



OICU-IOSCO

**‘What is the correlation between
size and risk?’**

**Identifying, monitoring and mitigating
systemic risk in a changing context**

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Disclaimer

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Speaking notes can be found at the end of the slides.

Introduction

Part 1: Current thinking

Institutional size and systemic risk.

Part 2: Issues to consider - nature and sources of systemic risk

- (1) Systemic risk in the non-banking sector
- (2) Non-institutional systemic risk
- (3) The evolving nature of systemic risk

Part 3 Conclusion

And further questions.

Current thinking

The context:

- Systemic risk considered from an institutional perspective.
- Efforts to contain systemic risk through identifying, monitoring and regulating systemically important institutions.
- Institutional size is a key measure.
- Question of 'size' and 'the right size' is dominating discussion.

Research:

- Positive but non-linear correlation between institutional size and systemic risk.
- But a number of caveats...

Caveats...

- Institutional size not universally revealed as key determinant.
- Focus of studies mainly on banking sector.
- Correlation in samples not necessarily representative of correlation in the whole sector.

The nature of the correlation between institutional size and systemic risk is not clear.

Understanding the correlation - Issues to consider:

Factor 1: Systemic Risk in the non-banking sector.

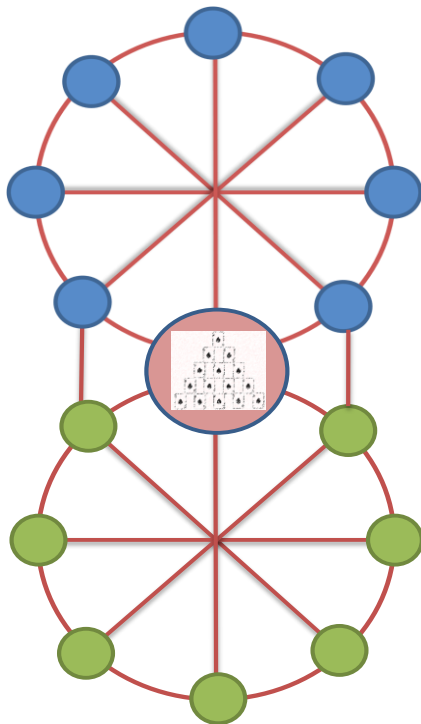
Factor 2: Non-institutional systemic risk

Factor 3: The evolving nature of systemic risk

Factor 1: Systemic risk in the non-banking sector

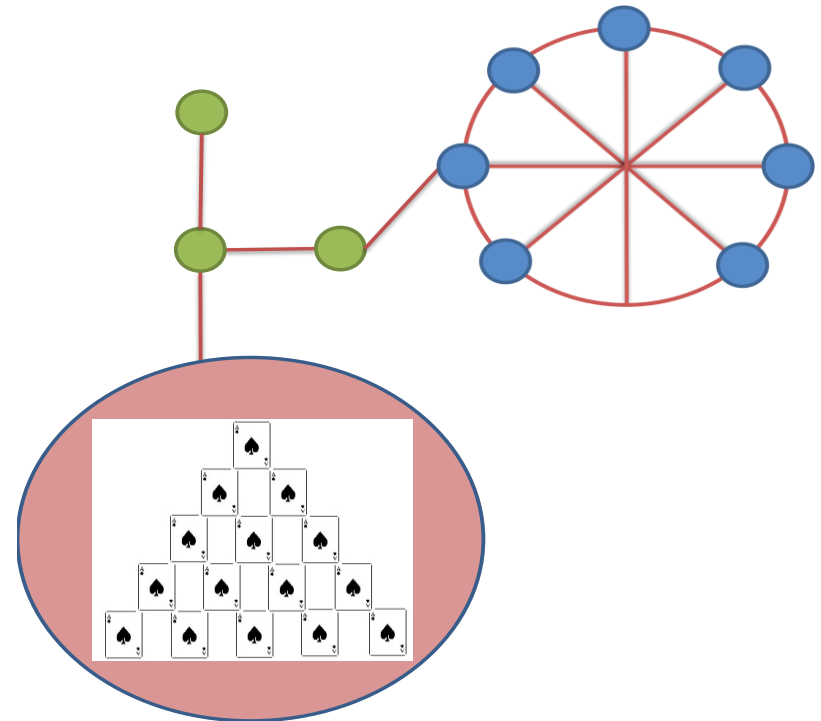
We cannot assume a correlation between institutional size and systemic risk in the non-banking sector.

Long-Term Capital Management
Size = \$4 billion
Interconnected



Systemic implications

Amaranth Advisors
Size = \$ 9.5 billion
Not interconnected



No systemic implications

Factor 1: Systemic risk in the non-banking sector

The correlation between size and risk may differ between sectors and for different types of institutions.

Factor 2: Transcending an institution-based approach

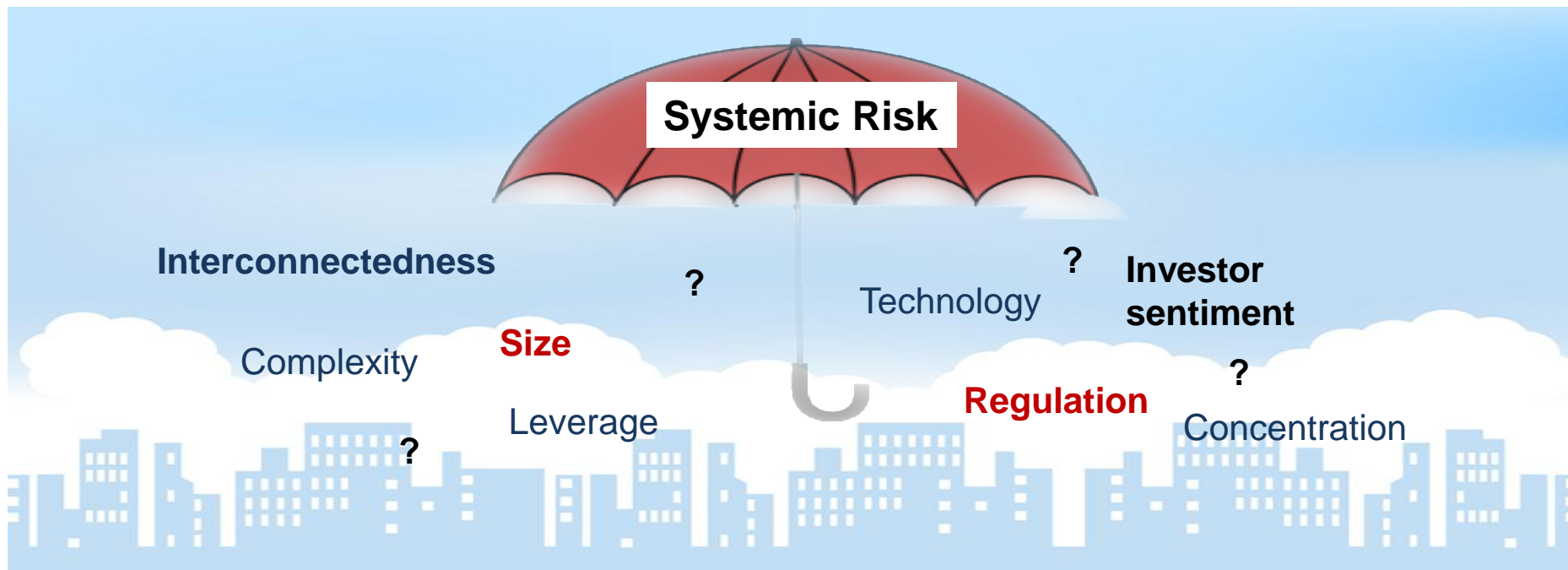
Systemic risk can build-up through certain activities, markets and products.

The correlation between size and risk may not tell us everything about the sources of systemic risk.

Factor 2: Transcending an institution-based approach

A correlation between size and risk may or may not hold under different market conditions – due to the influence of perception.

Factor 3: Evolving nature of systemic risk



A correlation between size and risk could be volatile across time.

Conclusion

Conclusions: Further questions

- What does the potential nature of the correlation between size and risk mean for efforts to address systemic risk?
- How can science assist us in overcoming some of these issues so that practical, robust methodologies for identifying and monitoring systemic risk can be developed?

'What is the correlation between size and risk?: predicting systemic risk in a changing context'

By Rohini Tendulkar, Research Department, IOSCO

Presented at the Joint Research Centre roundtable event, '*Scientific Support to Financial Analysis: How can science contribute to financial stability?*'

Brussels, 8 November 2012

Introduction

- The title of my presentation asks '*What is the correlation between size and risk?*'
- For the purposes of today's discussion, I will explore this in terms of institutional size and systemic risk and what this means for efforts to maintain financial stability.
- This is an important question given the place of institutional size in the current discourse addressing systemic risk.
- First, I will briefly explore some of the current thinking on the relationship between institutional size and systemic risk.
- I will then compare this with what we can discover about the actual correlation between institutional size and systemic risk from the literature... and what we still don't know.
- Next, I will introduce three factors concerning the sources of systemic risk. Through these factors, I hope to provide some further understanding on the nature of this correlation and perhaps guide research efforts in this area.
 - **Factor 1: Systemic risk in the non-banking sector**
 - **Factor 2: Non-institutional systemic risk**
 - **Factor 3: The evolving nature of systemic risk**
- I will conclude by inviting your thoughts on how science can assist us in overcoming some of the issues I discuss.

Part 1: Current thinking: Correlation between size and risk

- **Current Thinking - The Context and Approaches**
- Systemic risk can be broadly defined as dysfunction in the financial system with disruptive impacts on the real economy.
- Since the recent crisis, there has been concerted effort to measure, monitor and mitigate systemic risk in the financial system so as to support maintenance of financial stability.
- However, systemic risk is complex and difficult to map. Part of the reason, is that systemic events themselves are quite rare, making it difficult to pinpoint trends and causal factors.
- For simplicity and perhaps practicality, the current discourse appears to be framing systemic risk mainly in terms of systemically important financial institutions.
- Supervisory approaches provide frameworks for identifying these institutions, based on a list of factors - size, interconnectedness, complexity, substitution and cross-jurisdictional claims and liabilities.
- Here institutional size is still a key measure. Systemically important institutions all tend to be large suggesting that the larger the institution, the more important it is systemically, and by extension, the greater impact it can have on the stability of the financial system.
- This holds logically because large institutions also tend to also be complex, interconnected, non-substitutable and multi-national. The 'too big to fail' paradigm, social unrest over government bail-outs and consequences of institutional failures such as Lehman Brothers and AIG also reinforces this thinking.
- Thus, the question of 'size' and specifically 'the right size' is dominating discussion.
- Furthermore, from this perspective, systemic risk is essentially being seen as something that can be contained through the monitoring and regulation of large institutions.
- But, what exactly is the correlation between institutional size and systemic risk?

Current Thinking – Studies and Literature

- Most of the quantitative studies that reveal something about the relationship between institutional size and systemic risk do so in the context of developing systemic risk measures.
- These measures are based on market data and aim, in part, to identify the systemic risk posed by individual institutions.
- Some key measures include the Marginal Expected Shortfall (MES), The Systemic Risk Measure (SRISK) and the Delta Conditional Value-at-Risk (CoVaR).
- Now, these studies do diverge in terms of the institutional factors revealed as most correlated with systemic risk.
- However, when it comes to institutional size most (but not all) point to a positive albeit non-linear correlation.
- But there are a number of caveats to this conclusion:
 - The focus of most of these studies is mainly on the banking sector.
 - Some studies do actually find that institutional size is not statistically significant – especially those studies using a larger and more diverse sample size.
 - Furthermore, since finding the correlation between institutional size and risk is not the main objective of these studies, the samples are not necessarily designed so that a correlation for the whole sector or system can be extrapolated from a correlation between size and risk found in the sample.
- There is still much we don't know about the correlation between institutional size and risk, so how can we better understand it?
- To answer this second question, I would like to explore three factors regarding the sources and nature of systemic risk.
- These factors can perhaps cast some light on aspects of this correlation, with implications for our wider systemic risk identification and monitoring efforts.

Part 2: Issues

- **Factor 1: Systemic risk in the non-banking sector**
- The recent crisis has triggered a more system-wide perspective of systemic risk, which acknowledges the role of non-banking entities. As part of this, efforts are underway to label systemically important non-banking institutions in a similar fashion to what is done in the banking sector.
- For securities markets, the sheer number and different types of institutions involved makes size a tempting threshold value for distinguishing which entities to focus on.
- However, there is minimal research to draw from concerning the correlation between institutional size and risk in the non-banking sector, perhaps partly due to the diverse nature of the institutions involved.
- But, there are some empirical examples, where systemic risk is not dependent on institutional size.
- One example involves comparison between the hedge funds Long Term Capital Management and Amaranth Advisors.
- LTCM collapsed in 1998, when the Russian debt crisis caused global interest rate anomalies that threatened the hedge fund's relative value strategies. The U.S. Federal Reserve System was forced to intervene to mitigate the shake in confidence and possible destabilization of the financial sector.
- Amaranth Advisor's collapse was also linked to risky practices – betting on natural gas futures contracts and the weather. However its collapse had no systemic implications.
- What is interesting here is that the asset size of LTCM was only \$ 4 billion in the lead up to its collapse, making it relatively 'small'.
- In comparison, the size of Amaranth Advisors' another failed hedge fund was \$ 9.5 billion before its collapse.
- The reason for the systemic importance of LTCM was not related to its size but to its interconnectivity. The hedge-fund industry's activities had become heavily intertwined with global fixed-income markets prior to LTCM's collapse. Amaranth Advisors on the other hand was relatively large, but not particularly interconnected.
- So what does this mean for the correlation between institutional size and risk?
- This is only one example but highlights something that future research efforts into this topic may need to take into account.
- That is: even if a correlation between size and risk is found for the banking sector, we cannot assume that it holds for other non-banking entities.
- This is because the correlation between size and risk may differ between sectors and for different types of institutions.

Factor 2: Non-institutional systemic risk

- There are two points I want to make here.
- Firstly, I would like to briefly point-out that an institution-focused approach to systemic risk may miss some critical determinants.
- The recent financial crisis shows how the proliferation of certain activities can contribute to systemic risk build-up, amplification and transmission.
- For example, the securitization of loans, credit derivatives into structured investment vehicles was an activity that occurred across institutions, and which allowed banks to shift risks off their balance sheets into the shadows.
- Rapid disintermediation and capital-market linkages allowed risks to spread.
- Focus on individual institutions, regardless of size would miss this systemic risk build-up because it is the characteristics of the products, markets and activities that is important here from a systemic risk perspective.
- What does this mean for research efforts focused on the correlation between institutional size and systemic risk?
- Simply that we must also take into account other correlations between size and risk – for example size in respect to markets, products and activities.
- The second non-institutional factor that I want to discuss today concerns the psychological and behavioral dimension. This is another external factor that cannot be captured through an institution-based approach to measuring systemic risk concerns.
- There has been some recognition of this dimension in terms of how market sentiment, greed, underestimation of risk and herding can work to amplify a seemingly benign risk towards manifesting as a systemic one.
- What I find interesting in terms of identifying the correlation between institutional size and systemic risk concerns the influence of perception.
- Perception is important because it influences investor confidence, which in turn impacts behavior.
- Importantly, perception is extremely difficult to decouple from other perceived drivers of systemic risk.
- In the case of the correlation between size and risk, we have to ask – ‘how much of this can be attributed to perception of size, rather than the physical implications of size?’
- This is a difficult question to answer because perception is a difficult thing to quantify. But we have to ask, because if the influence of perception is highly embedded in this correlation, then the correlation will be unstable.
- It will be unstable because perception is changeable and difficult to predict. It is influenced by a number of external factors including news messages, uncertainty and peer sentiment.

- Right now, we know that the perception of stability in the financial system could be deeply influenced by the default of large, complex and interconnected institutions leading to panic, withdrawal and contagion.
- However, under different conditions, perceptions of stability could also be rocked by small but cumulative weaknesses.
- In other words, any correlation between institutional size and systemic risk (inferred from historical data) may only hold because perceptions of financial stability during that particular time were dependent on factors related to institutional size.
- In the future this may not be the case.
- A concrete example of the power of perception and how it can drive systemic risk, regardless of institutional size concerns Northern Rock.
- In 2007, Northern Rock suffered a severe bank run after approaching the Bank of England for liquidity support.
- The issue with Northern Rock was partly in its strategy, which relied on borrowing in the short-term from the interbank market, selling its mortgage loans on the wholesale market and replacing short-term interbank funding by issuing bonds.
- When securitized finance markets dried up, and funding through the interbank market became expensive, the business model failed.
- As the British authorities stepped in, uncertainty about the condition of the institution and the financial system, triggered panic, causing a nationwide bank run, contagion and a drop in shares of similar institutions dedicated to mortgage provision.
- But, Northern Rock was not a 'systemically important institution' per se – it was not large, particularly interconnected and was substitutable. However its collapse posed a systemic risk, in part because of perception.
- What this suggests about the correlation between institutional size and systemic risk, is that any observed correlation may or may not hold under different market conditions.
- This needs to be taken into account when we design systemic risk identification, measuring and monitoring methodologies.

Factor 3: The evolving nature of systemic risk

- Systemic risk can be roughly defined by its impact but it cannot be defined in terms of its sources.
- Current efforts to address systemic risk essentially attempt to infer its sources from historical data and examples. Even in my own presentation I have turned to past examples to highlight different aspects of systemic risk.
- However, systemic risk is essentially an umbrella term, loosely encapsulating a set of circumstances and factors that are constantly changing and evolving, in terms of their importance.
- I will show what this could mean for the correlation between size and risk through the example of the impact of regulation.
- In brief, the nature of systemic risk will be impacted by the regulation we are putting in place right now to mitigate it.
- Already the act of categorizing, monitoring and regulating large, complex and interconnected institutions based on their systemic importance is changing the relationship between institutional size and systemic risk.
- On one hand, this regulation may effectively contain the systemically risky aspects of large institutions, reducing their systemic risk potential.
- On the other hand, there is an implicit guarantee of safety given through the monitoring and regulation of these institutions which may drive activity towards them, making them even bigger.
- A failure of such an institution, triggered by other perhaps yet unknown factors, could have a devastating effect on the psychology of investors, severely undermining investor confidence in the whole financial system and amplifying the systemic risk potential of the institution.
- What this suggests is that in the medium/short-term, the correlation between institutional size and systemic risk may become less pronounced, however in the long-term it may be reinforced or exaggerated.
- What this essentially means for the correlation between size and risk is that this correlation is quite probably volatile across time.

Part 3 Conclusion

- Today I have mentioned the importance given to institutional size in the current discourse and when it comes to measuring, monitoring and mitigating systemic risk.
- This would seem to be supported by a positive but non-linear correlation between institutional size and systemic risk revealed in the relevant literature. Yet this correlation rests on a number of important caveats, suggesting that the correlation between size and risk, from a system-wide perspective, is still not really known.
- I have tried to supplement our understanding through further exploration of the nature and sources of systemic risk, highlighting what future scientific research efforts should take into account when it comes to the nature of this correlation.
- What this exploration has revealed is that the correlation between size and risk:
 - May differ between sectors and for different types of institutions.
 - May not tell us everything about systemic risk build-up e.g. in markets, products and through certain activities.
 - May or may not hold under different market conditions – due to the unpredictable influence of perception.
 - And could be volatile across time.
- I would now like to conclude by posing two questions:
- What does the potential nature of the correlation between size and risk mean for efforts to address systemic risk?
- And how can science assist us in overcoming some of these issues so that practical, robust methodologies for identifying and monitoring systemic risk can be built?