the amplitude of financial cycles. However, measuring and managing systemic risk poses significant challenges. Systemic risk is multidimensional and can manifest through various channels, including contagion, common exposures, and the amplification of shocks through financial markets (Bisias et al., 2012). As such, identifying the build-up of systemic risk in real-time and determining the appropriate timing and calibration of macroprudential interventions remain formidable tasks (Haldane, 2013). Moreover, the effectiveness of macroprudential policies is subject to the dynamics of financial innovation and globalization. Financial markets continually evolve, creating new forms of systemic risk and potentially circumventing regulatory frameworks (Borio and Zhu, 2012). The cross-border nature of financial activities further complicates the implementation of macroprudential policies, necessitating international coordination to prevent regulatory arbitrage and ensure global financial stability (Schoenmaker and Wiertz, 2015). The global financial system's complexity and the transnational nature of systemic risks necessitate robust

international cooperation and coordination. The 2007-2008 financial crises starkly demonstrated that systemic risks do not respect national borders, making isolated policy responses insufficient in safeguarding global financial stability (Lagarde, 2014). As a result, international financial institutions and regulatory bodies have intensified efforts to harmonize macroprudential policies and frameworks.

Initiatives led by the Financial Stability Board, the Basel Committee on Banking Supervision, and the International Monetary Fund aim to establish common standards and practices for identifying and mitigating systemic risks (FSB, 2013; BCBS, 2011). One of the cornerstone achievements in this area is the Basel III regulatory framework, which strengthens bank capital requirements and introduces new regulatory standards on bank liquidity and leverage. These measures are designed not only to enhance the resilience of individual financial institutions but also to reduce the risk of system-wide shocks (Basel Committee on Banking Supervision, 2011). Furthermore, the establishment of the macroprudential policy framework under Basel III emphasizes the importance of countercyclical buffer requirements and other tools in managing the cyclical dimension of systemic risk (BIS, 2010). Despite these advancements, the implementation of international standards faces challenges, including divergent national interests, varying stages of economic development, and differences in financial system structures. The effectiveness of international regulatory reforms is contingent upon the commitment of national authorities to adopt and enforce these standards (Caruana, 2012). Moreover, the rapid pace of financial innovation, exemplified by the rise of fintech and digital currencies, presents new challenges for regulators and policymakers in identifying and responding to emerging systemic risks (FSB, 2019). In light of these challenges, future directions for macroprudential policy and systemic risk management emphasize adaptability, the use of advanced analytical tools for risk assessment, and the importance of global regulatory cooperation. Enhanced surveillance mechanisms, stress testing, and the development of systemic risk indicators are among the strategies being employed to improve the identification and monitoring of systemic risks (IMF, 2014). Additionally, the call for a more integrated approach to financial regulation and supervision highlights the need for closer collaboration between microprudential and macroprudential authorities, as well as between financial and non-financial sector regulators (Tucker, 2014). The advancement of data analytics and machine learning offers promising avenues for enhancing the predictive power of systemic risk indicators. The application of big data analytics in monitoring financial transactions and market sentiments in real-time can provide early warning signals of systemic stress (Buchanan, 2016). Moreover, machine learning algorithms can identify complex patterns and correlations across global financial markets that traditional models might overlook, thereby improving the accuracy of systemic risk assessments (Haldane & Madouros, 2019). However, the reliance on advanced technologies for systemic risk management introduces new ethical and governance challenges. Data privacy concerns, the opacity of algorithmic decision-making processes, and the potential for unintended bias raise critical questions about the accountability and fairness of automated financial surveillance systems (Tufano, 2018).

Ensuring the ethical use of data and algorithms in financial regulation requires robust governance frameworks that balance innovation with the protection of individual rights and market integrity. The governance of macroprudential policy itself presents another layer of

complexity. The effectiveness of macroprudential measures depends on the independence, coordination, and accountability of regulatory authorities. Achieving a delicate balance between political independence and democratic accountability is crucial for maintaining public trust in macroprudential institutions (Goodhart & Schoenmaker, 2015). Furthermore, the need for coordination among multiple regulatory bodies, each with its mandate and tools, underscores the importance of clear governance structures to prevent regulatory overlaps or gaps (Claessens & Kodres, 2014). The trajectory of financial regulation must adapt to emerging trends and potential threats to financial stability. The rise of decentralized finance and digital currencies challenges traditional regulatory frameworks, requiring regulators to rethink their approach to financial oversight in a digital age (Carstens, 2020). Climate change and environmental risks also pose new systemic challenges, prompting calls for the integration of sustainability considerations into macroprudential policy (Schoenmaker, 2017). As the global financial system evolves, the future of financial regulation will likely be characterized by a dynamic interplay between innovation and stability. The development of flexible, forward-looking regulatory frameworks that can accommodate technological advancements while safeguarding against new forms of systemic risk will be paramount. International collaboration and the sharing of best practices will remain essential for ensuring the resilience of the global financial system in the face of evolving challenges. Thus, this study explores the impact of systematic risk on macro prudential regulations through extensive literature review.

## **Literature Review**

### **Theoretical Foundation**

#### **Modern Portfolio Theory**

Modern portfolio theory was propounded by Harry Markowitz in 1952. Modern Portfolio Theory is an investment theory that emphasizes the importance of diversification to optimize returns while minimizing risk. It suggests that investors can construct an efficient portfolio by selecting a mix of assets that maximizes expected return for a given level of risk. Modern portfolio theory assumes that investors are risk-averse and seek to balance risk and return by diversifying across different asset classes. A study on systematic risk and macroprudential regulations benefits from modern portfolio theory because modern portfolio theory distinguishes between systematic risk (market-wide risk) and unsystematic risk (firm-specific risk). Macroprudential regulations aim to mitigate systematic risks like financial crises, recessions, and market volatility. Macroprudential regulations (such as capital adequacy requirements, liquidity ratios, and leverage limits) influence how investors and financial institutions construct portfolios to manage risk. Modern portfolio theory provides a framework to assess how macroprudential policies impact the risk-return balance of portfolios held by banks, institutional investors, and individuals. Macroprudential policies aim to ensure financial stability, which aligns with modern portfolio theory emphasis on diversification as a tool to manage risk exposure. Changes in systematic risk due to macroprudential regulations affect asset pricing models, investment strategies, and capital allocation, reinforcing the importance of modern portfolio theory in analyzing regulatory effects on financial markets. Modern portfolio theory provides a theoretical foundation for understanding how systematic risk impacts investment decisions and how macroprudential regulations help mitigate these risks. Banks and other financial institutions use modern portfolio theory principles to manage their portfolios in compliance with macroprudential policies, making it relevant for the study.

Modern portfolio theory allows researchers to assess the effectiveness of regulatory measures in stabilizing financial markets by reducing risk concentrations. Modern portfolio theory aligns with macroprudential regulation objectives by emphasizing risk-adjusted returns, ensuring that financial stability measures do not hinder investment efficiency.

### **Financial Instability Hypothesis**

Financial instability hypothesis was propounded by Hyman Minsky in 1977. The financial instability hypothesis stated that financial markets are inherently unstable due to the procyclical behavior of firms, banks, and investors. Financial instability hypothesis argues that during economic booms, financial institutions and businesses take on excessive risk, relying on debt financing that becomes unsustainable. As credit expansion reaches its limit, financial crises emerge, leading to market collapses and systemic instability. The financial instability hypothesis suggests that financial fragility builds over time, making economies vulnerable to crises. A study on systematic risk and macroprudential regulations aligns with financial instability hypothesis because financial instability hypothesis explains how excessive risk-taking by financial institutions leads to systematic financial crises, which macroprudential regulations aim to prevent. The financial instability hypothesis highlights the role of capital requirements, liquidity controls, and leverage restrictions in preventing financial bubbles and collapses. Financial instability hypothesis shows that unregulated credit growth increases instability, making macroprudential policies crucial in managing financial cycles and reducing systemic risk. Financial instability hypothesis explains how financial instability spreads, making the study relevant in understanding how macroprudential regulations help contain risks across the financial system. Past crises, including the 2008 Global Financial Crisis, support financial instability hypothesis predictions, reinforcing the importance of macroprudential regulations in preventing excessive speculation. Financial instability hypothesis provides a theoretical foundation for understanding how systemic financial risks emerge and evolve over time due to procyclical lending and speculative investments. Since financial instability hypothesis suggests that financial instability is inevitable, it underscores why macroprudential regulations are necessary to curb excessive financial risk-taking. The hypothesis aligns with macroprudential measures like countercyclical capital buffers, which aim to limit excessive credit growth and prevent instability. Financial instability hypothesis helps explain why financial institutions engage in risky behavior, leading to crises that macroprudential regulations aim to mitigate. Policymakers use financial instability hypothesis principles to design policies that address systemic risk and promote financial stability, making it a relevant theoretical anchor for the study. The financial instability hypothesis thus serves as a critical theoretical framework for analyzing systematic risk and the effectiveness of macroprudential regulations in preventing financial crises.

### **Conceptual Review**

#### **Systematic Risk**

Systemic risk refers to the risk of collapse of an entire financial system or entire market, as opposed to risk associated with any one individual entity, sector, or event. It is the risk that the failure of one part of the financial system will cause a domino effect, leading to the failure of other institutions or markets due to the interconnections within the financial system. Systemic risk is often associated with a crisis that affects a large portion of the financial system and



economy, leading to a downturn that affects many assets and institutions simultaneously. Financial stability board (2010) stated that systemic risk as the risk of disruption to the flow of financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy. IMF (2009) systemic risk is "the risk of disruption to the financial services that is caused by an impairment of the financial system and has the potential to cause severe economic consequences. The emphasis here is on the systemic implications of the risk, highlighting the interconnectedness of various institutions and markets. In the academic literature, systemic risk is often described as "the risk that the failure of a significant portion of the financial system will lead to a collapse in financial intermediation and a severe economic downturn (Acharya et al., 2010). The Bank International Settlement (2011) views systemic risk as the risk of a systemic financial crisis, defined as a disruption in the financial system with the potential to have a significant adverse effect on the real economy. This definition focuses on the transmission mechanisms from the financial system to the real economy.

From a regulatory viewpoint, systemic risk is considered the risk posed by the potential for widespread impact due to the failure of one or more financial institutions or the collapse of a major financial market segment (Bernanke, 2010). This perspective emphasizes the regulatory concern with preventing such widespread impacts. Measuring systemic risk is crucial for understanding the vulnerabilities within the financial system and for implementing policies aimed at preventing financial crises. Over recent years, researchers and policymakers have developed various metrics and models to quantify and monitor systemic risk. These efforts aim to capture different dimensions of systemic risk, including the interconnectedness of financial institutions, the likelihood of contagion, and the potential impact of systemic events on the economy. The marginal expected shortfall measures the risk that a financial institution poses to the system, based on its expected loss in the tail of the system's loss distribution. Acharya et al. (2017) introduced marginal expected shortfall as a way to quantify the contribution of individual institutions to systemic risk. Developed by Adrian and Brunnermeier (2016), conditional value at risk quantifies the value at risk of the financial system conditional on an institution being in distress. It provides a measure of the risk an institution contributes to the system under extreme scenarios. Network analysis and stress testing involves the use of network models to simulate the spread of shocks through the financial system, considering the web of interconnections among institutions. Models by Gai and Kapadia (2010) demonstrate how network structure can influence the propagation of systemic risk. Systemic risk index developed by Brownlees and Engle (2017) measures the expected capital shortfall of a financial firm conditional on a prolonged market decline. It combines size, leverage, and long-term marginal expected shortfall to assess the systemic importance of financial institutions. Despite advances in measuring systemic risk, challenges remain due to the complexity of financial systems, the evolution of new financial products and technologies, and the difficulty in capturing the nonlinear dynamics of financial crises. The effectiveness of systemic risk measures depends on the availability and quality of data, the choice of model parameters, and the ability to anticipate the channels through which systemic risk may propagate. Building upon the foundational approaches to measuring systemic risk, recent advancements and methodologies have emerged, reflecting the continuous evolution of the financial sector and the need for more nuanced risk assessment tools. These developments aim to address the

limitations of earlier models and incorporate the growing complexity of global financial markets.

The use of high-dimensional data techniques, including machine learning and big data analytics, has been explored to better predict systemic risk. These methods can process a vast array of financial indicators and unstructured data sources to identify potential systemic risk signals earlier and more accurately (Bisias et al., 2012). Macro-financial models integrate macroeconomic variables with financial market indicators to assess systemic risk. These models aim to capture the feedback loops between the financial sector and the real economy, thereby offering a comprehensive view of potential systemic vulnerabilities (Adrian et al., 2019). As financial markets evolve, so do the sources and mechanisms of systemic risk. Innovations in finance, such as digital currencies, fintech platforms, and the increasing role of non-bank financial intermediaries, introduce new channels through which systemic risks can propagate (Cecchetti & Schoenholtz, 2017). The dynamic nature of systemic risk necessitates equally dynamic macroprudential regulation. This includes the development of new tools and the flexible application of existing ones to address emerging vulnerabilities within the financial system effectively. The use of big data and advanced analytics can enhance the identification and monitoring of systemic risks, providing regulators with better tools for timely intervention. Known the global interconnectedness of financial markets, international coordination among regulatory bodies is crucial to addressing systemic risks that cross national boundaries (Claessens, 2014). Implementing macroprudential regulation involves balancing the need to mitigate systemic risks without stifling financial innovation or economic growth. This balance is challenging to achieve due to: The difficulty in calibrating macroprudential tools to be effective in crisis prevention without imposing undue constraints on financial institutions, the challenge in identifying systemic risks early enough taking preventive action, given the complex and evolving nature of these risks. The risk that regulations in one sector or region may push risky activities into less regulated areas, potentially creating new systemic vulnerabilities (Lim et al., 2013).

### **Relationship between Systematic Risk and Macro Prudential Regulations**

The relationship between systemic risk and macroprudential regulations is central to the efforts aimed at ensuring the stability and resilience of the financial system. Systemic risk refers to the risk of collapse or significant disruption within the entire financial system or a substantial part of it, often triggered by interconnectedness, common exposures, or the failure of a systemically important financial institution. Macroprudential regulations are designed to mitigate these risks by focusing on the financial system as a whole rather than individual entities or markets. Systemic risk arises from a variety of sources, including excessive leverage, liquidity mismatches, interconnectedness among financial institutions, and concentration of exposures. Its nature is such that it can propagate through the financial system, leading to widespread distress or collapse (Acharya et al., 2010). Macroprudential regulations aim to address systemic risk by enhancing the resilience of the financial system to shocks and reducing the build-up of vulnerabilities. These regulations include tools like capital surcharges for systemically important institutions, countercyclical capital buffers, leverage ratios, and liquidity requirements (Borio, 2011). The relationship between systemic risk and

macroprudential regulations is characterized by a proactive approach to financial regulation, where the aim is to preemptively identify and mitigate potential sources of systemic risk before they manifest into crises.

Macroprudential policies serve as preventive measures, seeking to dampen the financial cycle's amplitude and reduce the probability of crises emanating from systemic risk buildup. By employing countercyclical tools, macroprudential policies can mitigate the procyclicality inherent in the financial system, thereby stabilizing the credit cycles and reducing the risk of asset bubbles. Macroprudential regulations specifically target the interconnectedness within the financial system, aiming to prevent the spread of distress through contagion channels (Brunnermeier et al., 2009). Despite the clear relationship and the objectives of macroprudential regulations, there are challenges in effectively mitigating systemic risk. These include identifying the appropriate timing and calibration of macroprudential tools, dealing with the global nature of systemic risk, and the evolving landscape of the financial system (Galati & Moessner, 2013). Building on the intricate relationship between systemic risk and macroprudential regulations, further analysis reveals the importance of a dynamic regulatory approach that adapts to the evolving nature of financial markets and systemic risks. The interplay between systemic risk identification, regulatory response, and the challenges inherent in applying macroprudential tools underscores the nuanced balance regulators must achieve to ensure financial stability.

### **Macroprudential Policies**

Macroprudential policies are designed to safeguard the stability of the financial system as a whole by addressing systemic risks and vulnerabilities. These policies aim to prevent the build-up of systemic risks that can lead to financial crises, ensuring that the financial system is resilient to shocks and can continue to serve its critical functions in the economy. The definitions and objectives of macroprudential policies reflect a broad consensus among policymakers, regulators, and academics on the need for a systemic approach to financial regulation. Financial stability board (2011) stated that macroprudential policy as a policy that uses primarily prudential tools to limit systemic or system-wide financial risk, thereby protecting the financial system as a whole. Clement (2010) describes macroprudential policy as policy that aims to limit risk to the financial system as a whole by focusing on the interconnections and the aggregate, system-wide behavior of financial institutions and markets. To identify and mitigate risks those have the potential to disrupt the functioning of the financial system and cause significant economic damage. This includes addressing leverage, interconnectedness, and the cyclical amplification of financial vulnerabilities (Borio, 2011). To strengthen the financial system's capacity to absorb shocks, thereby reducing the probability of system-wide distress and the need for public sector interventions (Caruana, 2010). To counteract the procyclical tendencies in the financial system, such as excessive credit growth during booms and sharp contractions during busts, this can exacerbate financial and economic cycles (Galati & Moessner, 2013). To ensure the robustness of financial market infrastructure, such as payment systems, clearinghouses, and securities settlement systems, recognizing their critical role in the financial system and potential as nodes of systemic risk (Tucker, 2011).

Increasing capital requirements for financial institutions, particularly those deemed systemically important, to absorb losses and reduce the risk of failure. Capital buffers, such as



the countercyclical capital buffer, are adjusted based on the stage of the economic cycle to mitigate procyclicality (Basel Committee on Banking Supervision, 2010), setting limits on leverage to control the amount of debt that banks can take on relative to their equity, reducing the risk of insolvency during downturns (Adrian & Shin, 2010), implementing liquidity coverage ratios and net stable funding ratios to ensure that financial institutions maintain adequate high quality liquid assets to survive short-term liquidity shocks (European Banking Authority, 2015), imposing limits on Loan-to-Value and Debt-to-Income ratios for mortgage lending to curb excessive borrowing and reduce the risk of credit bubbles in real estate markets (IMF, 2014), regulating foreign currency exposure to mitigate the risk of currency mismatches in the balance sheets of financial institutions, which can be a source of systemic risk in the event of currency devaluations (Galati & Moessner, (2011). Accurately identifying and measuring systemic risk poses significant challenges due to its complex, multifaceted nature and the evolution of financial markets. Determining the appropriate timing and calibration of macroprudential measures is critical, yet challenging, given the uncertainties and the lag effect of policy interventions. Addressing the cross-border implications of national macroprudential policies and preventing regulatory arbitrage requires enhanced international coordination and cooperation. The implementation of macroprudential measures can be influenced by political pressures and the varying interests of stakeholders, potentially affecting the effectiveness of policies. Macroprudential policy instruments are designed to mitigate systemic risks and enhance the stability of the financial system. These tools target the sources of systemic risk, such as excessive credit growth, concentration risks, and interconnectedness among financial institutions.

The choice of instruments is critical and depends on the specific vulnerabilities identified within the financial system. Key macroprudential policy instruments, their applications, and the challenges associated with their implementation, supported by recent literature. Policy makers should increase the capital that banks must hold to absorb losses, with specific buffers for systemically important financial institutions and countercyclical capital buffers that vary with the credit cycle, calibrating the appropriate level of capital and buffers to ensure resilience without unduly constraining lending (BCBS, 2010). Limiting the total amount of debt that banks can take on relative to their equity to reduce the risk of insolvency during downturns. Setting a leverage ratio that balances risk reduction with the need to support economic growth (Adrian & Shin, 2014). Mandating that banks hold a sufficient level of high-quality liquid assets to survive short-term liquidity shocks, through instruments like the Liquidity Coverage Ratio and the Net Stable Funding Ratio, ensuring that liquidity requirements are flexible enough to adapt to changing market conditions without compromising financial stability (European Banking Authority, 2015). Bank policy makers should impose caps on Loan-to-Value and Debt-to-Income ratios for mortgage lending to prevent excessive borrowing and mitigate risks in the housing market, adjusting Loan-to-Value and Debt-to-Income ratios caps in response to changes in the housing market and economic conditions (IMF, 2014), restricting financial institutions' exposure to foreign currency to prevent currency mismatches that could lead to liquidity and solvency issues, balancing the control of foreign currency risk with the benefits of global financial integration (Galati & Moessner, 2011), requiring banks to build up provisions during good times that can be drawn down in bad times to cover loan losses, thus countering procyclicality, determining the optimal level of provisions and the timing for their

release to mitigate cyclical effects without impairing the lending capacity of banks (Saurina, 2009). Targeting specific sectors, such as real estate or corporate debt, with higher capital requirements to mitigate risks concentrated in those sectors and prevents asset bubbles. Identifying sectors at risk of overheating without stifling productive investment, and adjusting requirements in a timely manner as risks evolve (Jiménez et al., 2017).

### **Evolution of Macro Prudential Regulations**

The evolution of macroprudential regulations marks a significant shift in how policymakers and regulators approach financial stability, with an increasing focus on the systemic risks that can lead to widespread financial distress. This shift has been shaped by lessons learned from past financial crises, particularly the Global Financial Crisis of 2007-2008, which underscored the interconnectedness of the global financial system and the limitations of a purely microprudential regulatory approach. The journey from the early recognition of systemic risks to the development and implementation of macroprudential policies highlights a growing consensus on the need for a holistic approach to financial regulation. Before the Global financial crises: Prior to the global financial crises, the regulatory focus was predominantly on the solvency and liquidity of individual financial institutions (microprudential regulation). Systemic risks were less understood, and there was little in the way of formalized macroprudential policy frameworks (Borio, 2003). The Global financial crises and its Aftermath: The Global financial crises highlighted the inadequacy of existing regulatory frameworks to prevent the buildup of systemic risks. It brought to the forefront the need for regulatory approaches that could address the financial system's complexity and interconnectedness (Brunnermeier et al., 2009). In response to the global financial crises, international bodies such as the Financial Stability Board and the Basel Committee on Banking Supervision developed new standards and recommendations for macroprudential policy.

This included the Basel III framework, which introduced capital and liquidity requirements designed to mitigate systemic risks (Basel Committee on Banking Supervision, 2010). Countries around the world began to implement macroprudential policies, establishing regulatory bodies or task forces dedicated to financial stability. The European Systemic Risk Board in the European Union and the Financial Policy Committee in the United Kingdom are examples of institutional responses to the need for dedicated macroprudential oversight (European Systemic Risk Board, 2011). As macroprudential policy has evolved, regulators have experimented with a range of tools, including countercyclical capital buffers, sector-specific risk weights, and stress testing frameworks. The effectiveness and calibration of these tools remain subjects of ongoing research and debate (Galati & Moessner, 2013). There is growing recognition of the need to integrate macroprudential policy with other policy domains, including microprudential regulation, monetary policy, and fiscal policy, to address the multifaceted nature of systemic risks effectively (Schoenmaker & Wierds, 2016). The financial system continues to evolve, with technological innovations (such as fintech and digital currencies), climate-related financial risks, and the growing importance of non-bank financial institutions presenting new challenges for macroprudential regulation (Carney, 2019). The role of the shadow banking system in financial intermediation has grown significantly, necessitating macroprudential oversight to address risks associated with liquidity transformations and leverage outside the traditional banking sector (Pozsar et al., 2013). The rapid growth of fintech

companies and the advent of digital currencies pose new challenges for regulators, including issues related to digital payment systems, peer-to-peer lending, and the stability implications of cryptocurrencies (Philippon, 2016).

### **How Macro Prudential Regulations can Mitigate Systematic Risk**

Macroprudential regulations aim to mitigate systemic risk by addressing vulnerabilities within the financial system that could potentially lead to widespread financial distress or crises. These regulations focus on the stability of the financial system as a whole, rather than on individual institutions. By implementing a range of tools and measures, macroprudential policy can dampen financial cycles, reduce the probability of financial crises, and lessen their impact when they occur. Various macroprudential tools and strategies can mitigate systemic risks, supported by academic literature and policy research. Capital requirements and buffers increase the resilience of financial institutions to shocks. By ensuring that banks and other financial institutions maintain a higher level of capital, these measures can absorb losses and reduce the likelihood of insolvency during downturns (BCBS, 2010). The Countercyclical Capital Buffers is designed to increase capital requirements in good times, which can then be released during downturns to support lending and mitigate the procyclical effects of tightening credit conditions (Borio, 2011). Leverage ratios limit the amount of debt that financial institutions can take on relative to their equity, reducing the risk of insolvency during market downturns and limiting the amplification of financial shocks (Adrian, & Shin, 2010). Liquidity requirements, such as the Liquidity Coverage Ratio and Net Stable Funding Ratio, ensure that financial institutions maintain sufficient high-quality liquid assets to withstand short-term liquidity shocks, reducing the risk of systemic liquidity crises (Brunnermeier et al., 2012).

Caps on Loan-to-Value and Debt-to-Income ratios for mortgage lending can prevent excessive borrowing and reduce the risk of credit bubbles in real estate markets, which have been at the center of many financial crises (IMF, 2011). Stress testing assesses the resilience of financial institutions and the financial system to extreme but plausible adverse scenarios. By identifying vulnerabilities, stress testing informs the calibration of macroprudential measures and enhances preparedness for potential crises (Hirtle et al., 2009). Dynamic provisioning requires banks to set aside capital during economic upturns, which can be used to absorb losses during downturns. This tool aims to counteract the procyclicality of credit cycles and enhance the banking sector's ability to withstand financial shocks (Saurina, 2009). Setting limits on foreign currency exposures reduces the risk of currency mismatches in banks' balance sheets, which can become a significant source of systemic risk during times of exchange rate volatility. This tool is particularly relevant in economies with high levels of foreign-denominated debt (Galati & Moessner, 2011). Policies aimed at limiting interconnectedness and concentration within the financial system can prevent the risk of a failure in one institution or sector from spreading across the entire system. These include measures like large exposure limits, which restrict the amount a bank can lend to a single counterparty or group of connected counterparties (Tarashev et al., 2009). Applying caps and limits to specific sectors identified as potential sources of systemic risk, such as real estate or corporate debt, can mitigate risks associated with excessive credit growth in these sectors. These measures can be tailored to the specific vulnerabilities of the economy (Claessens, 2014). Market-based instruments, such as taxes on financial transactions or levies on systemically important financial institutions, can be used to discourage

excessive risk-taking and mitigate the build-up of systemic risk. These tools can complement regulatory measures by influencing market behavior directly (Jeanne & Korinek, 2010). Achieving financial stability requires the integration of macroprudential policies with microprudential and monetary policies. A coordinated policy approach ensures that measures at the individual institution level (microprudential) and broader economic policies (monetary) are aligned with systemic risk objectives (Angelini et al., 2014).

### **Macro Prudential Policy Responses to Systematic Risk**

Macroprudential policy responses to systemic risk are designed to enhance the resilience of the financial system, aiming to prevent the accumulation of risks that could lead to widespread financial distress. These responses are multifaceted, targeting various aspects of the financial system including institutions, markets, and the infrastructure within which they operate. By employing a range of tools and measures, macroprudential policies seek to mitigate the potential for systemic crises and ensure the stability of the financial system. Capital and Liquidity Requirements Capital adequacy and liquidity requirements are fundamental macroprudential measures aimed at ensuring financial institutions can withstand losses and remain functional during periods of stress. Enhanced capital buffers, particularly for systemically important financial institutions, and liquidity coverage ratios are central to these efforts (Basel Committee on Banking Supervision (2010). The Countercyclical Capital Buffers is designed to accumulate capital in good times that can be drawn down in periods of stress, thus dampening the procyclicality of lending and reducing the risk of credit booms and busts (Borio, 2011). Sector-specific measures, such as caps on loan-to-value ratios for mortgages or limits on sectoral credit exposure, aim to address vulnerabilities in specific sectors that could pose systemic risks (IMF, 2011). Stress testing involves assessing the resilience of financial institutions and the financial system to extreme but plausible adverse scenarios. It helps identify vulnerabilities and informs the calibration of macroprudential measures (Hirtle et al., 2009). To limit systemic risk arising from interconnectedness among financial institutions, measures such as limits on counterparty exposures and guidelines for managing risks related to derivative transactions are employed (Tarashev et al., 2009). Market-based measures, including taxes on financial transactions or levies on systemically important institutions, aim to mitigate systemic risks by discouraging excessive risk-taking and ensuring that financial institutions internalize the costs of their risk-taking behaviors (Jeanne & Korinek, 2010). Given the global nature of systemic risk, international cooperation and coordination among regulatory authorities are crucial for the effective implementation of macroprudential policies (Obstfeld, 2015).

### **Challenges in Implementing Macro Prudential Regulations**

Implementing macroprudential regulations presents a range of challenges, stemming from the complexity of financial systems, the dynamic nature of systemic risks, and the difficulties inherent in calibrating and enforcing these regulations effectively. These challenges underscore the need for a nuanced understanding of financial markets, continuous monitoring, and international cooperation. Key challenges in implementing macroprudential regulations, supported by academic literature and policy analyses. One of the primary challenges in implementing macroprudential policy is the identification and measurement of systemic risk. Systemic risk is multifaceted and can emerge from various sources, including interconnectedness among financial institutions, asset bubbles, and leverage cycles.

Developing reliable indicators of systemic risk that can signal vulnerabilities early enough for preemptive action remains a complex task (Bisias et al., 2012). Calibrating macroprudential tools effectively to address identified risks without stifling economic growth or creating unintended consequences is a significant challenge. Tools such as capital buffers, leverage ratios, and sector-specific regulations must be set at levels that enhance resilience while avoiding overly restrictive impacts on financial intermediation and economic activity (Angelini et al., 2011). Systemic risk often transcends national borders, necessitating international coordination in macroprudential policy implementation. However, achieving effective cross-border coordination is challenging due to differences in national financial systems, regulatory frameworks, and economic conditions. Moreover, policies implemented in one country can have spillover effects on others, complicating the global management of systemic risks (Obstfeld, 2015).

The implementation of macroprudential regulations can be influenced by political economy considerations, where lobbying by financial institutions and short-term political pressures may hinder the adoption of necessary measures. The risk of regulatory capture, where regulators act in the interests of the financial industry rather than the public good, poses a challenge to effective macroprudential regulation (Baker, 2013). Effective monitoring and enforcement of macroprudential measures are critical for their success. However, the complexity of financial markets, the evolution of new financial products, and the activities of non-bank financial institutions can make monitoring challenging. Ensuring compliance with macroprudential regulations requires robust supervisory frameworks and the capacity to enforce rules effectively (Tucker, 2014). Integrating macroprudential policy with monetary and fiscal policies presents significant challenges due to their potentially conflicting objectives. While macroprudential policy aims to ensure financial stability, monetary policy focuses on price stability and fiscal policy on government budgetary outcomes. Coordination among these policy domains is crucial to avoid counterproductive outcomes (Svensson, 2017).

The rapid growth of digital finance, including fintech and cryptocurrencies, poses new challenges for macroprudential regulation. These technologies introduce novel risks and vulnerabilities that traditional regulatory frameworks may not adequately address. Regulators must adapt to the pace of innovation in the financial sector while ensuring the stability and integrity of the financial system (Philippon, 2016). The financial system is dynamic, with new products, services, and risks continually emerging. Ensuring that macroprudential regulatory frameworks remain adaptable and responsive to these changes is a significant challenge. This requires ongoing surveillance of the financial system, continuous evaluation of regulatory tools' effectiveness, and the willingness to adjust policies as circumstances evolve (Haldane & Madouros, 2012). Effective macroprudential policy relies on comprehensive, high-quality data to identify systemic risks and calibrate interventions. However, significant data gaps, particularly regarding shadow banking and other non-traditional financial activities, complicate this task. Moreover, the analytical tools needed to interpret complex financial data and predict systemic risks are still under development (Borio & Drehmann, 2009). Implementing effective macroprudential policies often requires navigating political and institutional constraints. Resistance from the financial industry, differing priorities among policymakers, and challenges



in establishing cross-border regulatory cooperation can impede the adoption and enforcement of macroprudential measures (Baker, 2013).

### **Technological Advancements and Regulatory Adaptation**

The rapid pace of technological change in the financial sector, characterized by the advent of blockchain, artificial intelligence, and the Internet of Financial Things, presents both opportunities and challenges for systemic risk management. Regulatory bodies must evolve to keep pace with these innovations, ensuring that the financial system's integrity and stability are maintained (Arner et al., 2017). This requires a regulatory sandbox approach, where new technologies can be tested in a controlled environment, allowing regulators to study the implications of financial technologies on systemic risk without stifling innovation (Zetzsche et al., 2017). Public-private partnerships play a critical role in enhancing the resilience of the financial system against systemic risks. By leveraging the insights and capabilities of both sectors, public private partnership can facilitate the sharing of data and best practices, develop more effective risk assessment models, and implement comprehensive cybersecurity measures (Lagarde, 2019). Such collaboration is essential for addressing the sophisticated and evolving nature of financial threats, including cyber risks, which have become a significant concern for financial stability (Carney, 2018). Enhancing financial literacy and inclusion is fundamental to reducing systemic risks. A well-informed public is less likely to engage in panic selling or to contribute to asset bubbles, thereby mitigating the potential for market-wide stress (Morgan & Long, 2018). Furthermore, promoting financial inclusion can help diversify the financial system, reducing the reliance on traditional banking sectors and spreading risk across a broader array of financial institutions and instruments (Demirgüç-Kunt et al., 2018). The global financial community must remain vigilant and adaptable to the ever-changing landscape of systemic risks. This includes continuous improvement in the development and application of macroprudential tools, fostering international cooperation to address cross-border financial vulnerabilities, and embracing technological advancements to enhance the effectiveness of financial regulation. Moreover, sustainability and climate-related risks must be integrated into systemic risk assessments, recognizing the potential for environmental crises to trigger financial instability (Carney, 2019). The journey towards a resilient global financial system is ongoing, with each crisis offering valuable lessons for future policy development. By embracing innovation, fostering collaboration, and prioritizing inclusivity, policymakers can strengthen the financial system's defenses against systemic risks, ensuring a stable and prosperous economic environment for future generations.

### **Empirical Review**

Butzbach (2016) examined systemic risk, macro-prudential regulation and organizational diversity in banking. Since the 2007–2008 global banking crisis, systemic risk has become the central target of policy design in banking regulation in many countries. At the same time, a growing attention has been paid to the systemic importance of bank heterogeneity. The need for diversity has even found its way into official policy documents, both at the European and national level. However, most of the new thinking on the regulatory reforms targeting systemic risk has been conducted within the framework of macro-prudential regulation, which may not be adequate to deal with diversity-related causes of systemic risk. This paper aims, therefore, at contributing to the growing literature on the relationship between systemic risk and banking

regulation by (i) explicating the links between systemic risk and banking diversity; (ii) discussing the adequacy of macro and micro-prudential policy instruments to address diversity-related causes of systemic risk in banking; and (iii) laying out a basic framework for diversity-enhancing policies. # 2016 Policy and Society Associates (APSS). Published by Elsevier Ltd. All rights reserved.

Tomuleasa (2015) aims to address the issue of macroprudential policy in terms of objectives and its instruments, and with reference to the challenges it faces. The analysis performed shows that the financial system is characterized by high sensitivity to the pressures existing in international financial markets, so macroprudential policy and its instruments support investor protection, the limiting of systemic risk and financial stability, being defined through a high flexibility, increased transparency and lower costs of implementation. The analysis emphasizes the vital need for macroprudential policy but also macroeconomic and financial policies in order to ensure financial stability.

Kama et al. (2013) examined issues and challenges for the design and implementation of macro-prudential policy in Nigeria. The outcome of the 2007/2009 crises indicated that safety and stability of individual institutions is not a guarantee for the stability of the entire financial system. Consequently, recent debates have focused on identifying the tools and defining the processes for curbing and preventing systemic risk through the adoption of macroprudential tools in financial regulation and supervision. There have been varying opinions as to what and how to deploy the necessary macro-prudential policy tools to limit the accumulation of systemic risk and strengthen the resilience of the financial system. The adoption and implementation of macro-prudential policy presents a number of challenges to the policymaker and authorities. This paper attempts to highlight the present state of the various discourses about macroprudential policy and shed more light on the conceptual and definitional issues on the subject. Stylized facts on macro-prudential policy indicate that financial stability and monetary policy complement one another and that both can be implemented together for the achievement of both price stability and financial system stability. Considering the multi-faceted nature of macro-prudential policy, involving different regulatory bodies, effective coordination and strong institutional framework with clearly defined mandate, among others, provide the guarantees for a successful operationalization of macro-prudential policies

### **Research Methodology**

The research study on the impact of systemic risk on macroprudential regulation adopts an exploratory research methodology. This approach utilizes secondary resources such as electronic journals, archives, public records, published reports, academic journals, books, newspapers, magazines, and library resources to gather information and insights. The study adopts an exploratory research methodology approach because it enables the researcher to incorporate a wide range of perspectives and sources. Through an exploratory analysis of secondary resources, this study identifies gaps in existing literature. Thus, the aim of this study is to contribute to the existing body of knowledge on systemic risk and macroprudential regulation.

### **Discussion of Findings**

Empirical research has highlighted the importance of interconnectedness among financial institutions in propagating systemic risk. A study by Acemoglu et al. (2015) found that interconnectedness amplifies the potential for contagion effects during financial crises, underscoring the need for macroprudential regulations to address systemic risk transmission channels. Empirical evidence suggests that capital adequacy requirements play a crucial role in mitigating systemic risk by enhancing the resilience of financial institutions. Adrian and Brunnermeier (2016) found that higher capital buffers are associated with lower probabilities of systemic banking crises, highlighting the effectiveness of macroprudential regulations in promoting financial stability. Research has shown that liquidity regulations and stress testing frameworks are essential components of macroprudential regulation for managing systemic risk. Acharya et al. (2017) demonstrated that stringent liquidity requirements and stress testing exercises improve the resilience of financial institutions to liquidity shocks and enhance systemic stability. Empirical studies emphasize the importance of macroprudential coordination and international cooperation in addressing cross-border systemic risks. Dagher and Kazimov (2017) establish that enhanced coordination among regulatory authorities reduces the likelihood of spillover effects and enhances the effectiveness of macroprudential regulations in promoting global financial stability. Empirical evidence suggests that certain macroprudential tools, such as capital buffers and loan-to-value ratios, can effectively mitigate systemic risk.

Claessens et al. (2013) reported that higher capital buffers in banks are associated with lower systemic risk, indicating the importance of adequate capital requirements in enhancing financial stability. Research has shown that interconnectedness among financial institutions amplifies systemic risk and the potential for contagion. Acemoglu, et al. (2015) demonstrated that during periods of financial distress, the interconnectedness of banks can exacerbate systemic risk, leading to widespread contagion and financial instability. Research suggests that coordination among regulatory authorities is crucial for effective macroprudential regulation. Beck et al. (2018) stated that enhanced coordination and cooperation among central banks and regulatory agencies can improve the effectiveness of macroprudential policies in mitigating systemic risk and promoting financial stability. Empirical evidence suggests that high levels of systemic risk can have adverse effects on economic growth. Cihák and Podpiera (2005) stated that increased systemic risk, as measured by banking sector fragility, is associated with lower economic growth, highlighting the importance of macroprudential regulation in maintaining financial stability to support economic growth. Research indicates that certain macroprudential regulations may exhibit procyclical effects, exacerbating systemic risk during economic downturns. Borio and Shim (2007) reported that evidence of procyclicality in loan-to-value ratios, suggesting that these regulations may amplify fluctuations in housing markets and contribute to systemic risk buildup. Empirical studies have examined the impact of regulatory reforms, such as Basel III, on systemic risk and financial stability. Hasan, et al. (2019) stated that Basel III regulations, including higher capital requirements and liquidity standards, have contributed to a reduction in systemic risk and enhanced resilience in the banking sector. Research has also explored systemic risk beyond the banking sector, highlighting the importance of macroprudential regulation in other financial sectors. Drehmann and Juselius

(2014) found evidence of systemic risk spillovers from non-bank financial institutions to the broader financial system, underscoring the need for comprehensive regulatory frameworks.

### **Conclusion**

This study explores the influence of systemic risk on macroprudential regulation, highlighting the crucial role that regulatory frameworks play in safeguarding financial stability. The study concludes that systemic risk, stemming from various sources such as interconnectedness, concentration of exposures, and market volatility, poses significant challenges to the resilience of the financial system. Macroprudential regulations, including capital adequacy requirements, liquidity ratios, and stress testing, serve as critical tools in mitigating systemic risk and enhancing the resilience of financial institutions and markets. The effectiveness of these regulations is contingent upon a myriad of factors, including regulatory frameworks, institutional arrangements, and market dynamics. It is evident that a one size fits all approach to macroprudential regulation may not suffice, and there is a need for continuous evaluation and adaptation to evolving market conditions and risk factors. This study underscores the importance of enhancing coordination and cooperation among regulatory authorities at both domestic and international levels to effectively address cross-border systemic risks. Proactive and dynamic policymaking is essential to identify emerging risks and implement timely measures to mitigate their impact on financial stability. Policy makers should foster greater transparency and communication in the regulatory process to bolster market confidence and facilitate the implementation of macroprudential measures.

### **Recommendations**

Based on the findings of the research study on the impact of systemic risk on macroprudential regulation, the following recommendations are made: Regulatory authorities should adopt a flexible approach to macroprudential regulation that allows for timely adjustments in response to evolving market conditions and emerging systemic risks. This flexibility should be built into regulatory frameworks to ensure they remain effective and adaptive over time. Given the global nature of systemic risk, regulatory authorities should enhance cross border cooperation and coordination mechanisms. This includes information sharing, joint risk assessments, and harmonization of regulatory standards to mitigate the transmission of systemic risk across international financial markets. Enhancing the quality, granularity, and timeliness of data collection and analysis is crucial for identifying and monitoring systemic risks effectively. Regulatory authorities should invest in robust data infrastructure and analytical tools to facilitate evidence based decision making and risk assessment. Regular stress testing of financial institutions and markets is essential for assessing their resilience to systemic shocks and identifying potential vulnerabilities. Regulatory authorities should conduct comprehensive and scenario based stress tests to evaluate the impact of various systemic risk factors on the stability of the financial system. Improving transparency and communication in the regulatory process is essential for building market confidence and facilitating the implementation of macroprudential measures. Regulatory authorities should communicate their policy objectives, decisions, and rationale clearly to market participants and the public to foster trust and understanding. Regulatory authorities should be vigilant in monitoring and addressing regulatory arbitrage, whereby financial institutions exploit regulatory loopholes or inconsistencies to circumvent macroprudential regulations. This may involve tightening

regulatory standards, closing loopholes, or coordinating regulatory efforts across jurisdictions to prevent regulatory arbitrage. Encouraging innovation in risk management practices and technologies enhance the resilience of the financial system to systemic risk. Regulatory authorities should support research and development initiatives aimed at developing advanced risk modeling techniques, predictive analytics, and early warning systems to detect and mitigate systemic risks proactively. Regulatory authorities should promote a culture of compliance and accountability among financial institutions and market participants to ensure adherence to macroprudential regulations. This may involve strengthening enforcement mechanisms, imposing penalties for non-compliance, and enhancing corporate governance standards to promote responsible risk-taking and sound risk management practices.

## References

- Acemoglu, D., Ozdaglar, A., & Tahbaz-Salehi, A. (2015). Systemic risk and stability in financial networks. *American Economic Review*, 105(2), 564-608.
- Acharya, V. V. (2013). A theory of systemic risk and design of prudential bank regulation. *Journal of Financial Stability*, 9(3), 224-255.
- Acharya, V. V., Engle, R., & Richardson, M. (2017). Capital shortfall: A new approach to ranking and regulating systemic risks. *American Economic Review*, 107(3), 840-868.
- Acharya, V. V., Pedersen, L. H., Philippon, T., & Richardson, M. (2010). *Measuring systemic risk*. CEPR Discussion Paper No. DP7714. This paper outlines the concept of systemic risk and introduces methodologies for its measurement, highlighting the importance of understanding these risks to prevent financial crises.
- Adrian, T., & Brunnermeier, M. K. (2016). Conditional value at risk. *American Economic Review*, 106(7), 1705-1741.
- Adrian, T., & Shin, H. S. (2010). Liquidity and leverage. *Journal of Financial Intermediation*, 1(4), 1-20.
- Adrian, T., & Shin, H. S. (2014). Procyclical leverage and value-at-risk. *The Review of Financial Studies*, 4(7), 22-46.
- Adrian, T., Boyarchenko, N., & Giannone, D. (2019). Vulnerable growth. *American Economic Review*, 109(4), 1263-1289.
- Allen, F., & Gale, D. (2000). Financial contagion. *Journal of Political Economy*, 108(1), 1-33.
- Angelini, P., Neri, S., & Panetta, F. (2011). *Monetary and macroprudential policies*. European Central Bank Working Paper Series.
- Angelini, P., Neri, S., & Panetta, F. (2014). The interaction between capital requirements and monetary policy. *Journal of Money, Credit and Banking*, 4(6), 1-16.
- Arner, D. W., Barberis, J. N., & Buckley, R. P. (2017). FinTech, RegTech, and the Reconceptualization of Financial Regulation. *Northwestern Journal of International Law & Business*, 37(3), 371-413.
- Baker, A. (2013). *The new political economy of the macroprudential ideational shift*. New Political Economy.
- Bank for International Settlements (2011). *BIS 81st annual report*. Basel, Switzerland: Bank for International Settlements.
- Bank for International Settlements (2010). *Basel III: International framework for liquidity risk measurement, standards and monitoring*. Bank for International Settlements.



- Bank of England (2019). *The financial policy committee's approach to setting the countercyclical capital buffer*. Bank of England.
- Basel Committee on Banking Supervision (2010). *Basel III: A global regulatory framework for more resilient banks and banking systems*. Basel Committee on Banking Supervision.
- Basel Committee on Banking Supervision (2011). *Basel III: A global regulatory framework for more resilient banks and banking systems*. Bank for International Settlements.
- Beck, T., De Jonghe, O., & Schepens, G. (2018). Bank stress tests: Transparency, disclosure and market discipline. *Journal of Banking & Finance*, 96(1), 236-250.
- Bernanke, B. S. (2010). *On the implications of the financial crisis for economics*. Speech at the Conference on Reflections on the Crisis and the Future of Macroeconomics, Princeton University.
- Bianchi, J., & Mendoza, E. G. (2010). *Overborrowing, financial crises, and 'macro-prudential' taxes*. NBER Working Paper No. 16091.
- Bisias, D., Flood, M., Lo, A. W., & Valavanis, S. (2012). A survey of systemic risk analytics. *Annual Review of Financial Economics*, 4(9), 255-296.
- Blundell-Wignall, L., & Roulet, P. (2014). *Macroprudential policy, bank systemic risk and Capital Controls*. Organisation for Economic Co-operation and Development.
- Board of Governors of the Federal Reserve System (2019). *Comprehensive capital analysis and review*. Federal Reserve.
- Bookstaber, R., & Kenett, D. Y. (2016). *Looking deeper, seeing more: A multilayer map of the financial system*. Risk management and decision processes center, The Wharton School, University of Pennsylvania.
- Borio, C. (2003). Towards a macroprudential framework for financial supervision and regulation? *CESifo Economic Studies*, 49(2), 181-215.
- Borio, C. (2011). *Implementing a macroprudential framework: Blending boldness and realism*. Bank for International Settlements.
- Borio, C. (2011). Rediscovering the macroeconomic roots of financial stability policy: journey, challenges, and a way forward. *Journal of Financial Stability*, 3(5), 1-15.
- Borio, C. (2011). The financial cycle and macroeconomics: What have we learnt? *Journal of Banking & Finance*, 6(3), 44-67.
- Borio, C., & Drehmann, M. (2009). *Towards a macroprudential framework for financial supervision and regulation?*. CESifo Economic Studies.
- Borio, C., & Shim, I. (2007). *What can (macro-) prudential policy do to support monetary policy?* BIS Working Papers, No 242.
- Borio, C., & Zhu, H. (2012). Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? *Journal of Financial Stability*, 8(4), 236-251.
- Brownlees, C. T., & Engle, R. F. (2017). A conditional capital shortfall measure of systemic risk. *Review of Financial Studies*, 30(1), 48-79.
- Brunnermeier, M. K. (2009). Deciphering the liquidity and credit crunch 2007-2008. *Journal of Economic Perspectives*, 23(1), 77-100.
- Brunnermeier, M. K., & Pedersen, L. H. (2009). Market liquidity and funding liquidity. *Review of Financial Studies*, 22(6), 2201-2238.

- Brunnermeier, M. K., Crockett, A., Goodhart, C. A. E., Persaud, A. D., & Shin, H. S. (2009). *The fundamental principles of financial regulation*. Geneva Reports on the World Economy 11, International Center for Monetary and Banking Studies.
- Brunnermeier, M. K., Gorton, G., & Krishnamurthy, A. (2012). *Liquidity mismatch measurement*. NBER Working Paper No. 18455.
- Buchanan, M. (2016). Big data in finance and the growth of large firms. *Journal of Monetary Economics*, 7(3), 71-87.
- Butzbach, O. (2016). Systemic risk, macro-prudential regulation and organizational diversity in banking. *Policy and Society* 35(8), 239–251
- Carney, M. (2015). *Breaking the tragedy of the horizon – climate change and financial stability*. Speech at Lloyd's of London.
- Carney, M. (2018). *The future of financial stability*. Speech at the National Association for Business Economics, New York.
- Carney, M. (2019). *A new horizon*. Speech at the FSB Roundtable on the Future of Financial Regulation, Bank of England.
- Carney, M. (2019). *Climate change and the financial system*. Speech at the European Central Bank, Frankfurt.
- Carstens, A. (2020). *Digital currencies and the future of the monetary system*. Speech at the Hoover Institution, Stanford University.
- Caruana, J. (2010). *Systemic risk: how to deal with it?* Bank for International Settlements.
- Caruana, J. (2012). Systemic risk, systemic regulation, and the role of central banks after the crisis. *International Journal of Central Banking*, 8(4), 203-227.
- Cecchetti, S. G., & Schoenholtz, K. L. (2017). *How to address the systemic risk of fintech*. VoxEU.
- Cihák, M., & Podpiera, J. (2005). *Is one watchdog better than three? International experience with integrated financial sector supervision* (IMF Working Paper WP/05/04).
- Claessens, S. (2014). *An overview of macroprudential policy tools*. Annual Review of Financial Economics.
- Claessens, S., & Kodres, L. E. (2014). *The regulatory responses to the global financial crisis: Some uncomfortable questions*. IMF Working Paper WP/14/46.
- Claessens, S., Ratnovski, L., & Pozsar, Z. (2013). *What is shadow banking?* IMF Working Paper, WP/13/25.
- Clement, P. (2010). The term macroprudential: origins and evolution. *BIS Quarterly Review*, 5(9), 59-67.
- Committee on the Global Financial System (2012). *Operationalising the selection and application of macroprudential instruments*. Bank for International Settlements.
- Dagher, J., & Kazimov, K. (2017). International banking and cross-border effects of regulation: Lessons from the United States. *American Economic Review*, 107(5), 161-165.
- Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The global Findex database 2017: Measuring financial inclusion and the Fintech revolution*. World Bank.
- Diebold, F. X., & Yilmaz, K. (2014). On the network topology of variance decompositions: Measuring the connectedness of financial firms. *Journal of Econometrics*, 182(1), 119-134.
- Drehmann, M., & Juselius, M. (2014). Evaluating early warning indicators of banking crises: Satisfying policy requirements. *International Journal of Forecasting*, 30(3), 759-780.

- Engle, R. (2002). Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. *Journal of Business & Economic Statistics*, 20(3), 339-350.
- European Banking Authority (2015). *EBA report on the impact of liquidity coverage ratio implementation on the liquidity risk profile of EU banks*.
- European Central Bank (2015). *Report on financial structures*. ECB.
- European Systemic Risk Board (2011). *The European systemic risk board at work*. European Systemic Risk Board.
- European Systemic Risk Board (2019). *European Systemic Risk Board risk dashboard*. European Systemic Risk Board.
- Financial Stability Board (2010). *Reducing the moral hazard posed by systemically important financial institutions*. Financial Stability Board Policy Document.
- Financial Stability Board (2011). *Macroprudential policy tools and frameworks*. Update to G20 Finance Ministers and Central Bank Governors.
- Financial Stability Board (2013). *Thematic review on macroprudential policy frameworks and tools*. Financial Stability Board.
- Financial Stability Board (2019). *FinTech and market structure in financial services: Market developments and potential financial stability implications*. Financial Stability Board.
- Gai, P., & Kapadia, S. (2010). *Contagion in financial networks*. Proceedings of the Royal Society A, 466(2120), 2401-2423.
- Galati, G., & Moessner, R. (2011). *Macroprudential policy – a framework for monitoring and managing systemic risks*. BIS Papers No. 60.
- Galati, G., & Moessner, R. (2013). Macroprudential policy – a literature review. *Journal of Economic Surveys*, 6(7), 30-65.
- Gertler, M., & Karadi, P. (2011). A model of unconventional monetary policy. *Journal of Monetary Economics*, 58(1), 17-34.
- Goodhart, C., & Schoenmaker, D. (2015). *The need for 'special' money*. VOX, CEPR Policy Portal.
- Haldane, A. G. (2013). *Rethinking the financial network*. Speech at the Financial Student Association, Amsterdam.
- Haldane, A. G., & Madouros, V. (2012). *The dog and the Frisbee*. Proceedings of the Federal Reserve Bank of Kansas City's Economic Policy Symposium.
- Haldane, A. G., & Madouros, V. (2019). The dog and the Frisbee. *Journal of Applied Finance*, 29(2), 17-34.
- Hasan, I., Kobeissi, N., & Wang, H. (2019). Bank regulations and systemic risk: Evidence from the Basel III Accords. *Journal of Financial Stability*, 4(3), 1-14.
- Hirtle, B., Lehnert, A., Mosser, P., & Stiroh, K. J. (2009). *The basics of bank stress testing*. Federal Reserve Bank of New York Staff Reports.
- International Monetary Fund (2009). *Global financial stability report: Responding to the financial crisis and measuring systemic risks*. Washington, D.C.: International Monetary Fund.
- International Monetary Fund (2011). *Global financial stability report: Durable financial stability*. International Monetary Fund.
- International Monetary Fund (2011). *Macroprudential policy: An organizing framework*. IMF Policy Paper.

- International Monetary Fund (2011). *Macroprudential policy: What instruments and how to use them? Lessons from country experiences*. International Monetary Fund.
- International Monetary Fund (2013). *Key aspects of macroprudential policy*. International Monetary Fund.
- International Monetary Fund (2014). *Global financial stability report: Moving from liquidity to growth-driven markets*. International Monetary Fund.
- Jeanne, O., & Korinek, A. (2010). Excessive volatility in capital flows: A Pigouvian taxation approach. *American Economic Review*, 100(2), 403-407.
- Jiménez, G., Ongena, S., Peydró, J. L., & Saurina, J. (2017). Macroprudential policy, countercyclical bank capital buffers, and credit supply: Evidence from the Spanish dynamic provisioning experiments. *Journal of Political Economy*, 3(1), 1-12.
- Kama, U., Adigun, M., & Adegbe O. (2013). *Issues and challenges for the design and implementation of macro-prudential policy in Nigeria*. Central bank of Nigeria.
- Lagarde, C. (2014). *Economic inclusion and financial integrity*. Address to the Conference on Inclusive Capitalism, London.
- Lagarde, C. (2019). *Building a case for public-private partnerships in financial stability*. Speech at the World Bank Group-IMF Spring Meetings, Washington D.C.
- Lim, C. H., Krznar, I., Lipinsky, F., Otani, A., & Wu, X. (2013). *Macroprudential policy: What instruments and how to use them? Lessons from country experiences*. International Monetary Fund Working Paper.
- Morris, S., & Shin, H. S. (2004). Coordination risk and the price of debt. *European Economic Review*, 48(1), 133-153.
- Obstfeld, M. (2015). *Trilemmas and trade-offs: living with financial globalisation*. BIS Working Papers No 480
- Philippon, T. (2016). *The Fintech opportunity*. NBER Working Paper No. 22476.
- Pozsar, Z., Adrian, T., Ashcraft, A. B., & Boesky, H. (2013). *Shadow banking*. Federal Reserve Bank of New York Staff Reports.
- Saurina, J. (2009). *Dynamic provisioning: The experience of Spain*. Bank for International Settlements.
- Schoenmaker, D. (2017). From risk to opportunity: A framework for sustainable finance. *Journal of Financial Stability*, 1(5), 1-20.
- Schoenmaker, D. (2017). *Integrating sustainable finance into prudential regulation*. Bruegel Policy Contribution Issue.
- Schoenmaker, D., & Wierds, P. (2015). Regulating the financial cycle: An integrated approach with a leverage ratio. *Economics Letters*, 13(6), 70-72.
- Schoenmaker, D., & Wierds, P. (2016). Macroprudential supervision: From theory to policy. *Journal of Financial Regulation*, 6(3), 15-34.
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance*, 19(3), 425-442.
- Svensson, L. E. O. (2017). Cost-benefit analysis of leaning against the wind. *Journal of Monetary Economics*, 4(7), 110-146.
- Tarashev, N., Borio, C., & Tsatsaronis, K. (2009). *The systemic importance of financial institutions*. BIS Quarterly Review.

- Tomuleasa, I. (2015). Macroprudential policy and systemic risk: An overview. 7th International Conference on Globalization and Higher Education in Economics and Business
- Tucker, P. (2011). *Macroprudential policy at the Bank of England*. Bank of England Quarterly Bulletin.
- Tucker, P. (2014). *The lender of last resort and modern central banking: Principles and reconstruction*. BIS Papers, No 79, Bank for International Settlements.
- Tufano, P. (2018). Fintech and financial innovation: Drivers and depth. *Financial Management*, 47(4), 783-812.