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The information in systemic risk rankings☆

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ABSTRACT

We propose to pool alternative systemic risk rankings for financial institutions using the method of principal components. The resulting overall ranking is less affected by estimation uncertainty and model risk. We apply our methodology to disentangle the common signal and the idiosyncratic components from a selection of key systemic risk rankings that have been proposed recently. We use a sample of 113 listed financial sector firms in the European Union over the period 2002–2013. The implied ranking from the principal components is less volatile than most individual risk rankings and leads to less turnover among the top ranked institutions. We also find that price-based rankings and fundamentals-based rankings deviated substantially and for a prolonged time in the period leading up to the financial crisis. We test the adequacy of our newly pooled systemic risk ranking by relating it to credit default swap premia.

1. Introduction

Since the 2008–2009 global financial crisis, many new approaches have been developed to quantify and rank 'systemic risk' contributions of firms in the financial sector. However, few of these approaches are currently actively used at public policy institutions such as central banks or supervising authorities. Possible reasons for this lack of adoption include a weak theoretical foundation for a number of these measures, as well as their frequent reliance on financial market data, which renders the rankings inherently volatile. We argue that the presence of multiple alternative and arguably noisy measures of financial sector firms' systemic risk contributions raises two important questions. First, is there a straightforward way to combine currently available systemic risk rankings to amplify the signal and reduce the noise due to model risk and estimation uncertainty? Also is a combined ranking sufficiently robust for policy purposes and targeted banking supervision? Second, does a robust measure of systemic

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importance correlate with financial institutions' cost of debt finance? Is it in line with a public sector guarantee for the most systemically important institutions? Similar questions are raised in, for instance, Kelly et al. (2015).

In our study we argue that the first questions can be addressed in an affirmative way while responses to the last questions depend mostly on the financial health of the sovereign. Specifically, we provide a principal components based methodology to combine systemic risk rankings of financial institutions with the aim of achieving a robust combined ranking. The combined ranking is based on six risk ranking methodologies and disentangles their common (signal) and idiosyncratic (noise) parts. Our approach reflects the notion that risk averse policy makers only pay attention to systemic risk rankings when other complementary approaches point in the same direction. Indeed, when different measures of systemic risk point in the same direction, it may be branded as irresponsible to pay no attention to the common signal, given the stakes at hand. Of course, some rankings and systemic risk measures may be more useful than others. We argue that if systemic risk rankings do not point in the same direction, policy makers could interpret this situation as a warning signal that prices in markets may be dislocated from their fundamentals. Information about a possible dislocation between prices and fundamentals may be distilled from our methodology. Since our principal components are obtained from a cross-sectional dataset, the analysis can be performed and repeated in any time period.

In order to extract the common information content of different input rankings, we perform an iterated cross-sectional aggregation of rankings based on a fairly straightforward factor model. The combined ranking is constructed from the eigenvalue that explains most of the variance of the observed data subject to a normalization. The usual optimality properties of the principal component hold in our modeling approach as well; see Lawley and Maxwell (1971). In our study, the method of principal components is used in the cross-section direction only. We do not obtain estimates of factors in a time series context. For a time series approach to 'systemic risk' we refer to Moreno and Pena (2013) and Giglio et al. (2015).

We apply our general framework to the European Union financial sector, studying $N = 113$ firms during $T = 139$ months from March 2002 to September 2013. As a result, our sample contains most of the build-up phase of financial instability in Europe during the expansion years of 2003–2007, the materialization of systemic risks during the global financial crisis between 2008 and 2009, and the most acute phase of the euro area sovereign debt crisis from 2010 to 2012. Our sample of listed financial sector firms contains commercial banks, insurers, asset managers, and broker/dealers. In terms of ranking methodologies, we consider risk rankings based on criteria such as SRISK (Acharya et al., 2012; Brownlees and Engle, 2015), MES (Acharya et al., 2010), the leverage ratio (Fostel and Geanakoplos, 2008; IMF, 2009; Geanakoplos and Pedersen, 2014), systematic risk defined as the so-called CAPM beta times market capitalization (Benoit et al., 2015), ΔCoVaR (Adrian and Brunnermeier, 2014; Castro and Ferrari, 2014), and firm's value-at-risk (Adams et al., 2014; White et al., 2015).

We focus on three main empirical findings. First, we demonstrate that the cross-sectional consistency between the different rankings is far from perfect. The respective mean rank correlations are positive, but routinely fall below 0.5. The poor association is not due to a few outliers, but is symptomatic of the fact that different ranking methodologies actually order financial firms differently in the cross-section. Of course, this is problematic for supervisory purposes. In addition, standard unit root tests suggest that a substantial fraction (up to 66%) of ranks tend to be non-stationary in the time dimension. Given the possibly non-stationarity properties of many of the rankings, we focus mainly on the cross-sectional dimension of the principal components analysis and discuss how these properties vary over the course of the two financial crises embedded in our sample. We clearly find that our combined ranking is substantially less volatile over time than most rankings taken in isolation. Crucially, our pooled risk ranking leads to relatively little variation (turnover) among firms at the top of the ranking. This feature is important for targeted banking supervision, as re-deploying on-site supervisory teams is costly and requires months of lead time in practice.

Second, when studying the time series of the results from our cross-sectional principal components analysis, we find a rising discrepancy during 2006–2007 between the loadings of price-based systemic risk rankings (such as VaR, ΔCoVaR, and MES) versus systemic risk rankings that also incorporate book values (such as leverage and SRISK). This appears to signal a dislocation between market prices and fundamentals already in the onset to the 2008 financial crisis. Hence different systemic risk measures signal different messages at a time when they are, arguably, the most important. Similar (smaller sized) changes in loadings emerge several times during the subsequent European sovereign debt crisis. Substantial deviations between the information embedded in different systemic risk rankings as evidenced by the principal component loadings may be used by policy makers as possible "red flags" to signal that imbalances in markets are building up, and that closer inspection of such potential imbalances is warranted.

Third, when we investigate the relationship between systemic importance and credit default swap (CDS) prices, we show that the systemic importance of financial firms tends to vary negatively with their CDS premia, provided that the sovereign is financially healthy. The extent of systemic importance of banks appears to correlate with a benefit from a funding perspective in the market for unsecured funds for some firms, most likely due to an implicit public sector guarantee; see also Kelly et al. (2015). For banks located in certain stressed euro area countries we obtain the opposite result, particularly during the most acute phase of the euro area sovereign debt crisis from 2010–2012. In this case the sovereign cannot provide a credible guarantee, and, if anything, appears to have become a liability to its more systemically important firms. To summarize, less implicit government support appears to be available for European financial firms that are 'too-systemically-safe-to-bother', and for firms that are backed by a financially weak sovereign.

Many contributions are made to formalize the notion of systemic risk and to investigate systemic risk contribution of individual financial firms. Acharya et al. (2010) are amongst the first to develop a model in which the capital shortfall experienced by a financial firm at a time when the financial system is undercapitalized generates negative externalities to the entire economy. He and Krishnamurthy (2014); Brunnermeier and Sannikov (2015), and Boissay et al. (2015) study economies with financial frictions