VOLATILITY, CORRELATION AND TAILS FOR SYSTEMIC RISK MEASUREMENT

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Abstract

This paper proposes an empirical methodology to measure systemic risk. We associate the systemic risk of a financial institution with its contribution to the deterioration of the system capitalization that would be experienced in a crisis. In order to measure this empirically we introduce the SRISK index, the expected capital shortage of a firm conditional on a substantial market decline. The index is a function of the degree of Leverage, Size and Marginal Expected Shortfall (MES) of a firm. MES is the expected loss an equity investor in a financial firm would experience if the market declined substantially. To estimate MES, we introduce a dynamic model for the market and firm returns. The specification is characterized by time varying volatility and correlation as well a nonlinear tail dependence. The empirical application to a set of top U.S. financial firms between 2000 and 2010 is used to illustrate the usefulness of the methodology. Results show that SRISK provides useful ranking of systemically risky firms at various stages of the financial crisis: one year and a half before the Lehman bankruptcy, nine companies out of the SRISK top ten turned out to be troubled institutions. The aggregate SRISK of the financial system provides early warning signals of distress in the real economy: a one standard deviation shock in aggregate SRISK predicts a twentyfive basis points drop in Industrial Production over the next month.

Keywords: Systemic Risk, Volatility, Correlations, Tails, Forecasting.

JEL classification: C22, C23, C53.

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Systemic risk analysis of top U.S. financial firms based on the results of this paper are updated weekly on the Vlab (http://vlab.stern.nyu.edu/).
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