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Macro-Financial Programming

Prepared by Selim Elekdag, Alejandro Guerson, Emanuel Kopp, and Yurii Sholomytskyi

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Contents

BOXES

FIGURES

TABLES

Executive Summary

Financial sector vulnerabilities can have profound macroeconomic consequences, underscoring the importance of integrating financial sector analysis into macroeconomic policy frameworks. The global financial crisis and more recent events—including the 2023 failures of several banks—demonstrate how financial sector shocks can propagate rapidly through the real economy, amplifying macroeconomic volatility and posing risks to economic and financial stability. Over the past two decades, the International Monetary Fund (IMF) has made significant progress in strengthening financial sector surveillance, including through the establishment of the Financial Sector Assessment Program (FSAP) and the mainstreaming of macrofinancial surveillance. These efforts have enhanced the integration of financial sector risks into Article IV consultations and IMF-supported programs. Notwithstanding these advances, an important challenge remains: translating insights from financial sector analysis into operational tools that can be consistently integrated into country teams' core macroeconomic frameworks.

This paper introduces FPP-FIN, an approach designed to embed financial sector dynamics within the IMF's traditional accounting-based macroeconomic frameworks. The approach extends the IMF's long-standing Financial Programming and Policies (FPP) framework by incorporating an extended representation of the banking system—its balance sheet, income statement, and key indicators—into macroeconomic analysis. The framework provides a tractable way to assess how macroeconomic developments affect banking system profitability, capitalization, and lending capacity, while also allowing financial sector conditions to influence macroeconomic outcomes.

In practice, two complementary use cases have emerged. The first extends the traditional FPP framework by integrating banking system indicators—such as capital adequacy, asset quality, and profitability—into the macroeconomic projection process. In this configuration, macroeconomic forecasts are used in conjunction with expert judgment to generate forward-looking projections of financial soundness indicators (FSIs), providing an integrated outlook for both macroeconomic performance and financial stability. This approach enhances policy discussions by offering a systematic, data-rich way to assess the consistency between macroeconomic scenarios and banking system resilience.

The second use case incorporates explicit two-way linkages between the real economy and the financial sector. Guided by a conceptual model, the framework captures macrofinancial feedback loops between economic activity and the banking system. These feedback mechanisms can generate financial accelerator effects in which deteriorating financial conditions amplify economic downturns, whereas strong banking sector balance sheets can support economic expansions. This extension enables more realistic scenario analysis, including the assessment of credit shocks, financial tightening, and regulatory policy changes.

The approach has been piloted in IMF surveillance and technical assistance (TA) contexts. In the 2024 Article IV Consultation for Kazakhstan, FPP-FIN was used to produce a baseline outlook for the banking sector alongside standard macroeconomic projections—marking the first time such an integrated financial stability outlook was included in an Article IV staff report. The framework also supported scenario analysis examining financial deepening, credit growth dynamics, and the implications of regulatory measures such as enhanced nonperforming loan (NPL) recognition.

FPP-FIN has also been applied in several TA projects, where the framework was integrated into existing macroeconomic modeling systems. The approach allowed IMF staff and country authorities to analyze macrofinancial feedback loops and, for instance, assess the potential impact of selected macroprudential policies. Variants of the framework have been adapted for use in countries such as the Bahamas, Costa Rica, Oman, and the United Arab Emirates (UAE), demonstrating its flexibility across different institutional and data environments.

Overall, FPP-FIN provides a practical and transparent way to strengthen macrofinancial analysis within the IMF's operational work. Rather than serving as a unified macrofinancial model, it provides a pragmatic and streamlined structure that can be selectively extended to address the macrofinancial policy issues most relevant for country-specific applications. Although deliberately parsimonious, the approach offers a useful first step toward embedding financial sector dynamics and macrofinancial feedback into country macroeconomic frameworks. Importantly, FPP-FIN is aligned with ongoing efforts to better integrate financial sector issues into the IMF's core work, as envisaged in the forthcoming 2026 Comprehensive Surveillance Review. Looking ahead, similar macrofinancial extensions could be incorporated into other modeling platforms—including semi-structural gap-trend forecasting models and dynamic stochastic general equilibrium (DSGE) models—further enhancing the integration of financial sector considerations into the IMF's surveillance, lending, and capacity development activities.

1. Introduction

Well-integrated analysis of financial sector issues is vital for the International Monetary Fund's (IMF) surveillance, lending, and capacity development mandates. The 2008 global financial crisis showed that financial sector shocks can have large macroeconomic effects. The COVID-19 pandemic highlighted the importance of assessing financial stability risks arising from household and corporate vulnerabilities. More recently, the sudden failures of Silicon Valley Bank, followed by the failure of Credit Suisse—the first global systemically important bank to fail since the global financial crisis—in March 2023, serve as a reminder of latent vulnerabilities.

The IMF has taken several initiatives over the past two decades to enhance the quality of financial sector analysis. A key milestone was the establishment of the Financial Sector Assessment Program (FSAP) in the wake of the Asian financial crisis (Box 1). Another major initiative was the mainstreaming of macrofinancial surveillance (Box 2), which included greater integration of FSAP findings into Article IV consultation reports, thereby increasing awareness of financial sector risks.[1] In particular, a strategy for financial sector surveillance was adopted with the aim of strengthening the analytical underpinnings of macrofinancial assessments (Box 3). Such progress is important because several studies have noted that disregarding the role of the financial sector can have adverse consequences for forecast quality, program performance, and surveillance (see Ho and Mauro 2016; Chen and Ranciere 2019; Independent Evaluation Office 2019; Carriere-Swallow and Marzluf 2021).

These initiatives have led to significant improvements in the integration of financial sector issues into the IMF's work, but implementation gaps persist. The 2018 Review of Program Design and Conditionality found that one in five structural conditions in IMF-supported programs targeted the financial sector (IMF 2019b). Notwithstanding their relatively more complex nature,[2] the coverage of financial sector issues in Article IV surveillance has deepened considerably, as noted in the 2021 Comprehensive Surveillance Review (CSR; IMF 2021). At the same time, systematically integrating these improvements into the regular surveillance and program work of IMF country teams remains a work in progress. The CSR underscored this gap, emphasizing the need for better integration and a clearer articulation of systemic financial risk, grounded in rigorous vulnerability analysis and a forward-looking perspective.[3] Likewise, the ongoing 2026 CSR acknowledges the progress made while highlighting strategic priorities, including better integration of financial sector policy advice into the overall policy mix.[4]

An important reason for these gaps is that explicit macrofinancial linkages remain largely absent from standard IMF macroeconomic frameworks. The IMF's long-standing "Financial Programming and Policies (FPP)" approach, as used by desk economists, consists of a four-sector setup—real, fiscal, monetary, and external—to generate baseline and alternative scenarios. Although these frameworks capture interrelations among the four sectors, the balance sheets underlying the monetary sector omit bank capital and income. As a result, such frameworks fail to support analysis of how financial conditions—including the profitability, capital adequacy, and overall soundness of the banking system—interact with macroeconomic variables.

[1] Article IV consultations provide the IMF's periodic assessment of individual members' economies, and for most members this is an annual exercise. Article IV surveillance aims to cover all macro-critical developments and policies (including fiscal, monetary, external, and structural policies), and macrofinancial analysis and policy advice is generally just one feature.

[2] See Borio (2012), Claessens and Kose (2018), Cochrane (2017), and Morley (2016) on the relatively more complex nature of financial sector issues.

[3] This echoes earlier recommendations that the analytical underpinnings of financial sector advice should be strengthened (including through greater integration); see, for example, the 2014 Triennial Surveillance Review.

[4] See IMF 2026a, IMF 2026b.

To address these gaps, this paper integrates a contemporary treatment of the financial sector into the IMF's accounting-based macroeconomic frameworks. Because the approach embeds a richer financial sector into the traditional FPP framework, it is referred to as "FPP-FIN." The main objective is to support the operationalization of macrofinancial analysis with an approach underpinned by a rich analytical framework without overburdening the underlying macroeconomic framework. As discussed later, two use cases have emerged in practice. The first extends the monetary sector in traditional accounting-based country macroeconomic framework, whereas the second adds further economic structure and explicit economic feedback in both directions. The two use cases build upon each other and are undergirded by theory but designed to remain practical and flexible, allowing for country-specific adaptations that enhance their usefulness for policy formulation.

The core idea is to incorporate the banking system's aggregate income statement, balance sheet, and key regulatory, supervisory, and bank performance indicators.[5] Standard macroeconomic projections—such as growth and inflation—are then used to estimate the banking system's balance sheet dynamics, profitability, and capitalization levels. A central feature of bank lending is the "capital gap," defined as the difference between the actual capital ratio and a "target" capital ratio. This target incorporates add-ons such as supervisory expectations and an additional management buffer, the latter of which can help lower funding costs. As long as the capital gap remains positive, which is typically the case under tranquil market conditions, credit demand from households and firms can be met.[6] However, if the capital gap turns negative, lending may be sharply restricted. Because generating higher profits or raising new equity usually takes time—especially during episodes of financial distress—banks often first respond by reducing lending and retaining profits as a quick way to improve their capital ratio.

The feasibility of the approach proposed in this paper depends on the availability of the IMF's Financial Soundness Indicators (FSIs), which summarize key aspects of the banking system—including capital adequacy, asset quality, and profitability (Box 6). Without these publicly available data, extending the financial sector along these lines would be difficult to implement in practice for individual country teams.

The first use case closely follows the time-honored IMF FPP macroeconomic framework. The framework itself enforces accounting relationships within and across sectors, with economic relationships introduced through the application of judgment consistent with the accounting. Forward-looking financial sector dynamics are driven mainly by desk macroeconomic projections. In this way, an outlook for financial stability—based on projected FSIs—complements the standard macroeconomic projections.

The second use case introduces explicit behavioral equations to capture two-way feedback between the real and financial sectors. A standard four-sector macroeconomic framework is augmented with a minimal set of behavioral relationships that strengthen the modeling of domestic demand dynamics. In particular, the consumption and investment equations can be extended to include real credit growth and the real lending rate. These additions integrate the real economy with the banking system, thereby establishing macrofinancial feedback and introducing a financial accelerator mechanism. This configuration can generate amplified, nonlinear, and asymmetric credit dynamics, leading to greater GDP growth volatility. Consider an adverse aggregate demand shock. Such a shock may erode capital buffers, but as long as the capital gap remains positive, the banking system can continue to meet credit demand from the real sector. However, if capital buffers are insufficient and the capital gap turns negative, banks are unable to fully accommodate even weakened credit demand. The resulting contraction in credit, transmitted through lower private consumption and investment, amplifies the downturn and produces a more severe recession.

[5] See Elekdag and Kopp (2026) for details and a conceptual macrofinancial model.

[6] This deemphasizes the interaction of money demand and money supply that drives credit growth in traditional financial programming; see Box 5.

FPP-FIN was piloted during the 2024 Kazakhstan Article IV Consultation (IMF 2025). Alongside the standard macroeconomic projections, the framework provided a baseline financial stability outlook—a first in IMF Article IV Staff Reports—marking an important step toward enhancing macrofinancial analysis in the IMF's country surveillance. The analysis projected that Kazakhstan's banking system would remain profitable, well capitalized, and able to support credit demand from households and firms. In addition, FPP-FIN was used for illustrative macrofinancial exercises, including a financial deepening scenario showing that further credit expansion is possible without compromising stability, provided credit risk is well managed. The framework also supported informal scenario assessments on credit growth consistency and the impact of narrowing interest margins on income and capital accumulation. It further provided quantitative estimates of regulatory policy initiatives—particularly regarding nonperforming loan (NPL) recognition—as recommended in the recent Kazakhstan FSAP.

FPP-FIN has also been applied in several Institute for Capacity Development (ICD) technical assistance (TA) projects as an extension to existing macroeconomic frameworks. The extended framework enhanced the analysis of macrofinancial linkages by integrating macroeconomic projections with banking sector dynamics. Accordingly, illustrative scenarios were used to quantify the effects of adverse aggregate demand and financial shocks, with the former highlighting shock amplification through feedback loops between the real economy and the banking sector. In addition, the extended framework facilitated an initial evaluation of selected macroprudential tools. Variants of the FPP-FIN framework have been adapted for use in the Bahamas, Costa Rica, Oman, and the United Arab Emirates (UAE), demonstrating their flexibility in accommodating country-specific policy priorities, software preferences, and data availability.

In summary, this paper presents an approach to incorporate macrofinancial linkages into traditional IMF macroeconomic frameworks. FPP-FIN is designed as a pragmatic and streamlined framework—not a unified macrofinancial model—that can be selectively extended to address key macrofinancial policy issues. The approach is intuitive, based on publicly available data, and can be readily integrated with existing macroeconomic frameworks. Different versions can be further adapted to individual country contexts. FPP-FIN has been used in selected surveillance and TA cases, thereby enriching policy or technical discussions and deepening engagement with country officials. More broadly, in line with the forthcoming 2026 Comprehensive Surveillance Review, FPP-FIN supports the IMF's ongoing efforts to better integrate financial sector policies, systemic risks, and emerging vulnerabilities into its core work.

The remainder of the paper is organized as follows. The next chapter provides a selective review of the literature to establish a conceptual reference point for how FPP-FIN can be applied in practice—whether through expert judgment, satellite equations, or more structural models that help inform macrofinancial linkages. The third chapter presents an illustrative model highlighting the key features of a banking system that can be appended to a range of macroeconomic frameworks. The penultimate chapter presents two country applications, illustrating the two use cases in the context of surveillance and TA. The paper concludes by outlining potential extensions relevant to the IMF's work in surveillance, lending, and capacity development.

Box 1. Financial Sector Assessment Program (FSAP)

The Financial Sector Assessment Program (FSAP) is the IMF's key instrument for financial surveillance. Established in 1999 in the aftermath of the Asian financial crisis, it began as a voluntary capacity development product and catalyst for financial sector reforms, providing independent, in-depth, and comprehensive assessment of financial systems. After the global financial crisis, the FSAP became a mandatory surveillance instrument for jurisdictions with systemically important financial sectors,

with assessments conducted periodically. Assessments are conducted jointly with the World Bank in emerging market and developing economies (EMDEs) and solely by the IMF in advanced economies (AEs).

The FSAP complements more frequent Article IV consultations with in-depth investigation of systemic vulnerabilities and policy frameworks by experts. In joint FSAPs, the Bank focuses on developmental issues whereas the IMF assesses stability issues. Stability assessments are anchored by three essential pillars: (1) quantitative risk assessment, including stress testing and interconnectedness analysis; (2) assessment of regulatory and supervisory frameworks based on international standards; and (3) evaluation of financial safety nets and crisis management arrangements. By combining quantitative systemic risk analysis with institutional assessments, FSAPs inform surveillance, capacity development, and policy dialogue with national authorities.

The scope of FSAP has changed as the financial system landscape evolved with emerging risks from nonbank financial intermediation (NBFIs), digitalization, and climate change. In addition to banks, assessments increasingly cover NBFIs, cross-sectoral linkages in system-wide analyses, and emerging risks related to climate change, digitalization, and cybersecurity. This broader scope also strengthens the FSAP's ability to assess interconnected risks and potential spillovers that could amplify shocks across institutions, markets, and borders.

The risk assessment pillar relies on stress testing and other quantitative tools to gauge the resilience of the financial system under adverse scenarios. It focuses on systemic vulnerabilities, cross-sectoral interlinkages, and potential domestic and cross-border spillovers that could amplify shocks and threaten financial stability. The analysis typically examines bank solvency and liquidity under adverse macroeconomic scenarios. Recent FSAPs increasingly extend this work to NBFIs—including investment funds, insurers, and pension funds—and often incorporate system-wide analysis of interconnectedness among banks, NBFIs, and other relevant nonfinancial sectors. They may also include microdata-based vulnerability analysis of the corporate and household sectors, sometimes linked to the assessment of macroprudential measures.

The FPP-FIN approach differs from the FSAP in both scope and purpose. Whereas FSAPs provide detailed diagnostic assessments of systemic risks, vulnerabilities, and policy frameworks, FPP-FIN offers a more aggregate and tractable representation of the financial sector within a macroeconomic framework. It embeds key banking system indicators to capture major macrofinancial linkages and feedback effects. The two approaches are therefore complementary: FSAPs provide diagnostic depth, whereas FPP-FIN helps integrate selected financial sector insights into macroeconomic analysis and policy discussions.

Contributor: Heedon Kang.

Box 2. Macrofinancial Mainstreaming in IMF Article IV Surveillance

Strengthening macrofinancial integration in surveillance has been a long-standing institutional priority for the IMF. This box presents a high-level historical overview of the sustained institutional efforts to support this goal.

From financial sector coverage to macrofinancial integration. Since the Mexican peso crisis and the Asian financial crisis in the 1990s, the IMF has undertaken a range of initiatives to strengthen financial sector coverage in surveillance. The global financial crisis further underscored the macroeconomic consequences of systemic financial risks and sharpened the focus on integrating macroeconomic and financial analysis. Efforts to embed financial sector considerations more systematically in surveillance have included better leveraging Financial Sector Assessment Program (FSAP) findings in Article IV (AIV) surveillance, developing macroprudential policy guidance, expanding analytical tools and data initiatives, and strengthening capacity building. A macrofinancial mainstreaming initiative was launched in 2015, initially covering a subset of members before being extended to the full membership by 2018.

Operationally, macrofinancial integration rests on three core components:

Embedding macrofinancial analysis into the macroeconomic baseline. This requires assessing the structure of the financial sector and its vulnerabilities, identifying the key channels through which two-way macrofinancial interlinkages operate, and ensuring consistency between the financial outlook—for example, credit growth, asset prices, and sovereign-financial sector exposures—and projections for the real, fiscal and external sectors.

Assessing systemic risks and vulnerabilities. Building on the identified macrofinancial linkages, surveillance should also assess systemic risks and potential feedback loops between the financial sector and the broader economy.

Using these assessments to inform policy advice. Analysis of macrofinancial interactions and systemic vulnerabilities should underpin policy advice aimed at strengthening system-wide resilience to aggregate shocks, addressing existing vulnerabilities, and ultimately reducing the likelihood and severity of financial sector stress and crises.

Taking stock and identifying remaining gaps. The 2019 Independent Evaluation Office (IEO) evaluation recognized the substantial expansion of macrofinancial analysis in Article IV consultations while highlighting persistent heterogeneity in depth across the membership and the need for additional macrofinancial expertise and stronger institutional support. The CSR (IMF 2021) highlighted the need for Article IV consultations to include a well-articulated and forward-looking assessment of systemic risk, stronger integration of FSAP findings, broader coverage of vulnerabilities beyond the banking sector, and closer links between systemic risk analysis and macroprudential policy advice. Subsequent initiatives sought to operationalize these objectives were launched, including with the publication of the 2022 Surveillance Guidance Note and the launch of a structured FSAP-Article IV integration process. The upcoming 2026 CSR will provide a new opportunity to take stock of progress made and identify priorities for further strengthening macrofinancial integration in IMF surveillance.

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Box 3. Macrofinancial Surveillance Tools

Macrofinancial surveillance at the IMF leverages a broad and evolving toolkit to assess vulnerabilities, risks, and transmission channels across sectors. These tools complement the FPP-FIN framework discussed in Chapter 3 by informing scenario design, calibration, and consistency checks. They are developed and maintained primarily by the Research Department (RES) and the Monetary and Capital Markets Department (MCM). For a more comprehensive discussion of these tools, see the *2026 Comprehensive Surveillance Review (CSR): Financial Sector Coverage and Macrofinancial Integration in Article IV Consultations*.

Selected tools that can provide useful inputs for FPP-FIN scenario design and calibration—including by helping identify sectoral vulnerabilities, assess risks, and inform key assumptions—include:

- **Real Estate Markets Module (REM):** Focuses on housing markets. It provides four vulnerability indicators (including price-to-income and price-to-rent ratios) that can be used to assess the risk of overheating and overvaluation in residential real estate markets. Two additional indicators help assess housing affordability: real hedonic house prices and a housing affordability measure based on Biljanovska, Fu, and Igan (2023).
- **Corporate Vulnerability Utility (CVU):** Focuses on vulnerabilities in the corporate sector. It provides five indicators covering: (1) excessive leverage, weak liquidity, low profitability, and elevated valuations; (2) exposure to foreign shocks through overseas sales, assets, and income; (3) external financing risk; (4) forward-looking probabilities of default; and (v) investment efficiency.

Other complementary tools include:

- **Bank Contagion Module (BCM):** Analyzes potential spillover effects arising from the interconnectedness of international banks. The module helps (1) assess how default and funding risks propagate across borders and (2) identify countries that may be most affected under alternative scenarios.
- **Growth-at-Risk 2.0 (GaR):** Enables country teams to assess and quantify downside tail risks to future GDP growth based on prevailing macrofinancial vulnerabilities and other economic shocks.
- **Credit Gap 2.0:** Helps country teams identify excessive credit growth, detect leverage buildups, and inform macroprudential policy design.
- **Bank Health Assessment Tool (HEAT 2.0):** Enables country teams to monitor the soundness of individual financial institutions relative to user-selected peer groups.
- **Public Sector–Bank Nexus Tool:** Enables country teams to evaluate banks' exposure to the public sector. It provides metrics on exposures by instrument, level of government, and currency, along with monthly tracking and peer comparisons, supporting more robust fiscal-financial risk analysis.
- **Balance Sheet Approach (BSA) Network Map and Cross-Sectoral Financial Exposure (CSFE) Tool:** Provide point-in-time and dynamic views of a country's gross and net cross-sectoral financial exposures. The tools offer interactive dashboards and network visualizations covering banks, government, corporates, households, and the rest of the world, helping teams identify vulnerabilities and transmission channels.
- **Systemic Risk (SysRisk) Tracker:** Extracts signals of cyclical systemic risk from macrofinancial indicators tailored to the needs of bilateral surveillance.
- **Housing Module:** Identifies housing market cycle phases and associated vulnerabilities, classifying countries into nonboom expansion, boom expansion, and contraction phases based on developments in real house prices.

- **SWIFT Monitor:** Tracks monthly domestic and cross-border interbank transactions through the SWIFT network, providing high-frequency proxies for economic activity, trade, and capital flows.

Looking ahead, the IMF continues to prioritize training, toolkit development, and interdepartmental coordination to deepen macrofinancial expertise and strengthen macrofinancial coverage. FPP-FIN contributes to this broader toolkit by providing an accessible entry point for country teams to integrate macroeconomic and financial sector analysis.

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2. Conceptual Framework

The first part of this chapter provides a selective review of the literature on modeling macrofinancial linkages. The second part examines structural banking models that establish the theoretical foundations for integrating the financial sector into the IMF's accounting-based financial programming frameworks. The purpose here is to provide a conceptual reference point for the use of judgment in applying FPP-FIN and for the specification of the simple equations that drive the feedback across the real and financial sectors.

A. Selected Review of the Literature

The eruption of the global financial crisis underscored the urgent need to deepen policy and academic work on macrofinancial linkages.[7] In response, one set of studies modeled financial friction using borrowing constraints in the tradition of Kiyotaki and Moore (1997), including Bianchi and Mendoza (2011), Jeanne and Korinek (2010), Quint and Rabanal (2013), Gelain and Ilbas (2017), as well as Linde, Smets, and Wouters (2020). In these papers, declining asset prices reduce the value of collateral, and therefore lending, and aggravate the severity of the ongoing recession. Another set of papers follows Bernanke and Gertler (1989) and Bernanke, Gertler, and Gilchrist (1999), including Christiano and others (2014), Curdia and Woodford (2010), Gourio (2012), Gertler and Kiyotaki (2014), and, more recently, Camara, Christiano, and Dalgic (2025). In these papers, shocks that erode the soundness of borrower balance sheets result in heightened borrowing spreads, thereby depressing consumption, investment, and aggregate demand, and reinforcing the downturn.[8]

A popular approach for quantifying macrofinancial linkages, particularly across central banks and international financial institutions, is bank stress testing. Macroprudential stress testing assesses whether the financial system's solvency and liquidity positions are sufficient to absorb adverse macroeconomic and financial shocks. Its granularity allows it to assess risks to the financial system in greater depth, as is necessary to understand the critical interplay of bank-specific and systemic issues.[9] This same granularity tends to lead to an approach that does not consider feedback from the financial to the nonfinancial sector. Typically, stress tests assess the impact of an adverse scenario—defined by a combination of shocks—on the financial sector alone, without considering subsequent second-round effects on the broader economy.

[7] For empirical work on macrofinancial linkages, see Cardarelli, Elekdag, and Lall (2008, 2010), who highlighted that episodes of financial turmoil characterized by banking sector distress are more likely to be associated with severe and protracted downturns. The nexus between business and financial cycles was later studied in the work of Claessens, Kose, and Terrones (2012) and the studies by Borio (2012) and Drehmann, Borio, and Tsatsaronis (2012). See also Adrian, Boyarchenko, and Giannone (2019), Prasad and others (2019), and Catalan and Hoffmaister (2020). For a general overview of macrofinancial linkages, see Claessens and Kose (2018).

[8] See also Stein (2010), Gertler and others (2020), and Curdia (2007); for open-economy variants, see Gertler and others (2007) and Elekdag and Tchakarov (2007). For a survey of the literature, see Gertler and Gilchrist (2018), Brunnermeier and others (2013), and Gertler and Kiyotaki (2015). Another strand of research was initiated by Diamond and Dybvig (1983) and later followed by Allen and Gale (1998) and highlights the interplay between liquidity and economic activity. See also Farhi and Tirole (2016), as well as Brunnermeier and Sannikov (2014). See also Adrian and others (2021), who develop a micro-founded New Keynesian open-economy model to study the interaction between monetary policy, foreign exchange intervention (FXI), and capital flow management measures (CFMs), incorporating a streamlined banking sector to capture sudden-stop dynamics.

[9] Although (macroprudential) stress tests assess the health of individual financial institutions using granular data, their ultimate purpose is not to determine whether specific banks are adequately capitalized, but rather to evaluate whether the identified vulnerabilities could compromise financial stability at the system-wide level (Adrian, Morsink, and Schumacher 2020). An advantage of bank-by-bank analysis is the assessment of interconnectedness, contagion, and therefore the cross-sectional dimension of systemic risk. See, for example, Cihak (2007), Adrian, Morsink, and Schumacher (2020), Krznar and Matheson (2017), and Catalan and Hoffmaister (2020).

B. Toward a Conceptual Framework

Recognizing the need for a more structural approach to financial sector analysis, recent advances have introduced banks into models to better capture feedback between the financial sector and the real economy. Gerali and others (2010) introduce a representative bank into a medium-scale New Keynesian model, and Angelini and others (2014) build on this framework to investigate monetary and macroprudential policy coordination.[10] Likewise, an extension of the quantitative Integrated Policy Framework by Adrian and others (2021) includes a parsimonious banking sector.[11] Note also that Mkhatrishvili (2025) develops a banking model that jointly incorporates solvency, liquidity, and maturity risks. A point of departure is the paper by Clerc and others (2015), who develop a model in which banks are exposed to risk and can default in equilibrium.[12] The model by Elekdag and others (2026) builds on Lipinsky and Miescu (2020) and extends the literature along three dimensions (Box 4). First, it incorporates both bank and corporate default and, importantly, allows these to reinforce one another. This introduces a novel channel of endogenous amplification: Heightened corporate defaults increase the probability of bank default—directly and indirectly—thereby raising systemic financial risk. Second, unlike the earlier papers, it develops an open-economy framework, enabling the analysis of external shocks on the domestic banking system. Third, the model is estimated using novel financial data, including profitability, capital adequacy, and asset quality metrics for both advanced and emerging market economies, allowing for a more precise quantification of how the banking system shapes the transmission of financial shocks.[13]

A related strand of the literature models nonlinear macrofinancial dynamics arising from occasionally binding constraints. For example, Holden, Levine, and Swabrick (2020) and Lang and Menno (2025) develop models in which occasionally binding regulatory constraints can sharply restrict bank lending, leading to "credit-crunch" episodes (see also He and Krishnamurthy 2013; Van der Ghote 2021). In tranquil times, banks retain sufficient profits to meet capital requirements, and lending rates play a central role in determining the supply of credit (the "pricing channel"). By contrast, during periods of stress or crisis, regulatory constraints become binding as banks struggle to raise enough equity to satisfy capital requirements. In such circumstances, credit becomes rationed, the "quantity channel" dominates, and a financial-accelerator-type dynamic emerges.[14] As emphasized by García (2017), capital regulation also influences banks' risk-taking behavior by encouraging them to hold capital buffers above minimum requirements. Accordingly, banks typically target capital adequacy ratios above minima, consistent with empirical evidence (Peura and Jokivuolle 2004; Jokipii and Milne 2008).

The macroeconomic frameworks in this paper are conceptually underpinned by these structural banking models. The following chapters extend the IMF's FPP framework to incorporate a banking system in an open-economy setting, broadly consistent with the approaches found in the studies cited earlier. Recall that financial programming is a practical, data-rich, accounting-based framework—guided by expert judgment—that has long been used at the IMF for macroeconomic analysis and forecasting. Building on this foundation, the frameworks in this paper introduce an aggregate banking sector subject to an occasionally binding regulatory capital

[10] Other notable papers include Meh and Moran (2010), Iacoviello (2015), Millard, Rubio, and Varadi (2023), as well as Hinterschweiger and others (2021). A notable feature of these papers is the possibility of exploring the interaction between monetary policy and selected macroprudential instruments.

[11] See also Basu and others (2025) for the core Integrated Policy Framework ideas with a focus on optimal policy design in small open economies with financial friction.

[12] Related work includes Mendicino and others (2020), Hodbod, Homar, and Meeks (2018), as well as Lozej, Mendicino, and Nikolov (2018).

[13] In particular, the novel financial data are used to fit bank provisions (that is, the loan loss rate), cost of funding, return on equity, (weighted average) risk weights, and the CET1 capital ratio.

[14] This intuition is consistent with Stiglitz and Weiss (1981), where, although the interest rate reflects the price of borrowing, it may not fully capture financing conditions when credit markets are characterized by asymmetric information. In particular, banks may ration credit rather than raise rates once higher lending costs worsen borrower selection or risk-taking incentives. Including credit (or credit growth) alongside the interest rate therefore allows investment demand to reflect both price and quantity constraints, recognizing that investment can be limited by credit availability even when interest rates remain stable.

constraint—following Elekdag and Kopp (2026)—to capture nonlinear macrofinancial dynamics. During normal (tranquil) periods, feedback effects between the real and financial sectors are expected to be limited. However, under turbulent market conditions—particularly when banking system vulnerabilities are elevated—powerful financial accelerator effects can emerge, as macrofinancial feedback loops significantly amplify shocks.[15]

In summary, the following chapter presents an approach that integrates a more contemporary treatment of the financial sector into the IMF's accounting-based macroeconomic frameworks. Two main use cases have emerged in practice. These two use cases illustrate the flexibility of the framework, which can be implemented at varying levels of complexity depending on country-specific needs. The first is a direct extension of the monetary sector within traditional financial programming. The framework presents rich and consistent aggregate balance sheet and macroeconomic data as a scaffolding for applying judgment to construct and analyze projections and scenarios, particularly to assess the effect of evolving financial conditions on growth projections and of the real economy and other factors on financial sector conditions. The second use case introduces additional economic structure and explicit two-way feedback between the real and financial sectors—guided by theory—while maintaining a practical orientation for country teams that rely on expert judgment within a disciplined forecasting framework. This additional economic structure can integrate empirical analyses of macrofinancial linkages, facilitate scenario analysis, and more easily communicate projections.[16]

Box 4. An Open-Economy Structural Banking Model

This box summarizes the model developed by Elekdag and others (2026), which synthesizes the literature reviewed in the paper and articulates the mechanisms that inform the judgment and satellite equations used in the practical applications.

The small open-economy New Keynesian model by Elekdag and others (2026) features five domestic agents: households, final goods producers, entrepreneurial firms, banks, and the government. Although macrofinancial linkages exist across all sectors, firms and banks are central to the model's financial amplification mechanisms and represent its novel dimensions.

Key Macrofinancial Linkages

Household deposits are intermediated by banks to finance corporate investment. A firm's borrowing cost depends on its leverage: the more indebted it is, the higher the probability of default, and thus the higher its external finance premium. In aggregate, higher corporate leverage translates into elevated corporate risk, as reflected in a rising default rate. Similarly, a bank's funding cost depends on the strength of its balance sheet. A lower capitalization ratio (that is, less bank equity) signals higher risk and raises the probability of bank default, which we refer to as systemic financial risk.

Mutually Reinforcing Financial Accelerators

The model features multiple interacting financial accelerators, amplifying the effects of economic shocks:

- An adverse shock to the economy which results in a fall in asset prices would reduce corporate net worth, increase leverage, and raise firms' probability of default. As a result, borrowing costs rise, investment falls, and the initial downturn is amplified—this is the classic financial accelerator of Bernanke, Gertler, and Gilchrist (1999).

[15] See Elekdag and Toprak (2026) for an open-economy banking model with nonlinear dynamics facilitated by global solutions, which is consistent with the pragmatic framework introduced by Elekdag and Kopp (2026).

[16] FPP frameworks with additional behavioral equations have proven useful in Institute for Capacity Development's TA practice for this reason, beyond the area of macrofinancial linkages. See, for example, Feridhanusetyawan and others (2025).

- At the same time, higher corporate defaults erode bank profits and deplete capital, reducing the capitalization ratio and increasing the probability of bank default (that is, systemic risk). Banks respond by raising lending rates to rebuild capital, further increasing corporate borrowing costs. This feedback intensifies the downturn and links corporate risk to systemic risk, reinforcing the financial accelerator. This is a novel feature of the model: Bank and corporate default are interdependent and therefore reinforce one another directly and indirectly (through endogenous dynamics), introducing an important channel of shock amplification.
- Firms face a collateral constraint: They can borrow only up to the value of their assets, as governed by a loan-to-value (LTV) ratio. A decline in asset prices reduces collateral value, tightening the borrowing constraint. Even if firms are willing to borrow at higher rates, they may be unable to, forcing cuts to investment and deepening the contraction—this is the financial accelerator introduced by Kiyotaki and Moore (1997), later popularized by Iacoviello (2015).
- A similar constraint applies to banks through a capital adequacy ratio (CAR): Banks must hold a minimum level of capital relative to their risk-weighted assets (RWAs). An erosion in capital forces banks to contract credit, reinforcing the downturn.

Second, in fact, as embodied in FPP-FIN, banks create deposits when they create loans. They are constrained not by the stock of reserves available, as these are provided by the Central Bank on demand, given the policy interest rate, but by their stock of capital, given capital adequacy requirements and their risk appetite.

Policy Challenge

The key policy challenge is to set CAR and LTV to balance the trade-off between: (1) supporting economic growth, and (2) containing the buildup of corporate and systemic financial risks associated with the borrowing needed to finance investment. This trade-off underscores the importance of macroprudential regulation within a structural framework that included multiple macrofinancial linkages across the real and financial sectors.

3. The FPP-FIN Approach

This chapter opens with an overview of a stylized banking system to clarify the core building blocks of the framework. It then presents an illustrative model that highlights the key features of a banking system that can be appended to a range of macroeconomic frameworks.

This chapter introduces an approach to embedding a richer financial sector within a standard IMF macroeconomic framework by appending a modular macrofinancial extension to an existing framework. A core design principle is to meet country authorities and desk officers where they are. Accordingly, the extension is designed to integrate seamlessly into a wide range of existing macroeconomic frameworks in a minimally invasive manner, without fundamentally altering the underlying models used for forecasting and policy analysis. The financial sector is represented by the aggregate banking system's income statement, balance sheet, and key banking indicators. These elements are used to project key financial sector variables—such as bank capitalization, asset quality, and profitability—conditional on country-specific macroeconomic forecasts, leveraging the IMF's FSIs (see Box 6). The FSI database provides a harmonized set of readily available indicators that enable consistent cross-country analysis and underpin the FPP-FIN approach. A key objective is to generate FSI projections that anchor a financial stability baseline consistent with, and complementary to, the macroeconomic outlook from the traditional sectors of the underlying framework, thereby enriching macrofinancial analysis. Before turning to the technical details, the chapter begins with an overview of a stylized banking system to clarify the core macrofinancial linkages.

A. Overview of a Stylized Banking System

A stylized banking system is represented by an aggregated income statement, balance sheet, and key banking metrics. We now proceed with an overview of each and its key components (Table 1).

Income Statement

The key elements of the banking system income statement are the following:

- *Net interest income* (NII) is defined as interest income earned on interest-earning assets minus interest expense paid on interest-bearing liabilities. It captures the core intermediation function of banks: transforming funding—often shorter-maturity deposits and wholesale liabilities—into longer-term loans and securities. Key determinants of NII include lending and deposit rates, the size and composition of the loan book and funding base, the maturity and repricing structure of assets and liabilities, and broader macroeconomic conditions. NII is also influenced by changes in credit risk, asset quality, funding mix, portfolio size, and the slope of the yield curve. Interest rate changes affect NII mainly through new lending and repricing instruments, whereas fixed-rate loans originated in the past are largely insulated until maturity. As a result, the pass-through from monetary and financial conditions to bank income is gradual and state dependent, reflecting balance sheet repricing structures.
- *Net noninterest income* (NNII) comprises fee and commission income and other revenues not directly related to traditional intermediation activities. These typically include payment and transaction fees, asset management and underwriting income, trading revenues, and other service-based charges, net of associated noninterest expenses. In many macrofinancial applications, NNII is projected to evolve broadly in line with economic activity, reflecting its close link to transaction volumes, financial market conditions, and overall business activity.

- *Loan loss provisions* (LLPs) are expenses set aside to cover expected credit losses (the accounting recognition that some earning assets will generate less income than expected). In practice, provisioning is closely linked to regulatory asset quality indicators, particularly the NPL ratio. A higher NPL ratio signals credit deterioration and leads banks to increase provisions, reducing current profits and capital accumulation. Although NPLs increase during downturns and episodes of financial stress, reinforcing pressure on bank balance sheets, their recognition typically lags the business cycle. When recoveries are slow, and write-offs are delayed, however, impaired assets continue to tie up capital, weaken banks' risk-bearing capacity, depress credit supply, and both amplify and prolong macroeconomic downturns (Ari, Chen, and Ratnovski 2019).
- *Dividends* are distributed at management's discretion; however, the dividend payout ratio (DPR) may be constrained by regulatory requirements and macroprudential policies, particularly when capital buffers are drawn down, or profitability weakens. Retained earnings, defined as profits not distributed to shareholders, accumulate to strengthen bank capital and represent the primary internal source of capital formation.

Balance Sheet

The balance sheet representation is intentionally stylized, reflecting data limitations and cross-country comparability constraints across many jurisdictions:

- This simplification is particularly pronounced on the liability side, where detailed information on funding composition is often unavailable. As a result, liabilities are typically aggregated into capital and an "other liabilities" category, which may include wholesale funding and other market-based sources that are relevant for assessing rollover and liquidity risks.
- The asset side is similarly aggregated, with nonloan assets grouped under "other assets," including holdings of government securities. Although such securities are often considered safe assets, they may expose banks to valuation losses arising from interest rate movements or sovereign risk concentration. Although loans may be decomposed into gross loans and (specific) provisions for analytical purposes, many simplified macrofinancial applications do not model these components separately.[17] Supervisors in many jurisdictions possess more granular data that would allow both sides of the balance sheet to be further disaggregated, thereby enriching the analysis. For tractability, total assets—capturing overall balance sheet size—are often assumed to evolve broadly in line with nominal GDP growth.

Table 1. Stylized Income Statement, Balance Sheet, and Selected Regulatory Indicators

Income Statement	Balance Sheet		Regulatory Indicators
	Assets	***Liabilities***	
Net interest income (NII)	Loans	Deposits	Regulatory capital
Noninterest income (net)	Gross loans		Tier 1 capital
Provisions (for loan losses)	Specific provisions		Risk-weighted assets (RWA)
Tax expense			Tier 1 capital ratio
Net income after tax	Other assets	Other liabilities	
Dividends paid			Nonperforming loans (NPLs)
Retained earnings (RE)		Capital	
Source: Authors' illustration.			

[17] Specific provisions relate to identified impaired loans; general (collective) provisions cover expected losses on the performing loan portfolio.

Regulatory, Supervisory, and Bank Performance Metrics

The main metrics cover capital adequacy, asset quality, profitability, and liquidity:

- Capital adequacy: Measures of capital adequacy are among the most important regulatory metrics for macrofinancial analysis, as they capture banks' capacity to absorb losses without disrupting intermediation or aggravating adverse financial-real economy feedback loops. Accordingly, they feature prominently in FSI tables (Table 2). Dividing regulatory capital by risk-weighted assets (RWAs) yields risk-based regulatory capital ratios. Depending on which type of regulatory capital is considered, the ratio becomes the capital adequacy ratio, the Tier 1 ratio, the Core Tier 1 ratio, or the Common Equity Tier 1 ratio—ordered by the quality of capital and loss-absorbing capacity.[18] A key post–global financial crisis reform under Basel III was not only to increase the quantity of capital but also to strengthen its quality—placing greater emphasis on common equity as the primary loss-absorbing buffer (Common Equity Tier 1 ratio).[19]
- Asset quality: The NPL ratio, discussed earlier, is a key measure of asset quality that provides a direct indicator of credit deterioration. A complementary indicator is the provisioning (or coverage) ratio—provisions relative to NPLs—which captures the degree to which expected losses on impaired loans are already recognized on the balance sheet—a low ratio may signal structural underprovisioning and vulnerability to future losses. LLPs are recorded through the income statement and directly determine banks' credit risk costs, weighing on profitability and capital accumulation. At the same time, NPLs that are not resolved through recoveries or write-offs continue to encumber regulatory capital, limiting banks' balance sheet capacity and constraining new lending.
- Profitability: Return on assets (ROA) and return on equity (ROE) are defined as net income divided by total assets and equity, respectively. They measure the profitability generated per unit of assets and per unit of shareholder capital, and are key indicators of banks' capacity to internally generate capital and absorb shocks without impairing intermediation. The net interest margin (NIM)—closely related to the discussion of NII earlier—captures the interest rate spread earned on the bank's core intermediation activities and is a central channel through which monetary and financial conditions affect bank profitability, reflecting funding costs, asset yields, and balance sheet composition. The ratio of noninterest expenses to gross income measures cost efficiency: Lower values indicate greater operating efficiency and stronger income retention.
- Liquidity and funding: A traditional liquidity metric is the ratio of liquid assets to short-term liabilities, which gauges a bank's capacity to meet near-term obligations without resorting to fire sales or costly funding.[20] Assessing the extent to which customer deposits cover loans on the bank's balance sheet—often summarized by the loan-to-deposit ratio—sheds light on funding resilience, as greater deposit funding reduces rollover risk and dampens the transmission of funding liquidity risk to credit supply.

[18] Tier 1 capital primarily consists of common equity (CET1)—paid-in capital and retained earnings—and certain additional capital instruments (for example, contingent convertible bonds "CoCos").

[19] RWA measures the bank's assets adjusted for their credit risk. RWA depends on total accounting assets, which are influenced by credit growth, and the average risk weight. In many cases, the RWA density (the RWA-to-total-accounting-assets ratio) is initially assumed to be constant. This assumption is in line with the Basel Standardized Approach and can be adjusted to reflect country-specific factors, cyclical conditions, changes in portfolio composition, or the effects of higher risk taking. Other capital adequacy metrics rely on broader measures of exposure, including total (non-risk-weighted) assets, thereby serving as a backstop against the potential understatement of risk weights.

[20] Basel III introduced two regulatory liquidity standards. The Liquidity Coverage Ratio requires banks to hold sufficient high-quality liquid assets to withstand 30 days of stressed cash outflows. The Net Stable Funding Ratio promotes more stable medium-term funding by requiring available stable funding to exceed required stable funding over a one-year horizon. Calculating liquidity ratios requires detailed, high-frequency liquidity position data. Such data are typically not publicly available and instead provided by banks directly to the supervisory authority, either upon request or as part of established supervisory liquidity reporting systems.

Table 2. Stylized Financial Soundness Indicators (FSIs) Table for a Banking System

Capital Adequacy
Regulatory capital to risk-weighted assets
Tier 1 capital to risk-weighted assets
Tier 1 capital to assets
Asset quality
Nonperforming loans (NPLs) to total gross loans
Provisions to NPLs
NPLs to capital
Earnings and Profitability
Return on assets (ROA)
Return on equity (ROE)
Interest margin to gross income
Noninterest expenses to gross income
Liquidity
Liquid assets to total assets
Liquid assets to short-term liabilities
Sensitivity to Market Risk
Net open position in foreign exchange to capital
Source: Authors' illustration. NPLs = Nonperforming loans; ROA = Return on assets; ROE = Return on equity.

B. FPP-FIN: Conceptual Model

This section presents an illustrative model, inspired by the literature discussed in Chapter II—particularly the structural framework in Box 4—that shows how key features of a banking system can, together with expert judgment, be appended to a range of macroeconomic frameworks.

This section presents an illustrative macrofinancial model that serves as a conceptual framework underpinning the FPP-FIN approach. The model, based on Elekdag and Kopp (2026), is deliberately parsimonious to focus attention on macrofinancial channels and feedback mechanisms. For instance, it is formulated as a closed-economy real model that abstracts from fiscal policy and nominal dynamics and therefore does not feature a role for monetary policy. A key feature of the model is that it is fully recursive and can readily be implemented in a wide array of packages (including spreadsheet-based software).

The model is organized into three blocks covering (1) the real economy, monetary policy, and credit demand; (2) key banking system income statement, balance sheet, and other key metrics; and (3) the lending rate and the monetary conditions index (MCI).

Block 1: Real Economy, Monetary Policy, and Credit Demand

The first block consists of four equations:

$$\hat{y}_t = \rho_y \hat{y}_{t-1} - b_{ymci} mci_{t-1} + \varepsilon_t^y \tag{1}$$

$$g_t = \bar{g} + (\hat{y}_t - \hat{y}_{t-1}) \tag{2}$$

$$r_t = (1 - \rho_r)\bar{r} + \rho_r r_{t-1} + \varepsilon_t^r \tag{3}$$

$$credy_t = \rho_{cred} credy_{t-1} + (1 - \rho_{cred})\overline{credy} + b_{credyy}\hat{y}_t - b_{credyr}(r_{t-1}^L - \bar{r}^L) \tag{4}$$

- The first equation summarizes aggregate demand, with the output gap ($\hat{y}_t$) depending on its own lag, the lagged MCI (defined later in equation 16), and an exogenous demand shock (ε_t^y), and can be interpreted as a variant of a textbook IS curve. Persistence parameters are represented throughout by ρ (such as ρ_y), and exogenous shocks are denoted by ε_t. Although some variables are denoted with "hats," such as the output gap (denoting percent deviations from steady state), in other cases these deviations are explicitly written for greater clarity. Although the notation for certain parameters can be cumbersome, they are chosen to associate each coefficient with its explanatory variable (for example b_{ymci}, which captures the sensitivity of the output gap to the MCI).
- The second equation links the output gap to real GDP growth (g_t), which converges to its steady-state value ($\bar{g}$).[21]
- The third equation describes a passive monetary policy rule, under which the real policy rate (r_t) reverts to the natural rate ($\bar{r}$) at a speed governed by its persistence parameter (ρ_r).
- The fourth equation captures credit demand through the credit-to-GDP ratio ($credy_t$), which depends on the contemporaneous output gap, the lagged lending-rate gap, and its own persistence, while converging to its steady-state level ($\overline{credy}$). The first three equations are expressed in percentage points, whereas the credit-to-GDP ratio is measured in percent of GDP.

Block 2: Banking System Balance Sheet, Income Statement, and Key Banking Metrics

This block represents the central departure from most existing macrofinancial frameworks used in the literature and in policy applications. It allows for an explicit and relatively granular projection of the banking system's balance sheet, income statement, and key regulatory capital metrics, thereby enabling a richer and more transparent macrofinancial analysis. The block consists of a set of equations covering asset growth and asset quality (including NPLs); banking system profitability and its main subcomponents (interest and noninterest income); bank capital accumulation; and the capital gap relative to regulatory requirements.

$$Assets_t = Assets_{t-1} \quad \left(1 + \frac{g_t}{100}\right) \tag{5}$$

$$npl_t = (1 - \rho_{npl})\overline{npl} + \rho_{npl} npl_{t-1} - b_{nply}\hat{y}_t + b_{nplr}(r_{t-1}^L - \bar{r}^L) + \varepsilon_t^{npl} \tag{6}$$

$$LLP_t = b_{llpnpl}\left(\frac{npl_t}{100}\right) Assets_{t-1} + \varepsilon_t^{LLP} \tag{7}$$

[21] Although omitted for parsimony, a shock term could be readily added to this equation to capture changes to potential or trend growth; analogous shocks could also be introduced in other model equations, such as equation (4).

$$Other_t = \chi \, Assets_{t-1} \tag{8}$$

$$\Pi_t = b_{pispread}\left(\frac{r^L_{t-1} - r_{t-1}}{100}\right) Assets_{t-1} - b_{pillp} LLP_t + Other_t + \varepsilon^{pi}_t \tag{9}$$

$$RE_t = (1 - DPR)\Pi_t \tag{10}$$

$$K_t = K_{t-1} + RE_t \tag{11}$$

The key relationships embedded in the banking system block are summarized as follows:

- We begin by assuming that, along the balanced-growth path, real bank assets grow at the same constant rate as real GDP (equation 5). As elsewhere, a shock term provides a way to add nonmodeled information or to capture specification errors such as nonlinearities ("judgment") and to fit historical data.[22]
- Asset quality is summarized by the NPL ratio, which evolves according to equation (6), where the ratio depends on its steady-state value ($\overline{npl}$), its own persistence, macroeconomic conditions (captured by the output gap), and lending-rate conditions. LLPs are then computed as a fixed fraction of lagged assets, scaled by the contemporaneous NPL ratio (equation 7).[23]
- NNII is captured by the term ($Other_t$), which is scaled proportionally to the size of the banking system—a feature whose importance will be emphasized later.
- Taken together, banking system profitability, Π_t, evolves according to equation (9), where the first term represents NII.[24] Profits are thus driven by the interest rate spread applied to the existing asset stock, offset by provisioning costs, and supplemented by noninterest income.
- Retained earnings (RE) and bank capital accumulation follow standard accounting identities (equations 10 and 11). Note that *DPR* denotes the dividend payout ratio.[25]

A key concept is the notion of the capital gap, which underpins the provision of credit. Since generating higher profits or raising additional equity typically takes more time, especially during periods of acute financial distress, banks often respond first by cutting back on lending to reduce RWA as a quick way to strengthen their capital ratio.[26] As shown in equation (12), the capital gap ($capgap_t$) is defined as the difference between actual regulatory capital—measured as bank capital relative to RWAs (with ω denoting the

[22] In principle, shocks could be introduced into all equations; however, in the interest of parsimony, some are excluded, particularly those corresponding to equations that represent accounting identities.

[23] Note that we use (total) assets as a proxy here; a simple fix while retaining model parsimony, would be to scale the parameter (b_{llpnpl}) in line with the loans-to-assets ratio in the data.

[24] Profits should be interpreted as posttax profits, with the tax rate omitted for brevity.

[25] The dividend payout ratio can be made state contingent—lower payout when capitalization falls below target, consistent with Basel distribution restrictions and observed bank behavior (Couaillier and others 2022)—which introduces an endogenous capital-rebuilding channel; see Elekdag and Kopp (2026).

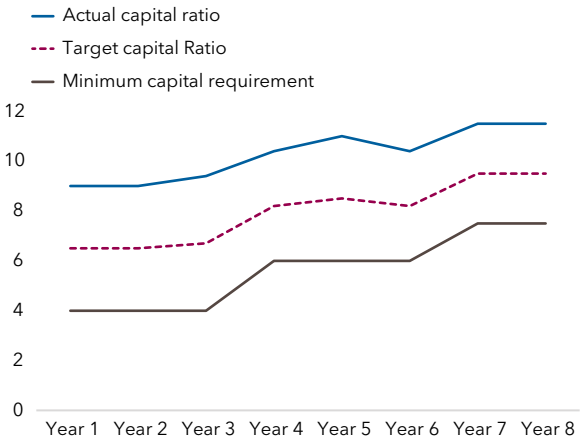
[26] While risk-weighted assets (RWAs) cover not only credit risk but also market, operational, and other risks (including counterparty credit risk, securitization, and credit valuation adjustment risk under Basel III; Basel Committee on Banking Supervision 2022), credit risk RWAs generally dominate, typically accounting for 70%–90% of total RWAs across banks (Berger and Bouwman 2014). Accordingly, when capital space is scarce, it is reasonable to assume that banks would allocate it primarily to credit intermediation (loans), rather than to activities that expand market risk exposures or materially alter operational-risk RWAs, which are usually more stable absent regulatory changes or significant revisions in historical loss data.

average risk weight)—and the minimum regulatory capital requirement (CAR^{REG}).[27] The capital gap captures a management buffer above minimum regulatory requirements, serving as the relevant reference point for the "target" capitalization ratio (Figure 1).[28]

$$capgap_t = 100 \frac{K_t}{\omega \ Assets_t} - CAR^{REG} \tag{12}$$

Several mutually reinforcing forces lead banks to target capital ratios well above regulatory minima. First, under Basel III, the Capital Conservation Buffer triggers automatic distribution restrictions: once a bank's CET1 ratio enters the buffer range, dividends, share buybacks, and discretionary compensation become constrained (Couaillier and others 2022). Second, banks' internal targets also reflect risk appetite, peer benchmarking, rating-agency expectations, and the desire to maintain buffers against idiosyncratic losses (Ghosh 2018; Acharya and Steffen 2020; Couaillier 2021). Third, banks operating close to regulatory floors may face higher funding costs, including wider credit default swap spreads and potential rating downgrades, raising the marginal cost of funding well before any formal threshold is breached (Berrospide and Edge 2010; Cohen and Scatigna 2016; Andreeva, Bochmann, and Couaillier 2020). The binding "minimum" for bank decision making is therefore often the internal target capital ratio—typically several percentage points above the legal floor—so capital pressure can constrain lending well before regulatory thresholds are crossed.

Figure 1. Actual, Target, and Minimum Capital Ratios
(Percent)



Source: Authors' calculations.

[27] Equation (12) can be extended to illustrate how the model can be used as a first-pass tool to assess selected macroprudential policy experiments, while remaining mindful of its limitations. In particular, the minimum regulatory capital requirement can be made time-varying, allowing for an assessment of changes in capital regulation. For example, exploratory simulations of a countercyclical capital buffer (CCyB) could be readily conducted within this framework, providing a transparent starting point for policy analysis.

[28] For example, if the minimum regulatory requirement is 10 percent, bank management may target an actual capital ratio of 11 percent, implying a management buffer of 1 percentage point (of which the steady-state value is represented by ($\overline{capgap}$). In practice, bank management may target a higher capitalization level, such that together with the regulatory requirement it serves as an effective minimum: 100 ($K_t/\omega Assets_t$) ≥ CAR^{REG} + $capgap_t$. In reality, individual banks typically hold an additional 1½%–2½% in capital as a management buffer.

Nonlinear Dynamics

The subsection focuses on a key distinguishing feature of the model—its ability to capture nonlinear and asymmetric dynamics—thereby highlighting the potentially severe macrofinancial consequences of acute banking system distress. Consider the following two equations, which introduce the capital shortfall ($shortfall_t$) and the adjusted capital gap ($capgap_t^{adj}$):

$$shortfall_t = \max\{0, -(capgap_t - \overline{capgap})\} \tag{13}$$

$$capgap_t^{adj} = capgap_t - \varphi\ shortfall_t \tag{14}$$

- The variable $shortfall_t$ captures the erosion of the bank's management capital buffer relative to its target level. Specifically, $\overline{capgap}$ denotes the desired buffer above the regulatory capital requirement. A shortfall emerges when the actual capital gap falls below this buffer, $capgap_t < \overline{capgap}$, with its size equal to the distance between the target buffer and the actual capital gap. Thus, $shortfall_t$ signals insufficient capital buffers before capital necessarily falls below the regulatory minimum.
- The variable $capgap_t^{adj}$ represents the adjusted capital gap that enters the lending-rate equation (discussed later), obtained by correcting the raw capital gap for any active shortfall. The adjusted capital gap therefore governs how solvency vulnerabilities translate into tighter lending conditions. The parameter φ controls the strength of the nonlinear amplification once a capital shortfall materializes, with higher values implying a stronger pass-through from shortfall to effective capital tightness.

Block 3: Lending Rate and Monetary Conditions Index

This block characterizes aggregate credit conditions through the determination of the lending rate and the MCI.

$$r_t^L = r_t + \eta + b_{rlcredy}\left(credy_{t-1} - \overline{credy}\right) - b_{rlcapgap}\left(capgap_t^{adj} - \overline{capgap}\right) + \varepsilon_t^{r^L} \tag{15}$$

$$mci_t = b_{mcir}(r_t - \bar{r}) + (1 - b_{mcir})(r_t^L - \bar{r}^L) \tag{16}$$

Equation (15) plays a central role in the model: It specifies the lending rate (r_t^L), which depends on the policy rate, the lagged credit-to-GDP gap, and the difference between the capital gap and its steady-state value.[29] The equation summarizes aggregate credit conditions, with the lending rate adjusting to reconcile credit demand pressures (through the credit gap) and credit supply conditions (through deviations in bank capitalization). The latter feature is noteworthy: when the adjusted capital gap falls below its steady-state value, that is, when ($capgap_t^{adj}$ _ $\overline{capgap}$) < 0, the lending rate rises, possibly in a nonlinear fashion, capturing the notion of a capital crunch described by Bernanke and Lown (1991).[30] Lastly, the MCI is then defined as a weighted average of the policy-rate and lending-rate gaps (equation 16); a broader financial conditions index can be considered as well.

[29] Notice that the credit term in equation (15) bears a resemblance to the Basel credit-to-GDP gap, with the important distinction that, in this simplified representation, the long-run (trend) credit-to-GDP ratio is assumed to be constant rather than slow-moving. Two natural extensions suggest themselves. First, the constant benchmark can be replaced by a time-varying trend for the credit-to-GDP ratio, bringing the specification closer to the Basel methodology. Second, credit and output could be modeled separately—allowing the numerator and denominator to evolve at different rates—which would strengthen the financial accelerator mechanism, albeit at the cost of increasing the model's complexity. Note also that $\bar{r}^L = \bar{r} + \eta$. In addition, along with equation (9), equation (15) abstracts from asset and liability repricing. The lending rate should be interpreted as an average lending yield, while the policy rate proxies funding conditions. Actual pass-through may be gradual or incomplete because of funding spreads, repricing lags, and balance sheet structure; such effects can be incorporated through judgment or satellite models where warranted.

[30] One parsimonious way to introduce credit rationing is to broaden the monetary conditions index (MCI) into a financial conditions index (FCI) that incorporates defined as ($capgap_t^{adj} - \overline{capgap}$). This formulation captures the idea that credit conditions may become restrictive even when the lending rate remains relatively stable—an outcome that may be particularly prevalent in financial systems with a large share of public banks or extensive directed lending. Accordingly, the next chapter discusses how quantity-based credit rationing could be introduced.

Model Properties

The framework is intended as a conceptual illustration, and no single parameterization would translate meaningfully across diverse country applications. Although a full treatment of parameterization and the steady state is left to Elekdag and Kopp (2026), two observations nonetheless stand out: First, existing macroeconomic frameworks can inform the calibration of Blocks 1 and 3; since these equations capture familiar macroeconomic relationships, ratio analysis, statistical estimation, and the empirical literature can also be used. Second, much of Block 2 consists of accounting identities, which simplifies calibration considerably, and the parameter in equation (7) can be anchored to the observed loan loss provisioning ratio. Equation (6) is a key behavioral relationship; its calibration could draw on regression analysis or common credit risk models (Foglia 2009; Ong 2014), complemented by judgment. The IMF's Global Stress Test (Ding and others 2022) offers additional country-specific benchmarks, including for equation (6).[31]

To provide insight into the model's dynamics and the associated macrofinancial feedback mechanisms, this section summarizes the effects of three shocks on three core variables. Specifically, we examine the responses of the output gap, the capital gap, and the (real) lending rate to an adverse aggregate demand shock.[32] The figures report impulse responses under three configurations: (1) the baseline ("Baseline"), where the sensitivity of the lending rate to the capital gap term in equation (15) is shut down ($b_{rlcapgap} = 0$), (2) a financial accelerator ("Accelerator") case, and (3) a nonlinear financial accelerator case ("Nonlinear"). The baseline serves both as a benchmark and as a diagnostic for system stability: although not shown, bank assets, LLPs, profits, and capital all evolve smoothly along the balanced-growth path, whereas the output gap, capital gap, and real lending rate remain at their steady-state values.

We begin with an adverse aggregate demand shock, calibrated as a 1-percentage-point negative shock to the output gap in 2001 (Figure 2). As expected, the output gap falls on impact. This deterioration in macroeconomic conditions leads to an increase in the NPL ratio, which in turn raises LLPs and erodes bank profits, slowing the accumulation of bank capital. The result is a progressive deterioration in the capital gap, which highlights the difference between the baseline and financial accelerator cases. In the Accelerator case, banks respond to weaker capitalization by raising the lending rate in an effort to rebuild capital buffers. This pushes up the MCI and acts as a drag on the recovery, reinforcing the downturn through the financial accelerator channel. The chain of events can be summarized as follows:

$$\hat{y}_t \downarrow\rightarrow \underbrace{npl_t \rightarrow LLP_t \rightarrow \Pi_t \downarrow\rightarrow RE_t \downarrow\rightarrow K_t \downarrow\rightarrow capgap_t \downarrow\rightarrow (capgap_t - \overline{capgap})}_{Banking\ System\ Block} \downarrow\rightarrow r_t^L \uparrow\rightarrow mci_t \uparrow\rightarrow \hat{y}_{t+1} \downarrow$$

Given the conservative calibration, the impact of the financial accelerator is economically meaningful but not excessive. For some country cases, this channel could be considerably stronger, as discussed later. In the baseline case, by contrast, the lending rate does not respond to movements in the capital gap. The absence of an increase in the lending rate limits the banking system's ability to rebuild capital through NII.

[31] See also forthcoming *Quarterly Projection Model User Guide*, or earlier work by Berg, Karam, and Laxton (2006). In applications where loan-loss provision ratios are approximately stable, which they tend to be, loan loss provision (LLP) coefficients can be translated into implied nonperforming loan (NPL) coefficients and used as calibration benchmarks for the NPL equation. Estimates from the IMF's Global Stress Test (GST) provide a useful cross-country reference range. Similarly, Hardy and Schmieder (2013) report ranges for default probabilities (DPs) and loss-given-default rates, which can be used to derive benchmarks for NPL and LLP ratios (IMF 2023).

[32] See Elekdag and Kopp (2026) for responses to other shocks, model extensions, and further details.

We now consider the adverse aggregate demand shock under a nonlinear specification. Several points are worth noting. First, once the nonlinear mechanism is activated ($\varphi > 0$) , the lending rate rises more markedly, reflecting heightened sensitivity to capital distress (Figure 2). Second, the response is asymmetric: comparable nonlinear effects would not arise following a favorable aggregate demand shock. Third, the calibration is conservative—whereas the nonlinear (shortfall) mechanism and the financial accelerator reinforce one another, both channels can be readily strengthened, as noted earlier. Importantly, the objective here is not necessarily to emphasize the strength of the financial accelerator mechanism but rather to enhance understanding of key macrofinancial linkages and their implications. Fourth, this nonlinear feature distinguishes the framework from many existing macrofinancial models with banking sectors, including standard dynamic stochastic general equilibrium (DSGE) formulations.

The model can be extended to capture a credit boom. The two preceding cases illustrate how macrofinancial feedback varies with the condition of the banking system—for example, feedback effects are likely to be more limited in a well-capitalized system than in a poorly capitalized system under stress. A third state corresponds to a credit boom, which can be modeled by allowing the steady-state credit-to-GDP ratio, $\overline{credy}$, to evolve over time and be subject to a persistent shock. A positive shock may be interpreted as a structural increase in financial deepening, leading to lower lending rates and higher credit demand, thereby stimulating economic activity. However, as documented by Schularick and Taylor (2012), credit-driven expansions have often culminated in systemic financial crises. To capture these risks more realistically, the scenario could incorporate endogenous increases in credit risk—for example, by raising risk weights if banks extend credit to riskier borrowers, with corresponding implications for capital ratios.

Key Model Features

There are several features of the model worth mentioning before closing this section.

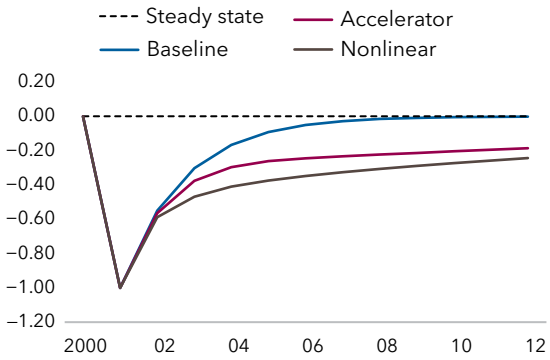
- First, the model is fully recursive and can be readily implemented in standard statistical, numerical, and even spreadsheet-based environments. Once calibrated and given initial conditions, the model can be used for scenario analysis and forecasting, making it well suited for applied policy work.
- Second, although key banking system quantities—such as assets and retained earnings—grow along the balanced-growth path in line with steady-state real GDP growth, all rates and ratios are stationary around their steady-state values. This includes, in particular, the capital gap. This stationarity property is important, as it avoids spurious drift in bank capitalization—a well-known challenge in applied macrofinancial policy models—and facilitates meaningful policy simulations.
- Third, the model features a financial accelerator mechanism operating through a macrofinancial feedback loop. Importantly, the tightening in monetary conditions feeds back into the real economy with a one-period lag, suppressing the output gap in the subsequent period. This timing convention ensures a fully recursive model and facilitates computations. It also reflects elements of reality, as the effects of monetary conditions on the economy materialize with a lag. Although this design enhances transparency and tractability, together with a granular representation of the banking system, it necessarily attenuates the contemporaneous strength of the financial accelerator relative to fully forward-looking frameworks such as Bernanke, Gertler, and Gilchrist (1999) or Elekdag and others (2026).[33]
- Fourth, although the current setup is presented as a standalone model, it is designed to augment existing macroeconomic frameworks in a minimally invasive manner, as discussed in the following section.

[33] That said, the strength of the financial accelerator mechanism is not the primary focus of this illustrative model. Instead, the model is designed to guide users through key macrofinancial feedback channels, thereby supporting macrofinancial surveillance, lending, and capacity development work. As noted in Elekdag and Kopp (2026), the calibration is deliberately conservative and could be modified to amplify the financial accelerator channel. Also note that, for tractability, the model is backward looking: Fully forward-looking models such as Elekdag and others (2026) result in a more powerful financial accelerator mechanism.

Figure 2. Impact of an Adverse Aggregate Demand Shock

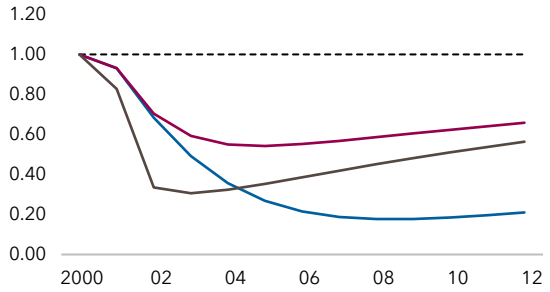
1. Output Gap

(Percent)



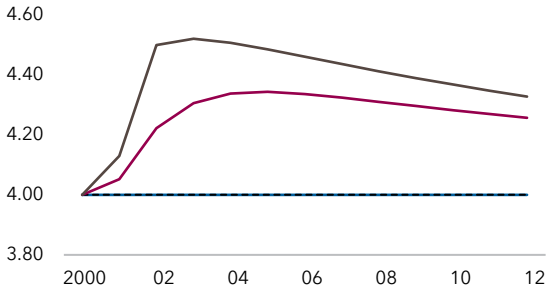
2. Capital Gap

(Percent)



3. Lending Rate

(Percent)



Source: Authors' calculations.

Note: The output gap and capital gap are expressed as percent deviations from their respective steady states, whereas the real lending rate is measured in percentage points. "Baseline" and "Accelerator" refer, respectively, to the linear version of the model without and with an operational financial accelerator mechanism. "Nonlinear" refers to the nonlinear specification of the financial accelerator model.

Limitations and Potential Extensions

Several limitations of the current framework should be acknowledged, alongside avenues for future refinement.

- First, the framework is not intended to serve as a unified macrofinancial model. Indeed, no such comprehensive framework exists in the academic literature or in operational policy practice (see, for example, Independent Evaluation Office 2019 and the references in Chapter 2). Rather, the approach adopted

here is deliberately more pragmatic: it presents, as a first pass, an intentionally streamlined framework that can be selectively extended to address the most salient policy issues at the intersection of macroeconomics and finance. Specifically, FPP-FIN focuses on the two-way, and possibly nonlinear, feedback between macroeconomic conditions, banking system soundness, financial conditions (particularly lending rates), the provision of credit, and, ultimately, the financial sector's ability to support sustainable growth. The remainder of this section discusses several limitations of the framework, as well as possible extensions.[34]

- Second, aggregation. The model represents the banking system in aggregate, which may mask vulnerabilities associated with interconnected bank balance sheets in the cross-section of institutions and tail risks arising from heterogeneity (see, for example, Elekdag, Malik, and Mitra 2020). Although this aggregation is a practical starting point—and standard in most macrofinancial applications—it abstracts from potential cross-bank differences in capitalization, asset quality, profitability, and funding structures, even if the aggregate measure is weighted by assets. More broadly, even an aggregated decomposition of household and corporate balance sheets—often key sources of systemic vulnerability—is not explicitly incorporated in most macroeconomic frameworks, representing another area for future research, particularly given their interconnections with the banking system.
- Third, cross-country applicability. The benchmark version of FPP-FIN is relatively better suited for emerging market, frontier, and low-income countries with bank-dominated financial systems, especially where banks are domestically funded, hold substantial domestic assets, and represent the main channel through which macroeconomic shocks affect credit supply, asset quality, profitability, and capital adequacy. It is less suited as a standalone framework for highly market-based or internationally integrated financial systems, where nonbank intermediation, capital market financing, securitization, or cross-border wholesale funding are central to macrofinancial transmission. At the same time, the framework could be extended to capture selected nonbank financial intermediaries (NBFIs). Depending on the specific characteristics of the financial system, these could include finance companies, mortgage and consumer credit providers, and similar institutions (including Fintechs with comparable business models) that extend credit on their own balance sheets and whose lending capacity depends on net worth, leverage, or regulatory solvency requirements.
- Fourth, asset prices and exchange rates. The framework does not explicitly model asset prices (and associated collateral effects), which are central to macrofinancial vulnerabilities. Many macroeconomic frameworks are developed at the annual frequency, whereas others operate at the quarterly frequency, even when they incorporate higher-frequency indicators. As such, reconciling high-frequency asset price movements with lower-frequency macroeconomic developments can be challenging. However, persistent asset price trends can be incorporated indirectly and as determinants of NPLs. Likewise, exchange rate dynamics and their interaction with balance sheets are not included in the current FPP-FIN extension (though still part of the underlying macroeconomic framework). Greater granularity on FX-denominated lending—particularly distinguishing between retail and corporate exposures—would improve risk assessment in this context. Although capital flows and exchange rates are typically incorporated in standard macroeconomic frameworks, their feedback to bank balance sheets—including through global financial cycle dynamics—could extend beyond the modeled interest rate or spread channels and be more fully integrated, subject to data availability. Similarly, valuation effects on government bond holdings and associated interest rate risk, particularly in the context of the bank–sovereign nexus, are not modeled

[34] As discussed in Box 3, FPP-FIN can be complemented by a broader set of macrofinancial tools, thereby augmenting the IMF's macrofinancial toolkit and allowing for more detailed analysis of specific macrofinancial linkages, risks, and vulnerabilities. One important omission is the treatment of liquidity risk, a core dimension of bank soundness. This reflects both data limitations and the fact that liquidity risks often materialize at a higher frequency than the framework's typical annual horizon. A possible extension would be to relax the assumption that the real policy rate fully captures bank funding costs, and instead allow funding costs to vary with bank solvency conditions.

in the current FPP-FIN framework. Liquidity risks are also beyond the present scope; a natural extension would incorporate solvency–liquidity feedback loops, for example, by linking bank funding costs to capital adequacy.

- Fifth, fiscal sector financing links could be added. In principle, although the current framework provides feedback to the fiscal sector through output, which affects tax revenue, explicit government financing by the financial sector is omitted.[35] To include this link explicitly, the banking system's aggregate balance sheet could be expanded with a new asset: holdings of government bonds. Government bonds could then be modeled to react to changes in valuation in line with the endogenous dynamics in FPP-FIN described earlier. For example, they could be set to be inversely related to domestic or foreign interest rates.[36] This would result in an additional layer of shock transmission to banks' balance sheets in response to changes in government debt, compounding its impact on private credit and output through its effect on asset values and thus the capital gap.
- Sixth, international capital flows vis-à-vis the financial sector are implicitly treated and should be carefully monitored and assessed in the macroeconomic framework calibration. This is needed to ensure a realistic macroeconomic forecast given the flow and stock implications for the balance of payments. Specifically, in the proposed setup, lending rates affect credit dynamics and monetary conditions. This requires accommodation in the financial account of the balance of payments for net financial sector flows, consistent with the FPP-FIN calibrated dynamics of private credit affecting banks' net foreign assets or a commensurate change in the central bank's net foreign assets. To the degree that changes in interest rates are set to affect domestic saving through a reaction of private consumption and investment, there will also be a change in other components of the current account balance.
- Seventh, systemic externalities and risk dynamics. Although the lending spread responds to balance sheet fundamentals such as capitalization, the framework does not explicitly incorporate independent shifts in risk appetite—potentially associated with belief distortions or changes in volatility—that may compress spreads during expansions and generate abrupt repricing during downturns. Nor does it explicitly model nonlinear amplification mechanisms arising from leverage, fire sales, or network spillovers. These channels are central to the buildup and unwinding of financial imbalances.[37]
- Several of these limitations are incorporated in the DSGE framework developed by Elekdag and others (2026). That model, along with other studies cited earlier, in combination with the tools noted in Box 3, could serve as a guide for selected country-specific applications, calibrated to data availability and policy needs, and complemented—as emphasized throughout—by expert judgment.

The next chapter illustrates how FPP-FIN is applied in practice through two country use cases. These two use cases illustrate that, depending on the needs of the specific country application, the framework can be implemented at different levels of complexity. The first extends the monetary sector of a traditional accounting-based macroeconomic framework through projections of FSIs and—recognizing the limitations of any model—relies heavily on expert judgment. The second use case, guided by the conceptual framework outlined earlier, incorporates additional country-specific structure that allows for explicit feedback between the real and financial sectors, with the framework serving as a guide rather than a rigid template.

[35] This contrasts with the traditional accounting-based financial programming framework, in which credit to the private sector is typically treated as a residual variable and then evaluated for its plausibility.

[36] One example could be to set the value of government bond holdings based on a debt accumulation identity on face-value government bond issuances, multiplied by a price that can be a function of the policy rate plus a sovereign premium, which would itself be a function of a public debt gap vis-à-vis a public debt target. Other specifications could be considered to better fit the data.

[37] The parsimony of the current framework has further implications. In particular, it is not designed to speak to the composition of assets. One natural direction for future work—especially in country applications—would be to allow asset growth to diverge from GDP growth. More generally, replacing the steady-state credit-to-GDP ratio with a time-varying trend or potential credit-to-GDP ratio would allow the framework to capture financial deepening. Modeling credit and GDP as distinct processes would also yield a stronger financial accelerator mechanism.

Box 5. The Banking System in Traditional Financial Programming

This box discusses how FPP-FIN addresses three limitations of the IMF's traditional financial programming approach.

The IMF's traditional Financial Programming and Policies (FPP) framework already contains the aggregate—albeit simplified—balance sheet of the deposit money banks. However, the way forecasts are constructed and interpreted has historically relied on two ideas that over time have largely lost their relevance, reflecting financial development and changes in monetary policy operating frameworks.[1]

First, traditional FPP supposes that the central bank conducts monetary policy by controlling the quantity of base money. It also supposes that banks are required to hold a fraction of each dollar deposited by the public in the form of reserves at the central bank. This required fraction, together with currency demand, determines the textbook "money multiplier," or the quantity of bank deposits supported by a given quantity of base money. According to this traditional approach, the central bank sets base money and the required reserve ratio to target a level of broad money that is consistent with its inflation and growth projections.

Second, the traditional FPP approach also supposes that banks require deposits to make loans. That is, bank customers place deposits in banks, which banks can then on-lend, and the quantity of deposits (determined originally by the quantity of base money) thus determines the banks' lending space. There is thus a sharp trade-off between bank lending to the government and to the private sector: More bank credit to the government (to cover the fiscal deficit) implies less credit to the private sector because of a crowding-out effect. Credit to the private sector becomes the final residual, and its adequacy is seen as a measure of the consistency of all the assumptions (growth, fiscal, and external) that drive it.[2]

FPP-FIN introduces three important refinements:

First, the conception that central banks run monetary policy by setting a quantity of money consistent with inflation objectives is generally no longer relevant.[3] Although some countries may pay attention to the information contained in monetary aggregates, most use an interest rate as their operational target instead of a money quantity target. Thus, in line with FPP-FIN, the quantity of base money and reserves does not constrain the scale of deposits and, thus, of bank lending.

Second, as embodied in FPP-FIN, the banking system creates deposits when it extends loans. Banks are constrained not by the stock of reserves available—since these are provided elastically by the central bank at the policy interest rate—but primarily by their stock of capital, regulatory requirements, balance sheet health, and risk appetite.[4]

Third, the traditional approach anchors fiscal crowding out primarily through the balance sheet of the banking system. Under this closure, greater bank financing of the fiscal deficit mechanically reduces the room available for private-sector lending. Although this mechanism may be relevant in financially shallow or bank-dominated systems, it is less relevant to interest rate-based monetary regimes. Moreover, in many economies, a significant share of government borrowing takes place outside the banking system, including through government bond issuance and through credit from nonbank financial institutions. In FPP-FIN, by contrast, bank credit is not mechanically constrained by deposits. Rather, lending reflects the interaction of credit demand with bank balance sheet

capacity and regulatory constraints. Specifically, the quantity of bank credit is demand determined unless the banks' lending space becomes depleted while complying with regulatory and accounting requirements.

Accordingly, fiscal crowding out operates primarily through macroeconomic channels. A fiscal expansion influences aggregate demand and may, depending on macroeconomic conditions and the monetary policy reaction function, prompt an interest rate response that tightens financial conditions and moderates private activity. These effects may be amplified if bank capital becomes constrained or if a credit gap emerges (as discussed in the main text).

FPP-FIN has already been introduced—in simplified form—in the IMF's Financial Programming and Policies (FPP) course for new staff (Box 9). The outcome has been a more relevant and operational approach to forecasting private-sector credit growth, emphasizing the interplay of credit supply and credit demand rather than money demand, and providing a clearer integration of macrofinancial linkages into the traditional framework.

[1] See Christofides and others (2005) and IMF (2014a) for a detailed discussion of the conceptual foundations and practical applications of traditional financial programming.

[2] In traditional Financial Programming and Policies (FPP) implementations, the relationship is often accounting-based rather than behavioral: (1) base money is treated as the exogenous policy anchor, (2) deposits are derived through reserve requirements, and (3) lending is constrained by deposit availability, and under this closure, private credit becomes the residual after fiscal financing needs.

[3] For low-income countries in sub-Saharan Africa, see Berg and Portillo, *Monetary Policy in SSA*, Chapter 1; the case is even clearer in more developed countries and other regions.

[4] Textbook presentations often describe banks as intermediaries that "lend out deposits," suggesting that deposit inflows precede loan creation. This description is useful for understanding funding structure and liquidity management at the level of an *individual* bank. However, at the level of the *banking system* as a whole, the accounting sequence runs in the opposite direction: when a bank extends a loan, it simultaneously creates a deposit. Deposits are therefore created endogenously through credit expansion, subject to capital, liquidity, and risk constraints. Monetary policy influences this process primarily through the policy interest rate and broader financial conditions, which affect credit demand, bank profitability, and risk-taking incentives, rather than by mechanically constraining the quantity of reserves. The apparent tension between "banks take deposits" and "banks create deposits" thus reflects the distinction between system-wide balance sheet mechanics and the funding constraints faced by individual institutions. See McLeay, Radia, and Thomas (2014) for a useful discussion.

Box 6. Financial Soundness Indicators (FSIs) Database

This box discusses the IMF's Financial Soundness Indicators (FSIs) database, a publicly available, harmonized cross-country data set that supports financial sector surveillance and provides key inputs to the FPP-FIN framework.

The IMF's FSIs database is a key input for financial sector forecasts (IMF 2019a). It serves as a valuable resource for macrofinancial analysis and is widely used across IMF surveillance activities, including Article IV Consultation Reports, Global Financial Stability Reports, and Financial Sector Assessment Programs (FSAPs). The FSI database provides a harmonized set of indicators across a broad range of countries, facilitating consistent cross-country analysis. The FSI database covers most IMF member countries and provides aggregated data on banking sector income statements, balance sheets, and other bank indicators. Its availability is thus essential for the ambitions of this paper. Without it, the cost to country teams of assembling the data required to implement FPP-FIN would be prohibitive—and

in some cases infeasible—given the confidential nature of many underlying time series. However, it is important to recognize that aggregation can obscure important dynamics at the individual institution level. For example, systemic risk—arising from common exposures and interconnectedness among banks that can trigger contagion—is better captured through more granular, bank-level data and through macroprudential stress testing of banking systems (Box 1).

Differences between FSIs and the IMF's International Financial Statistics (IFS) monetary survey may arise from coverage gaps (for example, FSIs may exclude certain banks or nonbank lenders) and from the use of prudential consolidation, which avoids double-counting of capital and activity across entities. Nevertheless, the two data sets are generally comparable, and such differences are often immaterial for macrofinancial analysis. In practice, discrepancies can typically be reconciled through appropriate scaling adjustments—see Annex 1 for further details.

Source: IMF 2019a, authors.

4. FPP-FIN: Country Applications

This chapter presents two country applications illustrating the two main FPP-FIN use cases. The first extends a traditional accounting-based macroeconomic framework with FPP-FIN—applied to Kazakhstan—and places a central role on expert judgment. The second introduces a richer structure, with explicit feedback between the real and financial sectors, drawing on approaches developed through TA projects discussed in the following chapter.

A. FPP-FIN: Application to Kazakhstan[38]

FPP-FIN was piloted during the 2024 Kazakhstan Article IV Consultation (IMF 2025). Alongside the standard macroeconomic projections, the framework provided a baseline financial stability outlook—a first for an IMF Article IV Staff Report. This marked an important step toward integrating macrofinancial analysis into IMF country surveillance. In addition, the framework supported policy analysis, including issues highlighted in the recent FSAP. Specifically, the extended framework was used to address the following policy questions:

- How would the banking system perform under the baseline macroeconomic forecast?
- Can the banking system supply the credit demanded by the real economy while maintaining adequate buffers?
- Can banks collectively support further financial deepening?
- Can the banking system manage accelerated NPL recognition, provisioning, and write-offs?

To address these questions, the standard four-sector FPP framework was extended to include a domestic banking sector. The model was also employed to analyze various financial policy measures.

The baseline financial stability outlook was conditional on the macroeconomic projections. As described later, FPP-FIN was applied, using the country team's projections and expert judgment, to determine the evolution of the banking system's aggregate income statement, balance sheet, and key regulatory indicators. The steps of this process are described later.

Framework in Practice

Macroeconomic inputs and data: Key inputs include desk projections of nominal and real GDP and prices (Table 3). In this application, credit demand is assumed to grow in line with GDP, except under the financial deepening scenario. Banking sector data are sourced from the FSI database.[39]

Income statement:

- First, NII was calculated using past *effective* funding and lending rates (Table 4). The average effective funding rate across all funding sources is computed as interest expense divided by funding volume, defined as the sum of deposits and bank bonds. Similarly, the effective average lending rate is interest income divided by the volume of interest-bearing assets, which includes loans and debt securities. Although these rates may not perfectly match actual bank lending rates on loans, these implicit average interest rates enable consistent forecasting of interest income and expenses for the banking system based

[38] We thank the Kazakhstan team, including Ali Al-Eyd, Nicolas Blancher, and Gregorio Impavido, for their valuable collaboration.

[39] To preserve tractability, selected financial soundness indicators (FSIs)—including the NPL ratio—may be projected directly rather than derived from separate projections of their numerator and denominator. The projected NPL ratio should therefore be interpreted as the combined outcome of NPL and credit dynamics. Where warranted, users may project NPL stocks and gross loans separately and derive the ratio endogenously.

on historical data. Using these, NII can be forecast: $NII_t = i_t^L\ IBA_t - i_t^F FV_t$. The difference between lending and funding rates—the interest rate spread—is very high in Kazakhstan, resulting in a substantial interest margin (relative to gross income) of close to 65 percent.

- Second, provisions for LLPs on NPLs were estimated with the help of a simple credit risk model and assumptions about future LLP rates. NPL ratios were modeled as a function of aggregate demand growth, leveraging expert judgment for calibration while taking into account country-specific circumstances, since the relationship between unemployment, lending rates, and credit quality was found to be empirically weak. This emphasized GDP growth as a broad indicator of economic activity, and therefore the empirical relationship that helped guide the projection of NPLs was as follows: $npl_t = 0.8\ npl_{t-1} - 0.3\ y_t$. The LLP rate (the share of NPLs that are provisioned), γ_{LLP}, was assumed to remain unchanged at 76 percent ($LLP_t = \gamma_{LLP}\ npl_t$).
- Third, noninterest income and expenses were assumed to grow proportionally to the size of the banking system's balance sheet in accounting terms. The income tax rate and DPR were set at 14 percent and 25 percent, respectively. This assumes no change in the effective corporate income tax, a standard assumption in the absence of anticipated tax reforms.
- Fourth, with the forecasts for NII, NNII, LLPs, income tax, and dividend payout in place, RE were calculated.

Balance sheet: The change in assets, specifically loans, drives the evolution of the banking system's aggregate balance sheet (Table 5). Currency and deposits, nonfinancial assets, as well as other assets are assumed to remain constant, while holdings of debt instruments change in line with nominal GDP growth. On the liability side, for simplicity, it was assumed that all new lending is funded by deposits, with forecast funding rates applied. Taken together, new loans enter the aggregate balance sheet as assets (gross loans), and the corresponding funding is reflected on the liability side as customer deposits.

Capital ratio: The current level of Tier 1 capital is calculated by adding RE to the previous period's capital. Total assets are then converted into RWA using a constant RWA density based on the final observation.

The capital gap and credit provision: To understand the link between the capital gap and loan growth, recall a version of model equation (12):

$$capgap_t = 100\frac{Tier\ 1_t}{\omega\ Loans_t} - CAR^{REG}$$

Relabeling loans as credit, this equation can be recast as:

$$Credit_t^{MAX} = 100\frac{Tier\ 1_t}{\omega(CAR^{REG} + capgap_t)},$$

where $Credit_t^{MAX}$ is the maximum amount of lending possible given the capital gap ($capgap_t$), the average risk weight (ω), and the minimum regulatory capital requirement (CAR^{REG}). For example, actual credit growth could be modeled as follows:

$$\Delta Credit_t \equiv 100\frac{min\{Credit_t^{DEMAND}, Credit_t^{MAX}\}}{Credit_{t-1}}.$$

During tranquil periods, when the capital gap is positive, the banking system can meet the projected credit demand. Conversely, during episodes of acute financial distress, if the capital gap is negative, the banking system cannot fully accommodate credit demand, potentially leading to a "credit crunch."

Key Takeaways

The FPP-FIN application enhanced the coverage of macrofinancial issues in Kazakhstan. Overall, the banking system is expected to remain resilient and well positioned to meet the credit demand of the real economy (Figure 3). In terms of profitability, the banking system is projected to continue benefiting from large interest rate spreads, with the ROA—a key profitability metric—expected to stay at around 4 percent (Table 6). At the same time, asset quality, measured by the NPL ratio, is projected to stabilize at 3 percent. Strong capitalization of the banking system supports its capacity to comfortably accommodate credit demand from households and firms. Credit growth is forecast to moderate from its post-COVID peak of 32 percent to about 15 percent annually, consistent with the current phase of the business cycle and typical for a country at this stage of financial development.

FPP-FIN was also used for illustrative macrofinancial scenario analysis. Given the current overall credit penetration of about 20 percent of GDP—which is low compared to other countries at a similar stage of financial development—a financial deepening scenario was designed. This scenario suggested that further financial deepening could be achieved without compromising financial stability, assuming proper credit risk management practices remain in place. FPP-FIN was also applied to other scenarios not explicitly included in the IMF staff report but discussed informally. For example, the framework assessed the consistency of credit growth projections given the current strength of banking system balance sheets. Another exercise examined the impact of increased bank competition on interest margins. Lastly, FPP-FIN provided initial estimates of the quantitative effects of regulatory measures. Inspired by a recommendation from the recent Kazakhstan FSAP, the framework was used to create illustrative scenarios quantifying the impact of greater NPL recognition on banking system profitability, capitalization, and capacity to supply credit to the real economy.

Role of Judgment

The analytic simplicity of the first FPP-FIN use case belies the richness of the scenarios it supports when accompanied by judgment and, where necessary, satellite analyses.

- Importantly, judgment does not substitute for formal analysis but complements it—helping interpret model outputs, incorporate institutional knowledge, and assess risks arising from nonlinear and state-dependent interactions between the financial sector and the real economy that are difficult to capture in parsimonious frameworks. As in standard FPP frameworks, the framework provides only limited guidance on the full array of mechanisms linking the real and financial sectors. More broadly, no single framework can fully capture the complexity of financial vulnerabilities, and sound macrofinancial assessments often require synthesizing insights across complementary tools.[40] Accordingly, projected FSIs—including capital adequacy indicators—should be interpreted in the context of the stylized nature of the framework and the inherent uncertainty surrounding financial sector dynamics.[41]
- Simple rules of thumb can help relate macroeconomic developments to banking sector outcomes—for example, calibrated relationships between GDP growth and NPLs—but even these remain indicative and must be accompanied by judgment.[42] In addition, shocks originating in the financial sector—such as changes in Tier 1 capital ratios, NPL provisioning rules, or declines in asset prices—can be examined, provided judgments are made regarding their direct implications for variables on the aggregate bank balance sheet.
- In practice, data limitations—including relatively short time series and the backward-looking nature of many FSIs—may further constrain purely model-based approaches. Judgment drawing on institutional knowledge—such as anticipated regulatory changes or supervisory actions—may therefore help inform projections in ways that purely econometric approaches cannot easily capture.

[40] The surveillance tools described in Box 3 could be leveraged in this context.

[41] As with other FPP-based outputs, discretion should be exercised regarding the disclosure of model-based projections.

[42] See Hardy and Schmieder (2013).

- In this use case, the implications of the financial sector for the real economy are not modeled explicitly. However, the emergence of a sizable credit gap may warrant reconsideration of growth and other macroeconomic projections, which are typically treated as exogenous assumptions. One challenge of this judgment-intensive approach is ensuring the transparency and internal consistency of the resulting scenarios, as well as the systematic consideration of empirical properties such as impulse response functions. The next section considers a way to address this challenge.

Table 3. Kazakhstan: Macroeconomic Input Data

	2022	2023	2024	2025
Gross domestic product growth, constant prices	3.2	5.1	3.9	5.0
Gross domestic product, current prices	103.8	120.6	133.8	149.9
Gross domestic product growth, current prices	23.6	16.2	11.0	12.0
Inflation	20.4	9.7	8.2	7.2
Unemployment rate, percent	4.9	4.7	4.7	4.6

Sources: Republic of Kazakhstan 2024 Article IV Staff Report; *World Economic Outlook*; 2023–25 forecasts based on authors' assumptions and calculations.
Note: All numbers in percent except for GDP at current prices, which are given in Kazakh tenge, trillion.

Table 4. Kazakhstan: Income Statement

	2022	2023	2024	2025
Net interest income (NII)	2.1	2.7	2.7	3.4
Noninterest income	1.3	1.8	2.0	2.2
Gross income	3.4	4.5	4.7	5.6
Noninterest expenses	1.2	1.5	1.7	1.8
Provisions	0.5	0.5	0.7	0.9
Net income before taxes	1.7	2.5	2.4	2.9
Income tax	0.3	0.3	0.4	0.4
Net income after income tax	1.5	2.2	2.0	2.5
Dividends payable (capital distribution)	0.0	0.0	0.5	1.2
Retained earnings	1.5	2.2	1.5	1.2
Profitability indicators				
	2022	**2023**	**2024**	**2025**
Return on (2Y) average assets	4.2	5.1	4.3	4.6
Return on equity	33	37	29	30
Interest margin to gross income	62	61	58	60
Noninterest expenses to gross income	35	32	35	33

Sources: IMF Financial Soundness Indicators and authors' calculations; 2023–25 forecasts based on authors' assumptions and calculations.
Note: All numbers in Kazakh tenge trillion, except for performance indicators, which are in percent.

Table 5. Kazakhstan: Balance Sheet

	2022	2023	2024	2025
Total assets	45.6	52.5	60.0	66.1
Nonfinancial assets	0.8	0.8	0.8	0.8
Financial assets	44.7	51.6	59.1	65.3
Currency and deposits	10.1	9.5	9.5	9.5
Loans	23.6	29.2	36.1	40.7
Gross loans	24.3	29.9	36.7	41.5
Specific provisions	0.8	0.9	0.7	0.9
Debt securities	9.0	10.3	11.7	13.3
Financial derivatives	0.1	0.2	0.2	0.2
Other financial assets	1.2	1.5	1.5	1.5
Liabilities	40.3	45.6	51.6	56.5
Currency and deposits	32.3	35.9	42.8	47.4
Loans	2.2	2.7	3.1	3.4
Debt securities	1.6	2.2	2.5	2.7
Other liabilities	3.2	3.5	3.2	3.0
Capital and reserves	5.2	6.9	8.4	9.6
Stability indicators				
	2022	**2023**	**2024**	**2025**
Loans to deposits ratio	73	81	84	86
Retained earnings to assets	11	13	14	15
Size of banking system (to GDP)	44	44	45	44

Sources: IMF Financial Soundness Indicators; *World Economic Outlook*; 2023–25 forecasts based on authors' assumptions and calculations.
Note: All balance sheet items in Kazakh tenge, trillion; stability indicators in percent. IMF = International Monetary Fund.

Table 6. Kazakhstan: Regulatory and Performance Indicators

	2022	2023	2024	2025
Capital adequacy				
Regulatory capital to risk-weighted assets	21.7	21.5	21.3	21.2
Regulatory Tier 1 capital to risk-weighted assets	18.6	19.2	19.4	19.5
Regulatory Tier 1 capital to accounting assets	11.1	12.8	13.4	13.8

(*continued*)

Table 6. Kazakhstan: Regulatory and Performance Indicators (continued)

	2022	2023	2024	2025
Asset quality				
Nonperforming loans to gross loans 1	3.4	2.9	3.0	3.1
Provisions as percent of NPL	76.9	76.0	76.0	76.0
NPLs net to capital	13.7	11.5	10.0	11.5
Earnings and profitability				
ROA	4.2	5.1	3.8	4.1
ROE	33.0	36.5	25.7	27.6
Interest margin to gross income	61.5	64.6	61.5	64.1
Noninterest expenses to gross income	35.4	34.3	37.3	34.8
Liquidity				
Customer deposits to (non-interbank) loans	73	81	84	86
Credit growth				
Credit growth, nominal	22	32	18	13
Credit growth, real	2	21	7	6
Demand growth				
GDP, real, yoy	3.2	5.1	3.9	5.0

Sources: IMF Financial Soundness Indicators; National Bank of Kazakhstan; *World Economic Outlook*; 2023–25 forecasts based on authors' assumptions and calculations.
Note: All numbers in percent. IMF = International Monetary Fund; NPL = nonperforming loan; ROA = return on asset; ROE = return on equity.

B. FPP-FIN: Modeling Two-Way Feedback[43]

FPP-FIN was used in the context of several TA projects. This section provides an overview of these TA projects and highlights common features associated with the FPP-FIN extension. See Box 7, which summarizes the case of Oman; Box 8, which summarizes three other TA projects that leveraged FPP-FIN; and Box 9, which discusses how FPP-FIN is being incorporated into ICD training. Within the scope of several ICD-led TA projects, custom-tailored banking sectors were integrated into countries' existing macroeconomic frameworks. As in the previous application, the banking system is influenced by macroeconomic and financial conditions transmitted through the demand and interest rate channels. However, these second use cases incorporated explicit two-way feedback mechanisms between the banking system and the real economy through the credit channel (loan volumes) and the market interest rate channel (the cost of bank credit), as illustrated in Figure 3. Consequently, a reduction in credit provision can exert a drag on economic growth, potentially further amplified by the financial accelerator effects discussed in the preceding chapter.

These TA applications therefore represent an integrated macrofinancial forecasting framework designed to provide insights into the following policy questions:

[43] As some of the underlying technical assistance (TA) reports are still under review and forthcoming, this section distills key takeaways from selected TA projects using illustrative data that are anonymized and modified to avoid disclosure of specific country cases, while preserving the core dynamics and value added of the FPP-FIN framework.

- How does the soundness of the banking system evolve under baseline and alternative macroeconomic scenarios?
- To what extent do credit conditions affect real GDP growth?
- What are the implications of gradually introducing selected macroprudential buffers?

Framework in Practice

Building on the discussion in the previous section, the application of FPP-FIN across these TA projects can be summarized as follows:

- *Income statement*: Starting with NII, income and expense components are forecast separately. This was done to capture the reality that, in general, banks tend to adjust funding rates more rapidly than lending rates, as funding costs are more sensitive to market conditions and deposit repricing—which can be tightly linked to global financial conditions, particularly in countries with managed floats—whereas lending rates are often constrained by contract terms and repricing schedules. LLPs are determined by the NPL ratio derived from the credit risk model, and noninterest income was typically projected to increase in line with inflation.
- *Balance sheet*: In case of some net oil-exporting countries, credit to the oil sector is excluded, although it still amounts to a sizable share of GDP and remains the primary driver of banking system assets. On the liability side, the funding mix is calibrated to the previous three years' average.
- *Actual and target capital ratios*: The target capital ratio is determined by country-specific regulation and includes macroprudential buffers such as the Capital Conservation Buffer, as well as an add-on to reflect market expectations based on discussions with supervisors (usually amounting to approximately 2 percentage points). Notably, although domestic systemically important banks face additional buffers, in some jurisdictions these are excluded because of the aggregate representation of the banking system.

Explicit two-way feedback between the financial and real sectors: [44] This approach not only builds on the conceptual model but also includes additional features depending on the underlying macroeconomic framework. Many macroeconomic forecasting frameworks project real GDP in a bottom-up manner using behavioral consumption and investment equations. These equations typically link (real) consumption and investment to their own lags, real GDP growth, and the (real) policy interest or lending rate. In such cases, the FPP-FIN extension can be readily integrated into the existing macroeconomic framework in a minimally invasive manner. The private consumption and investment equations are extended to include real credit growth and the real lending rate; an abridged version of the extended behavioral equations is as follows:[45]

$$\Delta c_t = 0.6\Delta c_{t-1} + 0.5\Delta y_t + 0.2\Delta credit_t - 0.1r_t^L$$

$$\Delta inv_t = 0.4\Delta inv_{t-1} + 0.5\Delta y_t + 0.3\Delta credit_t - 0.6r_t^L$$

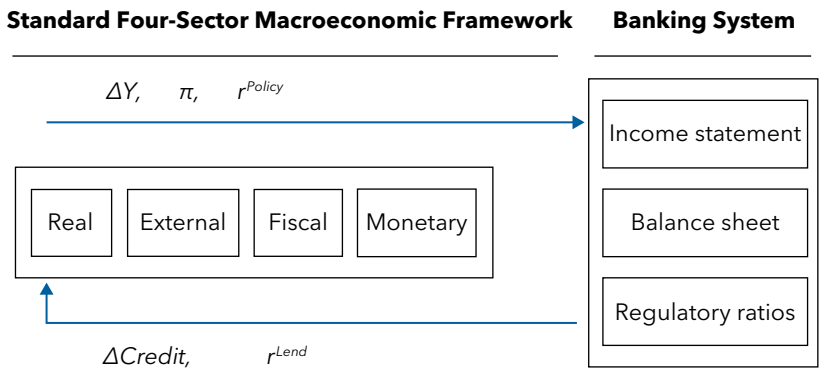
The two modifications are worth highlighting: First, note that instead of a real interest rate, the real lending rate is used. Naturally, an MCI in line with the conceptual model could have been introduced. Second, (real) credit growth is also introduced, which can be modeled as state dependent, depending on the capital gap

[44] These equations illustrate how the conceptual model is customized to country-specific circumstances and, importantly, to the structure of the four-sector macroeconomic framework. Because many country frameworks project consumption and investment in growth rates, the credit channel enters as real credit growth rather than as a credit-to-GDP (leverage) gap. Including both credit growth and the real lending rate allows aggregate demand to reflect both the price and quantity dimensions of credit conditions: the lending rate captures the cost of credit, whereas credit growth captures its availability, which can become a binding, state-dependent constraint when the capital gap turns negative even if lending rates adjust little.

[45] The coefficients in these two equations were calibrated using simple country-specific regressions, cross-checked against the elasticities embedded in the four-sector macroeconomic framework and typical ranges reported in the literature, and refined with judgment.

as discussed earlier. This use case of FPP-FIN can generate amplified, nonlinear, and asymmetric credit dynamics, resulting in more pronounced GDP growth fluctuations.

Figure 3. FPP-FIN: Two-Way Feedback



Source: Authors' illustration.

Key Takeaways

The FPP-FIN application enhanced the analysis of macrofinancial issues across the TA projects. Baseline macroeconomic projections indicate that real GDP growth would gradually converge over the medium term to estimates of potential growth. Conditional on these macroeconomic forecasts, the banking system's capital ratio was projected to remain above the target. Consequently, the banking system would be able to provide the credit demanded by households and firms, supported by ample buffers and a sizable capital gap.

FPP-FIN was used to design several illustrative scenarios:

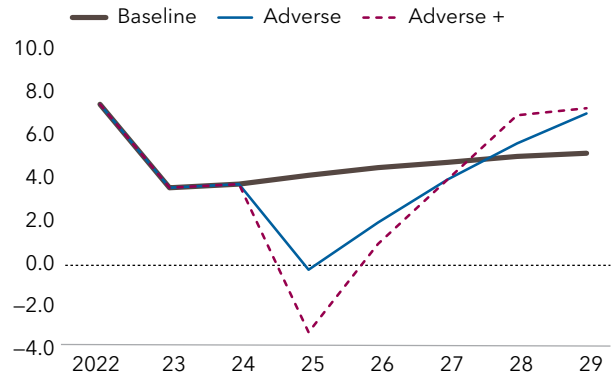
- The first scenario across the TA applications examined an adverse aggregate demand shock. To highlight the role of financial feedback channels, the analysis first considers a case in which the consumption and investment equations do not include credit growth and the lending rate. In this case, real GDP growth declines by 4 percentage points to −0.2 percent in the illustrative scenario (Figure 4, panel 1). In the second case, incorporating credit growth and the lending rate results in an additional decline of approximately 3 percentage points, pushing real GDP growth below the −3½ percent mark, consistent with the conceptual model. The adverse shock erodes the capital gap, tightening credit conditions and thereby exacerbating the shock's impact through the financial accelerator mechanisms described earlier.
- The second scenario considers a shock originating within the financial sector, characterized by a significant decline in bank profitability.[46] The shock is assumed to be sufficiently large to reduce capital, leading to a decline in credit provision and, consequently—through suppressed consumption and investment—to a reduction in growth of about 1 percentage point (Figure 4, panel 2).
- The third type of scenario explored the implications of selected macroprudential measures. For example, a few country applications considered an initial assessment of the implications of introducing or altering the countercyclical capital buffer (CCyB), because some authorities are considering incorporating the CCyB into their policy toolkit. Such preliminary quantitative analysis aims to inform the policy trade-offs between supporting growth and enhancing downside protection through additional capital buffers. In a few applications, early results suggested that gradually introducing a CCyB of 50 basis points would not impose undue pressure on the banking system and therefore would not materially act as a drag on growth.[47]

[46] Cyber or operational (tail) risks could motivate such scenarios.

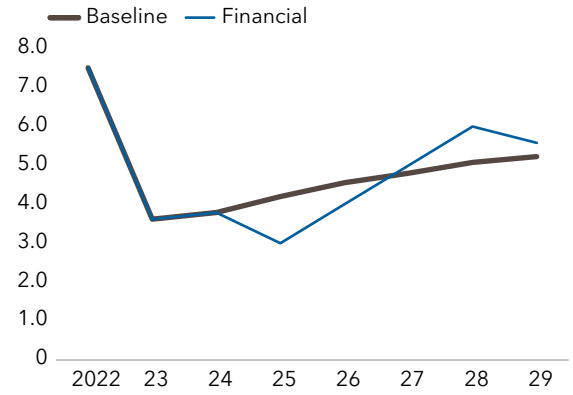
[47] This finding is consistent with academic studies including Lang and Menno (2025), which note that moderate increases in capital requirements are unlikely to materially dampen credit growth.

Figure 4. Baseline, Demand, and Financial Sector Shocks

1. Demand Shock
(GDP growth, percent)



2. Financial Sector Shock
(GDP growth, percent)



Sources: 2022–23 data from the WEO; and FSI databases. Forecasts based on authors' assumptions.
FSI = Financial Soundness Indicator; WEO = *World Economic Outlook*.

Box 7. Incorporating Macrofinancial Linkages: The Case of Oman

The case of Oman provides a novel illustration of financial sector integration in the spirit of FPP-FIN within an Institute for Capacity Development (ICD)-led technical assistance (TA) project. Specifically, a granular banking sector module and a detailed hydrocarbon sector were integrated into the Central Bank of Oman's (CBO) macroeconomic framework called the Oman Comprehensive Adaptive Expectations Model, OCAEM.[1] Importantly, this extended framework also embeds fiscal policy considerations, including an explicit role for the sovereign wealth fund. As a result, the framework captures a richer set of macrofinancial feedback channels.

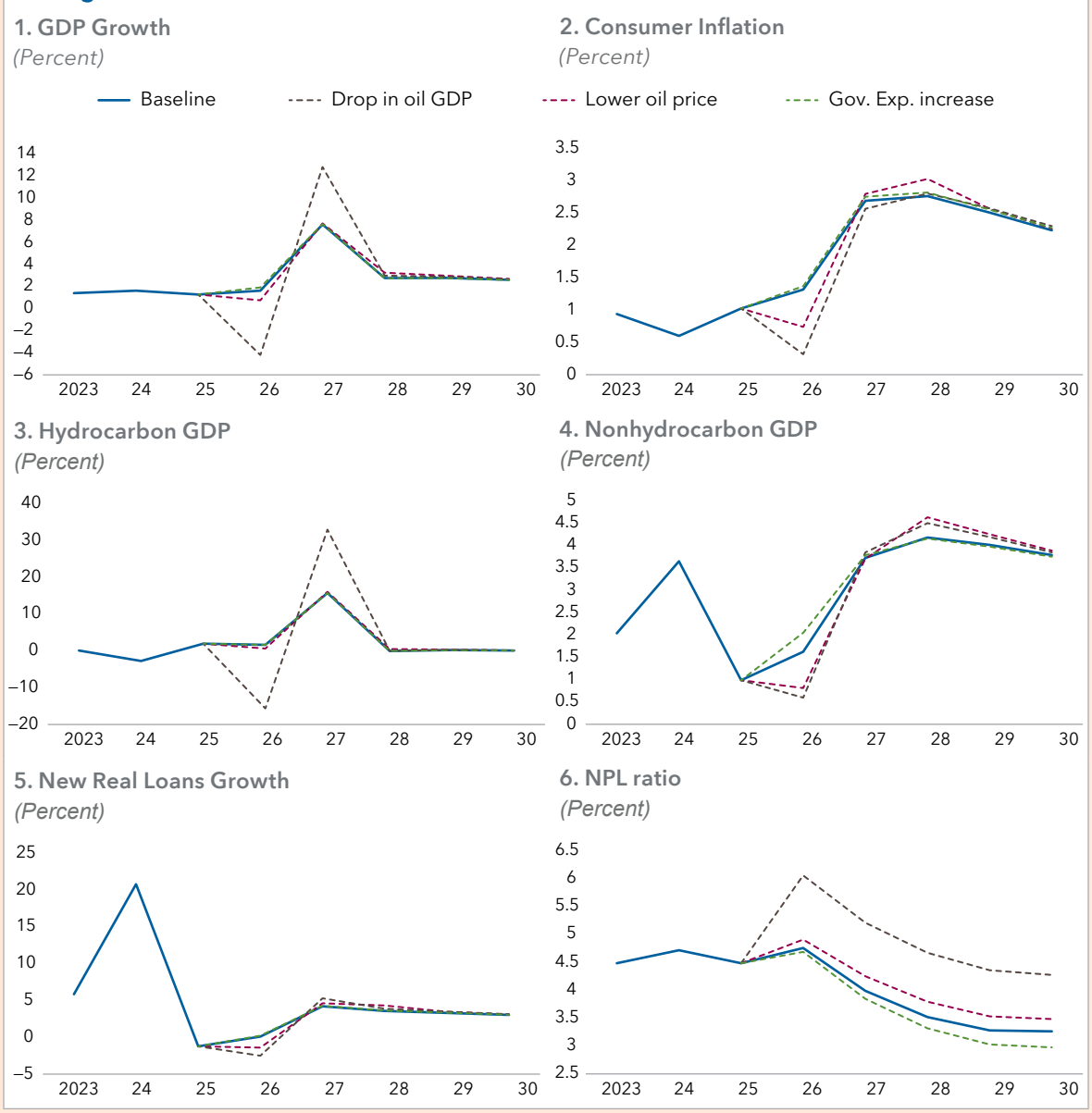
For instance, the extended framework incorporates explicit feedback mechanisms between the banking system, the oil sector, and the real economy through the credit channel (with new loan issuance linked to bank capital) and the market interest rate channel (with credit spreads tied to nonperforming loans). Consequently, a decline in oil prices can exert a drag on economic growth, which—by eroding banking system capital—can trigger the adverse financial accelerator effects discussed in the preceding chapter.

The CBO's extended macroeconomic framework includes two novel macrofinancial features worth highlighting. First, within a bottom-up approach to forecasting growth using behavioral relations for key aggregate demand components, including real private consumption that is driven by new (real) loans and a real interest rate gap, alongside standard determinants. Notably, the credit interest rate includes a risk-sensitive credit spread that increases with higher nonperforming loan levels. Second, credit growth depends not only on the dynamics of bank capital but also on the real oil price deviations from trend levels. Taken together, even these, country-specific parsimonious extensions substantially enrich the set of modeled macrofinancial linkages.

This customized framework was used to explore a wide range of policy-relevant scenarios, guided by expert judgment and cognizant of country-specific circumstances. A key application was assessing the implications of oil price shocks in a setting with macrofinancial linkages (see illustrative exercises

in Box Figure 7.1). Additional questions that could be investigated through this framework include the interplay between banking system's soundness, credit conditions, and nonhydrocarbon economic growth, as well as the potential role for macroprudential measures. Finally, the framework also allows for analysis of interactions between fiscal policy and transfers from stabilization funds in the face of adverse shocks.

Box Figure 7.1. Illustrative Simulations



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[1] See Hussain and Sholomytskyi (forthcoming) and Sholomytskyi, Butler-Blondel, and Hussain (2026).

Box 8. A Summary of Other Technical Assistance (TA) Applications

Variants of FPP-FIN were also applied in other Institute for Capacity Development (ICD) TA projects, including:

- *The Bahamas*: As part of a TA project with the Central Bank of the Bahamas, a domestic banking sector was integrated into the central bank's existing macro framework, originally developed in partnership with ICD. This project identified key macrofinancial transmission channels affecting Bahamian banks' capacity to provide credit to the real economy and explicitly incorporated these channels into the macro framework. Both the real and banking sector calibrations were refined, enabling the framework to generate consistent macrofinancial forecasts. Including the banking system directly in the macroeconomic framework raises awareness of financial sector effects among both macroeconomic forecasters and banking supervisors and enhances, *inter alia*, the analysis of risks for regulators.
- *Costa Rica:* FPP-FIN was custom tailored, owing to access to more granular supervisory data. This allowed for a more detailed and accurate representation of financial stability risks within the banking sector. The enhanced data granularity also improved the reliability of the analysis across banks and offers a potential model for other countries seeking to strengthen their financial stability assessments.
- *United Arab Emirates (UAE):* Collaboration with the Central Bank of the United Arab Emirates (CBUAE) was among the earliest TA applications of FPP-FIN. A customized banking sector module was integrated into the CBUAE's existing macroeconomic framework. Building on other FPP-FIN applications, the extended macroeconomic framework incorporated two-way feedback between the real sector and the banking system and was used to enhance the analysis of macrofinancial linkages, including the interplay between banking system soundness, credit dynamics, and real GDP growth.

Source: Authors.

Box 9. Applying the FPP-FIN Framework in IMF Internal Training Courses

Case studies in Financial Programming and Policies (FPP) courses were augmented with an FPP-FIN banking sector module to examine macrofinancial linkages. The augmented framework is used to assess how banking systems perform under baseline and alternative macroeconomic scenarios, whether projected growth can be funded domestically through the banking system, and how banking sector constraints may feed back into credit supply and the real economy.

Georgia 2023–Banking Sector Stability and Ability to Provide Credit to the Real Economy: This case study assesses the resilience of Georgia's banking system under the macroeconomic baseline and program scenarios using a balance sheet–based framework that links macro projections to financial soundness indicators (FSIs). Banking sector outcomes are evaluated conditional on projected credit demand, profitability, asset quality, capital adequacy, and funding conditions. The analysis focuses on whether the banking system can accommodate projected private sector credit growth—as implied by the Monetary Survey—without eroding capital buffers.

***Ghana 2023—Banking Sector Analysis amid Manifested Dislocations*:** In contrast to Georgia, the Ghana application starts from a position of heightened fragility, with macrofinancial stress already reflected in banking sector balance sheets. Rather than testing resilience about a stable baseline, the analysis explicitly assesses whether the banking system as a whole is adequately capitalized and how asset-quality pressures interact with credit growth. Capital adequacy is treated as a potentially binding constraint on lending, whereas nonperforming loan dynamics are analyzed as an active transmission channel. The exercise places particular emphasis on whether the banking system can supply the credit implied by macroeconomic projections without further weakening capital buffers.

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5. Conclusion

The global financial crisis and more recent events, such as the 2023 bank failures, highlight the critical importance of a well-integrated analysis of financial sector issues for the International Monetary Fund's core mandate. The IMF has made significant progress in strengthening financial sector analysis, notably through the mainstreaming of macrofinancial surveillance. These efforts have enhanced the integration of financial risks into Article IV consultations and program design. With these advances, the principal challenge is now operationalization—translating what we know into consistent, broad-based integration of financial sector dynamics within core macroeconomic frameworks, thereby further enhancing the IMF's surveillance, lending, and capacity development priorities.

To address this challenge, this paper introduces an approach—FPP-FIN—for embedding the financial sector within the IMF's accounting-based macroeconomic frameworks. In practice, two main use cases have emerged. The first extends the traditional "Financial Programming and Policies (FPP)" framework. The second use case further incorporates explicit two-way feedback loops between real economic activity and the financial sector, capturing financial accelerator effects that can amplify shocks and generate more realistic dynamic responses. While underpinned by theory, these approaches are deliberately designed to be practical and flexible, enabling country-specific adaptations and offering practitioners a first step in analyzing financial sector issues.

FPP-FIN has been piloted in IMF surveillance and technical assistance (TA) settings. Country cases from the Bahamas, Costa Rica, Kazakhstan, Oman, and the United Arab Emirates demonstrate its practical value in enriching policy dialogue and tailoring analysis to country-specific circumstances. These approaches are intuitive, rely on publicly available data, and are sufficiently flexible to be adapted to diverse country contexts. By expanding the IMF's macrofinancial toolkit, they support more robust surveillance and policy advice, ultimately advancing the IMF's mission to promote global financial stability and sustainable economic growth.

Looking ahead, future country-specific applications could integrate additional channels, such as the effects of property price fluctuations. The role of the exchange rate could be further emphasized, particularly through its interaction with foreign currency–denominated debt, introducing additional amplification mechanisms. Moreover, incorporating more granular data—distinguishing between consumer and corporate credit—would enhance the precision and depth of risk analysis.

More broadly, the approach in this paper can usefully be generalized to a broad range of macroeconomic models. FPP-FIN is a particularly tractable framework that is useful in a range of contexts. However, more sophisticated and richer models are appropriate for many operational purposes, and these too could be extended in a straightforward way to include macrofinancial linkages, as here. The Institute for Capacity Development, in collaboration with other IMF departments, is advancing work on how best to incorporate selected macrofinancial channels into semi-structural gap-trend models, such as the quarterly projection models and dynamic stochastic general equilibrium models, with a view to further strengthening surveillance and capacity development. FPP-FIN and related models are readily incorporated into the Comprehensive Macroeconomic Forecasting Environment.

Annex 1. IMF Financial Soundness Indicators (FSIs) Database

The IMF's *Financial Soundness Indicators (FSIs)* database is a key input for financial sector analysis. It covers approximately 130 economies that voluntarily began reporting data in the mid-2000s, forming an unbalanced panel across countries and over time. Given its broad coverage and standardized framework, the FSI database has become a valuable resource for IMF bilateral and multilateral surveillance. It provides aggregated data on banking sector income statements, balance sheets, and banking indicators.

Banking sector FSIs are intended to encompass all deposit takers, including licensed banks and bank-like institutions that accept deposits from the public. This definition generally excludes nonbanks that perform bank-type activities but do not take deposits. Ideally, FSIs should cover all banks and deposit-taking institutions in the banking system to avoid gaps and biases. In practice, however, smaller or specialized institutions may be excluded if they are immaterial in size, lack sufficient data-reporting capacity, or fall outside the supervisory perimeter (IMF 2019a).

It is important to recognize that aggregation can obscure important dynamics at the individual institution level. For example, systemic risk—arising from common exposures and interconnectedness among banks that can trigger contagion—is better captured through more granular, bank-level data and through macroprudential stress testing of banking systems (Box 1).

Likewise, differences between FSIs and the IMF's International Financial Statistics (IFS) monetary survey may arise from coverage gaps (for example, FSIs may exclude certain banks or nonbank lenders) and from the use of prudential consolidation, which avoids double-counting of capital and activity across entities. In particular, the notions of "claims on the private sector" in the monetary survey, "credit to the private sector" in the FSIs, and "gross loans" on the aggregated banking sector balance sheet differ in their accounting basis, institutional coverage, and degree of consolidation. As a result, discrepancies across these indicators are expected. Policymakers and analysts therefore need to be aware of these definitional differences to interpret trends consistently—although, in practice, such discrepancies can often be reconciled through appropriate scaling adjustments, thereby facilitating macrofinancial analysis.

Annex Table 1.1. Comparison of Credit Indicators across Data Sources

Area	Monetary Survey: Claims on Private Sector	FSI: Credit to the Private Sector (Percent of GDP)	FSI: Gross Loans (Bank Balance Sheet)
Accounting basis	Monetary and sectoral accounts	Supervisory and financial reporting standards	Regulatory bank financial statements
Coverage	Includes loans and other credit instruments (such as debt securities and trade credit) provided by deposit takers (commercial banks) and other financial corporations	Loans plus other credit instruments (for example, debt securities, and trade credit)	Only the volume of bank loans on the balance sheet, with the stock of LLPs excluded

Area	Monetary Survey: Claims on Private Sector	FSI: Credit to the Private Sector (Percent of GDP)	FSI: Gross Loans (Bank Balance Sheet)
Borrower scope	All private sector (households and businesses)	All private sector	All private sector, and sometimes also public sector
Use	Measures total claims of the banking system (including the central bank) on the private sector; used to assess credit creation and financial deepening	Assesses the banking system's overall credit exposure	Captures the volume of loans on the balance sheet, which forms the basis for many bank performance indicators, including the loan-to-deposit ratio and the nonperforming loans-to-gross loans ratio (NPL ratio)
Consolidation/ aggregation	Aggregates commercial banks and the central bank; consolidation cancels out interbank relationships to avoid double-counting	All depository institutions are aggregated, creating an "average bank" representing the banking system	Gross loans recorded in individual banks' balance sheets are added up, as are LLPs.

Source: IMF (2019a).

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