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AUTHORS	Ruslan Grytsenko 
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Ruslan Grytsenko, Ph.D. in Economics,
Associate Professor, Doctoral Student,
Academy of Financial Management,
Ukraine; Independent Member of the
Supervisory Board, JSC "State Export-
Import Bank of Ukraine", Ukraine.



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Ruslan Grytsenko (Ukraine)

FINANCIAL SYSTEM AS A NEURAL NETWORK OF TRUST: A CONCEPTUAL FRAMEWORK FOR FINANCIAL STABILITY

Abstract

Under stress, information about counterparties can change willingness to interact faster than balance-sheet indicators register it, yet financial stability analysis still treats trust mainly as an aggregate variable. The study aims to develop a conceptual framework explaining how information signals update trust in specific relationships and thereby change the effective topology of the financial network. The framework synthesizes information asymmetry, financial intermediation, institutional, and financial network theories; the neural network of trust serves only as a functional analogy. Trust is defined as a directed, time-varying relational state variable, distinct from perceived default risk, with willingness to transact treated as its consequence. A generic mechanism updates trust from its previous level, information signals, and feedback from realized interactions. The framework separates trust, potential channel capacity, effective link strength, and realized flow, with effective link strength serving as the edge weight; its general form allows positive link strength at low trust where collateral, guarantees, or legal enforcement substitute for trust. A network matrix of effective link strengths connects bilateral dynamics to systemic outcomes through centrality, concentration, redundancy, and dependence on critical nodes. Four propositions follow: signals alter trust before funds move; trust updating reshapes link strength and network topology; systemic consequences depend on the network position of affected links; and, although each link responds monotonically to trust, trust concentrated in systemically important links may increase intermediation efficiency while reducing systemic resilience under particular network configurations. The framework shifts financial stability analysis from the level of trust to its distribution across relationships.

Keywords

banking, financial networks, systemic risk, financial
intermediation, information asymmetry, relationship-
specific trust, information signals, contagion

JEL Classification

D83, D85, E44, G01, G21

INTRODUCTION

The traditional understanding of financial stability focuses on financial institutions' ability to maintain adequate capital and liquidity, manage risks, withstand crises, and ensure the continuity of financial services. However, information about counterparties' financial condition, changes in credit ratings, regulatory decisions, audit findings, or stress-test results can alter the behavior of other participants even before the corresponding transactions occur. Financial relationships depend not only on resource availability but also on how economic agents interpret such information, assess whether counterparties will meet their obligations, and adjust their willingness to interact. Trust thus links an information signal to an economic decision and the subsequent movement of funds, which is often merely the final manifestation of processes that begin with the dissemination of information.

An increase in trust does not always have an unambiguously positive effect on financial stability. A lack of trust increases uncertainty, constrains lending and investment, raises transaction costs, and contrib-

utes to the fragmentation of financial relationships. At the same time, excessive trust may lead to the underestimation of risks, weaker counterparty verification procedures, and the accumulation of excessive concentrations, thereby creating conditions and channels for the rapid propagation of systemic shocks.

Therefore, the resilience of the financial system depends not only on the overall level of trust, but also on the participants among whom trust is formed, the degree to which it is concentrated, and the extent to which it corresponds to the functional roles of the relevant financial institutions.

A simple illustration from Ukraine motivates this perspective. The banking system holds substantial liquidity buffers, with a liquidity coverage ratio (LCR) of 269% and a net stable funding ratio (NSFR) of 182% (National Bank of Ukraine, 2026), yet only about one-third of enterprises intend to rely on bank credit (National Bank of Ukraine, 2025). These aggregate indicators do not measure trust or the strength of bilateral links, and their coexistence may reflect many factors, including credit risk, demand conditions, borrowing costs, collateral constraints, regulation, uncertainty, and firms' investment expectations. They nevertheless illustrate that the availability of financial resources and their effective transmission through particular channels are distinct characteristics of a financial system, a distinction this article seeks to conceptualize.

Research on information asymmetry, financial intermediation, institutional trust, financial networks, and systemic risk explains how information and institutions reduce uncertainty in interactions among economic agents. Network models, in turn, demonstrate how the structure of financial exposures, obligations, and liquidity flows affects system resilience and the propagation of shocks. However, the mechanism through which information signals alter trust within individual relationships, shape the configuration of the financial network, and affect its resilience even before the corresponding financial flows arise remains insufficiently explored.

To address this conceptual gap, the article examines the financial system through the analogy of a neural network of trust. In this analogy, economic agents and institutions are represented as nodes, their relationships form network links, information circulates as signals, and trust is assumed to shape the changing strength of those links. This perspective is particularly relevant in highly interconnected modern financial systems.

The objective of this study is to develop a conceptual framework for examining how information signals may update trust in specific relationships among financial-system participants and thereby alter the effective strength and configuration of financial links, with potential implications for financial stability, systemic risk, and the efficiency of financial intermediation.

1. THEORETICAL BASIS

The theoretical understanding of trust in the financial system has developed at the intersection of several strands of research. Information asymmetry theory (Akerlof, 1970; Spence, 1973; Stiglitz & Weiss, 1981) shows that the uneven distribution of information gives rise to adverse selection, signaling problems, and credit rationing, so that the feasibility of a transaction depends on participants' ability to assess counterparties. Financial intermediation theory (Diamond, 1984; Holmström & Tirole, 1997) views banks

as institutions that collect, verify, and interpret such information, thereby reducing uncertainty and enabling financial relationships to emerge. Institutional economics (Williamson, 1985; North, 1990; Putnam, 1993; Fukuyama, 1995) treats trust as an institutional resource that reduces transaction costs and sustains long-term cooperation. These approaches, however, focus on the informational preconditions of decisions or on individual intermediaries and institutions rather than on trust as a parameter shaping the structure of relationships among many participants.

Ukrainian research develops this perspective through the analysis of institutional architecture. Heiets (2010) considers trust an important element of social capital in economic development, while Hrytsenko (2020) conceptualizes trust as a component of the institutional architectonics of economic space-time. Hrytsenko and Lypov (2020) analyze information platforms as a form of network-based institutional transformation and show that contemporary institutional interactions are increasingly acquiring a network character. This establishes an important theoretical link between the institutional nature of trust and the network organization of the modern economy. However, the question of how trust affects the strength of individual financial relationships and the configuration of the financial network as a whole remains insufficiently developed.

Empirical research also confirms the importance and variability of trust in financial behavior. Sapienza et al. (2013) distinguish trust as an expectation regarding the reliable behavior of another party from other determinants of willingness to engage in economic interaction. Knell and Stix (2015), examining trust in banks during normal and crisis periods, show that trust changes in response to financial shocks and the institutional environment. These findings are particularly relevant to financial stability because they indicate that trust is not a fixed attribute of an agent or institution but may be reassessed rapidly in response to new information and economic signals.

Evidence at the level of individual relationships is particularly relevant to the present framework. Afonso et al. (2011) show that during the 2008 crisis the federal funds market did not freeze uniformly: lenders became more sensitive to the credit risk of specific borrowers, so that access to funding depended on counterparty-specific assessments. Iyer and Puri (2012) find that depositors' withdrawals during a bank run depended on the length of their relationship with the bank and on their social networks. Anand et al. (2012) model how creditors' rollover decisions, driven by their confidence in counterparties, can turn a local loss of confidence into a systemic crisis depending on network structure. These studies indicate that willingness to interact is relationship-specific and that confidence losses can propagate through fi-

ancial networks; they do not, however, treat trust in a specific relationship as a parameter distinct from exposure and price.

A separate strand of research focuses on the quantitative assessment of trust. Onyshchenko et al. (2022) propose an approach to conceptualizing and measuring trust in the financial sector at different levels of the financial system. Methodological foundations for constructing aggregate and composite indicators have been developed by Saltelli (2007), Nardo et al. (2008), and Greco et al. (2019). These approaches provide a basis for comparing complex multidimensional characteristics, but they primarily measure the level of trust and are less suited to explaining how the same aggregate level may correspond to fundamentally different configurations of relationships among financial-system participants.

Grytsenko (2026) proposed a composite trust index, introduced a quadratic network term implying a nonlinear relationship between trust density and stability, and discussed trust targeting. In that study, trust density was measured as

$$DT_w = \frac{\sum t_{ij} \omega_{ij}}{\sum \omega_{ij}}, \quad (1)$$

$$\text{where } \omega_{ij} = \frac{A_{ij} \cdot M_{ij}}{1 + \pi_{ij}},$$

(denoted w_{ij} in the original) weights each relationship by the volume A_{ij} , maturity M_{ij} , and risk premium π_{ij} of the funds placed between participants i and j , and t_{ij} reflects the level of trust in that relationship as a static parameter. The incremental contribution of this article is to treat t_{ij} , which corresponds to T_{ij} in the specification of the effective capacity of a financial link presented below, as a directed and time-varying parameter that may be updated by information signals and may alter the effective configuration of financial links before observable flows change. The trust-density measure is adapted to this setting in Equation (9).

This shift is consistent with the financial-networks literature. Allen and Gale (2000) show that the structure of interinstitutional relationships affects the pattern of financial contagion. Acemoglu et al. (2015) demonstrate that interconnectedness may

provide resilience to relatively small shocks but can become a mechanism for systemic propagation once shocks exceed a certain scale. Haldane and May (2011) view the banking system as a complex ecosystem in which interconnectedness can simultaneously provide diversification and create systemic fragility. Glasserman and Young (2016) systematize contagion mechanisms in financial networks and show that systemic risk depends on the structure and intensity of interinstitutional exposures. These studies establish that the resilience of a financial system depends not only on the characteristics of individual institutions but also on the configuration of links among them.

Policy analyses of financial stability similarly emphasize interconnectedness and transmission channels (European Central Bank, 2024; International Monetary Fund, 2024; National Bank of Ukraine, 2026). In such analyses, however, trust is generally reflected only indirectly, through expectations, perceptions of risk, and the behavior of economic agents, rather than being treated as an explicit parameter of financial-network architecture.

The concept of an information channel whose characteristics determine the feasibility and quality of signal transmission goes back to Shannon (1948); in financial systems, relevant signals include prices, credit ratings, audit opinions, regulatory decisions, and central bank communications. Savolchuk and Grujić (2022) show for Ukraine that trust and expectations are formed dynamically in response to previous behavior and policy signals, which supports the proposition that an information signal may alter economic behavior before corresponding financial flows change.

Taken together, previous studies provide important foundations for representing the financial system as a network: they explain how information asymmetry and institutions shape uncertainty, demonstrate the role of financial intermediaries in processing information, provide methods for measuring trust, and show how network structure affects systemic risk. These strands, however, remain only partially integrated. Research on confidence dynamics (Knell & Stix, 2015), relationship-specific funding decisions (Afonso et al., 2011; Iyer & Puri, 2012), and network contagion driven

by creditors' confidence (Anand et al., 2012) addresses parts of the mechanism, but no widely established framework explicitly links information signals, bilateral trust updating, and effective network topology. The theoretical gap therefore lies not in establishing that trust matters, but in explaining how trust operates at the level of individual network links and how changes in these links may affect the architecture and resilience of the financial system as a whole.

To address this gap, the study develops a theoretical framework that integrates information asymmetry theory, financial intermediation, institutional economics, and financial network analysis. The framework rests on a functional analogy with neural networks, used exclusively as an analytical device and not as a claim of structural equivalence: economic agents and institutions are represented as nodes, information as signals, the effective strength of each link as a dynamic edge weight, and trust as one of the determinants that modify this weight, alongside channel capacity, barriers to interaction, and institutional protection. An information signal does not automatically generate a financial transaction; it first revises an agent's trust in a specific counterparty, which may change the effective strength of the relationship and, subsequently, the willingness to transact and the potential volume of financial interaction. Feedback from previous interactions updates these assessments over time. The framework therefore shifts the analytical focus from the aggregate level of trust to the architecture and dynamic adjustment of trust-based relationships across the financial system.

2. AIMS

The aim of the study is to develop a conceptual framework for examining how information signals may change trust in specific relationships among financial-system participants, potentially altering the strength and availability of financial links, and to explore the possible implications for financial stability, systemic risk, and the efficiency of financial intermediation.

The objectives are to distinguish trust in a specific relationship from the potential capacity of the channel, barriers to interaction, institutional pro-

tection, and realized financial flows; to specify the effective strength of a financial link in a general form and in an illustrative special case; to formulate a set of numbered theoretical propositions that can be tested empirically; and to outline, as secondary extensions, the conditions under which a functionally balanced architecture of trust and trust targeting could be evaluated.

3. RESULTS

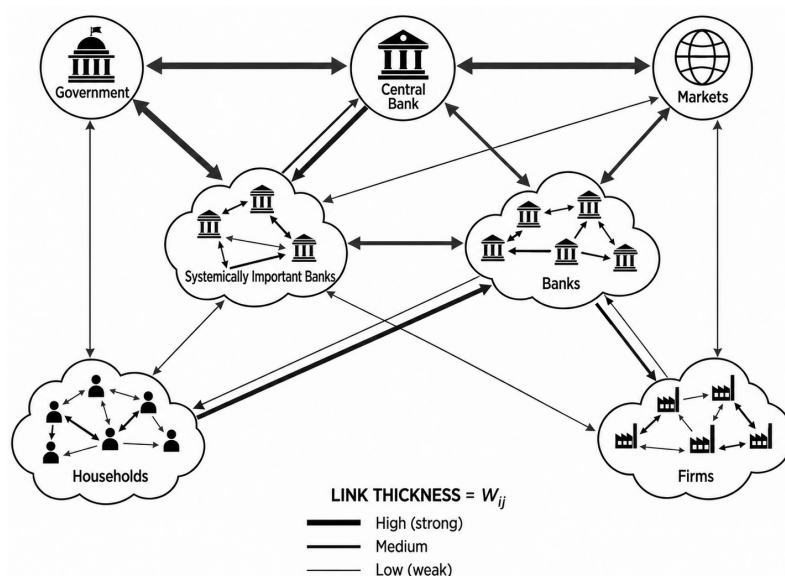
The framework represents the financial system as an adaptive information-processing network in which information signals may alter trust-based relationships before corresponding financial flows occur. Its core mechanism, stated formally as Proposition 1 at the end of this section, is the sequence: information signal $\rightarrow$ change in trust $\rightarrow$ change in the effective strength of the relationship $\rightarrow$ economic decision $\rightarrow$ financial transaction. Changes in the functional configuration of the financial system may therefore precede observable changes in financial flows, and trust acts as a dynamic parameter of individual links rather than merely as a general characteristic of economic relationships.

The same signal may have fundamentally different effects on the final outcome depending on the links through which it passes and the effective weight of each of those links. Similarly, in the financial system, information about the same economic agent does not generate the same response from all participants. Its impact depends on the structure of prior relationships, reputation, institutional guarantees, and the level of trust between the respective agents, which itself reflects their accumulated experience of interaction.

From this perspective, trust can exist and circulate independently in the form of potential financial opportunities, such as credit limits, ratings, guarantees, sureties, licenses, accreditations, or other expectations that are not accompanied by the immediate movement of funds. For this reason, a trust-based transaction is not identical to a monetary transaction. It may precede it, exist independently of it, or never result in the movement of money at all. In the notation introduced below, such cases correspond to a positive effective link strength W_{ij} with no realized flow F_{ij} (Equation (6)).

The financial system includes public authorities, regulators, and market institutions, each of which transmits signals that may influence trust and the expectations of economic agents; for example, the Ministry of Finance affects public borrowing and bond yields, while the central bank sets the policy rate and communicates on monetary policy and financial stability. Appendix A (Table A1) distinguishes, for each source institution, the signal it transmits, the relationship affected, the expected direction of trust updating, a potential empirical indicator together with the construct it represents, and the expected time lag, and indicates where an institution acts mainly through institutional protection or barriers rather than through trust itself; the table should be viewed as a set of potential variables for future analysis rather than a validated set of policy instruments. Because many heterogeneous institutions affect particular segments of the network, trust has a distributed character and cannot be reduced to the influence of a single regulator or intermediary.

Figure 1 illustrates the conceptual model of the financial system using the analogy of a neural network of trust. Its nodes represent major economic agents and institutions: the state, the central bank, banks, firms, households, and financial markets. Groups of agents – systemically important banks, other banks, firms, and households – are shown as clusters of individual agents connected by relationship-specific, and in some cases one-directional, links of different strength, reflecting the shift from aggregate to relationship-specific trust. The links form a multilayered network through which financial resources and economic information may circulate. Solid arrows denote financial links through which funds may flow; their thickness illustratively represents effective link strength (W_{ij}) rather than the volume of funds actually transferred, and their length illustratively indicates differences in the time required to decide whether a transaction can be executed; neither is estimated from data. Three links between groups – central bank and systemically important banks, households and banks, and banks and firms – are shown as pairs of one-directional arrows of different thickness to illustrate that effective link strength is directional ($W_{ij} \neq W_{ji}$); the remaining links between groups are drawn as double-headed arrows that combine both directions of interaction.



Note: Line thickness and length are illustrative: thickness schematically represents the effective capacity of a financial link, while length illustratively indicates the time required to make a decision. For double-headed arrows between groups, thickness indicates the relative strength of the group-level connection rather than an individual W_{ij} . The relative widths and lengths of the links are purely schematic and should not be interpreted as an empirical ranking of bilateral link capacities or decision times.

Figure 1. Schematic representation of the architecture of information and financial flows in a neural network of trust

To describe the effective capacity of a financial link, the study proposes the following illustrative conceptual specification, whose functional form requires further theoretical justification and empirical validation:

$$W_{ij} = T_{ij} \cdot C_{ij} \cdot (1 - B_{ij}), \quad (2)$$

where W_{ij} is an illustrative indicator of the effective capacity of the financial link between agents i and j , which in network terms serves as the weight of the directed edge from i to j ; T_{ij} is the level of trust of agent i in agent j ($0 \leq T_{ij} \leq 1$; in general, $T_{ij} \neq T_{ji}$), defined below as a relational state variable that modifies this edge weight rather than being identical to it; C_{ij} is the potential capacity of the channel, that is, the contractual or resource limit on the volume of interaction between i and j (e.g., a credit limit amount); B_{ij} is the level of external institutional or transactional constraints that limit the use of this capacity ($0 \leq B_{ij} \leq 1$). The three variables follow an operational convention intended to facilitate empirical identification: T_{ij} is a subjective relational assessment held by i about j ; B_{ij} comprises constraints that would limit the link even under full trust; and C_{ij} sets the maximum

volume the link could carry if trust were full and barriers absent.

The expression formalizes the proposition that potential financial capacity alone does not determine whether a relationship can be used effectively. Even a channel with substantial potential capacity may remain weak in practice when trust is low or barriers are high. Such barriers may include regulatory restrictions, reserve requirements, transaction and operating costs, political and legal risks, sanctions, jurisdictional differences, a lack of eligible collateral, and delays in transaction execution. Collateral therefore enters the framework in two distinct ways: its absence acts as a barrier, whereas available collateral, together with guarantees and other protective arrangements, is captured by the institutional protection term in Equation (3) below. Perceived counterparty default risk, information asymmetry, reputation, and the absence of prior cooperation affect W_{ij} through the updating of T_{ij} (Equation (4)) rather than through B_{ij} , which avoids counting the same factor twice.

More generally, the effective link strength can be written as

$$W_{it} = C_{it} \cdot \varphi(T_{it}, B_{it}, G_{it}), \quad (3)$$

where $G_{ij} \in [0, 1]$ is the degree of institutional protection of the link, that is, arrangements that limit i 's losses if j fails to perform, such as collateral, guarantees, clearing arrangements, legal enforcement, or insurance, and φ is bounded between 0 and 1, non-decreasing in T_{ij} and G_{ij} , and non-increasing in B_{ij} . Unlike trust, institutional protection does not depend on i 's expectation about j 's behavior, and unlike barriers, it expands rather than constrains the usable capacity of the link. The multiplicative form (2) is an admissible special case within this class that abstracts from institutional protection. It has a restrictive boundary property: when $T_{ij} = 0$, the effective link strength is zero regardless of any protection. In practice, institutional protection can partly substitute for trust and permit transactions even when trust is very low; the general form accommodates this by allowing $\varphi(0, B_{ij}, G_{ij}) > 0$ whenever $G_{ij} > 0$. The general specification is therefore conceptually preferable, and the propositions of the framework rely on its qualitative properties rather than on the multiplicative form itself. Time indices are omitted in Equations (2) and (3) for simplicity; all variables may vary over time.

3.1. Trust updating

Let $T_{ij}(t) \in [0, 1]$ denote agent i 's trust in agent j at time t . Trust is defined as agent i 's accumulated expectation that agent j will honor its commitments within their relationship, including in situations where j could benefit from not doing so. $T_{ij}(t) = 0$ corresponds to the absence of any such expectation and $T_{ij}(t) = 1$ to full expectation that commitments will be honored; intermediate values are interpreted as a normalized index rather than as a probability. This definition distinguishes trust from adjacent constructs. Perceived default risk and reputation concern j 's characteristics as a counterparty in general, whereas trust is directed and specific to the relationship between i and j ; confidence refers to the financial system as a whole. Signals about default risk, reputation, or system conditions are therefore inputs that revise trust rather than components of it, and accumulated experience enters through feedback from the relationship itself. Willingness to transact is a decision that also depends on channel capacity, barriers, institutional protection, and

the agent's own needs, and is treated as a possible consequence of trust rather than as part of the construct. Consistent with Sapienza et al. (2013), trust is thus separated as an expectation about the other party's behavior from other determinants of the decision to interact. Its evolution is described in general form as

$$T_{ij}(t+1) = \Gamma(T_{ij}(t), s_{ij}(t), f_{ij}(t)), \quad (4)$$

where $s_{ij}(t)$ denotes information signals relevant to the relationship and observed by i during period t , and $f_{ij}(t)$ denotes feedback from i 's own interaction with j in that period, such as timely repayment, delays, or default. Feedback is absent when the link was not used. Signals may be counterparty-specific (credit ratings, audit opinions, supervisory decisions concerning j), system-wide (central bank communication, stress-test results), or network-based, such as observed changes in other agents' trust in j .

The framework requires only four properties of Γ :

- (a) persistence: updated trust is non-decreasing in its previous level, so relationships carry memory;
- (b) responsiveness: updated trust is non-decreasing in the favorability of signals and feedback;
- (c) boundedness: $T_{ij}(t+1)$ remains within $[0, 1]$;
- (d) relationship specificity: the same signal about j may produce different revisions for different agents i , because each revision depends on $T_{ij}(t)$ and on i 's own history of interaction with j .

An illustrative case satisfying these properties is partial adjustment:

$$T_{ij}(t+1) = T_{ij}(t) + \lambda_{ij} [\hat{s}_{ij}(t) - T_{ij}(t)], \quad (5)$$

$$0 < \lambda_{ij} \leq 1,$$

where $\hat{s}_{ij}(t) \in [0, 1]$ is the reliability of j implied by the signals and feedback received in period t , and λ_{ij} is the speed of adjustment. If λ_{ij} is assumed to be larger when $\hat{s}_{ij}(t) < T_{ij}(t)$ than when $\hat{s}_{ij}(t) > T_{ij}(t)$, the specification can represent the possibility that trust is built gradually but lost rapidly.

A signal observed in period t thus revises $T_{ij}(t+1)$ and, through Equation (3), the effective link strength $W_{ij}(t+1)$, irrespective of whether any funds have moved between i and j . This gives the core mechanism of the framework a formal expression (Proposition 1): the effective configuration of financial links may change before observable financial flows do.

Formally, the framework distinguishes four elements of each directed relationship: trust $T_{ij}(t)$, the potential capacity of the channel $C_{ij}(t)$, the effective link strength $W_{ij}(t)$, and the realized financial flow $F_{ij}(t)$, defined as the volume of funds actually provided by i to j in period t . The realized flow cannot exceed the effective link strength:

$$0 \leq F_{ij}(t) \leq W_{ij}(t). \quad (6)$$

The three quantities are measured in comparable monetary amounts over the same period t : $C_{ij}(t)$ is the potential capacity for providing funds from i to j during the period, $W_{ij}(t)$ is the part of that capacity that trust, barriers, and institutional protection allow to be used, and $F_{ij}(t)$ is the amount of funds actually provided. Whereas $W_{ij}(t)$ describes the interaction that the relationship can support, $F_{ij}(t)$ describes the interaction that actually takes place, which also depends on demand for funds, prices, and the availability of alternative counterparties. A trust-based opportunity, such as an unused credit limit, may therefore exist with $W_{ij}(t) > 0$ and $F_{ij}(t) = 0$, and a change in $W_{ij}(t)$ need not be accompanied by an immediate change in $F_{ij}(t)$.

3.2. From links to the network

Collecting the effective strengths of all directed links gives the conceptual network matrix

$$W(t) = [W_{ij}(t)], \quad i, j = 1, \dots, n, \quad (7)$$

where n is the number of agents and $W_{ij}(t) = 0$ if no usable link exists from i to j ; the realized flows $F_{ij}(t)$ form a corresponding matrix $F(t)$. Trust updating (Equation (4)) changes $W(t)$ entry by entry, and the systemic consequences of these changes depend on the properties of the matrix as a whole rather than on the average level of trust. The framework links systemic outcomes to five such properties, each of which has an established counterpart

in the financial-network literature (Glasserman & Young, 2016):

- (a) connectivity: the extent to which agents are linked, directly or through intermediaries, by links with positive effective strength;
- (b) concentration: the degree to which total effective strength is concentrated in a small number of links or nodes;
- (c) centrality: the importance of a node as a source or recipient of effective strength and as an intermediary between other nodes;
- (d) redundancy: the availability of alternative links or paths through which an agent can replace a weakened link;
- (e) dependence on critical nodes: the share of the system's effective capacity that would be lost if the links of a single node weakened.

The framework distinguishes four related but distinct system-level constructs. Intermediation efficiency is the capacity of the network to channel funds between agents at low cost under normal conditions; resilience is its capacity to maintain this function when links or nodes are disrupted; systemic risk is the likelihood that a disruption to some links propagates into a system-wide loss of function; and financial stability is the state in which the system performs its functions without such disruptions, which requires both efficiency and resilience. In general form, each of these system-level outcomes, denoted $Y_k(t)$, where k indexes the outcome, can be written as

$$Y_k(t) = \Psi_k(W(t); Z(t)), \quad (8)$$

where $Z(t)$ denotes the context in which the network operates, including the characteristics of shocks, balance sheets, and agents' behavior, and each Ψ_k is a conceptual relationship that depends on the structural properties of the network listed above; $W(t)$ alone does not determine system-level outcomes uniquely. Two systems with the same average level of trust and the same context may therefore differ in $Y_k(t)$ if trust, and hence effective strength, is distributed differently across links. For the same reason, the systemic effect of a

trust shock depends on where it occurs: a decline in $T_{ij}(t)$ on a link that is central, highly concentrated, and weakly redundant may substantially reduce intermediation efficiency and resilience and increase systemic risk, whereas a comparable decline on a peripheral link with close substitutes may have little effect. Because trust is also updated by network signals, a loss of trust in a central node may lower other agents' trust in it as well and propagate through the network, consistent with the contagion mechanisms described by Allen and Gale (2000), Anand et al. (2012), and Acemoglu et al. (2015).

This structure also explains how a monotonic relationship at the level of a single link can coexist with a trade-off, and potentially a non-monotonic relationship, at the level of the system. By Equation (3), an increase in T_{ij} never weakens the link from i to j , since effective strength is non-decreasing in trust. The system-level outcome, however, depends on how such increases are distributed across $W(t)$. When trust rises mainly on links that are already central, effective strength becomes more concentrated and the system more dependent on a few critical nodes, so that properties (b) and (e) above deteriorate even as each individual link becomes stronger. Intermediation efficiency may then continue to rise, while resilience declines because a disruption affecting a central node spreads through links that carry a larger share of the system's effective capacity. The efficiency–resilience trade-off hypothesized below (Figure 2) can therefore arise not from any property of individual links but from the way monotonic link-level changes are distributed across the network structure in Equation (8); a non-monotonic combined outcome would additionally require an explicit weighting of efficiency and resilience.

Equation (4) is the formal counterpart of the adaptive process described by the neural-network analogy. As in a neural network, each element of the financial system – an economic or financial agent – continuously assesses and weighs the risks of interacting with other agents, thereby forming relationship-specific levels of trust. New information, accumulated experience, market signals, changes in the regulatory environment, and macroeconomic conditions lead to a continuous reassessment of these relationships; through Equation (3),

the resulting changes in trust modify the effective edge weights W_{ij} , in a manner analogous to the updating of weights during the training of artificial neural networks. The financial system therefore emerges not as a static collection of institutions but as an adaptive network that continuously adjusts its structure in response to accumulated experience and changes in the external environment.

In the context of the analogy, information on an institution's financial condition, credit ratings, audit findings, and regulatory violations can be interpreted as training signals ($s_{ij}(t)$ in Equation (4)) on which participants base their risk assessments, while crises, defaults, and regulatory actions provide feedback that may subsequently be embedded in rules, risk-assessment methods, and governance standards. When information is transparent and reliable, relationships may adjust more accurately; when it is distorted, the system may “learn” from misleading signals and direct resources toward unreliable agents. The adaptive capacity of the financial system therefore depends not on the number of crises it has experienced but on how accurately it interprets such signals and translates them into adjustments of relationships.

Grytsenko (2026) defines trust density as the degree of interconnectedness among participants in the financial system and the intensity of trust-based relationships between them. Within the present framework, the measure introduced in the Theoretical Basis requires four adaptations. First, links are directed: the ordered pairs (i, j) and (j, i) enter separately, so that $T_{ij}(t)$ and $T_{ji}(t)$ may differ. Second, a link is included whenever a channel exists, that is, when $C_{ij}(t-1) > 0$, even if no funds flow through it ($F_{ij}(t) = 0$), because trust-based opportunities may exist without realized transactions; pairs without a channel are excluded. Third, weights are defined by potential channel capacity at the beginning of the period, so that current revisions of trust do not alter them within the same period. Fourth, realized volumes and risk premia are excluded from the weights to avoid mechanical overlap: realized volumes depend on trust through Equations (3) and (6), and risk premia reflect the perceived default risk that enters trust updating through Equation (4), so weighting by either would partly measure trust twice. The adapted measure is

$$DT(t) = \frac{\sum T_{ij}(t) \cdot C_{ij}(t-1)}{\sum C_{ij}(t-1)}, \quad (9)$$

where both sums run over all ordered pairs (i, j) , $i \neq j$, with $C_{ij}(t-1) > 0$. As a single summary statistic, $DT(t)$ describes the capacity-weighted average level of trust. Consistent with the framework, it should be complemented by the network properties listed after Equation (7), since systems with the same trust density may differ in concentration, redundancy, and dependence on critical nodes.

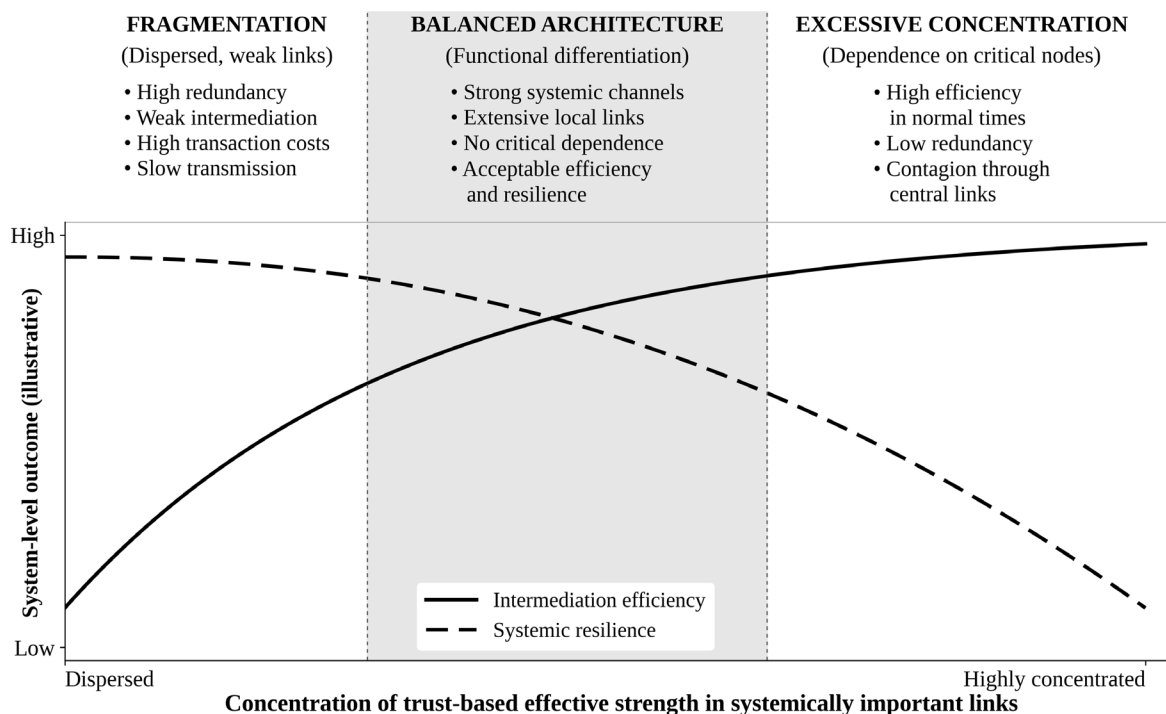
A functionally balanced architecture of trust might be characterized by functional differentiation: strong trust-based links in major systemic channels – the network’s “aortas” – combined with a sufficiently extensive local “capillary” network and the absence of critical dependence on any single node.

Excessive concentration of financial flows in only a few nodes may make the system highly efficient under normal conditions while simultaneously increasing its vulnerability to systemic shocks and

crises. A loss of trust in even one such node may spread rapidly through the network and generate financial contagion. Conversely, excessive fragmentation of the network into a large number of weak links slows the movement of capital, raises transaction costs, and reduces the effectiveness of monetary-policy transmission, while also creating resistance to the rapid systemic propagation of crises. Figure 2 schematically illustrates this hypothesis in terms of the distribution of trust rather than its average level: as trust-based effective strength becomes concentrated in systemically important links, intermediation efficiency may increase while systemic resilience declines.

When trust-based effective strength is dispersed across many weak links and no strong systemic channels exist, the financial system tends toward fragmentation: economic agents avoid interaction, financial intermediation contracts, lending and investment decline, and the use of cash, dollarization, and transaction costs increase. At the opposite end, excessive concentration of trust in a few systemically important links may create an “overheating” effect: agents

Source: Compiled by the author.



Note: The curves, scales, and zone boundaries are illustrative and do not represent empirical estimates.

Figure 2. Schematic illustration of the hypothesized trade-off between intermediation efficiency and systemic resilience

relying on central nodes may underestimate risk, leading to compressed risk premia, excessive credit growth, and higher leverage, while dense interconnections turn financial links into channels for the rapid transmission of shocks, so that even localized disruptions may escalate into systemic crises.

Thus, it can be hypothesized that trust has a dual effect: it may facilitate financial interaction, but under certain configurations of links it may also increase interdependence and systemic risk. This raises the question of whether there is a functionally balanced architecture of trust – a configuration of trust-based links rather than a single level of trust – within which intermediation efficiency and systemic resilience are jointly acceptable. If both are weighed jointly, their combined outcome may be non-monotonic in concentration, but the location of any maximum depends on the weights assigned to each and is not determined by the framework itself.

As a secondary extension, this hypothesis also raises the question of whether institutional signals and decisions can deliberately change trust in specific relationships and, consequently, the configuration of the financial network. Trust targeting in this sense lies beyond the core framework and remains an area for future research. Assessing its feasibility requires identifying measurable characteristics of trust-based links, mechanisms for influencing them, time lags, and potential unintended effects.

3.3. Theoretical propositions

The framework concludes with four propositions that can be tested empirically.

Proposition 1 (*information signals*)

A relationship-specific information signal revises agent i 's trust in agent j (Equation (4)) and, through Equation (3), the effective strength of the link, before any change in the realized flow F_{ij} is observed. Empirically, rating actions, audit opinions, or supervisory decisions concerning j should be followed by changes in independent measures of i 's trust in j , while realized flows adjust later, if at all.

Proposition 2 (*trust updating and effective link strength*)

Revisions of trust are persistent and relationship-specific, and, with channel capacity, barriers, and institutional protection held constant, they change effective link strength in the same direction. The same signal about j may therefore reshape the links of different counterparties of j to different degrees and thereby alter the effective topology of the network.

Proposition 3 (*network position*)

The systemic consequences of a given change in trust depend on the position of the affected link in the network matrix $W(t)$ (Equations (7) and (8)): they are larger for links that are central, carry a large share of the system's effective capacity, and have few substitutes than for peripheral links with close substitutes.

Proposition 4 (*efficiency–resilience trade-off*)

Although effective link strength is monotonic in trust at the level of individual links, the concentration of trust-based effective strength in systemically important links tends to increase intermediation efficiency while reducing systemic resilience (Figure 2). The relationship between trust and system-level outcomes therefore depends on the distribution of trust across links rather than on its average level and cannot be described by a single monotonic function of aggregate trust.

4. DISCUSSION

The proposed framework extends existing approaches by treating trust as a dynamic parameter of financial relationships rather than solely as a factor that reduces transaction costs or information asymmetry. Its primary contribution is the shift from aggregate trust to directed, time-varying, relationship-specific trust that is updated by information signals and, through changes in effective link strength, reshapes the topology of the financial network. The functionally balanced architecture of trust and the possibility of trust targeting are secondary extensions of this core framework.

This result is consistent with studies linking trust to the expectations and behavior of economic agents: Sapienza et al. (2013) conceptualize trust as an expectation regarding the behavior of another party, and Knell and Stix (2015) show that trust in banks is sensitive to crisis events. The proposed approach extends these findings by shifting attention from the aggregate level of trust to the specific links through which its changes propagate, which helps explain why the same information signal may have different consequences depending on the agents concerned and their position in the network.

A second result concerns the effect of network structure on financial resilience. Consistent with Allen and Gale (2000), Haldane and May (2011), Acemoglu et al. (2015), and Glasserman and Young (2016), the consequences of financial shocks depend not only on individual institutions but also on the configuration of the links between them. The proposed model extends this perspective by treating trust as a parameter that changes the effective strength of these links, so that formally similar exposures may have different systemic significance, and systemic risk may intensify through the rapid reconfiguration of trust-based relationships as well as through the accumulation of financial imbalances.

Systems with the same aggregate level of trust may exhibit different degrees of resilience if trust is distributed differently between central and peripheral nodes. A loss of trust in a central bank, a systemically important bank, or a key market infrastructure may have substantially greater network effects than a comparable change at the periphery. At the same time, a high level of trust does not in itself guarantee stability: excessive trust may weaken market discipline, reduce sensitivity to risk, and encourage excessive exposures. This suggests that the objective may be not to maximize trust but to support a functionally balanced architecture of trust. Such an approach reconciles the specialization of network nodes with the need to limit excessive risk concentration and dependence on individual transmission channels.

This conclusion has implications for financial stability policy. Central bank communications, stress-test results, supervisory decisions, deposit guaran-

tees, liquidity-provision mechanisms, and other institutional signals can be viewed not only as individual policy instruments but also as factors that alter trust-based relationships. Accordingly, macroprudential analysis could complement conventional indicators of capital, liquidity, and concentration with assessments of the resilience of systemically important trust channels. In this context, trust targeting should be regarded not as an already established analogue of inflation targeting, but as a direction for further research. Its practical implementation would require measurable indicators, a clearly defined target variable, policy instruments, a transmission mechanism, an understanding of time lags, and an assessment of potential side effects.

The proposed approach has several limitations. First, the model is conceptual and does not imply structural equivalence between the financial system and an artificial neural network. The neural-network analogy is used solely as an analytical device for representing agents as nodes, information as signals, and trust as one of the parameters determining the effective strength of network links. Second, the study does not empirically estimate relationship-specific trust or the resulting effective edge weights, nor does it quantitatively determine their optimal configuration. The results should therefore be interpreted as a theoretical foundation for subsequent empirical research and the development of methods for measuring trust.

Future research should focus on developing methods for quantitatively assessing trust between agents, empirically reconstructing trust networks using financial, behavioral, and informational data, and testing the relationship between their structural characteristics and indicators of financial stability. Such measures should capture trust independently of transaction volumes or stated willingness to transact, since otherwise the relationship between trust and effective link strength would hold by construction. Particular attention should be paid to identifying the conditions under which changes in trust stabilize the system and those under which they contribute to the accumulation or propagation of risk. This would make it possible to move from a conceptual analogy toward an empirically grounded model of trust architecture and to assess whether its purposeful shaping could become a practical component of financial stability policy.

CONCLUSIONS

The article proposes a conceptual model of the financial system using the analogy of a neural network of trust. Alongside the traditional view of trust as a factor that reduces transaction costs and information asymmetry, the proposed framework treats it as a variable that may influence how information signals are interpreted, how expectations are coordinated, and how financial links are configured. This perspective raises the question of how trust-based relationships may contribute to the financial system's adaptation to external shocks.

Within the proposed framework, financial intermediaries are viewed not only as institutions that reallocate financial resources but also as participants in the exchange of information signals that may affect counterparty assessments and trust between them. This makes it possible to examine the efficiency of the financial system as an outcome of interactions among its participants and to ask whether disruptions in information exchange and weakened trust-based links may contribute to the spread of financial crises.

The article's principal conceptual contribution is the shift from treating trust solely as an aggregate characteristic of the financial system to considering it as a variable specific to relationships between its participants. Changes in such trust may affect the effective strength of a financial link and participants' willingness to maintain their interaction. Information signals may alter assessments of a counterparty before any change appears in observable financial flows. The potential systemic consequences of these changes may depend, among other factors, on the positions of the relevant participants and links within the financial network.

This framework outlines a direction for future research on financial stability focused on how information signals may alter trust in specific relationships, the configuration of financial links, and the conditions for financial intermediation. It also provides a basis for examining the potential systemic consequences of these changes. Questions about whether an optimal configuration of trust-based links exists and whether trust targeting could serve as a public policy instrument require further theoretical justification and empirical testing.

AUTHOR CONTRIBUTIONS

Conceptualization: Ruslan Grytsenko.

Data curation: Ruslan Grytsenko.

Formal analysis: Ruslan Grytsenko.

Funding acquisition: Ruslan Grytsenko.

Investigation: Ruslan Grytsenko.

Methodology: Ruslan Grytsenko.

Project administration: Ruslan Grytsenko.

Resources: Ruslan Grytsenko.

Writing – original draft: Ruslan Grytsenko.

Writing – reviewing & editing: Ruslan Grytsenko.

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APPENDIX A

Table A1. Institutional trust signals: source, affected relationship, expected direction of trust updating, potential empirical indicators, and expected time lags

Source: Compiled by the author.

Source institution	Signal	Affected relationship (trust of → in)	Expected direction of trust updating	Potential empirical indicator (construct represented)	Expected time lag
Central bank	Policy-rate and liquidity decisions; forward guidance and financial-stability communication	Households, firms, banks → banking system	+ if consistent with prior guidance; – if unexpected or inconsistent	Survey-based trust of households and firms in banks and in the central bank (T)	Immediate to short
Ministry of Finance	Timely servicing of public debt; debt-issuance strategy	Banks, investors → state	+ timely servicing; – arrears or restructuring	Investor confidence surveys (T)	Short to medium
Banking supervisory authority	Stress-test results; supervisory decisions and sanctions concerning a specific bank	Depositors, other banks → that bank	+ favorable results; – adverse findings or sanctions	Depositor and interbank trust surveys (T); shift from unsecured to secured exposures to the bank (O)	Immediate to short
Deposit Guarantee Fund	Coverage level; speed of reimbursement in bank failures	Households → banks	Mainly via G_{ij} ; + prompt reimbursement	Household trust in deposit guarantees, from surveys (G)	Medium
Parliament	Predictability and quality of financial legislation	Many directed links at once (system-wide institutional signal)	+ predictable changes; – abrupt or retroactive changes	Business surveys on regulatory predictability (S)	Medium to long
Government	Consistency of economic policy; crisis-response decisions, including nationalization of systemically important banks	Agents → state; depositors → affected banks	+ consistent, credible response; – policy reversals	Household and business confidence surveys (T)	Medium to long
Capital market regulator	Enforcement of disclosure requirements; sanctions for market manipulation	Investors → issuers	+ credible enforcement; – revealed misconduct	Investor trust surveys (T)	Short to medium
State Treasury Service	Timeliness of budget payments	Contractors, banks → state	+ timely payment; – payment arrears	Contractor surveys (T); frequency of payment delays (S)	Short
Antimonopoly authority	Decisions on abuse of market power	Borrowers, clients → financial institutions	+ credible enforcement	Surveys of perceived fairness of financial services (T)	Long
Judiciary	Enforcement of creditor and property rights; rulings in financial fraud cases	Creditors → debtors	Mainly via G_{ij} ; + effective enforcement	Recovery rates; time required to enforce claims (G)	Long
Insurance companies	Timeliness and completeness of claim payments	Policyholders → insurers; lenders → insured borrowers	+ for policyholders; mainly via G_{ij} for lenders	Policyholder trust surveys (T); claim-settlement ratios (S)	Medium
Stock exchange	Listing and delisting decisions; trade-surveillance actions	Investors → listed issuers	+ admission to a higher listing tier; – delisting or surveillance actions	Investor trust surveys (T)	Immediate to short
Credit rating agencies	Rating actions and outlook changes	Banks, investors → rated entity	+ upgrade; – downgrade	Counterparty-specific trust surveys (T); shift from unsecured to secured exposures (O)	Immediate
Auditors	Unmodified, qualified, or adverse audit opinions	Lenders, investors → audited entity	+ unmodified; – qualified or adverse	Lender surveys (T); changes in collateral requirements for the entity (O)	Short
Banks	Changes in lending terms and fees; ability to meet obligations to customers	Households, firms → bank	+ reliable service; – failure to meet obligations	Customer trust surveys (T); complaint rates (O)	Short to medium

Table A1 (cont.). Institutional trust signals: source, affected relationship, expected direction of trust updating, potential empirical indicators, and expected time lags

Source institution	Signal	Affected relationship (trust of → in)	Expected direction of trust updating	Potential empirical indicator (construct represented)	Expected time lag
Independent valuers	Valuations of assets and collateral	Lenders → borrowers	Mainly via G_{ij} (reliability of collateral)	Haircuts applied to collateral (G)	Short
Investment advisers	Recommendations and risk assessments	Clients → recommended issuers and instruments	+ or – depending on the recommendation	Client trust surveys (T)	Short
Payment systems	Participant verification; fraud-prevention measures; access decisions	Participants → other participants	Mainly via G_{ij} and B_{ij}	Fraud incidence; operational incident data (G/B)	Immediate

Note: Relationships are directed and read as the trust of the first party in the second. Where the second party is a group, such as the banking system, the entry refers to the trust of each agent in the individual members of that group, so that the change applies to multiple directed links; system-wide institutional signals, such as those from Parliament, change the conditions of many bilateral relationships at once. “+” and “–” refer to the expected revision of T_{ij} following a favorable or an adverse signal. “Mainly via G_{ij} ” (or B_{ij}) indicates that the institution primarily affects institutional protection (or barriers) in Equation (3) rather than trust itself. The letter after each indicator shows the construct it represents: (T) trust T_{ij} , measured independently of transaction volumes; (G) or (G/B) institutional protection or barriers; (S) an information signal or feedback from realized interaction; (O) an observable consequence of trust, such as a shift toward secured exposures. Time lags are indicative: immediate (days), short (weeks to a quarter), medium (several quarters), and long (a year or more). The table is a set of potential variables for future research rather than a validated set of policy instruments.