

Macro-Financial Vulnerabilities

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Preface

The study of macro-financial vulnerabilities lies at the intersection of economics, finance, and policy design. It explores how the balance sheets of households, firms, financial intermediaries, and sovereigns interact to create cycles of leverage, liquidity, and confidence. These dynamics are neither accidental nor peripheral—they are the organizing forces of the global economy.

This report, **Macro-Financial Vulnerabilities**, is part of the *Bank & Finance Deep-Dive Series*—a multi-year research program examining the architecture of global finance through five interdependent layers: **Information, Infrastructure, Innovation, Integration, and Governance**. Each layer represents a dimension of resilience and interconnection within the global financial ecosystem.

While earlier reports have addressed specific structural risks—such as *Cyber Resilience*, *Sovereign Debt*, *NBFIs*, and *Quantum Finance*—the present volume provides the analytical glue that binds them together. It examines the feedback loops through which financial and macroeconomic forces interact, amplify, and transmit shocks across borders and sectors.

The motivation for this report is both conceptual and practical. Conceptually, it traces the evolution of macro-financial thought from Hyman Minsky’s insight that “stability breeds instability” to the modern frameworks of the BIS, IMF, and FSB that embed financial frictions into dynamic general-equilibrium models. Practically, it responds to the challenges facing policymakers today: how to manage rising debt burdens, tightening global liquidity, and non-bank intermediation within a coherent macro-financial strategy.

By integrating theory, evidence, and policy experience, *Macro-Financial Vulnerabilities* aims to provide central banks, finance ministries, and regulatory agencies with a unified lens for diagnosing systemic risk and designing adaptive responses. Its ultimate message is straightforward yet profound: **resilience is not achieved by eliminating volatility but by ensuring that financial systems can absorb and adapt to it.**

This publication has benefited from ongoing dialogue with academics, policymakers, and market participants worldwide. We are standing on the shoulder of giants such as Adrian, Bernanke, Borio, Brunnermeier, Carlstrom, Diamond, Dybvig, Fuerst, Gertler, Gilchrist, Kiyotaki, Minsky, Moore, Tirole, and many others who underscore that financial stability is a shared responsibility, demanding both intellectual rigor and institutional cooperation.

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Table of Contents

Executive Summary

1. Introduction – The Macro-Financial Nexus

2. Theoretical Foundations – From Amplification to Resilience

- 2.1 The Birth of the Macro-Financial Nexus
- 2.2 From Banks to Markets: The Rise of Endogenous Risk
- 2.3 Microeconomic Foundations of Fragility
- 2.4 Global Dimensions and Policy Feedbacks
- 2.5 From Amplification to Resilience

3. Sources of Macro-Financial Vulnerability

- 3.1 Credit, Leverage, and the Expansion Phase
- 3.2 Liquidity and Market Functioning
- 3.3 Maturity and Currency Mismatches
- 3.4 Sovereign–Bank–Market Interdependence
- 3.5 Structural Shifts and New Frontiers
- 3.6 From Diagnosis to Dynamics

4. Transmission Channels and Global Spillovers

- 4.1 The Architecture of Transmission
- 4.2 The Global Liquidity Mechanism
- 4.3 Sectoral Spillovers and Feedback Loops
- 4.4 Policy Spillovers and Coordination Challenges
- 4.5 Lessons and Forward Outlook

5. Sectoral and Regional Vulnerabilities

- 5.1 Household and Corporate Balance Sheets
- 5.2 Banking Systems: From Buffer to Amplifier
- 5.3 Non-Bank Financial Intermediaries
- 5.4 Sovereigns and the Return of Fiscal Constraints
- 5.5 Regional Divergences and Emerging Risks
- 5.6 Concluding Reflections

6. Policy Frameworks and Institutional Architecture

- 6.1 From Crisis Response to Resilience Management
- 6.2 The Evolution of Macro-Prudential Architecture
- 6.3 Institutional Coordination and Information Infrastructure
- 6.4 Cross-Border Governance and Global Safety Nets
- 6.5 Governance Principles for a Resilient Architecture
- 6.6 Concluding Reflections



7. Macro-Financial Stress Scenarios

- 7.1 From Surveillance to Simulation
- 7.2 Scenario Design and Methodology
- 7.3 Non-Linear Feedback and Second-Round Effects
- 7.4 Cross-Border Stress Propagation
- 7.5 From Quantification to Policy Calibration
- 7.6 Lessons and Strategic Implications

8. From Vulnerability to Resilience: Policy and Market Implications

- 8.1 The New Logic of Financial Policy
- 8.2 Building Systemic Buffers
- 8.3 Market Discipline and Transparency
- 8.4 Adaptive Policy and Learning Systems
- 8.5 Integrating Sustainability and Long-Term Resilience
- 8.6 Strategic Roadmap for a Resilient Financial Ecosystem
- 8.7 Concluding Reflections

9. Conclusions and Policy Recommendations

- 9.1 From Diagnosis to Design
- 9.2 Key Conclusions
- 9.3 Strategic Policy Recommendations
- 9.4 Implications for Policy, Markets, and Research
- 9.5 Final Reflection: Bending Without Breaking

10. References

11. Appendices

- Appendix A. The Financial Accelerator Model Redux
- Appendix B. Financial Intermediaries as Providers of Liquidity and Insurance
- Appendix C. Methodology and Data Sources
- Appendix D. Glossary of Terms
- Appendix E. Source–Exhibit Matrix

List of Tables

No.	Title
Table 1	Evolution of Macro-Financial Thought
Table 2	Core Sources of Macro-Financial Vulnerability
Table 3	Sectoral Indicators of Leverage and Vulnerability
Table 4	Sovereign Vulnerability Indicators
Table 5	Macro-Prudential Toolkit: Instruments and Objectives
Table 6	Design Principles for a Resilient Macro-Financial Framework
Table 7	Stylized Macro-Financial Stress Scenarios
Table 8	Using Stress-Test Results for Policy Action
Table 9	Systemic Buffers and Their Activation Triggers
Table 10	Incorporating Structural Risks into Macro-Financial Resilience Frameworks
Table 11	From Principles to Practice: Operationalizing Resilience

List of Figures

No.	Title
Figure 1	Key Highlights of the Report
Figure 2	Report Roadmap
Figure 3	The Financial Cycle: From Amplification to Deleveraging
Figure 4	Cross-Border Transmission Channels of Macro-Financial Vulnerabilities
Figure 5	Banking-Sector Vulnerabilities in the Interest-Rate Cycle
Figure 6	Global Heatmap of Macro-Financial Vulnerabilities
Figure 7	The Policy Triangle: Monetary, Fiscal, and Prudential Interactions
Figure 8	The Global Financial Safety Net
Figure 9	Dynamic Stress-Testing Architecture
Figure 10	From Stability to Resilience: A Paradigm Shift
Figure 11	The Adaptive Policy Cycle
Figure 12	The Five-Layer Architecture of Financial Resilience
Figure 13	From Vulnerability to Resilience: The Policy Transformation

List of Boxes

No.	Title
Box 1	The March 2020 Liquidity Shock: Anatomy of a Global Spillover
Box 2	Non-Bank Finance and the “Liquidity Mirage”
Box 3	The Importance of Macro-Financial Dashboards
Box 4	Cross-Border Stress Testing and the Role of Liquidity Swaps
Box 5	The Role of Information in Preventing Amplification
Box 6	Toward a Macro-Financial Resilience Architecture



List of Acronyms

Acronym	Full Term
AEs	Advanced Economies
AUM	Assets Under Management
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BoE	Bank of England
BoJ	Bank of Japan
CCAR	Comprehensive Capital Analysis and Review
CCyB	Counter-Cyclical Capital Buffer
CDS	Credit Default Swap
CET1	Common Equity Tier 1 Capital
CMIM	Chiang Mai Initiative Multilateralization
COVID-19	Coronavirus Disease 2019
DGI	Data Gaps Initiative
D-SIB	Domestic Systemically Important Bank
DTI	Debt-to-Income Ratio
ECB	European Central Bank
EMEs	Emerging Market Economies
ESM	European Stability Mechanism
EU	European Union
FLAR	Fondo Latinoamericano de Reservas
FCL	Flexible Credit Line (IMF)
FSAP	Financial Sector Assessment Program (IMF/World Bank)
FSB	Financial Stability Board
FSI	Financial Soundness Indicators (IMF)
FX	Foreign Exchange
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GFN	Gross Financing Needs
GFSR	Global Financial Stability Report (IMF)
G-SIB	Global Systemically Important Bank
HQLA	High-Quality Liquid Assets
IFS	International Financial Statistics (IMF)
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
IPF	Integrated Policy Framework (IMF)
IST	Integrated Stress Testing
LCR	Liquidity Coverage Ratio
LDI	Liability-Driven Investment
LTRO	Long-Term Refinancing Operation



MFVI	Macro-Financial Vulnerability Index
MNA	Middle East and North Africa
NBFI	Non-Bank Financial Intermediary
NGFS	Network for Greening the Financial System
NPL	Non-Performing Loan
NSFR	Net Stable Funding Ratio
OECD	Organisation for Economic Co-operation and Development
OIS	Overnight Indexed Swap
QE	Quantitative Easing
QIS	Quantitative Impact Study
QT	Quantitative Tightening
RBC	Risk-Based Capital
ROA	Return on Assets
ROE	Return on Equity
RRP	Reverse Repurchase Agreement
RWA	Risk-Weighted Assets
SDR	Special Drawing Rights (IMF)
SIFI	Systemically Important Financial Institution
SRB	“Single Resolution Board (EU)
STF	Short-Term Funding
T-Bill	Treasury Bill
TLAC	Total Loss-Absorbing Capacity
TLTRO	Targeted Longer-Term Refinancing Operations
UFR	Ultimate Forward Rate
VaR	Value at Risk
WEO	World Economic Outlook (IMF)



Executive Summary

Financial stability is the connective tissue of the modern economy. When it weakens, the effects ripple far beyond markets—undermining growth, fiscal space, and social trust. The past two decades have shown that systemic fragility arises not only from excessive risk-taking but also from the interaction of balance sheets, expectations, and policy responses across borders.

Macro-financial vulnerabilities are the patterns through which shocks in one part of the economy propagate to the rest. They emerge from credit cycles, maturity mismatches, and leverage interdependence, but their roots lie in incentives and confidence. This report argues that financial resilience requires understanding these linkages, not merely regulating their outcomes.

1. The Macro-Financial Nexus

Finance and the real economy form a feedback loop. Credit expansion fuels investment and consumption, which raise income and asset prices; rising valuations, in turn, relax borrowing constraints and encourage further leverage. When confidence reverses, this process amplifies downturns.

From Minsky (1986) to Bernanke and Gertler (1989) and modern frameworks by Brunnermeier and Sannikov (2014) and Borio (2014), research has shown that these cycles are not anomalies—they are structural features of capitalism’s financial engine.

The report situates these ideas within the empirical reality of a global system characterized by high debt, interconnected markets, and fragmented regulation. It proposes a unified analytical lens to interpret how financial fragility migrates across institutions, sectors, and borders.

2. The Evolution of Vulnerability

Vulnerability today is both **macro** and **financial**, both **domestic** and **global**:

- **Leverage** has shifted from banks to non-bank intermediaries.
- **Liquidity risk** has migrated from interbank markets to investment funds.
- **Sovereign stress** increasingly interacts with private credit cycles.
- **Cross-border transmission** operates through capital flows, balance-sheet linkages, and global risk appetite.

In this environment, shocks do not dissipate—they relocate. The 2008 crisis, the 2020 liquidity shock, and the 2022–2023 rate repricing all reveal how systemic stress can reappear in new institutional forms.

3. From Monitoring to Management

Traditional surveillance focused on data; resilience requires **dynamic management**. The report develops a multi-layered analytical framework:

1. **Diagnosis** – identifying vulnerabilities across balance sheets.

2. **Transmission** – tracing how shocks move across borders and sectors.
3. **Stress Scenarios** – testing resilience under alternative conditions.
4. **Policy Frameworks** – aligning monetary, fiscal, and prudential tools.
5. **Governance** – embedding coordination and learning in institutional design.

This approach transforms macro-financial stability from a reactive task into a **strategic capability**.

4. The Policy Imperative

Resilience depends on coordination. Monetary, fiscal, and prudential policies act on the same balance sheets; without alignment, one domain's remedy becomes another's vulnerability. The report calls for:

- **Integrated macro-prudential frameworks** linking stress testing, buffers, and risk mapping.
- **Rule-based counter-cyclical tools**—capital and liquidity buffers, fiscal escape clauses, and swap-line mechanisms—that can be activated without political delay.
- **Global coordination mechanisms**, strengthening liquidity provision, transparency, and reciprocity across jurisdictions.

The macro-financial agenda is therefore inseparable from global governance.

5. From Fragility to Resilience

Resilience is not the absence of volatility; it is the capacity to absorb and adapt to it. The report proposes five pillars for a resilient financial ecosystem:

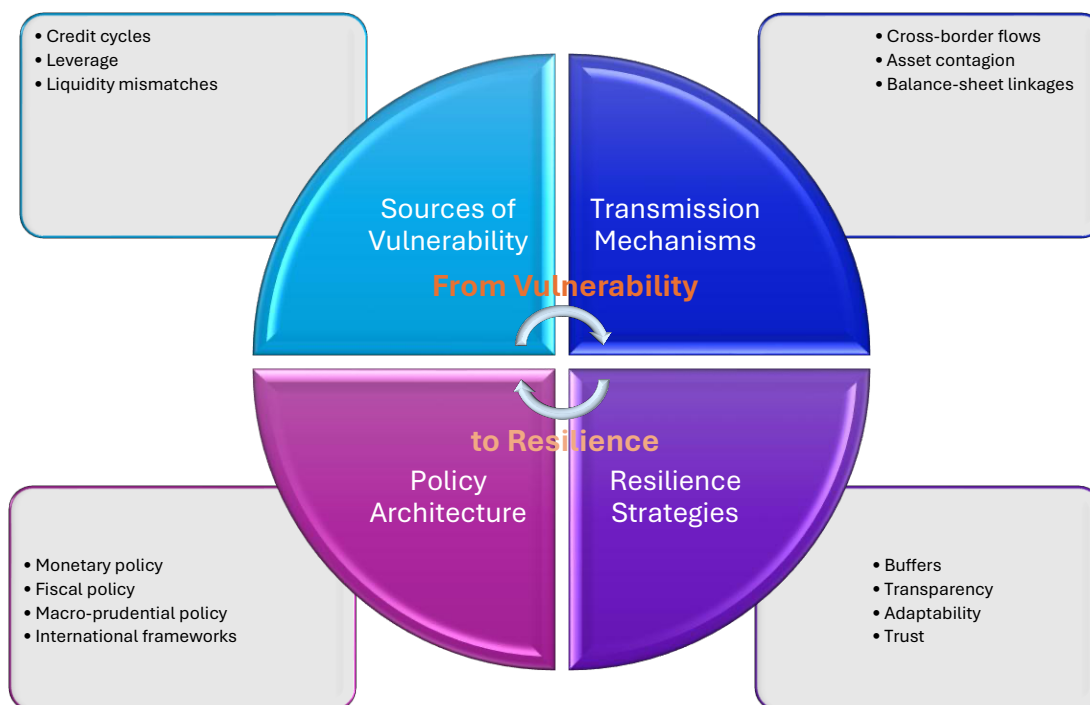
1. **Buffers** – capital, liquidity, and fiscal space.
2. **Diversification** – of funding sources, institutions, and jurisdictions.
3. **Transparency** – credible, real-time information that reduces uncertainty.
4. **Adaptability** – policy frameworks that learn and evolve.
5. **Trust** – the foundation that aligns expectations and enables cooperation.

Together, these pillars form the architecture through which financial systems can “bend without breaking.”

The report concludes that macro-financial resilience is not an endpoint but a *process*—a continuous cycle of monitoring, adaptation, and coordination that transforms vulnerability into capacity for renewal.

Figure 1 summarizes the report's overarching message. It positions the macro-financial system as a dynamic ecosystem where vulnerabilities arise from feedbacks among leverage, liquidity, and expectations—and where resilience emerges from coordination across policy domains. The figure encapsulates the report's key insight: vulnerabilities and resilience are two sides of the same process. The goal of policy is not to suppress financial cycles but to ensure they unfold within institutions capable of absorbing and adapting to change.

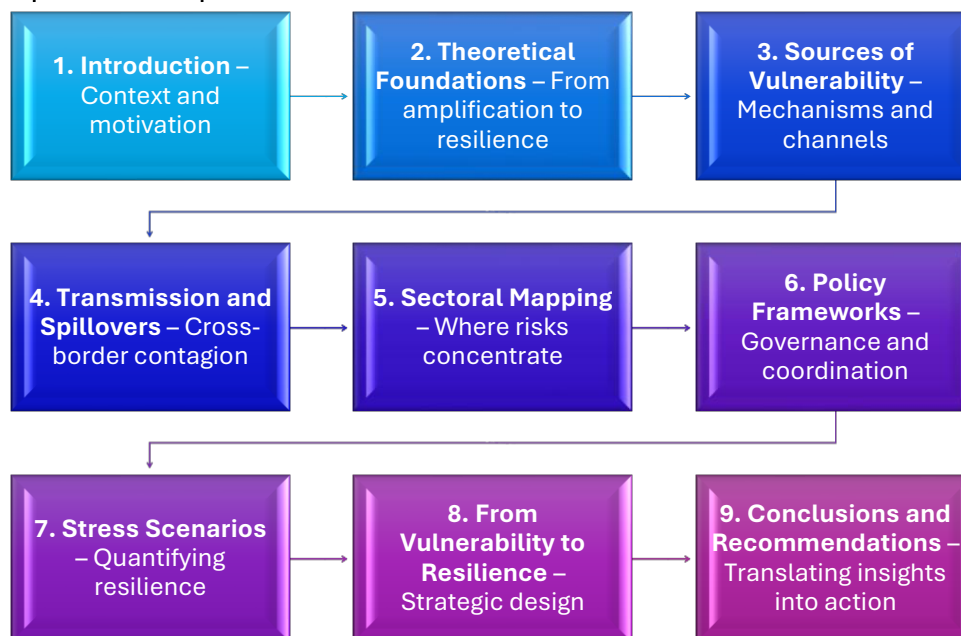
Figure 1 – Key Highlights of the Report



Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

Figure 2 outlines the structure of the report, showing how each section builds on the previous one to form an integrated narrative—from conceptual foundations to policy design. It provides a visual map of the report’s logic. It underscores that resilience analysis is cumulative: theory informs measurement, measurement informs policy, and policy reinforces the next cycle of understanding.

Figure 2 – Report Roadmap



Source: Bank & Finance elaboration.



1. Introduction – The Macro-Financial Nexus

Finance was long viewed as a neutral conduit — a transparent mechanism linking savers and investors, facilitating production and trade, but exerting little independent influence on the real economy. In the classical paradigm, capital markets were efficient, risk was dispersed by innovation, and prudence emerged from competition. Alan Greenspan’s famous faith in the self-regulating capacity of markets captured this late-twentieth-century orthodoxy (Greenspan, 1996).

The crises that followed would dismantle that illusion. From the Latin American debt collapses of the 1980s to the global financial crisis of 2008 and the sudden liquidity freeze of 2020, each episode revealed the same pattern: balance sheets that looked robust in tranquil times proved fragile under stress. The supposed neutrality of finance gave way to its **reflexivity**—the recognition that finance not only reflects the real economy but powerfully shapes it (Greenwood, Hanson, and Jin, 2023).

Modern economies depend on financial systems to allocate capital, transfer risk, and store value. These are productive and indispensable functions: they finance innovation, smooth consumption, and sustain growth (Levine, 2005). Yet they rest on a single, intangible foundation—**confidence**. The very instruments that hedge risk also create leverage; the very networks that provide liquidity can transmit panic across borders in seconds. When confidence wanes, the stabilizers of prosperity become channels of contagion.

This paradox—finance as both enabler and amplifier—defines the **macro-financial nexus**. In reality, credit cycles, asset valuations, and policy expectations form an interlocking system. Expansion phases feed on optimism and leverage; contractions feed on loss of trust and liquidity. Monetary and fiscal decisions influence risk-taking, while private balance sheets determine the transmission of policy.

Macro-financial vulnerabilities therefore do not appear as isolated “risks,” but as **patterns of interdependence**—the complex architecture through which households, firms, financial intermediaries, and sovereigns are bound together.

The experience of the early twenty-first century has reaffirmed a hard lesson: financial stability cannot be assured by the soundness of individual institutions alone. It depends on **systemic architecture**—on how leverage, liquidity, and expectations interact across balance sheets and jurisdictions. This insight underpins the evolution from micro-prudential supervision to macro-prudential policy, from institutional oversight to system-wide monitoring, and from national approaches to cross-border coordination (Borio, 2014; FSB, 2023; IMF, 2023).

That evolution has never been more urgent. Global debt ratios exceed historical peaks; rapid monetary tightening has re-priced risk across asset classes; and new forms of intermediation—non-bank finance, digital tokens, algorithmic trading—blur the boundaries of regulation. **Vulnerabilities** have not disappeared; they **have migrated**—from banks to markets, from public



to private balance sheets, and from advanced to emerging economies. Understanding these migrations is essential for any coherent strategy of resilience.

This report addresses that challenge. It approaches macro-financial vulnerability through an **integrated lens**, linking theory, data, and policy. It examines how imbalances originate, how they propagate through interconnected markets, and how policy frameworks can absorb and adapt to shocks. The aim is not to eliminate volatility—an impossible and undesirable goal—but to **manage complexity**: to design financial systems that bend without breaking, preserving confidence while reallocating risk and resources.

The logic of stability and fragility is inseparable from the structure of finance itself. Modern economies rely on the delicate interaction of credit, liquidity, and confidence; yet it is precisely through these channels that small disturbances can evolve into macroeconomic upheavals. Grasping this transformation requires more than institutional analysis—it demands an analytical framework that links **behavior, balance sheets, and expectations**.

The next section develops that framework. It traces the theoretical foundations of macro-financial vulnerability—from Minsky’s intuition that stability breeds instability, to the formal models of Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and Brunnermeier and Sannikov (2014), and to contemporary policy architectures at the BIS, IMF, and FSB that seek to translate those insights into systemic resilience.

2. Theoretical Foundations – From Amplification to Resilience

The study of macro-financial vulnerabilities begins with a simple observation: in modern economies, **finance and the real economy co-evolve**. Credit expansion fuels investment and consumption, which lift incomes and asset prices; in turn, rising valuations relax borrowing constraints and encourage further leverage. This feedback loop—the financial cycle—is not new, but the frameworks that explain it have evolved profoundly over the past half-century.

2.1 The Birth of the Macro-Financial Nexus

The idea that finance can amplify, rather than merely transmit, economic fluctuations was first articulated by Hyman Minsky (1986). His *Financial Instability Hypothesis* proposed that stability breeds instability: long periods of tranquil growth encourage risk-taking and leverage, gradually transforming “hedge finance” into “speculative” and eventually “Ponzi” finance. In this process, the structure of balance sheets—not just the size of credit—determines systemic resilience. Minsky’s intuition foreshadowed nearly every crisis since, from the U.S. savings-and-loan turmoil to the collapse of structured credit in 2008.

The formalization of this intuition began with Bernanke and Gertler (1989), who introduced the *financial accelerator* mechanism in a model where agency costs and borrower net worth



amplify business-cycle dynamics. Their insight was later extended by Carlstrom and Fuerst (1997), who incorporated similar credit frictions into a general-equilibrium framework, showing how leverage interacts with monetary transmission and investment decisions.

A decade later, Bernanke, Gertler, and Gilchrist (1999) embedded this mechanism fully within a dynamic New-Keynesian model, providing a comprehensive structure for analyzing how financial conditions propagate and magnify real-sector shocks (see **Appendix A** for a simplified model of the Financial Accelerator Mechanism). Almost simultaneously, Kiyotaki and Moore (1997) demonstrated that collateral constraints can generate self-reinforcing booms and busts even without exogenous disturbances.

Together, these contributions established the modern macro-financial paradigm: financial frictions are not small imperfections but integral features that reshape the entire propagation mechanism of business cycles.

2.2 From Banks to Markets: The Rise of Endogenous Risk

As markets supplanted banks as the dominant source of credit creation, new frameworks were needed to capture the behavior of **leveraged intermediaries**. Adrian and Shin (2010) highlighted how balance-sheet management by dealers and investment banks generates *pro-cyclical leverage*: when measured risks decline, institutions expand assets; when volatility rises, they deleverage abruptly. This mechanism explains why asset prices can move in tandem with funding conditions and why monetary tightening often triggers outsized market reactions.

Brunnermeier and Sannikov (2014) advanced the field further by introducing *endogenous risk*. In their model, even rational agents facing simple balance-sheet constraints can generate large fluctuations in volatility, liquidity, and credit spreads. The system oscillates between tranquil periods—when leverage builds silently—and turbulent episodes, when constraints bind and feedback loops amplify distress. The insight is powerful: fragility can arise endogenously, without any exogenous “shock”.

Meanwhile, Claudio Borio (2014) reframed these dynamics within a longer-term perspective—the *financial cycle*. Unlike short business-cycle fluctuations, financial cycles span decades, driven by slow-moving interactions between credit, asset prices, and perceptions of risk. This view placed macro-financial vulnerabilities at the heart of monetary and prudential policy, arguing that price stability alone cannot guarantee financial stability.

2.3 Microeconomic Foundations of Fragility

At the core of every macro-financial cycle lies a microeconomic mechanism: **liquidity transformation** (see **Appendix B** for a summary of the original paper that presents financial intermediaries as providers of liquidity and insurance). The Diamond–Dybvig (1983) model demonstrated how banks provide socially valuable maturity transformation—offering liquid

deposits while financing illiquid projects—but at the cost of run risk. Once depositors fear others will withdraw, self-fulfilling panics emerge. Later extensions by Allen and Gale (2000) and the **microeconomics of banking** literature (Freixas and Rochet, 2008) showed how incomplete contracts, asymmetric information, and limited commitment generate systemic fragility even in competitive markets.

These insights extend far beyond traditional banking. In today’s market-based systems, the same run dynamics appear in money-market funds, repo markets, and stable-coin ecosystems: liabilities that promise daily liquidity are backed by assets whose value depends on confidence. The classic *run on deposits* has become a *run on collateral*.

2.4 Global Dimensions and Policy Feedbacks

The globalization of finance has magnified these vulnerabilities. Cross-border capital flows, global liquidity cycles, and common investor bases transmit shocks almost instantaneously. Rey (2013) described this as the “global financial cycle”: risk appetite, leverage, and asset valuations move together across countries, largely independent of domestic conditions. Caballero, Farhi, and Gourinchas (2017) emphasized the chronic shortage of safe assets in a world where some economies issue credible liabilities and others cannot, driving imbalances and recurrent surges in capital flows.

At the same time, policy frameworks have struggled to reconcile domestic mandates with global spillovers. Tobias Adrian and colleagues at the IMF advanced an integrated macro-prudential and monetary policy approach, while the BIS and FSB developed global standards for capital, liquidity, and resolution regimes (BIS, 2023; FSB, 2023). These institutional innovations reflect a new understanding: macro-financial vulnerabilities are *collective phenomena*, requiring coordinated oversight and shared buffers.

The understanding of macro-financial vulnerabilities has evolved through successive intellectual eras, each redefining how economists and policymakers perceive the relationship between finance and the real economy. From the early notion of financial neutrality to modern theories of endogenous risk and systemic resilience, the field’s evolution reflects how experience with crises has shaped both models and institutions. **Table 1** traces this trajectory — identifying the dominant paradigms, representative frameworks, and their corresponding policy implications.

The historical arc presented in the table is instructive. The journey from the “finance as a veil” paradigm to today’s integrated policy frameworks marks a profound transformation in economic thinking: finance is no longer treated as a backdrop to production but as an adaptive system whose internal dynamics can destabilize or reinforce macroeconomic stability. This intellectual progression underpins the analytical foundations of this report — linking theory, evidence, and policy in a single ecosystemic perspective.

Table 1 – Evolution of Macro-Financial Thought

Era	Core Idea	Representative Frameworks	Policy Implication
1950s–1970s	Finance as a veil	Modigliani–Miller theorem; monetarist neutrality	Monetary control sufficient for stability
1980s–1990s	Finance as amplifier	Minsky (1986); Bernanke–Gertler–Gilchrist (1999); Kiyotaki–Moore (1997)	Incorporate credit channels into macro models
2000s	Endogenous risk and liquidity spirals	Adrian–Shin (2010); Brunnermeier–Sannikov (2014); Borio (2014)	Macro-prudential and systemic-risk tools
2010s–2020s	Integrated resilience and policy coordination	IMF IPF (2023); BIS (2023); FSB (2023)	Joint monetary–fiscal–prudential management of systemic risk

Source: Bank & Finance.

2.5 From Amplification to Resilience

The most recent wave of research and policy thinking reframes the challenge. Rather than focusing solely on how financial systems amplify shocks, attention is turning to **how they absorb them**. The concept of *resilience*—as developed by Brunnermeier (2024) and reflected in the BIS and IMF’s current frameworks—emphasizes adaptability over rigidity. A resilient financial system allows risk to reprice, credit to adjust, and resources to reallocate without triggering destabilizing cascades.

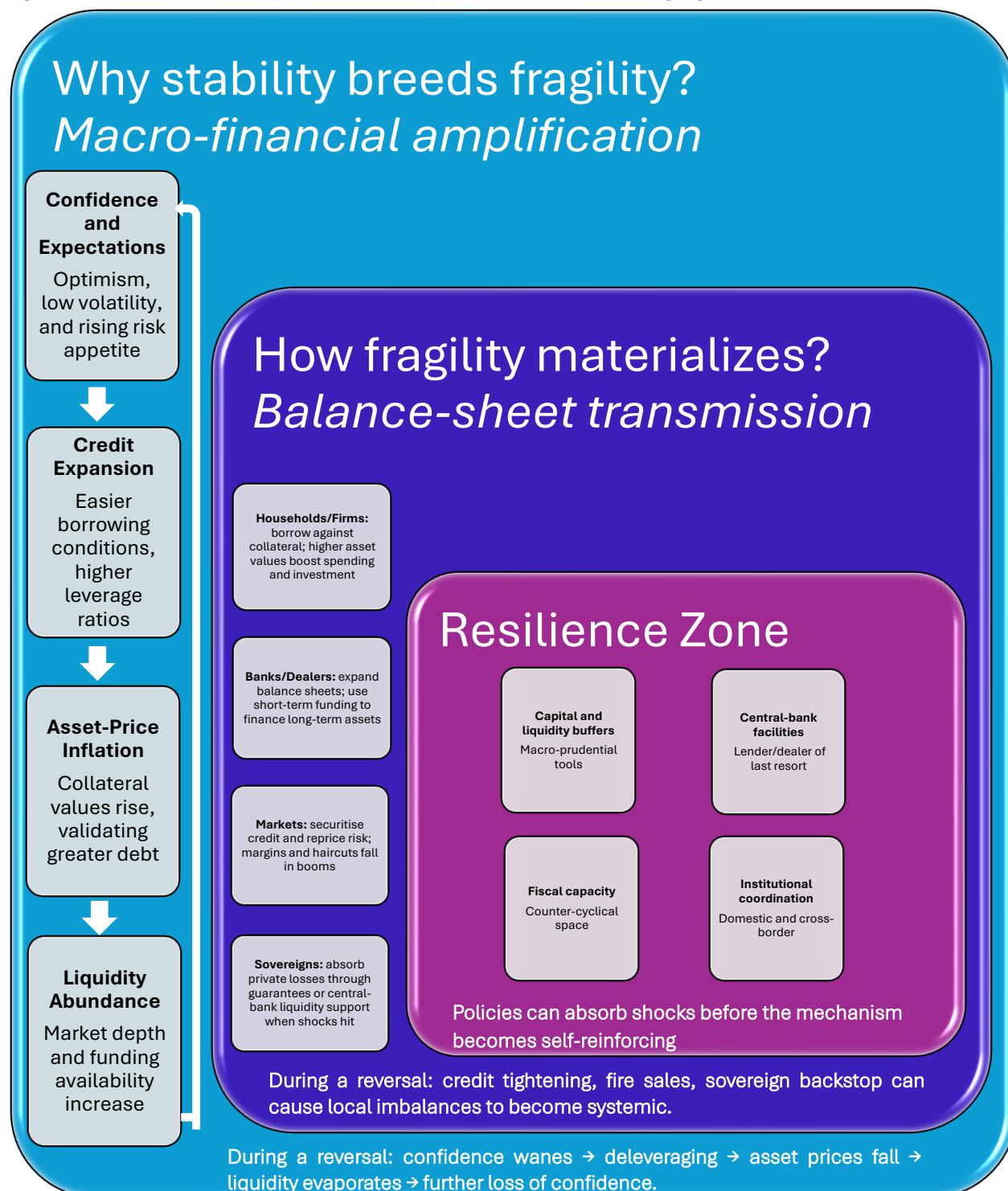
This shift has profound implications. It redefines prudential policy as a form of insurance rather than inhibition; it views liquidity and capital buffers as instruments for flexibility, not constraints on growth; and it places coordination—across borders, sectors, and policy domains—at the center of global financial governance. In short, the goal is no longer to prevent the rain, but to strengthen the roof.

The mechanisms discussed above can be visualized as a single dynamic process that connects financial behavior, market structure, and macroeconomic outcomes. During expansions, rising confidence, abundant liquidity, and optimistic expectations reinforce each other: credit grows, leverage increases, and asset valuations climb. When sentiment shifts, these same channels operate in reverse—collateral erodes, funding evaporates, and forced deleveraging magnifies real losses. **Figure 3** summarizes this self-reinforcing logic of finance: it captures both *why* stability breeds fragility and *how* that fragility unfolds through balance-sheet linkages.

The diagram highlights that macro-financial fragility is both a **behavioral process** and a **structural condition**. At its core, stability invites leverage, and leverage converts small disturbances into large movements in credit and prices. Understanding this duality—why financial systems generate cycles of euphoria and retrenchment, and how those cycles transmit through balance sheets—is essential to diagnosing vulnerability. Section 3 builds directly on this logic, examining the tangible sources of fragility in credit markets, liquidity

structures, and sovereign-financial linkages, and tracing how the mechanisms visualized here materialize in practice.

Figure 3 – The Financial Cycle: From Amplification to Deleveraging



Source: Bank & Finance elaboration based on Minsky (1986); Bernanke et al. (1999); Kiyotaki & Moore (1997); Adrian & Shin (2010); Brunnermeier & Sannikov (2014); BIS (2023); FSB (2023).

3. Sources of Vulnerability – Anatomy of Fragility

Macro-financial vulnerabilities arise when the mechanisms that connect finance and the real economy—credit, liquidity, and expectations—cease to absorb shocks and begin to amplify them. They are rarely confined to a single sector. Instead, they reflect **system-wide imbalances** that accumulate slowly and unwind abruptly, often along fault lines linking households, firms, financial intermediaries, and sovereigns.

3.1 Credit, Leverage, and the Expansion Phase

Credit creation is the lifeblood of economic growth, but also its most recurrent source of instability. Periods of sustained optimism encourage borrowing, raise asset valuations, and validate even looser credit standards—a dynamic captured in **Minsky’s** “*hedge-to-Ponzi*” progression (Minsky, 1986) and formalised in the *financial accelerator* framework (Bernanke, Gertler and Gilchrist, 1999). As balance-sheet strength improves, perceived risk declines, leverage rises, and marginal borrowers enter.

This process is self-reinforcing because collateral and creditworthiness are intertwined: higher asset prices relax borrowing constraints, while credit expansion supports those same prices (Kiyotaki and Moore, 1997). The outcome is an **endogenous boom** that appears sustainable until expectations reverse. When it does, leverage operates in reverse: collateral shrinks, funding evaporates, and deleveraging depresses asset values further (Adrian and Shin, 2010).

3.2 Liquidity and Market Functioning

While credit amplifies balance-sheet cycles, **liquidity** governs how those cycles propagate through markets. In tranquil periods, abundant liquidity masks fragility: narrow spreads and compressed volatility encourage leveraged trading strategies that rely on continuous market depth. Yet liquidity is **pro-cyclical**—it expands with risk appetite and disappears when uncertainty rises (Brunnermeier and Pedersen, 2009).

The result is the phenomenon observed in 2008 and again during the March 2020 turmoil: markets can shift overnight from excess demand for risky assets to a scramble for cash. In such moments, even safe instruments—sovereign bonds, money-market funds, stablecoins—can exhibit run dynamics akin to those described by Diamond and Dybvig (1983). What begins as a portfolio rebalancing becomes a systemic event as funding markets freeze and central banks are forced to act as *dealers of last resort* (BIS, 2023; FSB, 2023).

3.3 Maturity and Currency Mismatches

A subtler but equally powerful source of vulnerability lies in **maturity transformation**—the reliance on short-term funding to finance long-term assets. When refinancing risk is concentrated, liquidity stress rapidly becomes solvency risk. In global markets, this is

compounded by **currency mismatches**: borrowers in emerging economies often hold assets in domestic currency but owe liabilities in foreign currency, a condition known as the *original sin* (Eichengreen and Hausmann, 1999). Exchange-rate depreciation thus inflates debt burdens precisely when revenues fall, triggering balance-sheet recessions that can spread through trade and finance channels.

3.4 Sovereign–Bank–Market Interdependence

The line between private and public balance sheets has also blurred. During crises, governments and central banks absorb private losses; in turn, sovereign credibility becomes the anchor of financial stability. The so-called **sovereign–bank nexus**—banks holding large quantities of domestic public debt—creates a feedback loop: fiscal stress weakens banks, and weak banks amplify fiscal stress (Farhi and Tirole, 2018). In advanced economies, this linkage has re-emerged through massive central-bank balance sheets and pandemic-era fiscal expansions; in emerging markets, it remains a structural feature of financial repression and limited investor bases.

While the theoretical literature identifies the mechanisms of amplification, real-world fragility emerges from tangible imbalances that accumulate across sectors and instruments. These vulnerabilities differ in form — credit, liquidity, maturity, currency, or fiscal-financial linkages — yet they share a common property: each transforms localized stress into systemic risk through balance-sheet feedbacks. **Table 2** summarizes the principal sources of macro-financial vulnerability, their transmission channels, and illustrative historical episodes.

Table 2 – Core Sources of Macro-Financial Vulnerability

Source	Description	Transmission Channel	Typical Symptoms	Illustrative Examples
Credit & Leverage	Excessive borrowing during booms magnifies downturns	Collateral and balance-sheet feedbacks	Asset bubbles, credit booms	U.S. housing 2000–07; China property sector
Liquidity	Market depth vanishes under stress	Margin calls, fire sales	Funding stress, volatility spikes	March 2020 bond-fund turmoil
Maturity Mismatch	Short-term funding of long-term assets	Roll-over and interest-rate risk	Bank-run or repo stress	2008 wholesale funding freeze
Currency Mismatch	Liabilities in foreign currency, assets in local	Exchange-rate shocks	Debt overhang, sudden stops	Asian crisis 1997; Turkey 2018
Sovereign–Bank Nexus	Fiscal fragility transmitted to finance	Bond valuations, capital adequacy	“Doom loop” dynamics	Eurozone periphery 2010–12

Source: Bank & Finance Consulting Group elaboration based on BIS (2023); IMF (2023); FSB (2023).



Together, these sources form an interdependent web rather than separate categories of risk. Credit booms often coincide with liquidity complacency; maturity mismatches feed sovereign exposure; currency mismatches compound corporate leverage. Recognizing these connections is the first step toward effective macro-prudential oversight. Later sections of this report examine how such vulnerabilities propagate through global spillovers and how policy coordination can contain them before they crystallize into crisis.

3.5. Structural Shifts and New Frontiers

Beyond these classical drivers, new technologies and market structures are reshaping the landscape of vulnerability.

- **Non-bank financial intermediaries (NBFIs)** now account for nearly half of global financial assets, often operating with limited oversight but high interconnectedness (FSB, 2023).
- **Digital finance** introduces both diversification and fragility: tokenized assets and algorithmic liquidity pools replicate traditional leverage under new guises.
- **Climate and demographic transitions** alter long-term risk premia and the valuation of collateral, creating potential misalignments between financial horizons and real-economic adjustments.

These shifts underscore a recurring theme: vulnerabilities evolve with innovation. Every wave of financial progress introduces new channels for intermediation—and, inevitably, new forms of contagion.

3.6. From Diagnosis to Dynamics

Identifying vulnerabilities is only the first step; understanding how they interact is the essence of systemic analysis. Credit booms feed fiscal optimism, which raises sovereign leverage; liquidity squeezes force asset sales that impair collateral across markets; and exchange-rate shocks propagate through leveraged positions held by global investors. The system's fragility lies less in any single imbalance than in the **synchronization of behaviors** that emerge when everyone tries to de-risk simultaneously.

Section 4 explores these transmission channels and global spillovers in detail, analyzing how domestic imbalances translate into cross-border contagion and how policy frameworks can contain—or exacerbate—these dynamics.

4. Transmission Channels and Global Spillovers

Financial fragility seldom remains domestic. In an era of integrated markets, synchronized portfolios, and instantaneous information, vulnerabilities in one segment of the system can transmit across borders and sectors in a matter of hours. The globalization of finance has created vast benefits — deeper capital markets, lower borrowing costs, and broader risk-sharing — but it has also built dense networks of exposure that allow shocks to cascade far beyond their origin.

4.1 The Architecture of Transmission

At the core of cross-border spillovers lie three intertwined channels: **capital flows**, **balance-sheet linkages**, and **market sentiment**.

Capital-flow cycles are the most visible form of transmission. Periods of abundant global liquidity fuel borrowing and asset appreciation in emerging and frontier markets; subsequent tightening in advanced-economy monetary policy triggers reversals, exchange-rate depreciation, and debt-service stress.

Research by Rey (2013) and Obstfeld (2015) shows that the “global financial cycle” often overrides domestic policy autonomy: when global risk appetite contracts, even countries with sound fundamentals experience outflows and currency pressure.

Balance-sheet linkages transmit stress through financial intermediaries. Multinational banks, cross-listed firms, and global funds operate as conduits of contagion: losses in one jurisdiction compel deleveraging elsewhere. The Bank for International Settlements (BIS, 2023) estimates that over half of global bank assets are held by institutions with cross-border claims exceeding 20 percent of their balance sheets. Similarly, investment funds increasingly hold correlated portfolios of sovereign and corporate bonds, amplifying mark-to-market contagion during sell-offs.

Finally, **market sentiment** operates as an information channel. In tightly coupled systems, investors extrapolate from one region to another — a phenomenon known as *wake-up contagion* (Calvo and Mendoza, 2000). What begins as a fundamental repricing in one country can morph into global risk aversion, raising funding costs everywhere.

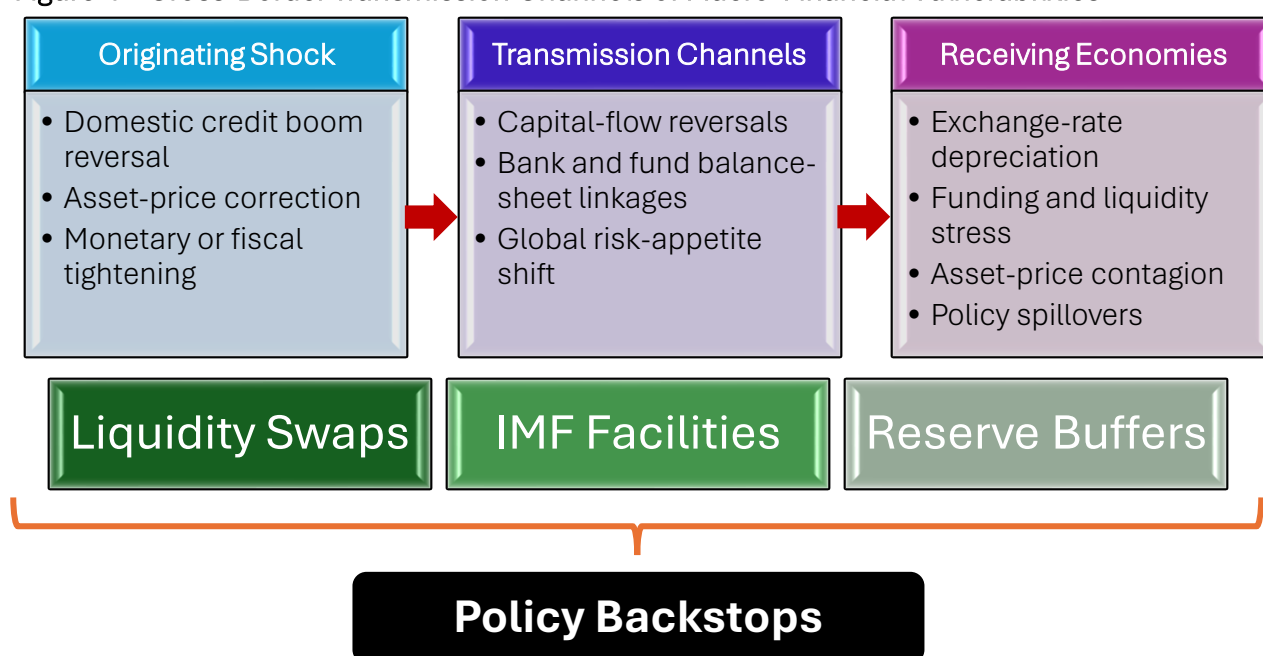
4.2 The Global Liquidity Mechanism

Global liquidity — the ease of financing in major reserve currencies — acts as the bloodstream of the world economy. When central banks in advanced economies pursue quantitative easing or maintain low rates, liquidity expands globally; when policy tightens, leverage unwinds across multiple jurisdictions (Bruno and Shin, 2015).

Because many emerging-market borrowers hold dollar-denominated debt, a stronger U.S. dollar tightens global financial conditions even without changes in domestic policy. This “*dollar channel*” explains why U.S. monetary cycles often precede turning points in global credit growth and capital flows.

Cross-border linkages transform domestic financial imbalances into global shocks. When monetary, credit, or asset-price adjustments occur in one economy, they propagate through a web of financial, trade, and expectation channels that tie balance sheets across borders. **Figure 4** illustrates this global transmission architecture—showing how local shocks move through capital flows, funding networks, and market sentiment before manifesting as macro-financial stress in other regions.

Figure 4 – Cross-Border Transmission Channels of Macro-Financial Vulnerabilities



Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); Rey (2013); Bruno and Shin (2015).

Figure 4 encapsulates how macro-financial vulnerabilities transcend borders. Shocks that originate in one jurisdiction—through credit tightening or valuation losses—rapidly spill into others via shared funding markets, correlated portfolios, and shifts in global risk appetite. The density of these linkages explains why local imbalances can trigger global liquidity cycles, and why resilience today depends as much on **international coordination and safety nets** as on domestic prudence. Understanding this network logic is essential for designing policy architectures that contain contagion without constraining capital mobility.

4.3 Sectoral Spillovers and Feedback Loops

Transmission is not only cross-border but also **cross-sectoral**. Market disruptions in one asset class can rapidly affect others through valuation, collateral, and funding channels.

- **Sovereign to banking:** rising sovereign spreads erode the value of bank holdings and curtail credit supply.
- **Banking to sovereign:** bank rescues increase public-debt ratios, widening spreads further — the so-called “doom loop” (Farhi and Tirole, 2018).
- **Markets to corporates:** higher volatility widens credit spreads, tightening financing for firms and prompting investment cuts.
- **Corporates to households:** employment and income effects feed back into consumption and housing markets.

These feedbacks can quickly become nonlinear. When investors and intermediaries attempt to reduce risk simultaneously, market depth collapses and correlations across assets rise — transforming diversification into common exposure.

4.4 Policy Spillovers and Coordination Challenges

Policy responses themselves can propagate shocks. An uncoordinated tightening by major central banks can drain liquidity from emerging markets; fiscal consolidation in one region can suppress global demand; and the pursuit of national financial safety may inadvertently export instability. The *Integrated Policy Framework* of the IMF (2023) and ongoing efforts by the BIS and FSB emphasize the need for coherent monetary-fiscal-prudential strategies that internalize these externalities.

Box 1 – The March 2020 Liquidity Shock: Anatomy of a Global Spillover

The COVID-19 outbreak in early 2020 produced one of the fastest and broadest liquidity crises in modern financial history. Within days of the first lockdown announcements, investors across the world rushed to obtain cash and high-quality collateral — a “dash for cash” that simultaneously hit money-market funds, bond ETFs, and even the U.S. Treasury market, the deepest and supposedly most liquid market on earth.

Three interlocking dynamics amplified the shock:

1. **Margin spirals.** Sharp price declines triggered margin calls on leveraged investors (hedge funds, real-money asset managers, and risk-parity funds). To raise cash, they sold the very assets used as collateral, further depressing prices and prompting additional calls — a textbook Minskyan feedback loop.
2. **Dealer-balance-sheet constraints.** Post-crisis regulations had reduced dealers’ capacity to absorb inventory. When investors dumped bonds, dealers’ balance sheets filled quickly, widening bid–ask spreads and freezing market-making activity.

3. **Cross-currency funding pressures.** Global institutions reliant on U.S.-dollar funding faced a sudden shortage as money-market investors retreated into domestic assets. The premium on dollar FX swaps surged, straining even solvent borrowers in Europe and Asia.

The stress spread almost instantaneously across jurisdictions and asset classes. By mid-March, spreads in investment-grade credit had quadrupled, emerging-market capital outflows exceeded USD 80 billion in a single month, and even Treasury yields briefly rose as investors liquidated the safest securities to obtain cash.

Policy reaction. A synchronized wave of interventions followed. The Federal Reserve reopened and expanded its network of dollar-liquidity swap lines to fourteen central banks and introduced the *Foreign and International Monetary Authorities (FIMA) Repo Facility* to backstop others. The ECB, BoE, and BoJ launched emergency purchase programs, while fiscal authorities guaranteed credit lines and money-market funds. Emerging markets used accumulated reserves, bilateral swap lines, and IMF Rapid-Financing instruments to stem capital flight.

Lessons. The March 2020 episode revealed that in a globalized financial system, liquidity shocks propagate through balance-sheet interlinkages, not trade channels. It underscored (i) the importance of **standing central-bank swap networks** as a global public good; (ii) the need to **monitor non-bank leverage and margining practices**; and (iii) the limits of national approaches to liquidity support when market stress is system-wide.

While extraordinary policy coordination ultimately stabilized markets, the episode demonstrated how fragile cross-border liquidity can be — and how quickly funding stress in one currency area can cascade worldwide.

Source: Bank & Finance elaboration based on BIS (2020, 2023); FSB (2020); IMF (2020); Federal Reserve (2020).

4.5 Lessons and Forward Outlook

The geography of contagion has changed, but its logic remains constant: interconnected balance sheets transmit shocks faster than policy frameworks can respond. Resilience therefore depends less on preventing volatility than on ensuring **diversified funding structures, transparent risk exposures, and credible global safety nets**. Swap lines, reserve accumulation, and macro-prudential buffers all serve this purpose — but only if accompanied by information sharing and institutional trust.

Section 5 turns to the sectoral anatomy of these vulnerabilities, mapping where exposures are most concentrated and how emerging structural shifts — from non-bank finance to digital assets — may redefine the next cycle of fragility.

5. Sectoral and Regional Vulnerabilities

Macro-financial vulnerabilities are not evenly distributed. They cluster in sectors whose balance sheets, funding models, or regulatory treatment magnify the interaction between leverage and liquidity. Mapping these concentrations helps to identify where policy buffers are strong, where they are eroding, and where systemic stress is likely to surface first when conditions tighten.

5.1. Household and Corporate Balance Sheets

Households and firms constitute the first link between macroeconomic activity and financial stability. When credit expands faster than income or productivity, leverage increases and sensitivity to shocks rises. In advanced economies, household vulnerabilities often take the form of **housing booms** financed through mortgage credit; in emerging markets, they stem from **foreign-currency borrowing** and shorter-term instruments. Corporate leverage, meanwhile, has been inflated by years of ultra-low interest rates, leaving many firms exposed to refinancing risk as rates normalize (IMF, 2023).

Table 3 summarizes selected indicators that capture balance-sheet fragility across sectors. It combines leverage ratios, liquidity buffers, and debt-service metrics from the BIS and IMF, illustrating how vulnerabilities differ between households, corporates, governments, and financial institutions.

Table 3 – Sectoral Indicators of Leverage and Vulnerability

Sector	Key Vulnerability Indicator	Typical Stress Point	Illustrative Region / Episode
Households	Debt-to-income ratio; LTV	Housing corrections	US (2007–08), Sweden (2023)
Non-financial corporates	Interest-coverage ratio	Refinancing at higher rates	China property (2021–24)
Banks	Loan-to-deposit ratio; NPL share	Funding & credit losses	Euro area (2011–12)
Non-bank intermediaries	Liquidity mismatch; redemption risk	Fire-sale contagion	Global (2020)
Sovereigns	Debt-to-GDP; rollover needs	Yield spikes	UK (2022), EMs (2023)

Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

The distribution of leverage across sectors reveals a common pattern: private-sector deleveraging since 2008 has been offset by rising public-sector indebtedness and market-based intermediation. While headline ratios differ across economies, the composition of debt—its maturity, currency, and investor base—often matters more than its size. This underscores the importance of a holistic perspective that looks beyond aggregate leverage to the **quality of balance sheets and the flexibility of funding structures**.

5.2. Banking Systems: From Buffer to Amplifier

Banking systems remain central to financial intermediation, but their risk profiles have shifted. Post-crisis regulation strengthened capital and liquidity buffers, yet profitability pressures and market competition have encouraged the migration of credit creation to the **shadow-banking** and **non-bank** sectors. Traditional banks now face interest-rate risk on their securities portfolios and deposit volatility as savers shift toward higher-yield alternatives. The failures of several regional banks in 2023 highlighted how duration mismatches and digitalized withdrawals can trigger rapid runs even in jurisdictions with robust supervision.

Figure 5 illustrates how rising policy rates affect bank balance sheets through three channels: (i) valuation losses on long-duration assets, (ii) funding repricing on deposits, and (iii) credit quality deterioration among leveraged borrowers.

Figure 5 – Banking-Sector Vulnerabilities in the Interest-Rate Cycle

Assets → market-value losses	Liabilities → deposit outflows
	Capital → compression of buffers
Mitigating factors: hedging, liquidity facilities, and capital buffers	

Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

This stylized balance-sheet view clarifies why rising rates can initially strengthen bank margins yet later undermine stability. The speed of repricing matters as much as its direction. Where interest-rate risk, liquidity exposure, and depositor behavior align unfavorably, banks can shift from acting as buffers to becoming amplifiers of systemic stress.

5.3. Non-Bank Financial Intermediaries

The growth of investment funds, insurers, and other market-based intermediaries has diversified financing sources but also introduced new **liquidity mismatches**. Many open-ended funds promise daily redemption while holding less-liquid assets; life insurers face duration gaps between long-term liabilities and market-valued portfolios. When volatility spikes, simultaneous redemptions and portfolio adjustments can trigger fire-sale dynamics (FSB, 2023).

Box 2 narrates the 2020–22 period, which demonstrated how apparent liquidity in asset markets can vanish abruptly once risk appetite declines. The episode underscores how NBFIs, while less leveraged than banks, can act as amplifiers through collective behavior.

Box 2 – Non-Bank Finance and the “Liquidity Mirage”

The transformation of market-based finance has blurred the boundary between *liquidity provision* and *liquidity illusion*.
In good times, abundant risk appetite, low volatility, and easy funding create the appearance of deep secondary-market liquidity. But when market sentiment shifts, that liquidity can

evaporate almost instantly—revealing structural mismatches embedded in non-bank portfolios.

Two recent episodes illustrate this dynamic:

1. **March 2020: the fund-redemption spiral.** As the pandemic shock hit, investors withdrew record sums from open-ended bond funds. To meet redemptions, managers sold investment-grade and emerging-market bonds into already-thin markets. Prices gapped lower, bid-ask spreads widened sharply, and even government-bond markets seized up. Funds that marked assets to market faced further withdrawals, reinforcing a *self-fulfilling liquidity run*. Only massive central-bank purchases and liquidity lines—chiefly the Federal Reserve’s Primary and Secondary Market Corporate Credit Facilities and global dollar-swap lines—halted the spiral.
2. **Autumn 2022: the UK LDI crisis.** A sudden rise in gilt yields, following fiscal announcements, forced pension funds using liability-driven-investment (LDI) strategies to post large margin calls on their derivative hedges. To raise cash, funds sold long-dated gilts, pushing yields higher still and generating further calls—a *feedback loop* akin to a leveraged margin spiral. The Bank of England’s emergency gilt-purchase program restored stability, but only after systemic stress had spread to core funding markets.

These events expose the “**liquidity mirage**” of modern markets: trading volumes and asset prices signal depth that depends on a narrow set of leveraged investors and dealer balance sheets. When these actors simultaneously retreat, market liquidity collapses, regardless of underlying fundamentals.

Policy implications.

- **Macro-prudential perimeter:** Liquidity regulation and stress testing must extend beyond banks to encompass open-ended funds, insurers, and pension schemes whose collective actions can move core markets.
- **Liquidity-management tools:** Swing pricing, redemption gates, and minimum liquid-asset buffers can mitigate first-mover advantage in investment funds.
- **Margining and collateral practices:** Pro-cyclical margin calls amplify volatility; more counter-cyclical margin frameworks and central clearing transparency could reduce systemic feedbacks.
- **Cross-border coordination:** Because the same investors operate across jurisdictions, consistent data and supervisory cooperation through the FSB’s NBFIs workstream are essential.

The “liquidity mirage” underscores that systemic risk no longer stems solely from leverage, but also from *collective behavior under stress*. A truly resilient financial ecosystem must treat liquidity as a shared resource—one that can vanish precisely when it is needed most.

Source: Bank & Finance elaboration based on FSB (2023); BIS (2023); Bank of England (2023); FCA and Bank of England (2022); ESMA (2023); IOSCO (2023).

The lesson is that liquidity regulation cannot remain confined to banks. Monitoring leverage, redemption risk, and collateral practices across the broader financial ecosystem is essential for identifying potential pressure points before they transmit to core funding markets.

5.4. Sovereigns and the Return of Fiscal Constraints

Public balance sheets have absorbed unprecedented shocks—from pandemic spending to energy-price subsidies—pushing global sovereign debt above 90 percent of GDP. Higher rates now test fiscal sustainability and the credibility of medium-term consolidation plans. Sovereigns with shallow domestic investor bases or heavy foreign-currency exposure face renewed rollover risk. The interaction between sovereign credibility and financial stability—the **sovereign–bank nexus**—remains a central vulnerability in both advanced and emerging economies (Farhi and Tirole, 2018).

Table 4 compares key fiscal and financial metrics that influence sovereign risk: debt ratios, maturity structures, investor composition, and external financing needs.

Table 4 – Sovereign Vulnerability Indicators

Indicator	Description	Risk Amplifier When...	Example Episodes
Debt-to-GDP	Public debt relative to output	Growth slows; rates rise	Italy (2011), UK (2022)
Average maturity	Weighted average tenor of debt	Short duration	Brazil (2015)
Foreign-currency share	Portion issued externally	Exchange rate depreciates	Turkey (2018)
Non-resident holdings	Investor base concentration	Sudden stops	Mexico (1994), Egypt (2023)
Contingent liabilities	Public guarantees, SOEs	Realized simultaneously	China local financing (2023)

Source: Bank & Finance elaboration based on IMF Fiscal Monitor (2023); BIS (2023).

Fiscal space is the ultimate backstop of financial stability. When sovereign credibility erodes, monetary and prudential policies lose traction. Maintaining a sustainable mix of maturity, investor diversification, and credible fiscal anchors is therefore the first line of defense against systemic stress.

5.5. Regional Divergences and Emerging Risks

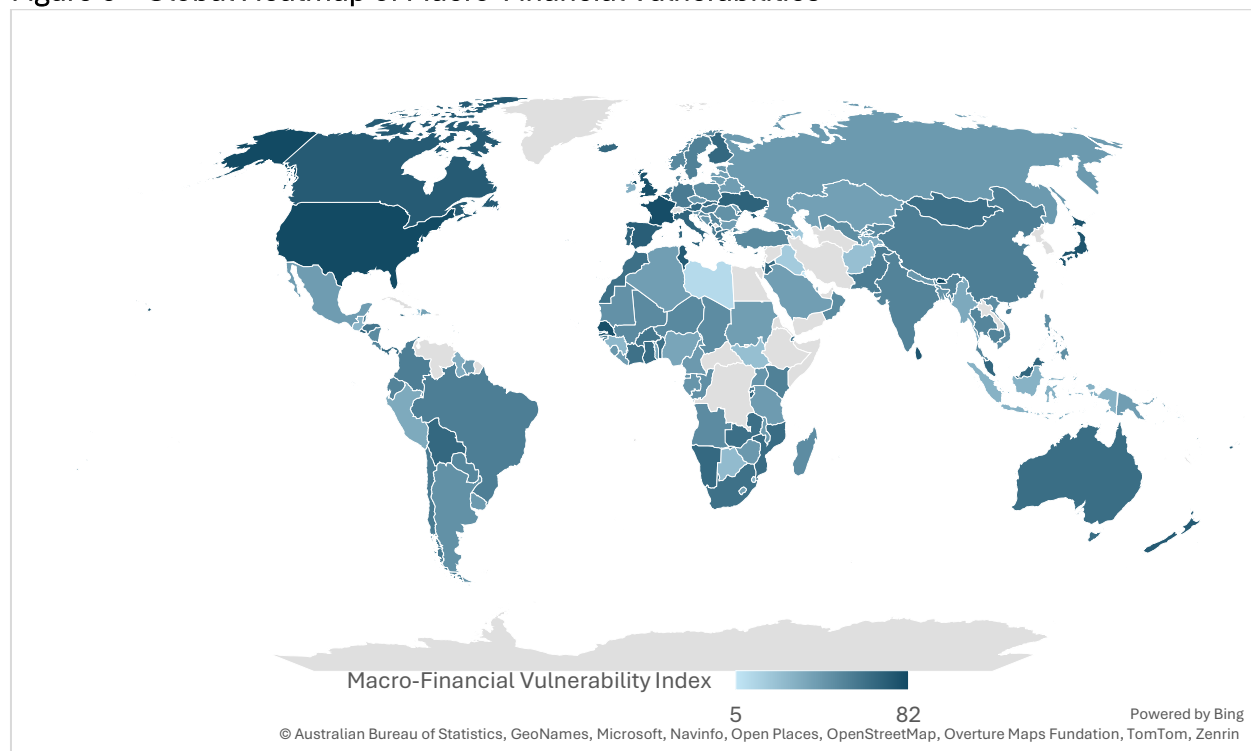
Regional patterns reveal contrasting sources of vulnerability.

- **Advanced economies** face interest-rate and valuation risks as policy normalization continues.
- **Emerging markets** confront currency mismatches and capital-flow volatility.

- **Low-income countries** grapple with debt distress and limited access to refinancing. Meanwhile, **climate and demographic transitions** introduce slow-burn fiscal and financial pressures whose effects compound over time (IMF, 2023).

Figure 6 synthesizes sectoral and regional indicators into a heatmap of vulnerability intensity. Darker shades indicate higher risk concentration across leverage, liquidity, and fiscal metrics.

Figure 6 – Global Heatmap of Macro-Financial Vulnerabilities



Source: Bank & Finance elaboration based on IMF (2023); BIS (2023); FSB (2023).

The heatmap illustrates that vulnerabilities are both cyclical and structural: they mirror local policy frameworks but are also synchronized by global liquidity conditions. This dual nature reinforces the need for adaptive resilience strategies that account for the co-movement of risks across geographies.

5.6. Concluding Reflections

The sectoral and regional anatomy of macro-financial fragility reveals that vulnerabilities migrate rather than disappear. As policy, technology, and markets evolve, leverage finds new channels; liquidity risks resurface in new forms. Effective surveillance must therefore combine micro-level data with macro-systemic perspectives, linking household balance sheets to sovereign exposures and domestic indicators to global conditions.

The next section turns to **Policy Frameworks and Institutional Architecture**, outlining how central banks, regulators, and international bodies can operationalize resilience in a world where financial interdependence is both an opportunity and a source of persistent vulnerability.

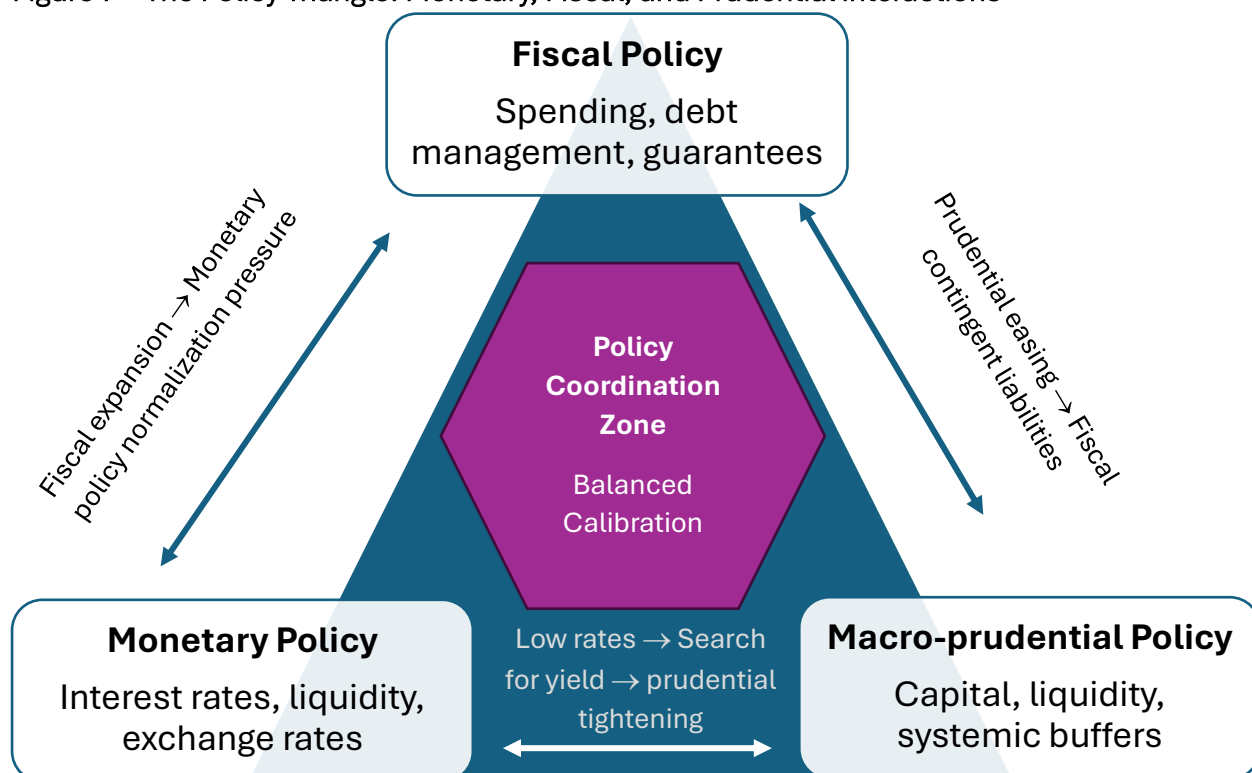
6. Policy Frameworks and Institutional Architecture

6.1 From Crisis Response to Resilience Management

Every financial crisis leaves behind a regulatory legacy. The 2008 Global Financial Crisis created the macro-prudential era; the 2020 pandemic shock accelerated the fusion of fiscal, monetary, and prudential policies. What has emerged is not a single global architecture but a patchwork of national frameworks, international standards, and ad hoc coordination mechanisms.

The challenge is coherence. Monetary policy seeks price stability; fiscal policy targets growth and sustainability; prudential policy preserves resilience. Yet in practice, these objectives interact. Loose monetary conditions can inflate leverage; fiscal guarantees can weaken market discipline; regulatory tightening can drain liquidity. A coherent policy framework must internalize these feedbacks rather than manage them in isolation. **Figure 7** visualizes the interdependence among the three main macro-financial policy domains. Each side of the triangle represents a policy function, while the arrows show the transmission effects and tensions that arise when objectives are misaligned.

Figure 7 – The Policy Triangle: Monetary, Fiscal, and Prudential Interactions



Source: Bank & Finance elaboration based on IMF (2023); BIS (2023); FSB (2023).

The triangle underscores that stability depends on coordination as much as on instrument design. Effective macro-financial governance requires transparent communication, rule-based flexibility, and institutional structures that align incentives across agencies. Fragmented mandates create blind spots; integrated frameworks create resilience.

6.2 The Evolution of Macro-Prudential Architecture

Since 2008, most jurisdictions have established **macro-prudential authorities**—committees or councils integrating central banks, regulators, and finance ministries. Their mandate is to monitor systemic risk, set counter-cyclical buffers, and coordinate responses. The **Basel III** reforms codified capital and liquidity requirements, while the **FSB** and **IMF** developed cross-border monitoring tools. Yet, implementation remains uneven: emerging economies often lack the institutional independence or data infrastructure needed for early warning.

Table 5 summarizes key instruments available to macro-prudential authorities, grouped by objective—limiting leverage, building buffers, or containing contagion.

Table 5 – Macro-Prudential Toolkit: Instruments and Objectives

Objective	Typical Tools	Transmission Mechanism	Implementation Challenges
Counter-cyclical capital	CCyB, sectoral capital add-ons	Dampens credit booms	Calibration under uncertainty
Liquidity buffers	LCR, NSFR	Mitigates funding stress	Trade-offs with credit supply
Borrower-based limits	LTV, DTI ratios	Reduces household leverage	Political sensitivity
Market-based measures	Margin & haircut floors	Contain pro-cyclicality in markets	Coverage of non-banks
Systemic capital surcharges	GSIB/D-SIB buffers	Internalizes systemic footprint	Coordination across groups

Source: Bank & Finance elaboration based on BIS (2023); FSB (2023); IMF (2023).

The toolkit illustrates a maturing discipline: macro-prudential policy is no longer crisis management but *crisis prevention*. Its credibility, however, depends on data granularity, political backing, and the capacity to act pre-emptively—before vulnerabilities become visible to markets.

6.3 Institutional Coordination and Information Infrastructure

Information asymmetry remains a central obstacle. Data on cross-sectoral exposures, derivatives, and shadow-banking linkages often remain fragmented across agencies.



The **Data Gaps Initiative (DGI III)** led by the G20, IMF, and BIS has expanded coverage, yet real-time integration is still limited. Coordination failures can delay responses precisely when speed matters most.

Modern surveillance relies on dashboards that integrate high-frequency indicators into risk maps. As **Box 3** explains, these tools bridge the gap between academic models and policy action.

Box 3 – The Importance of Macro-Financial Dashboards

In an increasingly complex financial ecosystem, the speed and quality of information determine the effectiveness of crisis prevention. The Data Gaps Initiative (Phase III) launched by the G20, IMF, and BIS marked a decisive step toward integrated, cross-sectoral surveillance—but the challenge is no longer *data collection* alone. It is *data fusion*: translating fragmented streams of information into a coherent picture of systemic risk in real time.

Macro-financial dashboards provide this bridge between raw data and policy action. They consolidate indicators from banking, markets, corporate balance sheets, and capital flows into visual maps that highlight where vulnerabilities are forming and how they may propagate.

Prominent examples include:

- **The IMF’s Global Financial Stability Map**, which synthesizes dozens of market, credit, and macro indicators into an intuitive “risk compass” for global conditions.
- **The ECB’s Systemic Risk Dashboard**, which tracks more than 60 metrics across sectors and member states, allowing supervisors to compare vulnerabilities at a glance.
- **National central-bank heatmaps**—from the Bank of England’s *Financial Stability Dashboard* to Banco de México’s *Macroprudential Monitor*—which integrate domestic stress-testing results, funding conditions, and early-warning indicators.

Advances in **artificial intelligence and machine learning** now enhance these platforms. Pattern-recognition algorithms can sift through thousands of time series to detect early signs of credit overheating, liquidity stress, or network contagion long before traditional models would flag concern. Natural-language-processing tools extend surveillance to news flows and financial disclosures, capturing shifts in sentiment and expectations.

Yet technology alone is not sufficient. Dashboards only strengthen resilience if the underlying data are **timely, standardized, and interoperable** across institutions. Without common taxonomies, confidentiality protocols, and secure exchange platforms, insights remain siloed and coordination lags—especially during fast-moving episodes of market stress.

Policy implications.

- **Institutional coordination:** Joint data hubs linking central banks, market regulators, and finance ministries can reduce blind spots and accelerate decision-making.

- **Standardization:** Adoption of shared metadata and granular exposure templates—as promoted by the DGI III and BIS IHFS initiatives—enables comparability across jurisdictions.
- **Transparency and accountability:** Publishing selected dashboard indicators fosters market discipline and strengthens public trust in macro-prudential oversight.

Ultimately, macro-financial dashboards are not just analytical tools; they are **governance instruments** that enable collective awareness of systemic risk. As finance becomes more digital and interconnected, information infrastructure will define the frontier of stability policy—just as capital buffers defined it after 2008.

Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); ECB (2023); Banco de México (2023); G20 / IMF / BIS (2023); FSB (2023).

The shift from backward-looking statistics to forward-looking analytics marks a cultural transformation in financial supervision. Transparency and interoperability of data systems are becoming as crucial as the instruments of policy themselves.

6.4 Cross-Border Governance and Global Safety Nets

Financial globalization requires coordination beyond national borders. The BIS, IMF, and FSB constitute the institutional backbone of this architecture, but regional arrangements—such as the **European Stability Mechanism** or the **Chiang Mai Initiative**—have also expanded their role. Central-bank **swap lines** have become the de facto lender-of-last-resort network for the global dollar system. During the March 2020 turmoil, these facilities provided more than USD 450 billion in liquidity to foreign institutions (BIS, 2023).

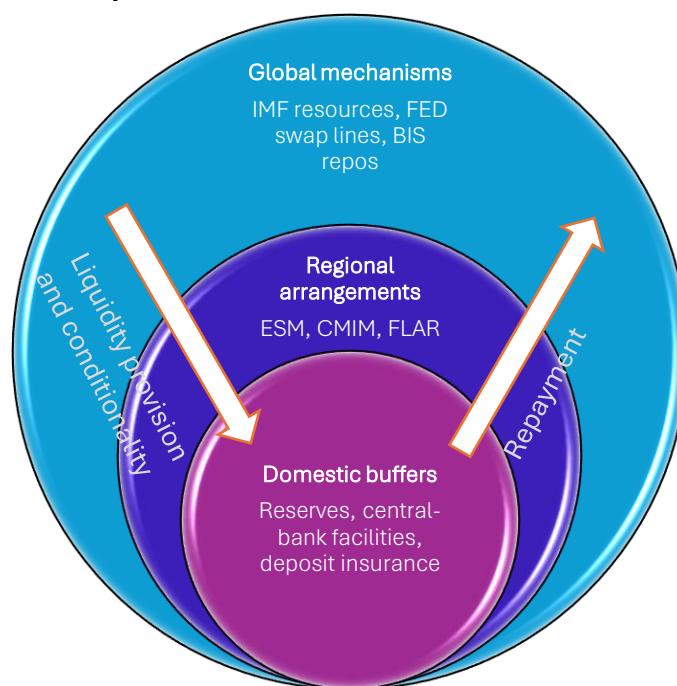
Figure 8 depicts the multi-layered structure of the global safety net. The concentric design distinguishes national, regional, and global instruments that provide liquidity and crisis support. This figure highlights both the progress and fragmentation of the global safety net. While its scale has grown, access remains uneven and coordination ad hoc. Institutionalizing reciprocity and transparency—so that liquidity provision reinforces, rather than replaces, market discipline—remains a central policy priority.

6.5 Governance Principles for a Resilient Architecture

The future of financial governance lies in **integration and adaptability**. Effective architectures share five traits:

1. **Clarity of mandates** – overlapping objectives blur accountability.
2. **Timely information sharing** – real-time data reduces policy lag.
3. **Pre-emptive flexibility** – rules that allow counter-cyclical calibration.
4. **Cross-border reciprocity** – recognition of foreign regulatory regimes.
5. **Transparency and communication** – credibility as a macro-prudential instrument.

Figure 8 – The Global Financial Safety Net



Source: Bank & Finance elaboration based on IMF (2023); BIS (2023).

Table 6 synthesizes lessons from global practice into design principles that enhance resilience while maintaining policy autonomy.

Table 6 – Design Principles for a Resilient Macro-Financial Framework

Principle	Operational Example	Implementation Benefit
Clarity of mandates	Statutory definition of macro-prudential councils	Avoids overlap and inertia
Information sharing	Integrated supervisory data hubs	Reduces blind spots
Flexibility	Dynamic capital buffer rules	Enables early adjustment
Reciprocity	Mutual recognition of cross-border standards	Prevents regulatory arbitrage
Transparency	Public release of systemic-risk assessments	Builds market discipline

Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

These principles translate complex theory into institutional practice. A resilient architecture is not one that prevents shocks, but one that aligns incentives and information so that shocks are absorbed efficiently and learning is continuous.

6.6 Concluding Reflections

The evolution of macro-financial governance shows that resilience is not a static goal but a dynamic equilibrium between innovation and regulation. The architecture built since 2008 has undoubtedly strengthened systemic safety, yet its effectiveness depends on trust—between institutions, across borders, and over time.

The next section turns from governance design to application: **stress scenarios and macro-financial stress-testing frameworks** that operationalize these principles and quantify resilience under alternative future paths.

7. Macro-Financial Stress Scenarios

7.1 From Surveillance to Simulation

Surveillance identifies vulnerabilities; stress-testing measures their potential impact. In the years after 2008, central banks, the IMF, and the BIS transformed stress-testing from a micro-prudential exercise focused on individual institutions into a **system-wide simulation framework**.

Modern macro-financial stress analysis now integrates *macro variables* (growth, inflation, interest rates) with *financial variables* (credit spreads, liquidity, capital flows), capturing how shocks propagate through balance sheets and markets.

Stress scenarios thus serve three purposes:

1. **Diagnosis** – revealing hidden nonlinearities and feedback loops.
2. **Calibration** – informing the level of capital and liquidity buffers.
3. **Coordination** – aligning monetary, fiscal, and prudential responses under a shared analytical baseline.

7.2 Scenario Design and Methodology

A macro-financial stress test combines **macro paths** (GDP, inflation, rates, exchange rates) with **sectoral balance-sheet models** that determine losses, capital depletion, and funding pressures.

The IMF's *Integrated Stress Testing Framework (IST)*, the BIS's *Macro-prudential Stress Toolkit*, and national central-bank systems share a common structure:

1. Construct baseline and adverse macroeconomic paths;
2. Translate macro shocks into credit, market, and funding losses;

3. Incorporate second-round effects (fire sales, margin calls, liquidity squeezes);
4. Evaluate capital and liquidity adequacy;
5. Aggregate system-wide outcomes.

Table 7 summarizes four stylized scenarios used to illustrate the range of systemic pressures that can arise in current conditions. Each combines macroeconomic, financial, and cross-border dimensions, drawing on recent BIS and IMF risk assessments.

Table 7 – Stylized Macro-Financial Stress Scenarios

Scenario	Shock Description	Main Transmission Channel	Expected Vulnerability	Policy Stress Point
1. Interest-Rate Repricing	Rapid global tightening; long yields up 300 bps	Valuation losses, funding stress	Banks, duration-mismatch NBFIs	Liquidity backstops
2. Corporate Refinancing Cliff	Sudden widening of credit spreads	Roll-over and credit risk	Leveraged corporates, HY funds	Credit facilities, guarantees
3. Sovereign Debt Stress	Rising risk premia, debt-market volatility	Sovereign–bank nexus	High-debt EMs & periphery AEs	Fiscal credibility, investor base
4. Liquidity Freeze and Dollar Shortage	Global risk-off, capital outflows	FX funding and collateral	EM banks, global funds	Swap lines, IMF facilities

Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

These scenarios are not forecasts but *stress narratives*: coherent stories that explore how multiple shocks can interact. Their value lies in testing system resilience under plausible extremes rather than predicting precise outcomes.

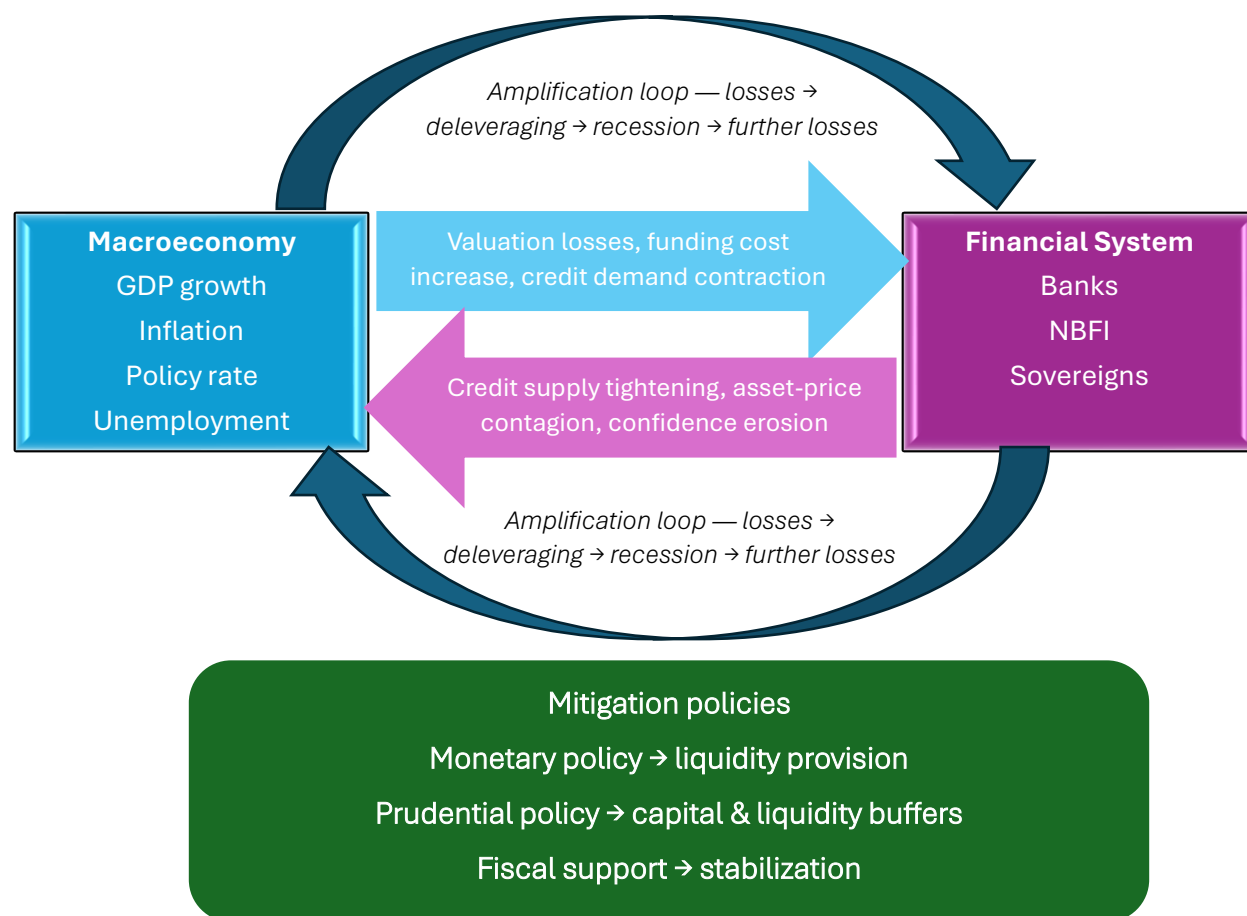
7.3 Non-Linear Feedback and Second-Round Effects

Financial systems rarely react linearly. When losses trigger deleveraging, asset sales depress prices, collateral shrinks, and liquidity spirals reinforce downturns — the mechanism captured by Brunnermeier and Pedersen (2009) and later integrated into central-bank stress models. Macro-financial stress tests therefore include *endogenous responses*: credit tightening, liquidity hoarding, and shifts in risk appetite that transform initial shocks into systemic crises.

Macro-financial stress testing is no longer a one-way exercise in which macroeconomic shocks are imposed on the financial system. Modern frameworks recognize that feedbacks run both ways: credit and liquidity responses by financial institutions alter aggregate demand, asset prices, and policy trajectories. **Figure 9** depicts this two-way architecture, illustrating how

macro and financial blocks interact dynamically and how timely policy intervention can prevent stress from escalating into systemic instability.

Figure 9 – Dynamic Stress-Testing Architecture



Source: Bank & Finance elaboration based on IMF (2023); BIS (2023).

The figure underscores that resilience depends not on static capital ratios but on **response dynamics**—how swiftly markets, institutions, and policymakers absorb shocks and recalibrate behavior. When feedback loops are well understood and counter-cyclical tools are pre-positioned, financial systems can bend without breaking. Dynamic stress testing thus becomes not just a diagnostic tool but a **policy design instrument**, translating complex interdependence into actionable resilience strategies.

7.4 Cross-Border Stress Propagation

Because balance sheets are globally connected, adverse shocks often trigger **multi-jurisdictional losses**. Dollar shortages, sovereign downgrades, or fund outflows in one region can spill over through funding markets and asset valuations. The 2022–23 tightening cycle

showed that correlations between advanced- and emerging-market asset classes can rise sharply once global liquidity contracts (BIS, 2023).

Box 4 – Cross-Border Stress-Testing and the Role of Liquidity Swaps

Financial globalization means that no balance sheet is fully domestic. Modern banks, asset managers, and sovereigns operate in balance-sheet networks tied together by currency funding, derivatives, and collateral chains. When global liquidity tightens, these linkages turn local shocks into global ones—a process that traditional, country-based stress tests often miss.

Cross-border stress-testing frameworks aim to fill that gap. The **IMF’s Integrated Policy Framework (IPF)** and the **BIS Global Liquidity Stress Model** simulate how changes in U.S. interest rates, dollar funding costs, or risk sentiment propagate through cross-currency and cross-sector channels. These models integrate data on banks’ foreign-currency liabilities, FX hedging positions, and cross-border credit exposures to estimate the global pass-through of funding stress to credit supply.

Their insights are clear:

- A 100-basis-point rise in U.S. policy rates can reduce foreign-currency credit growth in emerging markets by several percentage points, even in economies with sound fundamentals.
- Currency mismatches and collateral haircuts act as amplifiers, forcing leveraged institutions to deleverage in synchronized fashion.
- Central-bank swap lines, reserve buffers, and macro-prudential capital measures can significantly dampen these effects.

The March 2020 episode demonstrated these dynamics in practice. When dollar funding markets froze, non-U.S. banks and corporates with large short-dollar positions faced acute rollover risk. The **Federal Reserve’s network of swap lines**—reopened and expanded to fourteen major central banks—supplied more than USD 450 billion in offshore dollar liquidity within weeks. This intervention stabilized cross-currency basis spreads and prevented a cascade of forced deleveraging across advanced and emerging markets alike. The episode proved that swap lines function as *global safety valves*—their effectiveness, however, depends on prior agreements, transparency, and trust among participating central banks.

Policy implications.

1. **Integrate global liquidity into national stress tests.** Funding shocks in one currency area must be modeled as endogenous, not exogenous, variables.
2. **Institutionalize swap-line networks.** Pre-arranged multilateral facilities, supported by the IMF and BIS, can act as standing crisis-management tools rather than ad-hoc arrangements.
3. **Enhance data sharing.** Incorporating cross-border positions and FX derivatives into supervisory datasets improves the realism of global stress simulations.

4. **Coordinate response protocols.** Simultaneous activation of swap lines, collateral easing, and fiscal backstops reduces contagion potential.

Cross-border stress-testing transforms liquidity from an assumption into a variable that can be managed. In a system where money and risk flow seamlessly across borders, *the geography of finance is the geography of confidence*—and swap lines are its connective tissue.

Source: Bank & Finance elaboration based on BIS (2022, 2023); IMF (2023); Board of Governors of the Federal Reserve System (2023); FSB (2023); Bank of England (2023).

Cross-border stress-testing models extend national frameworks by linking banking, FX, and sovereign sectors across currencies. Integrating swap-line availability and cross-currency exposures into stress tests ensures that global liquidity is treated as a *systemic variable*, not an external assumption.

7.5 From Quantification to Policy Calibration

Stress-testing results feed directly into policy decisions:

- **Monetary authorities** adjust collateral frameworks and liquidity facilities;
- **Prudential regulators** set counter-cyclical buffers;
- **Fiscal authorities** evaluate contingent liabilities.

The credibility of these exercises depends on transparent disclosure and clear use of results. When stress tests are seen as routine diagnostics rather than crisis instruments, they anchor expectations and reinforce confidence.

Table 8 lists key policy levers that can be activated when stress scenarios reveal material systemic risk

Table 8 – Using Stress-Test Results for Policy Action

Policy Domain	Typical Action	Objective	Timing
Monetary	Expand liquidity lines; collateral flexibility	Prevent funding freeze	Immediate
Prudential	Raise or release CCyB; adjust LCR/NSFR	Smooth credit cycle	Pre-emptive / counter-cyclical
Fiscal	Activate guarantees; targeted support	Contain confidence shock	Short-term
Coordination	Activate swap lines; IMF precautionary programs	Contain cross-border spillovers	Immediate / standby

Source: Bank & Finance elaboration based on IMF (2023); BIS (2023); FSB (2023).



Stress testing thus becomes a bridge between **analysis and execution**. Its purpose is not only to assess capital adequacy but to calibrate the entire policy mix—anticipating where coordination and buffers are most needed.

7.6 Lessons and Strategic Implications

Three broad lessons emerge:

1. **Interdependence requires integration.** Stress scenarios must link monetary, fiscal, and prudential domains rather than treat them separately.
2. **Speed matters.** Resilience is a function of response time as much as of capital size.
3. **Transparency builds trust.** Publicly credible stress-testing frameworks enhance market discipline and reduce uncertainty during shocks.

The next and final analytical section turns from simulation to policy design, outlining how **macro-financial resilience can be institutionalized** through governance, communication, and adaptive learning.

8. From Vulnerability to Resilience: Policy and Market Implications

8.1 The New Logic of Financial Policy

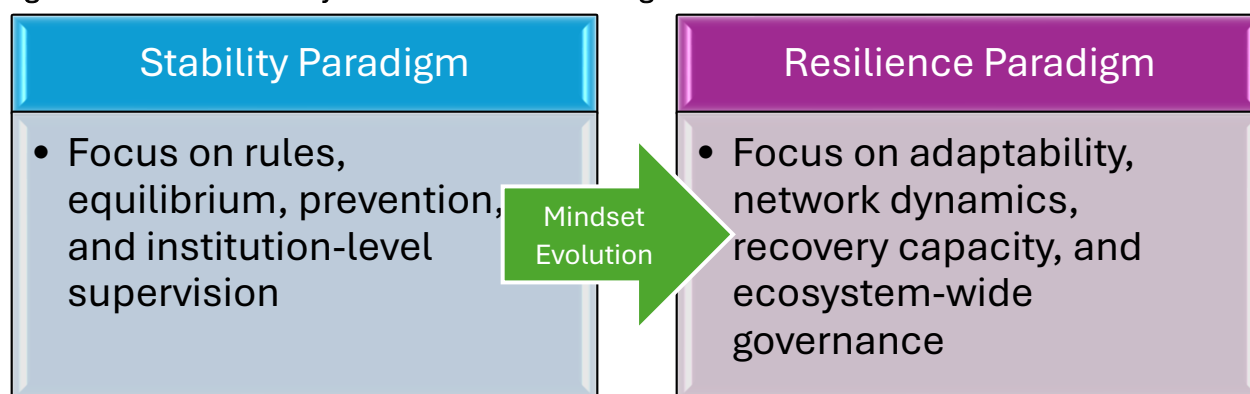
For most of modern history, financial policy focused on **stability through control** — regulating institutions, constraining credit, and reacting to crises when they occurred. In a world of complexity and interdependence, this approach is no longer sufficient. Resilience, not mere stability, has become the guiding principle: the capacity of the system to absorb shocks, adapt, and recover without systemic collapse (Brunnermeier, 2024; BIS, 2023).

This shift implies a change in mindset. Instead of minimizing volatility, policymakers must manage *its consequences*; instead of targeting equilibrium, they must enable *continuous adjustment*. In this framework, the resilience of finance depends on five elements: **buffers, diversification, transparency, adaptability, and trust**.

Figure 10 contrasts the old paradigm of control-based stability with the new paradigm of adaptive resilience. It visualizes how objectives, instruments, and evaluation metrics evolve when complexity and uncertainty are recognized as structural features of finance.

The figure illustrates that resilience does not replace stability—it redefines it. The goal is not to eliminate shocks but to ensure they remain *non-systemic*, transforming crises into manageable adjustments and maintaining confidence through transparency and coordination.

Figure 10 – From Stability to Resilience: A Paradigm Shift



Source: Bank & Finance elaboration based on Brunnermeier (2024); BIS (2023); IMF (2023).

8.2 Building Systemic Buffers

Macro-financial resilience begins with *capacity to absorb losses*. Capital and liquidity buffers in banks, margining frameworks in markets, and fiscal space at the sovereign level form the first line of defense. But buffers are only effective when **usable**—when institutions can draw on them without triggering stigma or panic.

Table 9 summarizes the principal categories of systemic buffers, their purposes, and the conditions under which they should be deployed. It synthesizes lessons from post-crisis reforms and recent international coordination efforts.

Table 9 – Systemic Buffers and Their Activation Triggers

Buffer Type	Holder / Authority	Activation Trigger	Objective	Key Challenge
Capital and liquidity buffers	Banks, supervisors	Credit growth, stress-test thresholds	Absorb balance-sheet losses	Timely release & stigma risk
Counter-cyclical fiscal space	Governments	Output gap, financing conditions	Stabilize demand	Credibility and political economy
Market liquidity facilities	Central banks	Funding stress, volatility spikes	Prevent fire sales	Moral hazard, calibration
Global swap lines / IMF facilities	Central banks, IMF	FX funding shortages	Contain spillovers	Access and reciprocity
ESG and climate buffers	Financial institutions	Transition and physical risks	Align incentives with sustainability	Measurement and standardization

Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

Buffer design is as institutional as quantitative. What matters is not only how much capital or liquidity exists, but **how credibly and flexibly it can be mobilized** under stress. Effective frameworks require rule-based triggers, transparent communication, and coordination between prudential, fiscal, and monetary authorities.

8.3 Market Discipline and Transparency

Resilience also depends on *information flow*. When investors and counterparties can assess risk accurately, market signals reinforce prudence; when opacity prevails, small shocks produce overreactions. Initiatives such as the **FSB's transparency standards**, **IMF's Data Gaps Initiative**, and **BIS's exposure statistics** represent critical progress.

However, transparency must be paired with accountability. Disclosure without enforcement can create false comfort; enforcement without disclosure breeds uncertainty. The objective is *credible transparency*—timely, comparable, and usable information that aligns market and regulatory discipline.

Box 5 shows that financial information is not merely a reporting tool; it is a stabilizer. When risk perceptions adjust smoothly, liquidity remains; when data are delayed or unreliable, markets freeze. In a complex ecosystem, the most powerful stabilizer is clarity. Transparency reduces contagion not by preventing loss, but by preventing *surprise*.

Box 5 – The Role of Information in Preventing Amplification

Information is the quiet infrastructure of financial stability. The same shock can produce a mild repricing or a systemic crisis depending on the clarity, credibility, and timeliness of data available to market participants. When investors know where risks reside, losses are absorbed; when they do not, they withdraw from entire markets.

Opacity and amplification. In 2007–08, uncertainty over who held sub-prime and structured-credit exposures froze interbank markets. Banks hoarded liquidity because they could not distinguish solvent from insolvent counterparties, and complex securitization chains obscured ultimate risk holders. The result was not only credit losses but a collapse of *trust*—the key transmission channel of modern finance. The episode demonstrated that a lack of transparency transforms idiosyncratic credit risk into a system-wide funding shock.

Progress since 2008. Global reforms tackled this informational fragility on multiple fronts:

- **BIS and FSB data frameworks** expanded granular exposure statistics, derivatives trade repositories, and cross-border banking data to map counterparty linkages.
- **IMF and G20's Data Gaps Initiative (III)** now promotes consistent reporting of non-bank leverage, foreign-currency exposures, and climate-related financial risks.

- **Accounting and disclosure standards**—IFRS 9, the FSB’s Enhanced Disclosure Task Force, and money-market-fund transparency templates—have improved comparability and timeliness of risk data.
- **Fund-level reforms** after 2020 (e.g., in UCITS and U.S. ’40-Act funds) mandated frequent public reporting of portfolio liquidity profiles, enabling investors and supervisors to monitor redemption pressures in near real time.

Credible transparency. The key lesson is that transparency works only when data are **usable, comparable, and enforced**. Disclosure that overwhelms with detail but lacks consistency may obscure rather than illuminate; conversely, secretive enforcement erodes confidence. Effective transparency creates *predictable accountability*: markets can discipline risk-takers because they understand exposures, and supervisors can intervene early because they see stress forming.

Policy implications.

1. **Integrate disclosure into macro-prudential frameworks.** Early-warning indicators depend on standardized, timely data from both banks and NBFIs.
2. **Strengthen data validation and governance.** Shared taxonomies and audit trails prevent informational arbitrage.
3. **Use transparency as a stabilizer.** When participants trust the data, they adjust portfolios smoothly instead of freezing markets—reducing the amplitude of price and liquidity shocks.

The boundary between crisis and adjustment is often informational. Finance does not collapse from loss alone—it collapses from *surprise*. In an interconnected system, clarity is capital.

Source: Bank & Finance elaboration based on FSB (2012, 2023); BIS (2023); IMF (2023); IASB (2014); IOSCO (2023).

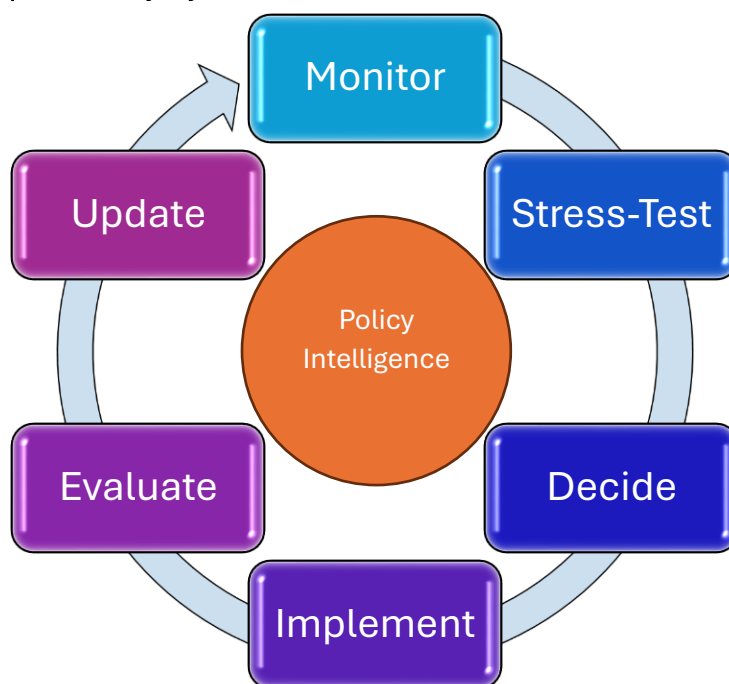
8.4 Adaptive Policy and Learning Systems

Complexity demands policies that can learn. Fixed rules fail when the environment changes faster than regulation can adapt. The next generation of macro-financial frameworks must therefore combine **rule-based discipline** with **data-driven adaptability**.

Figure 11 depicts an iterative process of policy learning, showing how information flows from monitoring to stress testing, to decision-making, and back into model improvement.

The adaptive cycle embodies the principle of *resilience through feedback*. Policies are no longer fixed shields but responsive systems — capable of evolving as the sources of fragility evolve.

Figure 11 – The Adaptive Policy Cycle



Source: Bank & Finance elaboration based on IMF (2023); BIS (2023).

Central banks and regulators increasingly use **real-time data analytics**, **AI-based monitoring**, and **stress-test learning loops** to recalibrate thresholds dynamically (IMF, 2023; BIS, 2023). This approach transforms supervision from static compliance to *continuous adaptation*.

8.5 Integrating Sustainability and Long-Term Resilience

Resilience cannot be separated from sustainability. Financial systems that ignore environmental and demographic transitions merely postpone instability. The integration of **climate risk**, **biodiversity**, and **social fragility** into macro-financial frameworks extends resilience from cyclical to structural time horizons (NGFS, 2024; IMF, 2024).

Table 10 – Incorporating Structural Risks into Macro-Financial Resilience Frameworks

Structural Dimension	Relevant Financial Channel	Policy Integration Mechanism
Climate transition risk	Credit and collateral valuation	Green capital requirements; climate stress tests
Physical climate risk	Insurance, infrastructure	Risk-based pricing; resilience bonds
Demographic aging	Savings, pensions, housing	Longevity-adjusted prudential metrics
Technological disruption	Labor, productivity	Innovation incentives, retraining finance
Social inequality	Household debt, access	Inclusive credit frameworks

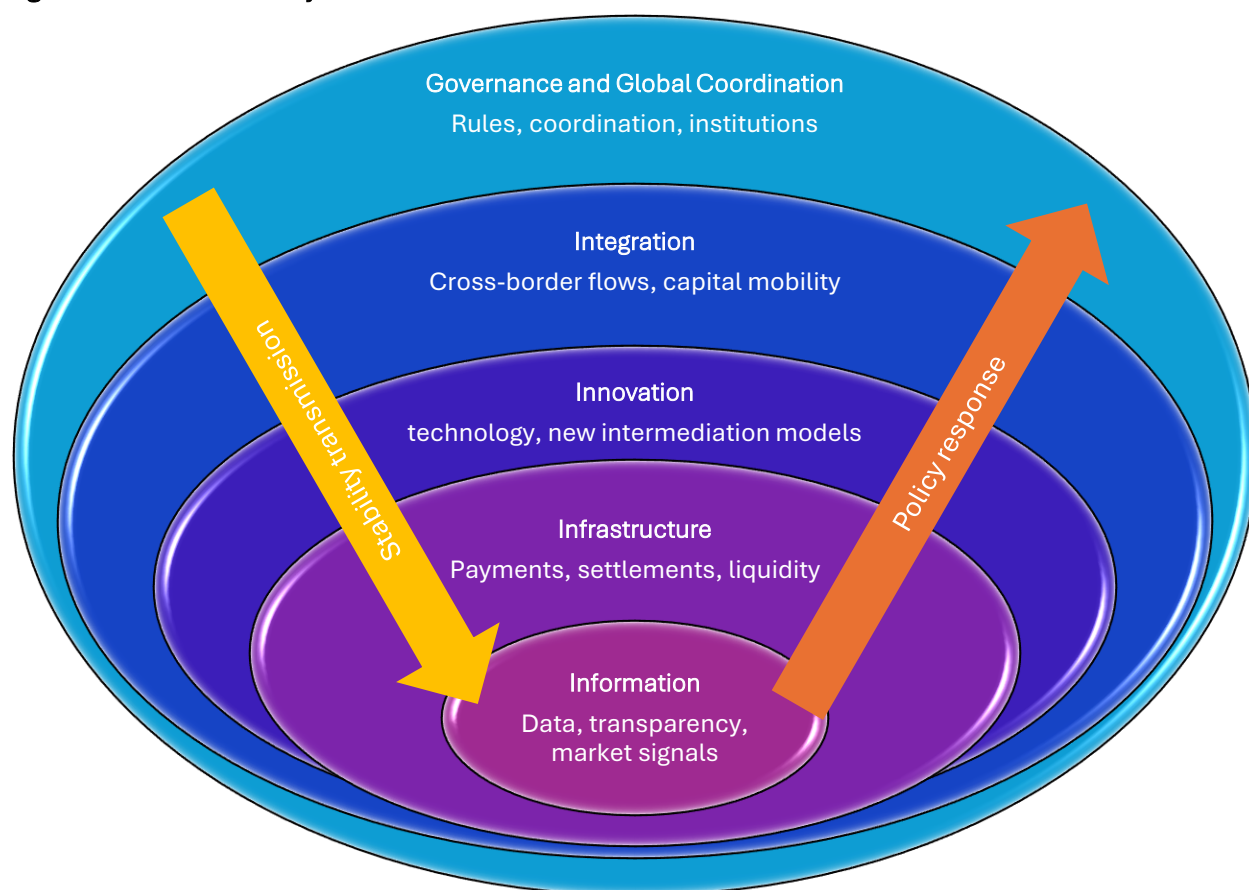
Source: Bank & Finance elaboration based on NGFS (2024); IMF (2024); OECD (2024).

Table 10 illustrates how sustainability considerations can be embedded in traditional macro-financial policy tools, linking short-term stability with long-term resilience. Integrating structural risks does not dilute macro-financial policy—it deepens it. A system resilient to short-term shocks but fragile to long-term transitions is stable only in appearance. The future of financial governance lies in aligning macro resilience with sustainable transformation.

8.6 Strategic Roadmap for a Resilient Financial Ecosystem

Figure 12 consolidates the entire report’s argument into a unified framework. It shows how the five structural layers interact to convert vulnerability into resilience.

Figure 12 – The Five-Layer Architecture of Financial Resilience



Source: Bank & Finance elaboration.

This framework captures the essence of modern macro-financial resilience: a multilayered ecosystem where information supports trust, infrastructure enables adaptability, innovation broadens opportunity, integration spreads risk, and governance maintains coherence. Together, they form the architecture through which finance can serve growth without amplifying fragility.

Resilience is not an endpoint but a continuous process of adaptation.



The *Bank & Finance* framework synthesizes this journey through five reinforcing pillars: **Information, Infrastructure, Innovation, Integration, and Governance**. Each pillar anchors a dimension of systemic strength, together forming the architecture of a financial ecosystem capable of weathering shocks and supporting inclusive growth.

8.7 Concluding Reflections

The macro-financial world has entered an era where **complexity is the new normal**. Resilience cannot be decreed by regulation alone; it must be designed into the architecture of markets, institutions, and incentives.

The central message of this report is therefore pragmatic: **vulnerability is inevitable, but systemic collapse is not**. By aligning buffers, transparency, adaptability, and governance, policymakers can transform fragility into flexibility — ensuring that finance remains not a source of contagion but a channel of recovery.

The final section draws these insights together into a set of **policy recommendations and concluding messages** for global and national decision-makers.

9. Conclusions and Policy Recommendations

9.1 From Diagnosis to Design

The analysis throughout this report demonstrates that macro-financial vulnerabilities are not accidents of policy or isolated shocks. They are the predictable by-products of a financial system that is adaptive, innovative, and globally integrated — but also prone to cycles of leverage, optimism, and correction. The task of policy, therefore, is not to suppress this dynamism but to **govern it intelligently**, transforming fragility into flexibility.

The central message is that **finance has become a core driver of macroeconomic dynamics**. Credit creation, liquidity provision, and risk intermediation determine not only financial conditions but also investment, productivity, and fiscal capacity. Recognizing this endogeneity shifts the paradigm: stability is no longer achieved by external control, but through internal design — through institutions and incentives that make self-correction possible.

9.2 Key Conclusions

Three broad conclusions emerge from the preceding analysis:

1. **Vulnerability is systemic, not sectoral.** Credit, liquidity, and expectations interact across balance sheets. Shocks that begin in one market quickly migrate through collateral,

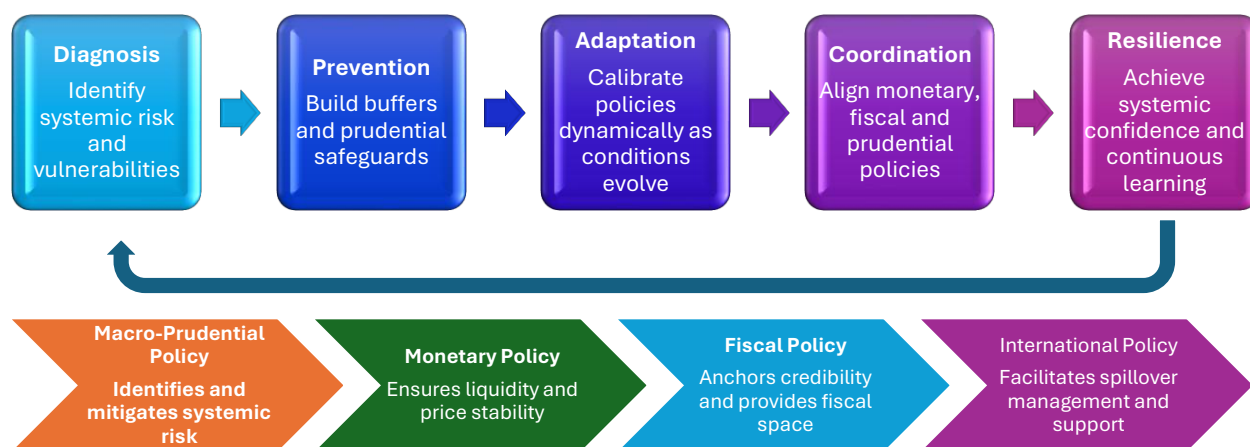
valuation, and funding channels. Fragmented oversight obscures these linkages, delaying preventive action.

2. **Resilience depends on coordination.** Monetary, fiscal, and prudential tools operate through the same balance sheets. Without alignment, one policy’s solution becomes another’s vulnerability. The effective frontier of policy is therefore *coherence* — the ability to manage cross-domain feedbacks in real time.
3. **Complexity requires adaptability.** Static regulation cannot keep pace with evolving technology, markets, and global interdependence. Future frameworks must embed learning mechanisms, flexible buffers, and data-driven monitoring so that governance evolves alongside finance itself.

These conclusions are not abstract; they form the foundation for a new generation of macro-financial governance.

The evolution of financial governance over the past two decades reflects a profound transformation—from reactive crisis management to proactive resilience design. Rather than treating stability as a one-time outcome, policy now views it as a *continuous process* that integrates diagnosis, prevention, adaptation, and coordination. **Figure 13** visualizes this transformation as a dynamic continuum, illustrating how each policy domain—macro-prudential, monetary, fiscal, and international—contributes to a self-reinforcing cycle of stability, coordination, and confidence.

Figure 13 – From Vulnerability to Resilience: The Policy Transformation



Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

Figure 13 encapsulates the report’s central thesis: resilience is not a static equilibrium but an adaptive process of continuous learning and coordination. Financial stability emerges not from insulation but from the **capacity to adjust, align, and rebuild confidence** after disruption. In this sense, the journey from vulnerability to resilience is less a linear transition than a *policy*



evolution—where diagnosis informs prevention, prevention enables adaptation, coordination sustains confidence, and resilience reinforces preparedness for the next cycle.

9.3 Strategic Policy Recommendations

The following recommendations synthesize the report’s analytical and policy insights into actionable priorities for national and international authorities.

- 1. Strengthen Macro-Financial Integration Frameworks.** Establish permanent coordination platforms among central banks, finance ministries, and prudential regulators. Shared stress-testing models and joint scenario analysis should become standard practice. Internationally, extend this coordination through the IMF, BIS, and FSB to ensure that domestic decisions consider global feedback effects.
- 2. Institutionalize Counter-Cyclical Resilience.** Convert temporary crisis measures into standing instruments. Capital and liquidity buffers, fiscal escape clauses, and swap-line arrangements should be pre-authorized and rule-based, enabling timely activation without political delay. Resilience should be *institutionalized*, not improvised.
- 3. Expand System-Wide Data Infrastructure.** Accelerate the G-20 Data Gaps Initiative by integrating datasets across banking, capital markets, and non-bank sectors. Use digital-ledger and real-time reporting technologies to provide supervisors with consolidated exposure maps. Transparency and comparability must extend across borders, currencies, and asset classes.
- 4. Embed Climate and Demographic Transition Risks.** Incorporate physical, transition, and aging-related risks into macro-prudential frameworks through scenario design and capital calibration. Global consistency in taxonomies, disclosure standards, and stress methodologies will reduce uncertainty and prevent greenwashing.
- 5. Reinforce the Global Financial Safety Net.** Broaden access to liquidity backstops — expanding swap lines and regional pooling arrangements for emerging markets. Coordination between the IMF, regional facilities, and major central banks should move from *discretionary* to *structured reciprocity*.
- 6. Promote Adaptive Learning in Supervision.** Create continuous feedback loops between monitoring, stress testing, and policy adjustment. Leverage AI and big-data analytics to detect emerging risks early and recalibrate regulatory thresholds dynamically. Supervision should evolve at the same pace as markets.
- 7. Enhance Communication and Credibility.** Crisis management is as much about narrative as instruments. Clear, consistent communication reduces panic and strengthens expectations. Authorities should publish systemic-risk assessments, disclose stress-test frameworks, and signal coordinated responses ahead of shocks.

Table 11 links the report’s five resilience principles to concrete policy actions and institutional deliverables, providing a practical blueprint for implementation.

Table 11 – From Principles to Practice: Operationalizing Resilience

Resilience Principle	Policy Application	Institutional Deliverable
Buffers	Dynamic counter-cyclical capital, fiscal space	Pre-defined activation protocols
Diversification	Balanced funding structures	Macro-prudential risk maps
Transparency	Cross-sector data integration	Global disclosure standards
Adaptability	Learning-based supervision	Real-time policy dashboards
Trust & Coordination	Communication, swap-line networks	International policy compact

Source: Bank & Finance elaboration based on BIS (2023); IMF (2023); FSB (2023).

This blueprint turns theory into governance. By aligning institutions around measurable goals — buffers, data, flexibility, and trust — the financial ecosystem can evolve toward durable resilience without sacrificing innovation or growth.

9.4 Implications for Policy, Markets, and Research

For policymakers, the implication is to shift from *cyclical stabilization* to *structural preparedness*. For markets, it is to internalize that stability is a shared public good — requiring transparency and discipline alongside innovation. For researchers, it is to bridge theory and empirics, integrating behavioral finance, network theory, and climate economics into macro-financial models.

Future progress will depend on collaboration: between economists and technologists, regulators and market participants, national and global institutions. Resilience cannot be imported; it must be cultivated within each financial ecosystem through credible policy and continuous learning.

9.5 Final Reflection: Bending Without Breaking

The modern financial system cannot be made perfectly stable — nor should it be. Volatility is the price of progress; innovation is the source of renewal. The challenge is to ensure that the financial ecosystem can **bend without breaking**: absorbing shocks, reallocating resources, and sustaining confidence even when conditions deteriorate.

Macro-financial vulnerabilities will persist, but their consequences can be managed. With foresight, coordination, and trust, finance can regain its essential purpose — not as a source of systemic fragility, but as the infrastructure of global resilience.

The preceding analysis reveals that vulnerabilities in the global financial system are not isolated—they form feedback loops between information, liquidity, leverage, and trust. Managing them requires an architecture that transforms reflexivity into resilience. **Box 6** distills the report’s lessons into five interlocking pillars that together define a macro-financial resilience framework.

The five pillars outlined in Box 6 summarize the frontier of macro-financial policy. They shift the focus from controlling individual institutions to governing the ecosystem’s collective behavior. Building this architecture will not eliminate crises, but it can ensure that when the next shock arrives, the system bends—without breaking.

Box 6 – Toward a Macro-Financial Resilience Architecture

The crises of recent decades—from the 2008 banking collapse to the 2020 liquidity shock—have shown that stability depends not on the absence of stress, but on the system’s capacity to absorb and adapt to it.

Macro-financial resilience emerges when five functions operate in concert:

1. **Information Integrity.** Reliable, timely, and interoperable data enable early detection of systemic build-ups. This includes cross-sector exposure mapping under the G20–IMF–BIS *Data Gaps Initiative III* and real-time macro-financial dashboards integrating banks, markets, and non-banks.
2. **Liquidity Governance.** Adequate and elastic liquidity backstops—central-bank facilities, swap-line networks, and fund-level liquidity tools—turn potential fire sales into orderly adjustments. Resilience hinges on treating global liquidity as a public good rather than a by-product of monetary policy.
3. **Prudential Coordination.** National frameworks must align monetary, fiscal, and macro-prudential objectives. The IMF’s *Integrated Policy Framework* and BIS-FSB initiatives demonstrate how joint calibration can internalize cross-border spillovers.
4. **Cross-Border Stress Readiness.** Stress-testing models that link funding, FX, and sovereign channels across jurisdictions allow policymakers to simulate contagion paths and pre-position defenses—transforming crisis management from reactive to anticipatory.
5. **Credible Transparency.** Information flow underpins market discipline and confidence. Consistent disclosure, enforced standards, and accessible data convert opacity-driven amplification into informed adjustment.

Together, these pillars form the **Macro-Financial Resilience Cycle**:

Information → Prevention → Coordination → Response → Transparency → Renewed Confidence.

Each stage feeds the next, creating a self-reinforcing loop between knowledge and stability. The architecture is not a static blueprint but a living system—its strength lies in continuous learning and adaptation.

Source: Bank & Finance elaboration based on BIS (2024); IMF (2023, 2024); FSB (2023); OECD (2024); NGFS (2024).

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11. Appendices

Appendix A. The Financial Accelerator Model Redux

To illustrate the ideas behind the financial accelerator mechanism, we provide a simplified model adapted from *Carlstrom, Fuerst, Ortiz and Paustian (2014)*.

- An entrepreneur has a profitable project that requires one unit of input and creates $\omega_t \sim N(1, \sigma)$ units of capital, whose price is q_t .
- Entrepreneurial net worth, nw_t , is not enough to entirely cover the required investment and needs to get external funds.
- ω_t is privately observed and its verification is costly, which creates agency costs and makes equity finance problematic.
- In this context, the value of capital is positively affected by net worth of entrepreneurs:

$$q_t = p * nw_t + \epsilon_t^d$$

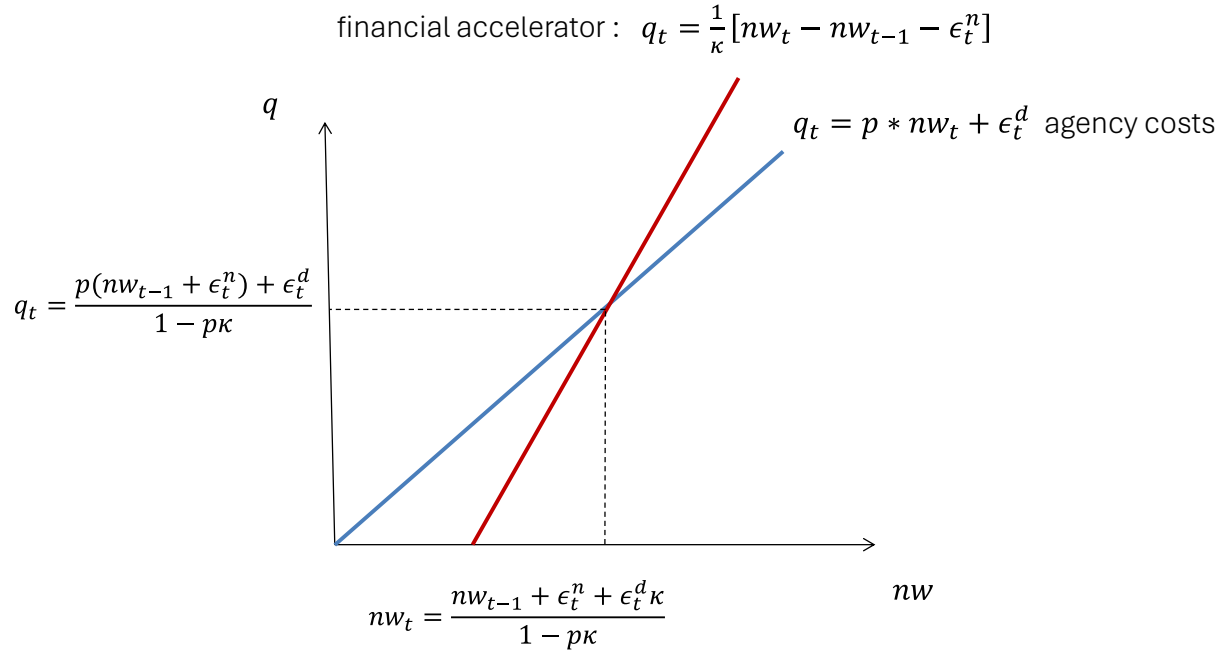
Financial frictions, due to agency costs, are captured by $p > 0$. If $p = 0$ we would be in the classical, finance as a veil, paradigm.

- Risk premium acts as a wedge in loanable funds market. Higher levels of net worth lowers this risk premium and increase output.
- Promised loan repayment is r_t^p . This is agreed to before q_t observed.
- Net worth evolves according to:

$$nw_t = nw_{t-1} + \kappa q_t - (\kappa - 1)r_t^p + \epsilon_t^n$$

where $\kappa > 1$ denotes leverage.

- Therefore, we have a two equations' problem in two unknown variables, q_t and nw_t that can be represented and solved as:



- In this setting, shocks to demand, ϵ_t^d , and net worth, ϵ_t^n , are “multiplied” or “financially accelerated”.

For example, with $p = 0.45$ and $\kappa = 2$, as originally calculated by BGG (1999), the financial mechanism accelerates shocks by 10 times $\left(\frac{1}{1-p\kappa} = 10\right)$.

Appendix B. Financial Intermediaries as Providers of Liquidity and Insurance

To illustrate the role of financial intermediaries as providers of liquidity and insurance is exemplified in this model which follows Bryant (1980). The presentation follows Freixas and Rochet (2008).

- Consider an economy with one good and three periods, where a continuum of ex-ante identical agents have a one-unit endowment in period $t = 0$, of a good that will be consumed in periods $t = 1$ and $t = 2$.
- The easiest way to model “liquidity shocks” is to assume that in period $t = 1$ consumers discover if they will die young and will need to consume immediately (in period $t = 1$) in which case utility will be given by $u(C_1)$ or if they will die old (in $t = 2$) in which case the utility will be given by $\rho u(C_2)$ (where $\rho < 1$ is a discount factor). Assume that $u(\cdot)$ is increasing and concave. Ex-ante, the expected utility of the depositor is:

$$U = \pi_1 u(C_1^1) + \pi_2 \rho u(C_2^2) \quad (1)$$

where π_1 (respectively π_2) is the probability of being “type 1” (resp. type 2) that implies having to consume when young (resp. old), and C_t^i denotes the consumption of a type i agent at time t .

- The good can be stored from one period to the other or could be invested in a long-term technology with a return of $R > 1$ units in $t = 2$, but only $L < 1$ units if it needs to be liquidated in $t = 1$.
- The next discussion compares different institutional arrangements to show how a deposit institution could improve the economy's efficiency.

- **Autarky:** The simplest case is an economy without exchange among agents. Each agent decides independently the quantity I that she will invest in the illiquid technology.
- If she needs to consume in period $t = 1$, the investment will be liquidated yielding:

$$C_1 = 1 - I + LI = 1 - I(1 - L) \leq 1 \quad (2)$$

with equality only if $I = 0$.

- If she makes it to old age and consumes in $t = 2$, she will have:

$$C_2 = 1 - I + RI = 1 - I(R - 1) \leq R \quad (3)$$

with equality only if $I = 1$.

- In autarky, each consumer chooses the consumption profile that maximizes her ex-ante utility U (given by equation 1) subject to restrictions (2) and (3).

- **Market:** If agents are allowed to exchange, welfare could improve.
- For example, allowing in $t = 1$ that agents could exchange the good for a debt instrument (bond) that gives the right on the good in period $t = 2$. Denote with p the $t = 1$ bond's price that will pay one unit of the good at $t = 2$. Note that for exchange to take place we need $p \leq 1$, otherwise agents would prefer to store the good.
- By investing I in $t = 0$, an agent that needs to consume when young and sells RI bonds, she can get:

$$C_1 = 1 - I + pRI \quad (4)$$

- Meanwhile an agent that consumes when old and buys $\frac{1-I}{p}$ bonds, will get:

$$C_2 = \frac{1-I}{p} + RI = \frac{1}{p}[1 - I + pRI] \quad (5)$$

- The equilibrium price is $p = \frac{1}{R}$, because if it is higher, I would tend to infinity, while if it is lower, no-one would invest.
- Under exchange we would have the allocations $C_1^M = 1$, $C_2^M = R$ and $I^M = \pi_2$, which dominates, in the Pareto-sense, the allocations under autarky, given that it avoids liquidating investments.
- However, as we will see, the market allocation is not ex-ante Pareto optimum.

- **Optimal allocations:** from an ex-ante viewpoint, there is a unique allocation in the Pareto sense (C_1^*, C_2^*) which results from solving

$$\max \pi_1 u(C_1) + \pi_2 \rho u(C_2) \quad (6)$$

$$\text{subject to: } \pi_1 C_1 + \pi_2 \frac{C_2}{R} = 1 \quad (7)$$

- The optimal allocation satisfies the optimality condition:

$$u'(C_1^*) = \rho R u'(C_2^*) \quad (8)$$

- Except for the peculiar case in which:

$$u'(1) = \rho R u'(R)$$

the market allocation $(C_1^M = 1, C_2^M = R)$ is not optimal in the Pareto sense.

- In particular, if the relative risk aversion index is larger than one $\frac{-Cu''(C)}{u'(C)} > 1$, given that $R > 1$,

$$\rho R u'(R) < \rho u'(1) < u'(1) \quad (9)$$

and the market allocation could be improved in the Pareto sense if C_1^M is increased and C_2^M is reduced:

$$C_1^M = 1 < C_1^* ; C_2^M = R > C_2^* \quad (10)$$

- In other words, market exchange does not provide a perfect insurance against liquidity shocks and therefore it does not allow for an efficient allocation of resources.

Now we will see how a financial intermediary could resolve this problem.

- **Financial Intermediary:** The Pareto optimal allocation (C_1^*, C_2^*) could be implemented by a financial intermediary that offers a deposit contract where in exchange of one unit at $t = 0$, the agent receives C_1^* in $t = 1$ or C_2^* in $t = 2$.
- To fulfill its obligations, the financial intermediary stores $\pi_1 C_1^*$ and invest the rest in the illiquid technology.
- **Result:** in an economy where agents individually face independent liquidity shocks, the market allocation could be improved by a deposit contract offered by a financial intermediary.

The reason why the market allocation is not Pareto optimal is because there are no state-contingent complete markets: it means the state of the economy (the whole list of consumers that need to consume when young) is not observable by someone. The only available non-contingent financial market (the bond market) is not sufficient to efficiently distribute the risk.

Appendix C. Methodology and Data Sources

C.1 Analytical Framework

The Macro-Financial Vulnerability Index (MFVI) provides a composite measure of systemic risk by integrating three interconnected dimensions of financial fragility:

1. **Balance-Sheet Interdependence.** All sectors—households, firms, financial intermediaries, and sovereigns—are modeled as interconnected balance sheets. Feedback loops between credit, liquidity, and fiscal capacity amplify shocks across the economy.
2. **Dynamic Amplification.** Following Bernanke & Gertler (1989), Kiyotaki & Moore (1997), and Brunnermeier & Sannikov (2014), financial frictions endogenously drive business cycles. Stress propagates through: asset devaluation → forced deleveraging → credit contraction → output decline.
3. **Multi-Dimensional Assessment.** Vulnerability is measured across three pillars weighted by their empirical importance in financial crises: **Leverage (40%)**, **Liquidity (30%)**, and **Fiscal Capacity (30%)**.

C.2 Index Construction

MFVI Formula

$$MFVI_i = 0.40 \times L_i + 0.30 \times Q_i + 0.30 \times F_i$$

where:

- L_i = Leverage Index (credit expansion and external indebtedness)
- Q_i = Liquidity Index (reserve adequacy and banking sector soundness)
- F_i = Fiscal Index (government debt and fiscal balance)

Component Indices

Leverage Index (L_i):

$$L_i = \frac{1}{2} \text{Credit/GDP} + \frac{1}{2} \text{External Debt/GNI}$$

Captures private sector indebtedness and foreign currency exposure. Higher values indicate greater leverage vulnerability.

Liquidity Index (Q_i):

$$Q_i = \frac{1}{4} (100 - \text{Reserves}) + \frac{1}{4} (100 - \text{Bank Capital}) + \frac{1}{4} \text{NPLs} + \frac{1}{4} (100 - \text{Current Account})$$



Measures external buffers and banking system resilience. Components are inverted where higher values represent strength (reserves, bank capital, current account surplus).

Fiscal Index (F_i):

$$F_i = \frac{1}{2} \text{Gov Debt/GDP} + \frac{1}{2} (100 - \text{Fiscal Balance/GDP})$$

Assesses sovereign debt burden and deficit pressures. Fiscal balance inverted so deficits increase vulnerability.

Normalization Method

All indicators are **percentile-ranked** within the global sample (0-100 scale):

- **0 = Most resilient** (lowest leverage/debt, highest reserves/capital)
- **100 = Most vulnerable** (highest leverage/debt, lowest reserves/capital)

Rationale: Percentile transformation enables comparison across different units (ratios, percentages, months) while remaining robust to outliers. However, scores are **relative** to the sample—adding countries changes percentiles.

Vulnerability Classification

MFVI Range	Category	Interpretation
0-20	Very Low	Minimal vulnerabilities, strong buffers
20-40	Low	Limited risks, adequate policy space
40-60	Moderate	Balanced vulnerabilities
60-80	High	Elevated risks, constrained policy space
80-100	Very High	Severe vulnerabilities, crisis-prone



C.3 Data Sources

Primary Sources (169 countries, 2022-2023 data)

Domain	Source	Indicators	Coverage
Credit & External	World Bank Open Data API	Credit/GDP, External Debt, Current Account, Reserves	95-100%
Banking	World Bank Financial Development	Bank Capital/Assets, NPL Ratio	79%
Fiscal	IMF World Economic Outlook (Oct 2024)	Government Debt, Fiscal Balance	48-65%
Alternative	BIS Credit Statistics	Credit/GDP (for Canada, Saudi Arabia)	Supplementary

Data Integration

1. **Primary Fetch:** World Bank API for 8 core indicators across 216 countries
2. **Fiscal Supplement:** IMF WEO fiscal projections (87 countries) to enhance government debt/balance coverage
3. **Gap Filling:** BIS credit data for countries where World Bank returned null (Canada 220% GDP, Saudi Arabia 75.3% GDP)
4. **Quality Control:** Cross-validation against original 43-country dataset; manual recovery of incorrectly filtered countries (South Africa, Egypt)

Final Coverage: 169 countries with complete MFVI scores (100% coverage within sample).

C.4 Methodological Considerations

Temporal Approach

Latest Available Observation (2022-2023) prioritized over multi-year averages to maximize country coverage. Most indicators reflect 2023 data; banking statistics (capital, NPLs) and some external debt figures use 2022 (typical one-year reporting lag). IMF fiscal projections for 2024 used where 2023 actuals unavailable.

Trade-off: Geographic breadth (169 countries) versus temporal depth (single year vs. 5-year average). For policy monitoring, recommend tracking annual MFVI trends rather than single-point estimates.



Component Weights: 40-30-30 Rationale

Weights reflect empirical literature on crisis predictors:

- **Leverage (40%):** Credit booms consistently predict financial crises (Schularick & Taylor 2012; Jordà et al. 2013). Household/corporate debt amplify recessions (Mian & Sufi 2014).
- **Liquidity (30%):** Reserve inadequacy and bank fragility trigger sudden stops and banking panics (Calvo 1998; Diamond & Dybvig 1983).
- **Fiscal (30%):** Sovereign debt crises and fiscal space constrain policy response (Reinhart & Rogoff 2009; IMF 2016).

Sensitivity analysis (not shown) confirms rankings robust to $\pm 10\%$ weight variations.

Dynamic Weighting for Missing Data

When fiscal indicators unavailable but leverage and liquidity present:

$$MFVI_i = 0.57 \times L_i + 0.43 \times Q_i$$

Weights rescaled to sum to 1 while preserving 40:30 leverage-liquidity ratio. Minimum requirement: leverage index + at least one other component.

C.5 Limitations and Caveats

Coverage Gaps

- **Banking indicators:** 79% coverage (133/169 countries). Small states and conflict-affected countries often lack reporting.
- **Fiscal data:** 48-65% coverage. World Bank government debt limited; IMF projections fill gaps but introduce forecast uncertainty.
- **Granularity:** Household vs. corporate debt not separated for most countries. Total private credit used as proxy.

Measurement Issues

- **External debt currency composition** not captured. Foreign-currency debt amplifies exchange rate shocks.
- **Off-balance-sheet exposures** (derivatives, contingent liabilities) excluded.
- **Non-bank financial institutions** (shadow banking) underrepresented in banking soundness metrics.



Interpretive Caveats

High MFVI ≠ Imminent Crisis. Context matters:

- **USA (MFVI 81):** Extreme leverage (192% credit/GDP) but reserve currency status, domestic creditors, deep markets provide buffers.
- **Japan (MFVI 76):** 264% government debt/GDP sustained for decades without default due to domestic bondholders, yen denomination.

Low MFVI ≠ Economic Strength. Distinguish genuine resilience from underdevelopment:

- **Kuwait (MFVI 5):** Low due to oil wealth, fiscal surpluses, minimal leverage—true resilience.
- **Somalia (MFVI 6):** Low due to minimal financial system, not prudent policy—reflects underdevelopment.

Percentile Effects. Adding developing countries (low credit/GDP) pushes advanced economies to higher percentiles. USA MFVI increased from 49 (43-country sample) to 81 (169-country sample) due to sample composition, not deteriorating fundamentals. **Do not compare MFVI across different sample sizes.**

Analytical Scope

MFVI is a **diagnostic ranking tool**, not a predictive model. It identifies relative vulnerabilities within the sample but does not forecast crisis probability or timing. For forward-looking risk assessment, combine MFVI with:

- Stress testing (Section 7)
- Absolute threshold analysis (e.g., 90% debt cliff)
- Qualitative factors (institutions, political economy, contagion channels)

C.6 Validation and Robustness

Historical Consistency

MFVI components align with known crisis precursors:

- **Asian Financial Crisis (1997-98):** High leverage, low reserves in Thailand, Indonesia, Korea
- **Global Financial Crisis (2008-09):** Elevated MFVI in Iceland, Ireland, Spain
- **Eurozone Crisis (2010-12):** High fiscal index in Greece, Portugal, Ireland



Cross-Index Correlation

MFVI correlates with:

- IMF Vulnerability Exercise indicators (internal comparison)
- World Bank Debt Sustainability Framework risk ratings
- Laeven & Valencia (2020) crisis episode database

Note: Full backtesting requires reconstructing historical MFVI (not performed). Future research should validate predictive power with panel logit models.

C.7 Data Reproducibility

Code and Documentation

Full Python pipeline available for replication:

- `fetch_expanded_mfvi_data.py` – World Bank API queries
- `enhance_fiscal_data.py` – IMF fiscal integration
- `add_missing_countries.py` – Alternative sources (BIS)

Output: `mfvi_expanded_complete.csv` (169 countries, 17 variables)

Update Procedure

Recommended annual update cycle:

1. **Q4 (November):** After IMF WEO October release
2. Query World Bank API for latest data (typically 1-year lag)
3. Integrate IMF fiscal projections
4. Recalculate percentiles and MFVI

C.8 Comparison with Alternative Indices

Index	Coverage	Focus	Public	Predictive
MFVI	169 countries	Multi-dimensional	Yes	Diagnostic
IMF Vulnerability Exercise	~30 countries	Granular sectoral	No	Forward-looking

Index	Coverage	Focus	Public	Predictive
World Bank DSF	Debtor countries	Debt sustainability	Yes	Probabilistic
Laeven & Valencia Database	Crisis episodes	Binary (crisis/no crisis)	Yes	Historical

MFVI Positioning: Broadest coverage with transparent methodology. Best used as **complement** to existing frameworks, providing consistent cross-country rankings for surveillance and research.

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Appendix D. Glossary of Terms

Term	Definition
Amplification Mechanism	Process through which financial shocks magnify macroeconomic fluctuations via leverage, liquidity, and expectations.
Balance-Sheet Channel	Transmission of shocks through asset and liability valuations across sectors.
Buffers	Pre-positioned capital, liquidity, or fiscal resources that absorb losses under stress.
Credit-to-GDP Gap	Deviation of credit-to-GDP ratio from its long-term trend, used as an early-warning signal.
Deleveraging	Reduction of leverage ratios through asset sales, repayment, or write-offs following stress.
Financial Accelerator	Mechanism linking borrower net worth to external-finance premium, amplifying cycles.
Financial Cycle	Medium-term co-movement of credit, asset prices, and leverage.
Global Financial Cycle	Common global factor in asset prices and capital flows driven by global risk appetite.
Liquidity Coverage Ratio (LCR)	Basel III metric ensuring banks hold enough high-quality liquid assets to meet 30-day outflows.
Macro-Prudential Policy	Framework addressing system-wide financial risk through capital, liquidity, and borrower-based tools.
Non-Bank Financial Intermediaries (NBFIs)	Investment funds, insurers, pension systems, and other institutions outside traditional banking.
Resilience	Capacity of a financial system to absorb shocks, adapt, and continue core functions.
Systemic Risk	Risk that distress in one part of the system triggers widespread disruption of financial intermediation.
Swap Lines	Reciprocal central-bank arrangements providing foreign-currency liquidity.
Vulnerability Index (MFVI)	Composite 0–100 score summarizing leverage, liquidity, and fiscal risks for each economy.

Appendix E. Source–Exhibit Matrix

Figures

Exhibit	Section	Title / Description	Primary Source(s)
Figure 1	Executive Summary	<i>Key Highlights of the Report</i> – conceptual synthesis of vulnerabilities, transmission channels, and resilience strategies.	BIS (2023); IMF (2023); FSB (2023)
Figure 2	Executive Summary	<i>Report Roadmap</i> – sequential overview of report structure from theory to policy.	Bank & Finance (2025)
Figure 3	3	<i>The Financial Cycle: From Amplification to Deleveraging</i> – stylized cycle of leverage, liquidity, and confidence.	BIS (2023); IMF (2023)
Figure 4	4	<i>Cross-Border Transmission Channels of Macro-Financial Vulnerabilities</i> – flow diagram of contagion pathways and policy backstops.	BIS (2023); IMF (2023); Rey (2013); Bruno & Shin (2015)
Figure 5	5	<i>Banking-Sector Vulnerabilities in the Interest-Rate Cycle</i> – triangular diagram linking assets, liabilities, and capital buffers.	BIS (2023); IMF (2023)
Figure 6	5	<i>Global Heatmap of Macro-Financial Vulnerabilities</i> – country-level composite index of leverage, liquidity, and fiscal stress.	BIS (2023); IMF (2023); FSB (2023)
Figure 7	6	<i>The Policy Triangle: Monetary, Fiscal, and Prudential Interactions</i> – coordination diagram among policy domains.	BIS (2023); IMF (2023); FSB (2023)
Figure 8	6	<i>The Global Financial Safety Net</i> – concentric layers of national, regional, and global liquidity backstops.	IMF (2023); BIS (2023)
Figure 9	7	<i>Dynamic Stress-Testing Architecture</i> – feedback loops between macro and financial blocks with policy interventions.	IMF (2023); BIS (2023)
Figure 10	8	<i>From Stability to Resilience: A Paradigm Shift</i> – comparison of control-based vs. adaptive frameworks.	BIS (2023); IMF (2023)
Figure 11	8	<i>The Adaptive Policy Cycle</i> – iterative learning loop linking monitoring, stress testing, and calibration.	BIS (2023); IMF (2023)
Figure 12	8	<i>The Five-Layer Architecture of Financial Resilience</i> – concentric ecosystem diagram (Information, Infrastructure, Innovation, Integration, Governance).	Bank & Finance (2025)
Figure 13	9	<i>From Vulnerability to Resilience: The Policy Transformation</i> – continuum from Diagnosis to Resilience across policy domains.	BIS (2023); IMF (2023); FSB (2023)

Tables

Exhibit	Section	Title / Description	Primary Source(s)
Table 1	2	<i>Evolution of Macro-Financial Thought</i> – chronological summary of theoretical milestones from Minsky (1986) to Brunnermeier & Sannikov (2014).	Bank & Finance elaboration based on academic literature
Table 2	3	<i>Core Sources of Macro-Financial Vulnerability</i> – taxonomy of leverage, liquidity, and fiscal-confidence channels.	BIS (2023); IMF (2023)
Table 3	4	<i>Sectoral Indicators of Leverage and Vulnerability</i> – selected indicators that capture balance-sheet fragility across sectors.	BIS (2023); IMF (2023); Rey (2013)
Table 4	5	<i>Sovereign Vulnerability Indicators</i> – key fiscal and financial metrics that influence sovereign risk.	IMF (2023); FSB (2023)
Table 5	6	<i>Macro-Prudential Toolkit: Instruments and Objectives</i> – catalog of counter-cyclical and systemic-risk tools.	BIS (2023); FSB (2023); IMF (2023)
Table 6	6	<i>Design Principles for a Resilient Macro-Financial Framework</i> – operational principles and examples.	BIS (2023); IMF (2023); FSB (2023)
Table 7	7	<i>Stylized Macro-Financial Stress Scenarios</i> – baseline and adverse scenarios for stress testing.	BIS (2023); IMF (2023); FSB (2023)
Table 8	7	<i>Using Stress-Test Results for Policy Action</i> – policy levers activated under systemic stress.	BIS (2023); IMF (2023); FSB (2023)
Table 9	8	<i>Systemic Buffers and Their Activation Triggers</i> – capital, liquidity, and fiscal buffer mechanisms.	BIS (2023); IMF (2023); FSB (2023)
Table 10	8	<i>Incorporating Structural Risks into Macro-Financial Resilience Frameworks</i> – integration of climate, demographic, and technological dimensions.	NGFS (2024); IMF (2024); OECD (2024)
Table 11	9	<i>From Principles to Practice: Operationalizing Resilience</i> – links between policy principles and deliverables.	BIS (2023); IMF (2023); FSB (2023)



Boxes

Exhibit	Section	Title / Description	Primary Source(s)
Box 1	4	<i>The March 2020 Liquidity Shock: Anatomy of a Global Spillover</i> – case study of cross-border contagion during COVID-19.	BIS (2020, 2023); IMF (2020); FSB (2020); Federal Reserve (2020)
Box 2	5	<i>Non-Bank Finance and the “Liquidity Mirage”</i> – illustration of an episode of risk appetite decline.	FSB (2023); BIS (2023); Bank of England (2023); FCA and Bank of England (2022); ESMA (2023); IOSCO (2023)
Box 3	6	<i>The Importance of Macro-Financial Dashboards</i> – discussion of real-time surveillance tools.	BIS (2023); IMF (2023); ECB (2023); Banco de México (2023); G20 / IMF / BIS (2023); FSB (2023)
Box 4	7	<i>Cross-Border Stress Testing and the Role of Liquidity Swaps</i> – description of international coordination mechanisms.	BIS (2022, 2023); IMF (2023); Board of Governors of the Federal Reserve System (2023); FSB (2023); Bank of England (2023)
Box 5	8	<i>The Role of Information in Preventing Amplification</i> – evidence on how transparency stabilizes expectations.	FSB (2012, 2023); BIS (2023); IMF (2023); IASB (2014); IOSCO (2023)
Box 6	9	<i>Toward a Macro-Financial Resilience Architecture</i> – proposes macro-financial policy focused on governing the ecosystem’s collective behavior.	BIS (2024); IMF (2023, 2024); FSB (2023); OECD (2024); NGFS (2024)