



A framework for assessing the systemic risk of major financial institutions

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ABSTRACT

In this paper we propose a framework for measuring and stress testing the systemic risk of a group of major financial institutions. The systemic risk is measured by the price of insurance against financial distress, which is based on *ex ante* measures of default probabilities of individual banks and forecasted asset return correlations. Importantly, using realized correlations estimated from high-frequency equity return data can significantly improve the accuracy of forecasted correlations. Our stress testing methodology, using an integrated micro–macro model, takes into account dynamic linkages between the health of major US banks and macro-financial conditions. Our results suggest that the theoretical insurance premium that would be charged to protect against losses that equal or exceed 15% of total liabilities of 12 major US financial firms stood at \$110 billion in March 2008 and had a projected upper bound of \$250 billion in July 2008.

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1. Introduction

Banks have been the most important financial intermediaries in the economy, by providing liquidity transformation and monitoring services. The mal-functioning of the banking system can be extremely costly to the real economy, as illustrated in a number of financial crises in both industrial and developing economies in the past few decades, including the current global credit-liquidity turmoil. Therefore, financial regulators and central banks have devoted much effort to monitoring and regulating the banking industry. Such regulation has been traditionally focused on assuring the soundness of individual banks. More recently, there has been a trend towards focusing on the stability of the banking system as a whole, which is known as the macro-prudential perspective of banking regulation (see Borio, 2003, 2006). For instance, Goodhart et al. (2005, 2006), Goodhart (2006) and Lehar (2005) propose measures of financial fragility that apply at both the individual and aggregate levels. At the international level, the Financial Sector Assessment Program (FSAP), a joint IMF and World Bank effort

introduced in May 1999, aims to increase the effectiveness of efforts to promote the soundness of financial systems in their member countries.

In order to assess the health of a financial system, two related questions need to be addressed. First, how to measure the systemic risk of a financial system, where systemic risk is defined as multiple simultaneous defaults of large financial institutions? Second, how to assess the vulnerability of the financial system to potential downside risks?

In answering the first question, traditional measures have focused on banks' balance sheet information, such as non-performing loan ratios, earnings and profitability, liquidity and capital adequacy ratios. However, given that balance sheet information is only available on a relatively low-frequency (typically quarterly) basis and often with a significant lag, there have been growing efforts recently to measure the soundness of a financial system based on information from financial markets. For example, Chan-Lau and Gravelle (2005) and Avesani et al. (2006) suggest treating a banking system as a portfolio and using the *n*th-to-default probability to measure the systemic risk by employing liquid equity market or CDS market data with a modern portfolio credit risk technology. Similarly, Lehar (2005) proposes to measure systemic risk, defined as the probability of a given number of simultaneous bank defaults, from equity return data. The market-based measures have two

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