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Leverage, balance-sheet size and wholesale funding

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A B S T R A C T

Positive co-movements in bank leverage and assets are associated with leverage procyclicality. As wholesale funding allows banks to quickly adjust leverage, banks with wholesale funding are expected to exhibit higher leverage procyclicality. Using Canadian data, we analyze (i) if leverage procyclicality exists and its dependence on wholesale funding, (ii) market factors associated with this procyclicality, and (iii) if banking-sector leverage procyclicality forecasts market volatility. The findings suggest that procyclicality exists and that its degree positively depends on use of wholesale funding. Furthermore, funding-market liquidity matters for this procyclicality. Finally, banking-sector leverage procyclicality can forecast volatility in the equity market.

1. Introduction

In the aftermath of the recent financial crisis, the high levels of leverage among financial institutions has widely been identified as one of the major causes of the crisis. This has focused attention on both how financial institutions manage their leverage ratios (defined as assets divided by equity) and on potential regulatory actions required to prevent the build up of excessive levels of leverage in the financial sector. Given the nature and severity of the recent financial crisis, leverage has quickly become one of the focal points of both academic research and policy-oriented discussions related to financial stability.

While the slow build up of leverage over several years among financial institutions is an important issue, some studies also identify the importance of higher frequency movements of leverage. In this

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regard, one major question has been raised: Does leverage positively co-move with assets, and if so, what are its implications for market volatility? Adrian and Shin (2010) study this relationship between financial institution leverage and assets in the United States and find evidence that such a correlation exists.

One channel in which this positive correlation can be observed is when a financial institution actively manages its balance sheet with respect to changes in the value of equity. For example, when the value of equity increases due to a rise in prices of some marked-to-market assets, a financial institution's leverage ratio decreases. If the financial institution actively manages its balance sheet, it can raise non-equity liabilities and lever up. In this process, the newly-raised liabilities are invested into new assets, leading to a positive relationship between changes in leverage and balance-sheet size. Furthermore, as prices of assets tend to increase during booms and decrease during busts, leverage becomes procyclical to economic activity *in addition to* balance-sheet size.

This paper highlights the interaction of leverage procyclicality with the use of wholesale funding. The degree of procyclicality varies across different types of financial institutions and with respect to changes in macroeconomic and market environments. Financial institutions that use wholesale funding (e.g., institutional deposits, repos, commercial paper and banker's acceptances) display high degrees of procyclicality as these market-based funds are readily available at short notice for quick adjustments to leverage. However, the crisis disrupted short-term wholesale funding markets, revealing the high funding-liquidity risks associated with these funds. With reduced access to wholesale funding, financial institutions lost the ability to adjust leverage easily and quickly, which dampened the degree of procyclicality.

Specifically, we have three main objectives. First, we show that leverage of Canadian financial institutions is procyclical (i.e. positive correlations between leverage and balance-sheet size) and that the degree of procyclicality depends on the usage of wholesale funding. Second, we identify macroeconomic and market variables that are important for the degree of procyclicality. Third, we study if banking-sector leverage procyclicality can forecast aggregate volatility in the equity market. The empirical strategy chosen to achieve the first two objectives is a two-step method, similar to the approach outlined by Kashyap and Stein (2000) in their work on the bank lending channel of monetary policy. The first step cross-sectionally estimates the degree of leverage procyclicality based on monthly *bank-level* balance sheet data for all federally chartered deposit taking institutions in Canada over the period 1994–2009.[1] The analysis for the first objective is derived from the outcome of this step. Then, the second step determines if and how the degree of procyclicality changes over time following macroeconomic and market-wide changes. The results from this step are used for the discussion of the second objective. For the third objective, we construct volatility measures from the Toronto Stock Exchange Broad Index to gauge aggregate market volatility. We regress these volatility measures on banking-sector leverage procyclicality.

With respect to the first objective, we find strong procyclicality of leverage. In addition, we find significantly higher degrees of procyclicality among financial institutions that use more wholesale funding over those that use less. This confirms the findings by Adrian and Shin (2010) that leverage among US investment banks, who mainly rely on market-based wholesale funding to fund their investment activities, is strongly procyclical. They do not find such leverage procyclicality for commercial banks, which rely less on wholesale funding.[2] These results consistently prevail through various robustness checks and model extensions.

Secondly, we find that degrees of procyclicality change with liquidity in short-term wholesale funding markets, where funding-market liquidity is measured as changes in the trading volume of repos and the volume of outstanding commercial paper and banker's acceptances. Specifically, for wholesale funding users, we find that procyclicality is high when the liquidity of these markets is also high. Hence, when these markets become illiquid, wholesale funding users lose the ability to quickly adjust leverage, leading to weaker procyclicality of leverage. This result is consistent with

[1] Availability of high frequency (i.e., monthly) data for Canadian banks is important for the analysis in capturing volatility in short-term funding markets.

[2] However, their results regarding cyclicality of leverage among commercial banks appear to be sensitive to time periods and use of micro vs. macro data. See Berrospide and Edge (2010) and Adrian et al. (2012).