

Enhancing Financial System Security Analysis Based on a Macro-Finance Perspective

Ilayda Tunc

EHL Hospitality Business School (Switzerland), Lausanne, CH

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Abstract

“Financial system security” is often discussed as if it were mainly a micro problem: better risk models, stronger internal controls, tighter compliance. A macro-finance lens flips the view. It treats security as an emergent property of the whole system, shaped by leverage, liquidity, interconnected balance sheets, market plumbing, and (increasingly) shared digital infrastructure. This paper builds an integrated framework for analyzing financial system security that links (i) balance-sheet fragility, (ii) market liquidity and collateral dynamics, (iii) network contagion and payment clearing, and (iv) operational and cyber shocks. Using established macro-finance mechanisms and systemic risk measurement tools, we show why risks can look small in “good times” yet remain structurally capable of cascading into economy-wide stress. We then translate the framework into a practical monitoring and policy toolkit: early-warning indicators, scenario design, stress testing logic, and macroprudential and cyber-resilience instruments. The goal is not to predict the next crisis with precision, but to make vulnerabilities visible early enough to reduce the probability and severity of systemic breakdowns.

Keywords: *financial stability; systemic risk; macro-finance; leverage; liquidity; network contagion; macroprudential policy; cyber risk*

1. Introduction: what “security” means at the system level

In everyday language, a “secure” financial system is one where people can save, borrow, insure, and make payments without fearing sudden freezes, runs, or widespread institutional failure. In macro-finance, that idea becomes more specific: security is the system’s ability to absorb shocks without amplifying them through feedback loops that impair credit supply, disrupt payment and settlement, and push the real economy into deep contraction.

This distinction matters because most of the time the system looks safest precisely when it is building the conditions for insecurity. During expansions, measured risk tends to fall, funding becomes easier, leverage rises, and maturity mismatch can grow quietly. When a shock hits, the same structure that boosted returns becomes a mechanism for forced deleveraging, fire sales, and contagion. Modern macro-finance models formalize this idea: risk is not only “out there” (exogenous), it is also produced endogenously by leverage and market functioning.

So, a macro-finance security analysis asks four practical questions:

- i. **Solvency security:** Who becomes insolvent under plausible losses, and how quickly does capital scarcity spread?
- ii. **Liquidity security:** Who cannot roll funding or meet collateral calls under stress, even if solvent?
- iii. **Network security:** How do contractual linkages (interbank claims, clearing, payment chains) transmit distress?

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- iv. **Operational/cyber security:** What happens if critical digital services fail, or an attack triggers a run-like dynamic?

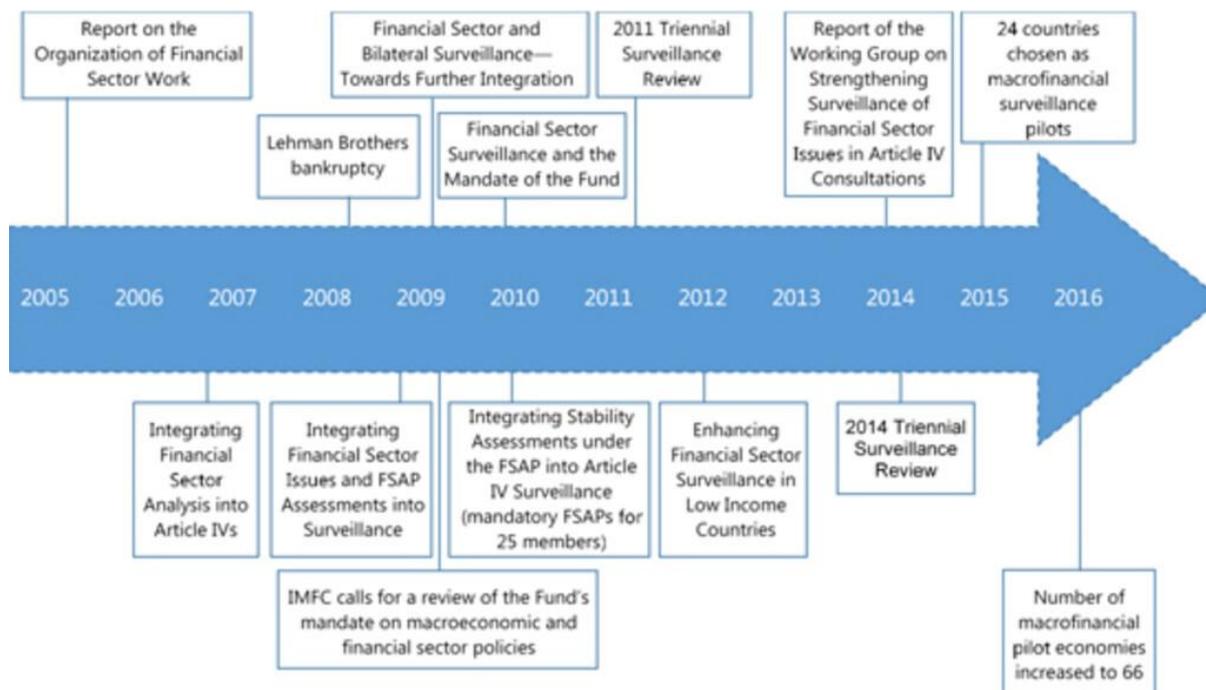


Figure 1. Timeline of Macro financial Analysis in Article IV Surveillance

2. Core macro-finance mechanisms behind systemic insecurity

2.1. Runs, liquidity preference shocks, and confidence as a coordination problem

Classic banking theory shows why even “healthy” institutions can fail if short-term creditors run: if many withdraw at once, liquidation destroys value and validates the panic. The key security lesson is that stability depends on both fundamentals and expectations. Deposit insurance, lender-of-last-resort facilities, and credible backstops are therefore not merely “support”; they are structural security components.

2.2. Liquidity spirals: when funding conditions and market liquidity feed each other

Modern financial systems rely heavily on collateralized funding (repo, margins, derivatives). In stress, haircuts rise, margins tighten, and intermediaries sell assets to meet constraints. Those sales push prices down, which triggers more margin pressure: a self-reinforcing spiral. A macro-finance security assessment treats this as a central failure mode, especially where balance sheets are large, leveraged, and marked-to-market.

Fire-sale externalities make this worse: private institutions may rationally sell first to protect themselves, but collectively they create price impact that damages everyone. This is why liquidity risk is not just an internal model issue; it is a coordination and externality problem.

2.3. Endogenous risk and the leverage-crisis cycle

Macro-finance models with financial intermediaries show that leverage and risk premia can move nonlinearly: small shocks can suddenly flip the system from stable to crisis mode once constraints bind. The “volatility paradox” idea captures a familiar pattern: long calm periods can encourage leverage that later makes the system fragile.

Empirically, leverage and balance-sheet expansion among key intermediaries has been shown to be procyclical, meaning the system tends to increase exposure when measured risk is low. From a security standpoint, that is like widening the highway at high speed without adding guardrails.

2.4. Interconnectedness: diversification until it becomes contagion

Network models demonstrate a “phase transition” style result: adding links can improve risk sharing for small shocks, but beyond a threshold it can accelerate contagion for larger shocks. This is a subtle but crucial macro-finance point: the same structure that looks efficient in normal times can transmit stress in bad times.

At the plumbing level, clearing and settlement matter. In payment networks, defaults and unpaid obligations interact; clearing vectors and priority rules determine who gets paid and who fails. Those mechanics turn “credit events” into systemic events.

3. Measuring “security” in macro-finance: from institution risk to system risk

Security analysis needs metrics that respect externalities. Two widely used approaches illustrate the shift.

(a) Conditional system tail risk (CoVaR). CoVaR measures how much the system’s Value-at-Risk worsens when a particular institution is in distress, connecting firm characteristics (leverage, size, maturity mismatch) to systemic contribution rather than standalone risk.

(b) Connectedness/spillover measures. Econometric connectedness tools use correlations, Granger-causality, and variance decompositions to quantify how shocks propagate across sectors and markets. These help identify when the system is becoming more tightly coupled and therefore more cascade-prone.

Network-science measures like DebtRank complement econometrics by focusing on “systemic impact” and centrality: which nodes are “too central to fail,” even if not the largest.

4. An integrated macro-finance security framework

Putting the pieces together, we can treat financial system security as a multi-layer resilience problem:

- i. **Balance-sheet layer (solvency + leverage):** capital buffers, asset quality, concentration risk, and leverage dynamics.
- ii. **Funding and collateral layer (liquidity):** maturity mismatch, reliance on runnable funding, margining/haircut sensitivity, and the potential for liquidity spirals.
- iii. **Market functioning layer:** depth, price impact under stress, fire-sale susceptibility, and risk premia jumps when intermediaries are constrained.
- iv. **Network layer:** interbank exposures, CCP and payment dependencies, cross-holding structures, and clearing/settlement rules.
- v. **Operational/digital layer:** common service providers, concentration in cloud/technology stacks, and cyber events capable of triggering run-like dynamics.

A practical security analysis maps each major institution and market segment across these layers, then looks for **cross-layer amplification**. For example:

- High leverage (Layer 1) + collateral-sensitive funding (Layer 2) + illiquid markets (Layer 3) is a classic crisis recipe.
- A highly central node (Layer 4) that is operationally fragile (Layer 5) can convert “IT outages” into payment freezes and panic.

This layered view avoids a common mistake: treating cybersecurity, liquidity regulation, and capital adequacy as separate silos. In reality, they are coupled.

5. Stress testing the system: scenarios that match macro-finance failure modes

A security-oriented stress test should not only shock asset values. It should also stress **funding, margins, market liquidity, network linkages, and operational capacity**.

Scenario family A: balance-sheet recession shock.

A rise in defaults reduces intermediary equity; risk premia widen sharply when constraints bind. This is consistent with intermediary-based asset pricing and macro-finance crisis dynamics.

Scenario family B: collateral and margin shock.

Haircuts rise, forcing asset sales into thin markets; prices fall and margins tighten further (liquidity spiral).

Scenario family C: network contagion shock.

A large node fails to meet obligations; clearing and payment rules distribute losses and shortfalls, possibly triggering secondary defaults.

Scenario family D: cyber-operational “run” shock.

A disruption reduces confidence in access to funds, triggering withdrawals or funding refusal. Recent macro-finance work models cybersecurity as a choice with externalities and shows how cyber risk can produce run-like outcomes, especially under illiquidity-driven failure.

A key principle is **nonlinearity**: many crises are not “big shocks”; they are medium shocks hitting a system that has quietly become tight-coupled and highly levered.

6. Policy and design implications: building security as a system property**6.1. Macroprudential regulation: leaning against the cycle**

Macroprudential policy exists because private incentives do not internalize systemic externalities. Countercyclical capital tools, leverage constraints, and sectoral buffers aim to reduce the build-up of vulnerabilities in booms so that the system has room to absorb losses in busts.

6.2. Liquidity regulation and market-wide guardrails

Because liquidity spirals operate through margins and haircuts, security design must include market-wide tools: robust liquidity buffers, stable funding profiles, and attention to collateral dynamics in stress. In practice, this also means monitoring procyclical leverage and runnable short-term funding at systemically important intermediaries.

6.3. Network resilience: centrality, clearing, and “too-connected-to-fail”

Interconnectedness calls for exposure limits, improved transparency, and strong clearing/settlement infrastructure. Network models imply that policymakers should care not only about size, but also about where an institution sits in the web of obligations.

6.4. Cybersecurity as macro-financial policy

Cyber risk is no longer a side issue. Concentrated digital dependencies (including shared service providers) create a common-shock channel. Empirical evidence suggests cyber incidents can have contagion features, and theory highlights free-riding in cybersecurity because it behaves partly like a public good.

A macro-finance security agenda therefore includes: minimum cyber resilience standards, shared incident reporting, scenario testing for “cyber runs,” and governance that treats operational resilience as core to financial stability, not just IT compliance.

7. Conclusion

From a macro-finance perspective, financial system security is not just the absence of fraud, hacks, or individual bank failures. It is the robustness of a complex, leveraged, confidence-sensitive, and tightly interconnected system that can amplify shocks through liquidity spirals, network contagion, and endogenous risk dynamics. The practical payoff of this perspective is clarity: it tells us what to measure (system externalities, not only firm VaR), what to stress (funding, collateral, networks, operations), and what tools to use (macroprudential buffers, liquidity guardrails, network resilience, and cyber standards).

The main lesson is simple but uncomfortable: **security is often weakest when it feels strongest**. The job of macro-finance security analysis is to make that invisibility visible early, and to design institutions and rules that keep inevitable shocks from turning into system-wide breakdowns.

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