

dr. I.P.P. van Lelyveld

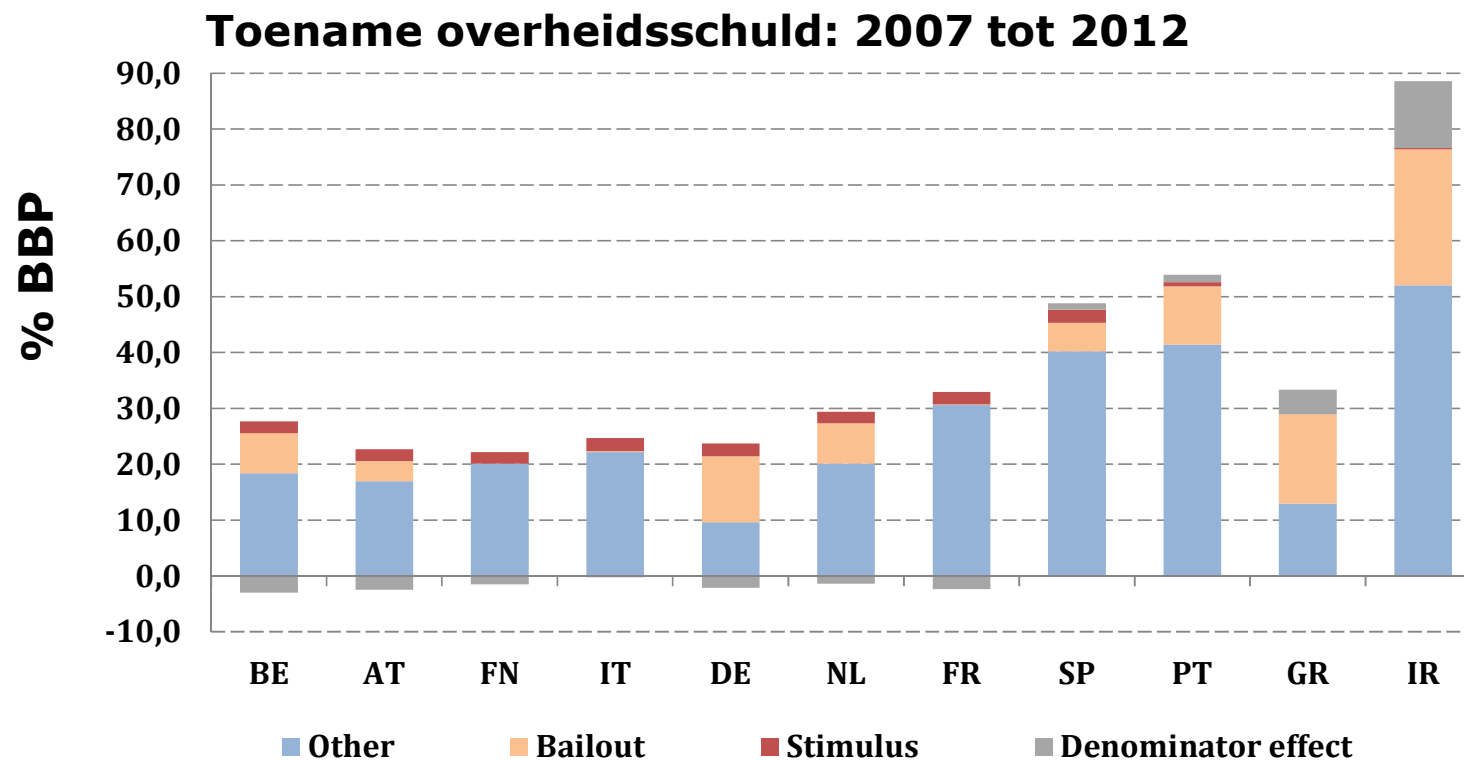
RISICO'S IN EEN VERBONDEN WERELD

VRIJDAG
10 JUNI 2016

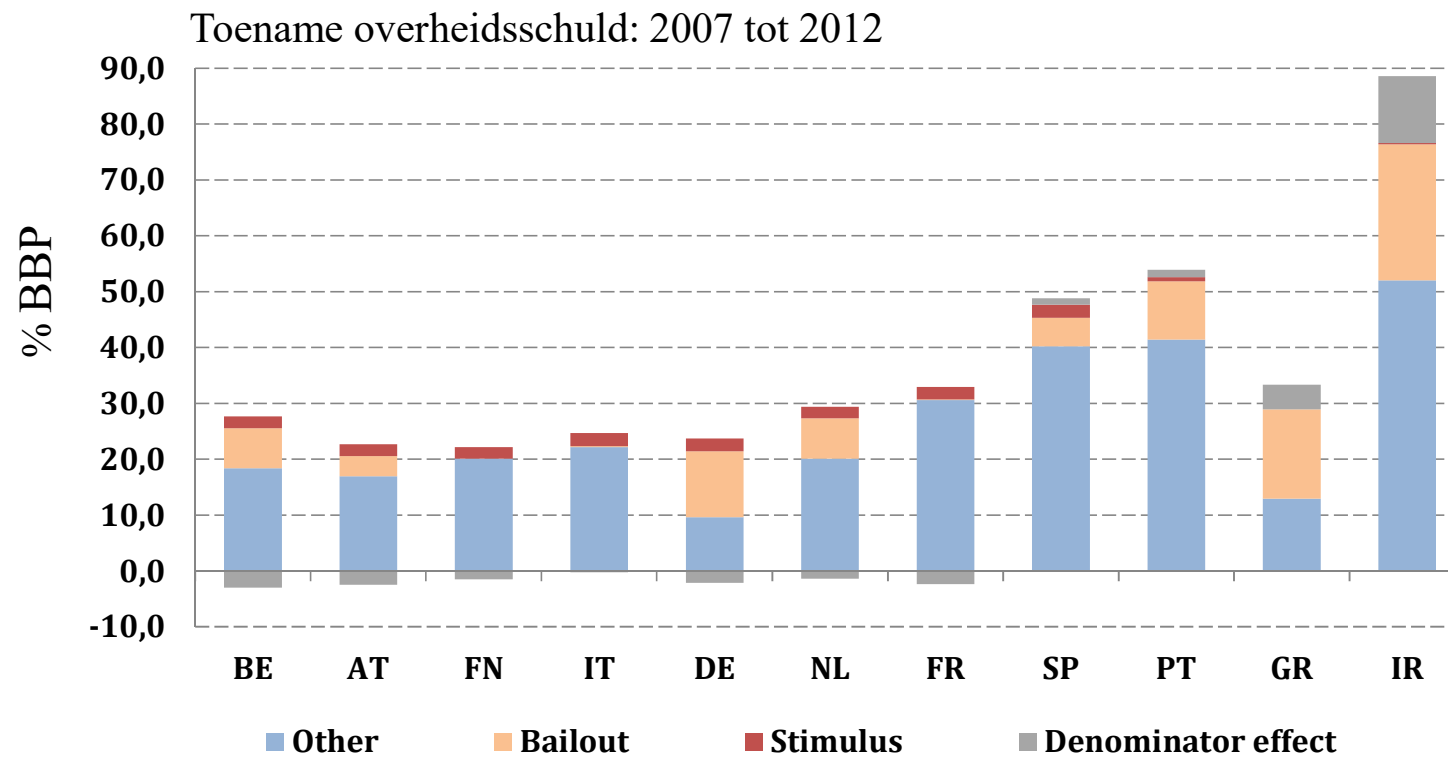
- MEER GRANULAIRE DATA, BETERE RISICO INSCHATTING

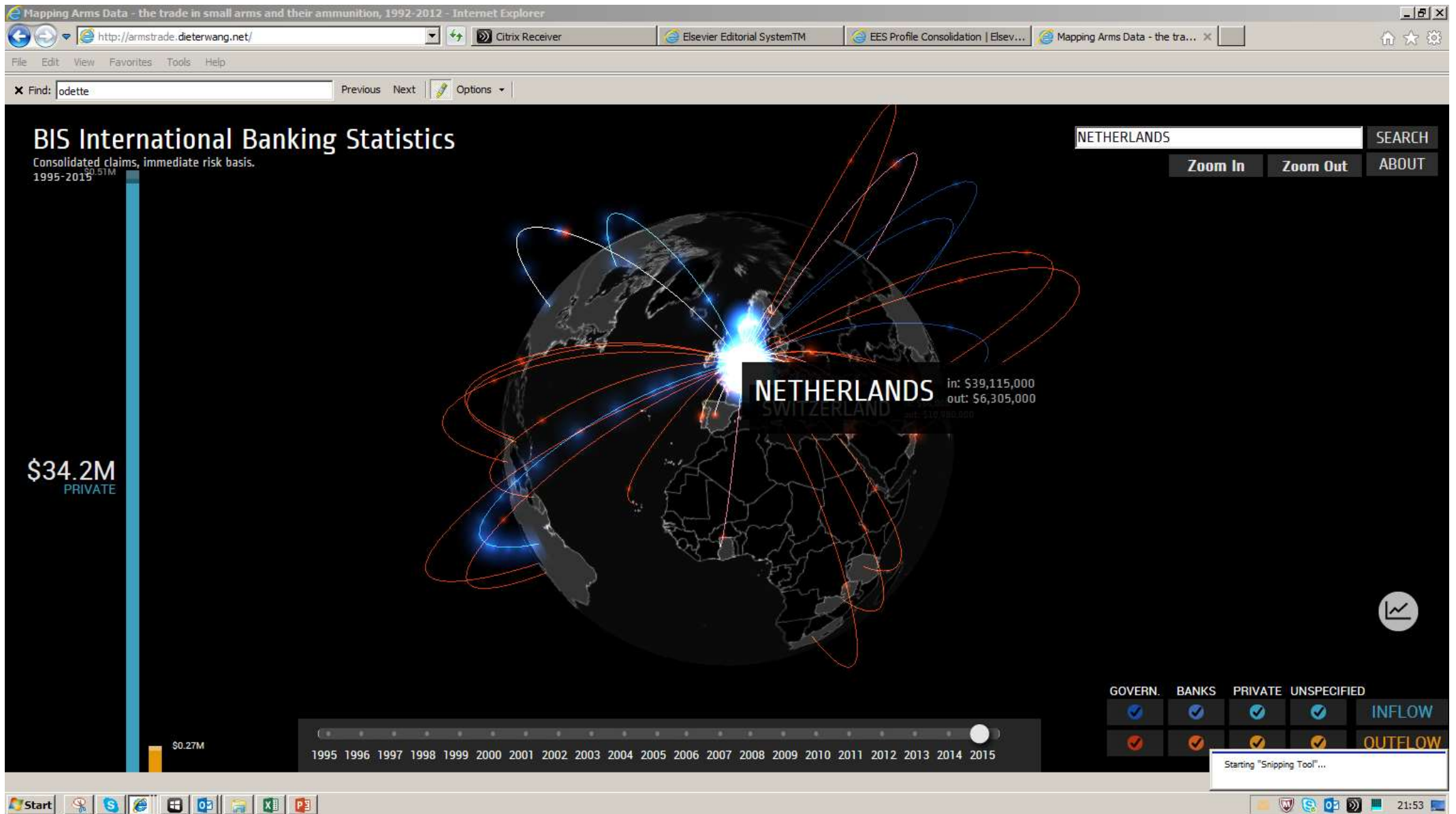


Indirecte kosten veel groter dan bailout



Voor boekje













socilab

About Resources Books

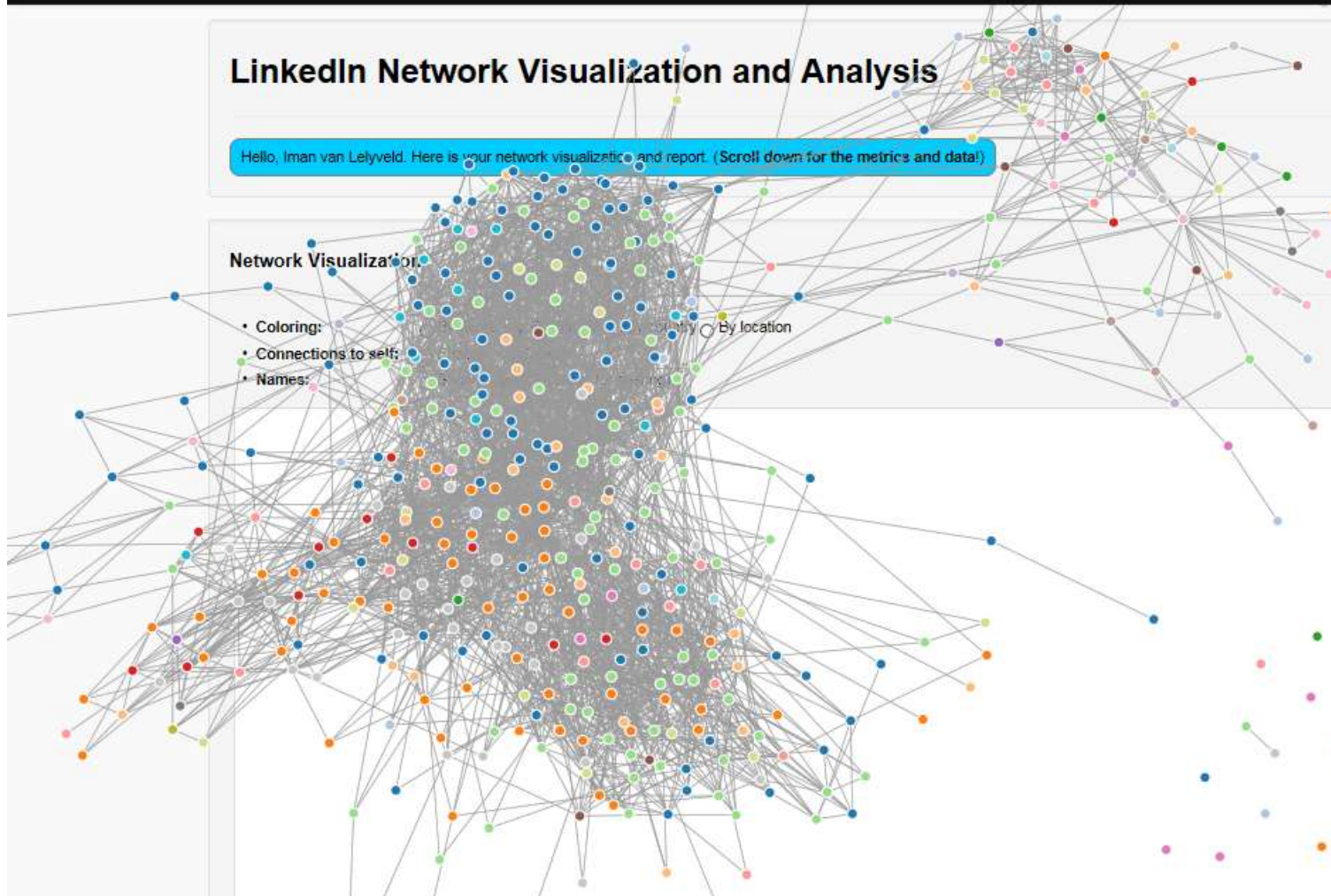
LinkedIn Network Visualization and Analysis

Hello, Iman van Lelyveld. Here is your network visualization and report. (Scroll down for the metrics and data!)

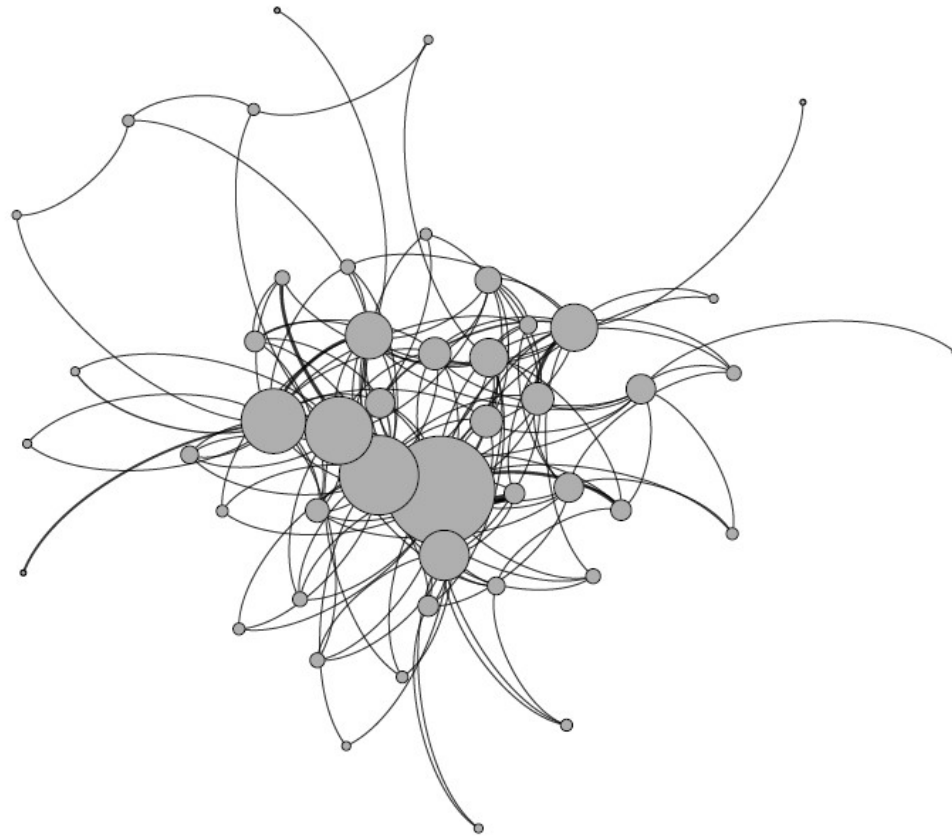
Network Visualization

- Coloring:
- Connections to self:
- Names:

By location



Een netwerk met een kern en een periferie



Science, February 19, 2016 Policy Dashboard based on Complexity Theory

Stefano Battiston, J. Dooyne Farmer, Andreas Flache, Diego Garlaschelli, Andrew G. Haldane, Hans Heesterbeek, Cars Hommes, Carlo Jaeger, Robert May, Marten Scheffer

INSIGHTS | PERSPECTIVES

COMPLEX SYSTEMS

Complexity theory and financial regulation

Economic policy needs interdisciplinary network analysis and behavioral modeling

By Stefano Battiston,^{1,2} J. Dooyne Farmer,^{3,4} Andreas Flache,⁵ Diego Garlaschelli,⁶ Andrew G. Haldane,⁷ Hans Heesterbeek,⁸ Cars Hommes,^{9,10} Carlo Jaeger,^{11,12} Robert May,¹³ Marten Scheffer¹⁴

Traditional economic theory could not explain, much less predict, the near-collapse of the financial system and its long-lasting effects on the global economy. Since the 2008 crisis, there has been increasing interest in using ideas from complexity theory to make sense of economic and financial markets. Concepts, such as tipping points, network contagion, feedback, and resilience have entered the financial and regulatory lexicon, but

POLICY actual use of complexity models and results remains at an early stage. Recent insights and techniques offer potential for better monitoring and management of highly interconnected economic and financial systems and, thus, may help anticipate and manage future crises.

TIPPING POINTS, WARNING SIGNALS. Financial markets have historically exhibited sudden and largely unforeseen collapses, as a systemic crisis, such as "phase transitions" may in some cases have been triggered by unpredictable stochastic events. More often, however, there have been endogenous underlying processes at work. Analysis of complex systems ranging from the climate to ecosystems reveal that, before a major transition, there is often a gradual and sustained loss of resilience. This resilience drops to a critical level. A small disturbance can trigger a cascade that propagates through the system and propels it into a crisis state.

Complexity theory and network analysis offer a new paradigm for understanding complex systems. In the context of financial systems, this approach has been used to study the resilience of financial networks and to identify potential tipping points. For example, the Bank of International Settlements recently developed a framework for analyzing the interconnectedness of banks based on the interrelationships between banks to gauge the systemic risk posed to the financial network by Global Systemically Important Banks. Recent research on contagion in financial networks has shown that network topology and position of banks matter; the global financial network exhibits a hierarchical structure, with individual banks acting as hubs. Capturing these effects is essential for quantifying stress on individual banks and for

looking at systemic risk for the network as a whole. Despite ongoing efforts, these effects are unlikely to be routinely considered anytime soon.

Information asymmetry within a network—e.g., where a bank does not know the solvency of its counterparties—may be problematic. The banking network typically displays a core-periphery structure, with a core consisting of a relatively small number of large, densely interconnected banks that are not very diverse in terms of business and risk models. This implies that core banks' defaults tend to be highly correlated. That, in turn, can generate a collective moral hazard problem (i.e., players take on more risk, because others will bear the costs in case of default), as banks recognize that they are likely to be supported by the authorities in situations of distress, the Basel

accord amplifies their incentives to herd in the direction.

Estimating systemic risk relies on granular data on the financial network. Unfortunately, business transactions between banks are often hidden because of confidentiality issues. Tools being developed to reconstruct networks from partial information and to estimate systemic risk (7) suggest that publicly available bank information does not allow reliable estimation of systemic risk. This estimate would improve greatly if banks publicly reported the number of connections with other banks, even without disclosing their identity.

In addition to data, understanding the effects of interconnectedness also relies on integrative quantitative models and concepts that reveal the important network aspects. A systemic approximation of the failure of individual nodes. For example, DebtRank, which measures the systemic importance of banks in the network, is a relatively new work (8). Also, the use of a two-dimensional model may be even more important than two-agent models.

"...policies and financial regulation...are successful in stabilizing experimental macroeconomic systems"

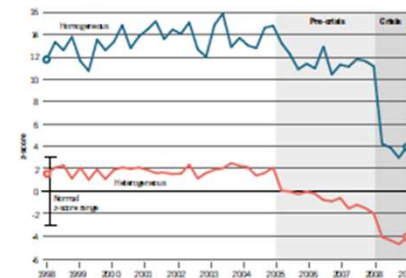
Early warning signals of the 2008 crisis in the Dutch interbank network. The figure portrays temporal analysis of two loops, joins of banks that are at the same time debtor and creditor to each other. Although the resampling of the loops is not very informative about possible ongoing structural changes, its comparison with a random network model indicates that a corresponding number of standard deviations by which the number of two-loop joins in the network deviates from its expected value in the model. Small magnitude z -scores (2) indicate approximate deviations from the model, whereas larger magnitude indicate statistically significant deviations. Two different random network models were used: a homogeneous network with the same number of links as the real network (top) and a heterogeneous network where every bank has the same number of connections in the real network (bottom). The homogeneous model often used in standard analysis highlights only a broad structural change (2008). The more realistic heterogeneous model also identifies a gradual early warning "precursor" phase (2005–2007). (Modified from (2))

to test systemic risk implications of reforms developed by the Basel Committee on Banking Supervision, which show how dynamically changing risk limits can lead to increased systemic risk (9). ABMs of market dynamics can be linked with ABM models to understand how propagation of systemic risk through social networks affects aggregate market behavior, which is critical to managing the stability and resilience of macroeconomic systems.

Some behaviors in financial markets in production, and those controlled laboratory experiments provide more detailed understanding of mechanisms, causality and conditions for emergence of macro phenomena. A simple behavioral model, with agents gradually switching to better performing heuristics, explains individual, as well as emergent, market behavior in these laboratory experiments. The experiments also provide a general mechanism for managing risk contagion in such systems. For example,

AGENTS AND BEHAVIOR. Agent-based models (ABMs) are computer models in which the behavior of agents and their interactions are explicitly represented as decision rules mapping agents' observations onto actions. Although ABMs are less well established in analyzing financial-economic systems than in, e.g., traffic control, epidemiology, or battlefield conflict analysis, they have produced promising results. Atrial (6) developed a simple ABM that explains more than three dozen empirical properties of firm formation without recourse to external shocks. ABMs provide a good explanation for why the volatility of prices is clustered and time-varying (15) and have been used

laboratory experiments with human subjects can provide empirical validation of individual decision rules of agents, their interactions, and emergent macro behavior. Recent experiments studying behavior of a group of individuals in the laboratory show that economic systems may deviate significantly from rational efficient equilibrium at both individual and aggregate levels (14). The specific feature of positive feedback systems leads to persistent deviations of prices from equilibrium and emergence of speculation-driven bubbles and crashes, strongly amplified by coordination or mimetic behavior and herding behavior (15). There is strong empirical evidence of



Early warning signals of the 2008 crisis in the Dutch interbank network. The figure portrays temporal analysis of two loops, joins of banks that are at the same time debtor and creditor to each other. Although the resampling of the loops is not very informative about possible ongoing structural changes, its comparison with a random network model indicates that a corresponding number of standard deviations by which the number of two-loop joins in the network deviates from its expected value in the model. Small magnitude z -scores (2) indicate approximate deviations from the model, whereas larger magnitude indicate statistically significant deviations. Two different random network models were used: a homogeneous network with the same number of links as the real network (top) and a heterogeneous network where every bank has the same number of connections in the real network (bottom). The homogeneous model often used in standard analysis highlights only a broad structural change (2008). The more realistic heterogeneous model also identifies a gradual early warning "precursor" phase (2005–2007). (Modified from (2))

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monetary and fiscal policies and financial regulation, designed to weaken positive feedback, are successful in stabilizing experimental macroeconomic systems when properly calibrated (16). Complexity theory provides methodological understanding of these effects.

POLICY DASHBOARD. It is an opportune time for academic economists, complexity scientists, social scientists, ecologists, epidemiologists, and researchers at financial institutions to join forces to develop tools from complexity theory as a complement to existing economic modeling approaches (17). One ambitious option would be an online, financial-economic dashboard that integrates data, methods, and indicators. This might monitor and assess the global economic and financial system in searching down to real time, in a way similar to what is done with other complex systems, such as weather systems or social networks. The funding required for essential policy-relevant and fundamental interdisciplinary programs in these areas would be trivial compared with the costs of systemic financial failures or the collapse of the global financial-economic systems (18).

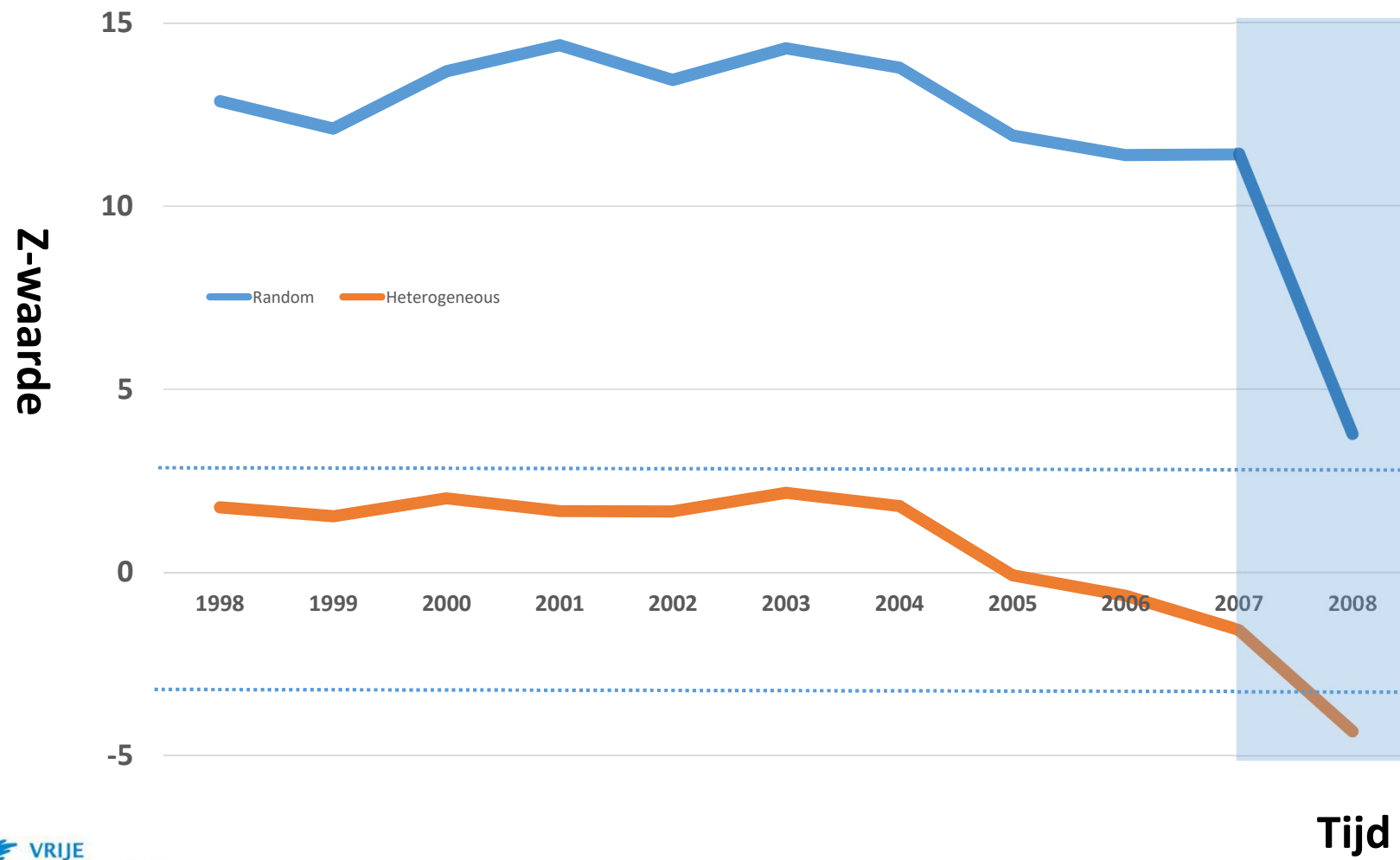
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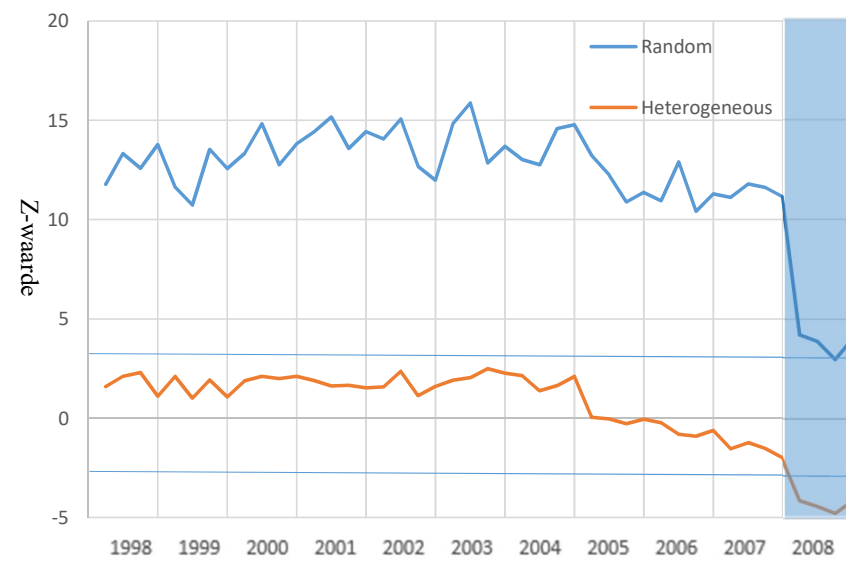
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Predicting the next financial crisis

Using network analysis and behavioral modeling to predict the next financial crisis

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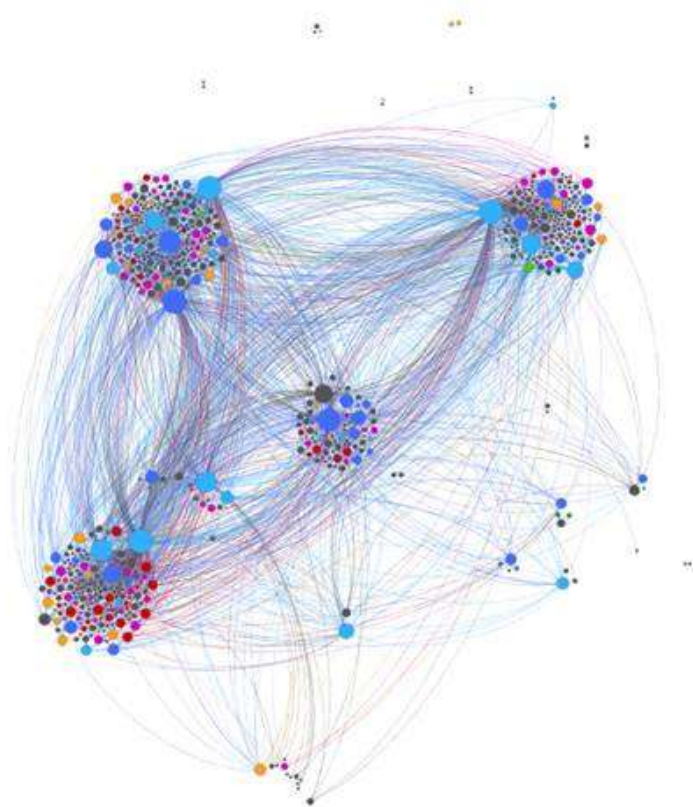




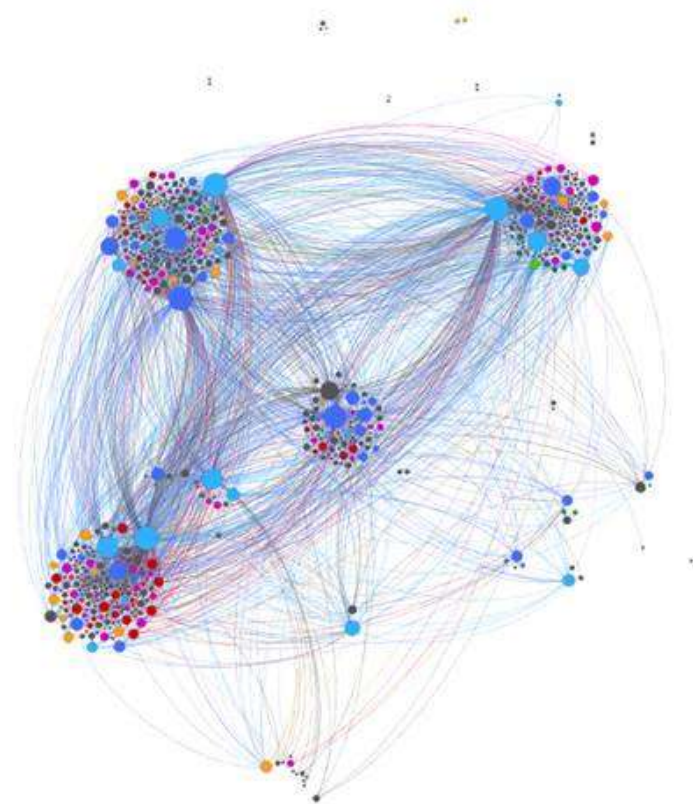




Aandelen en obligaties



CDS



Network structure can help to see change early



OPEN Early-warning signals of topological collapse in interbank networks

Tiziano Squartini¹, Iwan van Lelyveld² & Diego Garlaschelli³

SUBJECT AREAS:
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AND COMPLEXITY
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ARTIFICIAL PHYSICS
COMPLEX NETWORKS

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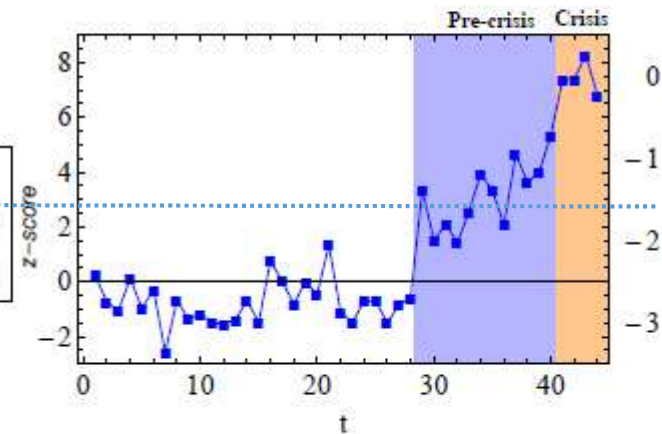
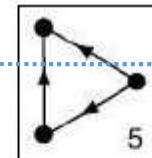
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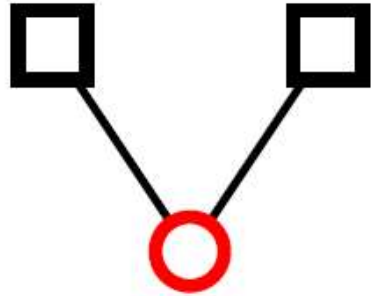
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The financial crisis clearly illustrated the importance of characterizing the level of “systemic” risk associated with an entire credit network, rather than with single institutions. However, the interplay between financial distress and topological changes is still poorly understood. Here, we analyse the quarterly interbank exposures among Dutch banks over the period 1998–2008, ending with the crisis. A clear controlling factor is the “pre-crisis” period, the topological changes in the network are “predictable” – signature of the crisis. By contrast, if the heterogeneity of banks’ connectivity is controlled for, the same properties show a gradual transition to the crisis, starting in 2005 and preceded by an even earlier period during which anomalous debt loops presumably favoured the underestimation of counter-party risk. These early-warning signals are undetectable in an network reconstructed from partial bank-specific data, as routinely done. We discuss important implications for bank regulatory policies.

Financial and banking systems are strongly interconnected networks of institutions exposed to both endogenous and exogenous fluctuations^{1,2}. When defaults occur, they cascade throughout the network and can cause the collapse of an entire system, as dramatically witnessed by the recent financial crisis³. As a consequence, the analysis of economic and financial networks as the propagation channel for distress has received a lot of attention^{4–6}. Much effort has been devoted to the search for regularities in the structure of financial networks, i.e. looking for degree heterogeneity, a core-periphery or a modular structure^{7–10}. Similarly, null models have been introduced in order to understand whether part of the observed topological complexity can be explained naturally simply in terms of the observed heterogeneity of connectivity^{11–14}. For interbank networks specifically, a lot of attention has been devoted to quantifying the level of systemic risk (the risk of the collapse of the system) as a function of the structure of the network^{15–17}. In particular, the concept of systemic risk has been defined as the risk of the collapse of the system as a function of the structure of the network^{15–17}. In particular, the concept of systemic risk has been defined as the risk of the collapse of the system as a function of the structure of the network^{15–17}.

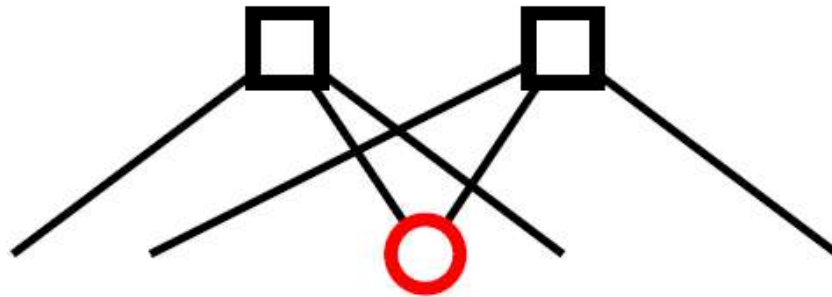


Squartini, Van Lelyveld, and Garlaschelli (2013)



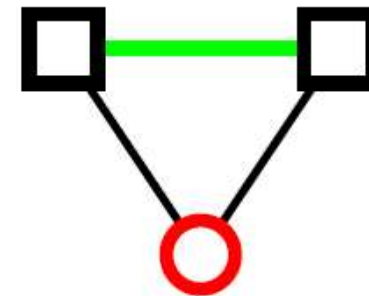
Institution

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Figure: *