

Lauri Jantunen

SYSTEMIC RISKS AND CRISES

The financial crisis that started in 2007, although not particularly unique in terms of the world's economic history¹, was in many ways still a very exceptional financial event. Each crisis has their own particular set of characteristics, and while for example the Great Depression of the 1920s was fuelled by a stock market boom, the financial crisis of 2007 is widely being considered to have been instigated by low interest rates and mortgage securitization. The turmoil that followed the unwinding of market positions led to a default of a number of U.S. financial institutions and prompted the U.S. government to respond with an unprecedented bailout operation. Despite these actions, the financial crisis that followed is considered to be the worst since the Great Depression. Finland was hit particularly hard by the crisis and the global downturn, and curiously it seems that the Finnish financial markets took a worse hit than the banking sector that was at the heart of the storm.

While the U.S. managed to steer clear, the financial crisis had a severe spillover effect on the other side of the Atlantic. Loss of competitiveness, fiscal deficits and aftershocks of the 2007 crisis burst economies open in Greece, Ireland, Italy, Portugal and Spain. Europe had to deal with contagion that undermined the economic stability of the whole continent and even threatened to spread globally. The European Union was forced to pass equally unprecedented bailout operations, but even by 2013 the crisis is yet to be completely resolved.

The severe economic implications and the costs involved in bailouts have been exceptional. So much so, that the governments have taken a number of steps to ensure that such economic calamity could never be reproduced in the future. Some of the new regulations include microprudential precautions that strive to ensure the operations and stability of individual financial institutions and economic agents, but also encompasses macroprudential counter-cyclical actions that aspire to mitigate the buildup of financial excesses and try to reduce macroeconomic vulnerabilities. All said, there is a debate on whether these new laws and regulations have any possibilities to control future crises. This is simply because the very nature of the market centric economy is such that the competitive landscape changes constantly. Essentially it is a perpetual cycle in which

¹ The crisis was approximately the 100th in records of economic history.

agents develop and evolve, which fundamentally means that by definition all these new regulation will prove to be inadequate to contain future financial meltdowns.

But what actually is this systemic crisis that brings fear to the eyes of politicians and economists? By definition a systemic crisis is used to define a particularly dangerous economic meltdown that not only risks bringing down whole markets, but has the potential to break entire economies – both nationally and internationally. This is stark contrast to more conventional economic distress scenarios, that usually only concerns a small number of assets, economic entities or some specific parts of financial systems.

The systemic nature of markets is assumed to have its roots in the interlinked and interconnected nature of the modern global economy. For example the financial institutions around the globe are not only deeply interconnected by the interbank market, but also linked via a myriad of other connections such as credit default swaps, insurances, commodities and brokerage services. Essentially this means that the collapse of one economic entity can set off a deadly domino game effect that has the capacity to bring down the entire system.

Probably the most common type of systemic crisis is a bank run. That is, a particular situation where due to a rumor or actual information, a large number of depositors expects a financial institution to default, and therefore want to withdraw their deposits. Under normal situations, financial institutions could handle these withdrawals, but the sheer amount of requests pose a challenge under fractional reserve banking². Thus due to the excess demand, the financial institutions is unable to meet its commitments, and may well default or increase the risk of default regardless of its actual financial health. Another variation of a bank run is a situation where information asymmetries and liquidity limitations can trigger general unease on the financial stability of an economy or particular financial assets. This nervousness can set off a massive herding effect among investors from risky assets to safer assets. The recent spike in the demand for precious metals such as gold and German government bonds are both good examples of such the *flight to quality* crowding-in effect that can have profound implications on the global macroeconomic environment for example via interest rates and carry-trades³ in the foreign exchange markets. These are just a few reasons why financial supervision authorities have a duty

² Fractional reserve banking refers to a system where financial institutions retain only a certain percentage of customers' deposits as funds to meet daily operations. The exact amount for reserve requirements is usually set by national central banks.

³ A carry-trade is a trade where investors sell a certain currency in order to purchase another currency yielding a higher interest. Usually these trades involve substantial leverage, which increases their systemic risk.

and mandate to try and implement policies that prevent such scenarios and protect the needs of the general public in situations where information is hard or expensive to obtain, and failures could result in the loss of welfare.

But financial authorities have also an obligation to regulate the use of monopoly power and assess the externalities involved in market failures. This is specifically evident in the recent debate on the bailout of institutions that have been deemed *too big to fail*, that is their relative weight on the appropriate functioning of the markets, or a one particularly important market for the economy, is so high that society cannot bear the costs involved in the default of such an institution. The actual interpretation for too big to fail has proved to be problematic, because it is not evident whether a relatively big share of activities in a certain market should be the sole way of assessing strategic importance to a certain economic agent.

Institutions are generally classified into four groups when assessing their systemic qualities. The most notable agents are considered to individually systemic due to their size and level of connectedness, while less important players are considered systemic as part of a herd. The rest of the market is either described as non-systemic large or tinies. Individually systemic institutions require both micro- and macroprudential regulations, but these rules are progressively reduced up to a point where we are left with just minimal regulations as we progress toward the lower end of this classification. However, the global character of modern business implies that size itself probably shouldn't be used to evaluate systemic relevance, but more so the level of interconnectedness that a financial agent is engaged in within a certain market. Commodity markets for instance have an important impact on economies of commodity-rich countries such as Australia or Canada, so the instability and malfunctioning of such markets can have notable knock-on effects on the whole economy. But the securitization of commodities can make the causal process involved the proper functioning of the market hard to detect. A good example of such hard to observe systemic risk is the reported issues related with how some commodity companies relying on single financial institutions for funding, and how this could potentially have severe systemic implications in case this financial institution with a market-making role would fail.

There thus seems to be some ambiguities involved in the interpretation of systemically important players, because a market-making role does not need to involve a relatively big size in the aggregate market, but more so, is assessed based on the relative role within smaller markets and on how these markets affect the functions of the general economy.

These market-makers however play a very important role in providing liquidity to markets, but fundamentally it is important to ask whether such an important role should only be given to formal institutions with official supervision, or whether private markets can indeed provide such systemically important functions. Experiences from the 2007 financial crisis might suggest that skepticism is warranted, but it is not evident that already fiscally overstretched governments would want to bear the costs of such activities. Economic literature often suggests insurances as a solution to virtually any economic question relating to negative externalities, but the potential spillover effects effectively mean that defaults could result in systemic crises that would essentially lead to a force majeure that any single insurer would be able to cover under normal situations.

These intricacies in the financial system were not that evident before the crisis of 2007. Later research has however discovered how fragile the system actually is and there is consensus that further research is needed to better understand the process that drives these exceptional events. It is not only important because these incidents pose an acute danger to the general economy, but also because just protecting oneself from these events can have significant negative externalities on the economy (for instance the flight to quality example discussed above). But in this perspective, the global economy and tighter interconnectedness also means new challenges for protection. Some go as far as declare the end of the capital asset model⁴ and paint a picture of an ever more interconnected economy where it is impossible to diversify risk onto uncorrelated assets because everything has become interlinked in some way or the other – when everybody tries to hedge against riskiness in their portfolio, it is not technically possible to reduce risk by diversification anymore.

What really sets systemic crises apart from regular economic downturns is the dangerous chain effect that takes place when single markets start to fail. Contagion usually refers to the adverse implications that relate to the negative incentives associated with illiquid markets that render the proper functioning of markets impossible. In other words, what might first seem as just insensitive market adjustments under liquidity constraints, can quickly escalate and spread disorder to other markets due to the interconnected nature of the modern economy. Contagion spills over and soon the stability of the whole economic system might be under threat.

⁴ The capital asset model (CAPM) is a theoretical model introduced by J. Treynor, W. Sharpe, J. Lintner and J. Mossin used to determine the required rate of return of an asset based on non-diversifiable risk, with the assumption that for one risk is divertible across other assets and/or markets.

Although contagion can transfer internationally via both finance flows and the goods markets, it is generally more related to the interlinked nature of financial markets, and is regarded to be especially large in the international financial flows where volatility is high. The fundamental idea is that when an exogenous shock hits a certain economy, the country might be forced to react and for example start to withdraw funds from abroad back home. This might create demand and supply imbalances in international markets and could activate substantial adjustment measures as investors modify their portfolios for the new equilibrium. Naturally, the strength of the movement is stronger the higher the relative share of the adjustment is for the economy. For example, a severe earthquake in Japan could prompt significant repatriation of foreign investments in order to rebuild the disaster area.

The exact causal process underlining contagion is still not well understood and there seems to be relatively large discrepancies in how individual agents react to different scenarios. But it seems that these institutional microfoundations play an important part in the systemic stability of an economy. Despite the aforementioned, it is not very clear whether individual economic agents or even single countries should ultimately assume the responsibility of global economic stability. For example, when faced with financial or economic distress, it might be advisable for a rationally behaving economic agent to liquidate assets even though it could instigate further fire sales in the financial markets in general. The interest of an individual might simply not be in line with the interests of an entire economic system.

It is worth noting, that under normal situations most of the international transactions are usually hedged for changes in the foreign exchange markets. In this sense, some of the negative implications of risks involved in international trade are automatically removed. Nevertheless, large shocks usually come as a surprise, so while hedging takes out some of the effects, the long-term implications will still remain intact as economic agents will still have to adjust to the new equilibrium.

Contagion is often divided into two main categories. We usually talk of fundamental contagion when we refer to the normal interdependence between market economies. That is the regular investment flows and exchange of goods between economies. Fundamental contagion can be due to shocks such as changes in interest rates of major economic trading partners such as the U.S., but can also result from price changes in commodity prices. Then there is financial contagion that can be highly irrational, when for example investments are being withdrawn based on very little real information and analysis of the

local situation. Finland is often considered to suffer from its geographic location, because international investment flows are usually the last ones to enter peripheral economies, but also the first ones to withdraw. Although, it should be noted, that the recent banking crisis in Europe has also enabled Finland to enjoy the positive implications of the flight to quality crowding-in effect.

Devaluations are also a catalyst for major changes, just because they can impact the trade balance almost instantly and set off big adjustments in financial flows. But the devaluation effect can also be multiplied if investors expect the devaluation to result in a devaluation spiral between different countries. This effect can even have an effect on other currencies as well. The closer the countries are in terms of trade and economic integration, the higher is the risk of contagion. Equally well, a low level of international trade, limited economic integration and capital controls seem to mitigate the effects or even allow total immunity of economic contagion. Free markets and capital movements therefore seem to ease the transfer of contagion even though they do not directly cause them by themselves.

Regulating free markets can sometimes be a rather complex issue. In the question of contagion we should ask whether the risk posed by market failure is greater than the risk posed by policy failures. Because things can easily get from bad to worse if regulation ends up creating further market failures or result in inhibiting the natural correction reaction to excess movements. Basically the regulations prior to the crisis of 2007 proved to be very inflexible and actually ended up contributing more to the problem rather than to the solution, as strict regulations sent the markets into a death spiral. The situation was partly due to strict accounting regulations that were in place to protect the general public, but also due to risk management and leverage practices that are generally pro-cyclical. Plummeting asset prices forced many institutions to face regulatory constraints as to demonstrate solvency by reducing exposure to volatile stock prices, which essentially pushed stock prices even lower. But, plummeting asset valuations also made balance sheets weaker and increased leverage, which forced many institutions to rebalance their financial statements by selling assets. Investment funds are for example highly regulated in terms of their portfolio strategy and a correction in the price of one asset can make another asset's share of the investment portfolio too large in terms of regulation. This can force the fund to balance their portfolio and thus contaminate even a healthy asset. Furthermore, risk management practices often centered on VaR⁵ models that favored the sale of assets with high risk, and margin trading was susceptible to margin calls, all having

⁵ Value at risk (VaR) is a common measure of risk of loss in financial assets for a given portfolio, probability and time horizon.

potentially devastating systemic effects on the market place. In light of this, we can easily understand how unprepared and fragile the global financial system was to handle an economic cataclysm. Recent advances in financial regulations have tried to address these problems, by for example introducing explicit capital charges for liquidity risk and proposing more flexible accounting practices such as the mark-to-funding⁶ rule, which enables a more long-term perspective rather than the usual mark-to-market⁷ valuations used today.

There has been quite a bit of research studying the behavior of investors. There are some studies, which take a very pragmatic approach and simply classify investors into specific categories, but more eloquent approaches spend time analyzing the behavior in the market place. One conclusion from these studies is that even rational investors are susceptible to excessive behavior that we cannot explain based on fundamentals alone. It is argued that this is due to contagious behavior that relates to informational asymmetries and multiple-equilibria in the markets. This type of behavior in the global marketplace can explain for example why a crisis in Ireland can initiate sales spikes in Frankfurt or New York.

But how well are investors informed about the true circumstances that a particular market operates in? Do they for example sell some assets just because investors expect contagion, or do they make a rational analysis of the situation and act purely based on fact? Research suggests that fixed costs relating to information can lead to a herding behavior, where uninformed investors simply mimic the actions of informed investors. This can of course result in significant movements with equally powerful consequences on the markets, but helps us to understand why sales from a specialized hedge fund can potentially stir panic in other investors operating in the same market. But based purely on economic theory, this type of herding behavior can actually be very profitable and advisable, especially when the number of potential assets grows and the cost to analyze and follow all markets becomes high.

Multiple equilibrium theory suggests that one very straightforward explanation for contagion is the changes in expectations that occur when one market is driven to disequilibrium for example due to a drop in asset prices, capital outflows, devaluation or even debt default. The model defines rational behavior as actions that are based on the actions of all others. Essentially this means that the Nash equilibrium in the example of

⁶ Mark-to-funding basically divides pools of assets based on the maturity of financing used.

⁷ Mark-to-market values assets based on their current market price. This can increase volatility as it may force sales based solely on accounting standards.

bank runs can either be found when everybody keeps their savings in the bank, or when there actually is a run on the bank.

Expectation can also change because of new regulations that govern financial transactions. These regulations can occur in one country, but if investors expect that similar regulations can be implemented elsewhere as well, this can trigger strong responses internationally. But the markets may as well question the IMF's or European Union's ability to serve as a lender of last resort. This was very evident during the sovereign crisis in Europe, when the sheer size of the bailout packages required to secure stability simply started to seem exorbitant. Such situations may spark panic if investors fear that bailout packages will not be available to all those who may need them.

Small changes in expectations or informational contagion can have disproportionately large effects on the markets because a single adjustment is amplified across the whole financial system. Adjustments in one sector can have direct spillover, so called domino effects, but can also produce indirect spillover effects as prices, constraints and other responses of market participants adjust for the new status quo. It is worth noting that interestingly, the direct effects do not seem to have the potential to generate substantial crises by themselves.

Empirical research on systemic crises and contagion is problematic because the definition itself is relatively broad. It is not evident whether we are measuring network externalities or just assessing potential risk associated with accounting practices. Matters are made worse by the fact that empirical research has potentially massive amounts of data available for study, so extra care and time should be devoted to building the model and theory in order to extract relevant knowledge out of this pool of data.

Correlations between economies, interest rates, stock prices and spreads have been studied, but although there are signs of notable co-movements, it is not necessarily an indication of contagion. Such correlation can just be attributed to the historical transmission mechanisms, which also work under normal conditions, and by such, do not serve as statistical evidence of contagion. We would need to be able to control endogenic changes in for example in economic fundamentals, risk perception and preferences in order to analyze contagion at its purest. This of course is very complicated without seriously limiting assumptions in the analysis, but explains well why the results in econometric studies have not been uniform. Another way to approach the study of systemic effects is to analyze conditional probabilities. That is, not just focus on correlation, but also assess the probability for a crisis if one or many other countries suffer

from financial distress. Such an approach can shed some light to the financial and trade channels that might assist in spreading the contagion. These studies give evidence to the fact that trade relations tend to be central when assessing the spreading of contagion, but also that big economic forces such as the U.S. tend to be in an important role when distributing shocks to the rest of the world. Interestingly not all of these patterns seem to hold under period of crises.

BIBLIOGRAPHY

- Acharya, V. V., Pedersen, L. H., Philippon, T., & Richardson, M. (2013). How to Calculate Systemic Risk Surcharges. *Quantifying Systemic Risk*.
- Ang, A., & Longstaff, F. A. (2011). Systemic Sovereign Credit Risk: Lessons From the U.S. and Europe. *NBER Working Paper, No. 16982*.
- Bordo, M., & Murshid, A. (2000). The International Transmission of Financial Crises Before World War II: Was There Contagion? *The Contagion Conference*.
- Brunnermeier, M., & Oehmke, M. (2013). Bubbles, Financial Crises, and Systemic Risk. *Handbook of the Economics of Finance, Vol. 2*.
- Brunnermeier, M., Crocket, A., Goodhart, C., Persaud, A. D., & Shin, H. (2009). The Fundamental Principles of Financial Regulation. *Geneva Reports on the World Economy 11*.
- Dornbusch, R., Park, Y. C., & Claessens, S. (2000). Contagion: Understanding How It Spreads. *The World Bank Research Observer, Vol. 15, No. 2*.
- Eichengreen, B., Rose, A., & Wyplosz, C. (1996). Contagious Currency Crises. *NBER Working Paper 5681*.
- Ewald, N., Kröger, J., Kuhnert, S., McCarthy, M., Nieto-Parra, S., Santiso, J., et al. (2010). Contagion and Spillovers: New Insights From the Crisis. *SUERF Study 2010/5*.
- Forbes, K., & Rigobon, R. (1999). No Contagion, Only Interdependence: Measuring Stock Market Comovements. *NBER Working Paper 7267*.
- Hansen, L. P. (2013). Challenges in Identifying and Measuring Systemic Risk. *Risk Topography: Systemic Risk and Macro Modeling*.
- Pekkarinen, J., Sinko, P., Freystätter, H., Mattila, V.-M., Maliranta, M., Mäkinen, R., et al. (2011). Finanssikriisin Reaalitaloudelliset Vaikutukset Suomessa: Alustava Kokonaisarvio. *Valtioneuvoston Kanslian Raporttisarja*.
- Stein, J. C. (2013). Overheating in Credit Markets: Origins, Measurement, and Policy Responses. *Research Symposium by the Federal Reserve Bank of St. Louis*.