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Solvency vs. liquidity. A decomposition of European banks' credit risk over the business cycle

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ABSTRACT

This paper provides evidence for the procyclicality of banks' credit risk by investigating the historical resilience of several European banking sectors before and after the 2008 banking crisis. It provides a decomposition of banks' probabilities of default between a solvency and a liquidity component. The results show a gradual build-up of fragilities before 2008 in most countries. Increased probabilities of default are shown to be mainly driven by a surge in liquidity risk, even when shocks of relatively low magnitude are imposed on the system.

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1. Introduction

There is a substantial literature highlighting the various reasons why systemic risk may arise in banking sectors. However, few theoretical papers explain why systemic risk may occur at one particular point of the business cycle. A widespread approach is to consider credit risk, either for a

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single institution or for a set of institutions, as arising as a consequence of an extreme random event. In contrast, a handful of recent papers have been describing banking crises as the consequence of previously accumulated fragilities. In particular, key balance sheet items such as leverage and short-term wholesale funding were shown to be pro-cyclical. The distinction between statistical and structural views of financial crises has been investigated on methodological grounds by [Vuillemeys \(forthcoming\)](#).

My main contribution in this paper is to provide an empirical reconstruction of European banks' probabilities of default over the last business cycle (from 2004 to 2010). In addition, the theoretical framework I use enables decomposing these probabilities of default between a solvency and a liquidity component, where solvency risk and liquidity risk are defined as independent events. I am then able to track banks' total credit risk over time, but also each of its drivers. The same scenario (a shock on the non-performing loans ratio) is imposed for each year and for all banks in 8 Euro area countries.

The empirical exercise yields two major results. First, banks' probabilities of default are shown to be pro-cyclical for a wide range of shocks. For all countries but one, they reached a maximum in 2008. In this regard, risk is endogenous to the business cycle. Second, the rise in total credit risk is shown to be driven by liquidity rather than by solvency risk. This is true for all banking systems and matches other accounts of the causes of the financial turmoil (such as [Brunnermeier, 2009](#)). Finally, the results enable assessing the relative strength of various banking sectors conditional on a given scenario. These results are obtained using year-end public balance sheet data.

This paper contributes to the debate on the relative importance of solvency and liquidity risk. Whereas solvency is defined by a bank having a positive net present value, liquidity is defined by its ability to repay its maturing liabilities with its current cash or liquid assets. Failures from illiquidity have long been considered to be likely to occur primarily for banks which were prone to insolvency, so that solvency risk had to be regulated in the first place (through capital ratios). This is true as long as solvent-but-illiquid institutions are able to pledge part of their long-term assets to tap short-term funding, i.e. it amounts to assuming that other market participants are themselves liquid.

Contrary to this long-received view, both a recent theoretical literature and the 2008 empirical evidence suggest that the illiquidity of solvent banks can be a salient feature of present-day banking crises. Some of the main bank failures during the past years have been shown to be due to such a phenomenon. [Shin \(2009\)](#) shows that the failure of Northern Rock in 2007 is mainly attributable to over-abundant short-term wholesale funding. Concerning anecdotal evidence, Bear Stearns's failure in 2008 has been presented by Christopher Cox, then chairman of the SEC, as a case exemplifying the illiquidity of a solvent bank.¹ The same could be argued about Dexia's bankruptcy in 2011.² Such examples clearly illustrate that, in order to be robust, it is not enough to hold significant capital buffers. A balance between short-term liabilities and liquid assets must also be kept. Such observations motivated the recent change in regulatory framework from Basel II – which dealt only with risk-weighted capital ratios – to Basel III, which introduces two liquidity ratios (among which a short-term ratio, the *liquidity coverage ratio*). An intuition behind why runs on solvent banks may occur is either (i) because of imperfect information in the short run, so that the exact balance sheet of solvent institutions cannot be adequately observed, or (ii) because short-term creditors are themselves leveraged and liquidity-constrained, so that they have to reduce the outstanding amount of funding they provide to *all* institutions (see, for example, [Vayanos and Gromb, 2010](#)). In this regard, one strength of the theoretical framework I use is that it considers solvency and

¹ Namely, "The fate of Bear Stearns was the result of a lack of confidence, not a lack of capital. When the tumult began last week, and at all times until its agreement to be acquired by JP Morgan Chase during the weekend, the firm had a capital cushion well above what is required to meet supervisory standards calculated using the Basel II standard". Source: *Chairman Cox Letter to Basel Committee in Support of New Guidance on Liquidity Management*, Securities and Exchange Commission, March 20, 2008.

² In June 2011, in the stress testing exercise conducted by the European Banking Authority (see EBA, *2011 EU-wide stress test results*, June 2011), Dexia appeared as one of the best-capitalized financial institutions in Europe. It failed in October 2011 with the withdrawal of large amounts of wholesale funding.

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