

# **Too Big to Fail and Systemic Risk**

Master Thesis  
in  
Corporate Finance

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## **Abstract**

This thesis discusses the problem of too big to fail in the context of the recent financial crisis. Building upon research from Billio et al. (2010), it contributes to the growing literature on systemic risk by proposing a risk contribution measure. Moreover, a comparison between Bear Stearns' and Lehman Brothers' relative systemic importance is undertaken. Empirical results provide some evidence on the validity of the indicator in respect to the identification of systemically important institutions. Still, some limitations concerning measure precision and robustness emerge. Moreover, no clear conclusion can be drawn on the relative importance of the aforementioned investment banks.

**Keywords:** Systemic risk contribution; Granger causality; macroprudential regulation; credit default swaps

**JEL Classification:** C51, G21, G28

# Executive Summary

## Problem

The bursting of the U.S. housing bubble in the summer of 2007 marked the beginning of a period, characterized by massive writedowns and contagion within the financial sector. Governments throughout the world felt themselves impelled to step in and bail so-called *too big to fail* or *systemically important financial institutions* out. They reasoned their actions by asserting that the failure of such an entity would induce contagion and thereby put the whole system at risk. As a result, regulators and researchers currently strive to construct a new framework, aimed at reducing the externalities too big to fail institutions pose. Once designated as such, systemically important entities will be subject to stricter rules and required to hold additional capital cushions. In this vein, it shall be ensured that tax payers' money are never again put at risk.

This thesis has the purpose to discuss the problems concerning too big to fail and systemic risk, as well as the therewith connected recent events and regulatory issues. The main goal, however, is to introduce a measure of systemic risk contribution for banks and other financial institutions. It shall suit the purposes of macroprudential regulation and represent an appropriate tool for the identification of systemically relevant entities. In addition, it shall assist regulators in the attribution of capital and tax requirements. Last but not least, the proposed indicator shall be tested in an empirical setting.

## Approach

The here proposed method for systemic risk contribution measurement, the so-called *Causality Risk Measure* (CRM), extends the work of Billio et al. (2010). As the name implies, it makes use of the well-known concepts of Granger and instantaneous causalities. More specifically, the systemic importance of a financial institution is derived as a direct function of the contagion it induces into the system. This is estimated by measuring the credit risk spillover effects, reflected in the market prices of financial intermediaries' liability instruments. In fact, CRM employs credit default swap spreads as a primary data input. The reason therefore is that previous research has identified a comparative advantage of these derivatives in the pricing of downside risks. Nevertheless, due to its grade of liquidity and frequent lead in the information revelation to other markets, stock data is considered, too. In addition, because of the possibility of omitted variable bias in the empirical estimation, an augmented version of the systemic risk indicator is introduced. The so-called *Causality Risk Measure Without Instantaneous Causalities* (CRM(\IC)) enjoys exactly the same features as CRM does, except for the fact that it abstracts from the usage of instantaneous causalities.

For the estimation of CRM and CRM(\IC) a sample of 36 major financial institutions with operations in the United States is used. Moreover, two time periods are chosen. The first one begins as of November 14, 2007 and ends on March 14, 2008, the last trading day prior to the bailout of Bear Stearns. The second one lasts from May 12, 2008 until September 12, 2008, reflecting the period prior to the default of Lehman Brothers. This selection is motivated by the secondary goal of the thesis to provide further insights on the systemic risk posed by the aforementioned investment banks in the eve of their demises. In addition, where possible, residual return series are additionally extracted by controlling for liquidity, counterparty and general macroeconomic effects in the CDS market. The reason therefore is that such factors may lead to spurious Granger and instantaneous causations. Along similar lines, residual stock returns are obtained by accounting for common sector effects. Finally, data for *SRISK%*, another systemic risk relevance indicator, published and maintained by the New York University, is used to compare results.

## **Findings**

The results of the empirical estimation provide further insights on the properties of the aforementioned measures. To begin with, systemic risk scores and rankings exhibit notable variation, depending on the indicator version considered. This property is not only observed for comparisons between CRM and CRM(\IC) but also when data inputs are interchanged. Moreover, caused by the small sample size, systemic risk indicators are not precise enough to ensure an optimal differentiability in rankings. Put it differently, many entities achieve an equal score and hence cannot be distinguished in systemic terms from one another. In addition, CRM and CRM(\IC) rankings do not coincide with *SRISK%* for either period, whereat for certain institutions the differences are strongly pronounced. Despite this fact, all measures agree to a great extent on which institutions contribute to systemic risk most. In fact, for CDS derived CRM and CRM(\IC), at least 8 out of the 12 highest scoring financial companies can be found under the *SRISK%*'s top 12 contributors list. Furthermore, the CDS derived measure versions indicate a strong link between investment banks. However, this relationship is much less pronounced when stock marked data is used instead. Last but not least, based on the results for different indicator versions, it is not possible to determine whether Bear Stearns or Lehman Brothers posed a higher threat to stability at the time of their collapse.

## **Evaluation**

The performance of systemic risk contribution measures can most effectively be evaluated using backtesting procedures. Due to the default event rareness for large and interconnected financial institutions, this is rather difficult to achieve, though. Despite this fact, the results of the empirical

analysis confirm a high degree of conformity between CRM, CRM(\IC) and SRISK% in terms of too big to fail designation. This might be considered as some indication for indicator validity. However, the variability of causality risk measures stresses the importance of right model, as well as data input selection. Moreover, CRM and CRM(\IC) exhibit some inherent limitations, such as inability to capture nonlinear effects. Future research might be able to overcome such shortcomings, though.