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Is the Leverage of European Commercial Banks Pro-cyclical?

A. Baglioni, A. Boitani, M. Liberatore, A. Monticini

Abstract

Detecting whether banks' leverage is indeed procyclical is relevant to support the view that booms and crises may be reinforced by some sort of supply side financial accelerator, whilst finding a plausible explanation of banks' behaviour is crucial to trace the road for a sensible reform of financial regulation and managers' incentives. The paper shows that procyclical leverage appears to be well entrenched in the behaviour of a sample of major European banks, which are commonly labelled as mainly "commercial banks".

JEL Classifications: G21 and E3

Keywords: Banks, Pro-cyclicality, Financial Regulation

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1 Introduction

In traditional models of the financial accelerator (Bernanke, Gertler, 1989; Kiyotaki, Moore, 1997) procyclical asset prices increase (decrease) the value of borrowers' collateral and thus increase (decrease) the value of loans they are able to obtain. The ensuing credit expansion (contraction) fuels cyclical upturns (downturns). This is a demand-side (of credit) channel through which the financial system may have an amplification effect on the business cycle. On the other hand, the pioneering "lending view" model (Bernanke, Blinder, 1988) relies on a supply-side (of credit) effect, working through the effect of monetary policy on banks' balance sheets. As in this model banks' net worth is ignored, no amplification mechanism is at work.

However it is a shared view that a supply side amplification mechanism had a role in the growth of the recent financial bubble (2002-2007) and in the economic crisis (2007-201?) triggered by the burst of the bubble. Most observers point at banks' leverage as the propagating factor. The mechanism may be shortly described as follows. During upturns, asset prices rise and - for a given value of debt - leverage goes down. When asset prices go up, banks targeting their leverage will increase their debt in order to purchase more assets and restore the initial leverage. Such a mechanism also works, in the reverse, when there is a negative shock to asset prices. The dynamics of banks' balance sheets may reinforce cyclical upturns and downturns, to some extent independently of monetary policy.

The propagation mechanism becomes self-reinforcing if banks do not try to keep a *constant* leverage but for some reason let it be procyclical. Following an increase in the price of securities, banks would *increase* leverage and demand for *more* securities than needed to restore the *initial* leverage. An upward pressure on asset prices follows, which in turns feeds back in higher leverage, generating a vicious spiral. Any negative shock to banks' balance sheets would trigger a downward spiral of leverage and asset prices. Several explanations have been put forward for the procyclical management of banks' leverage (see Angelini, Panetta, 2009, for an extensive survey).

Detecting whether banks' leverage is indeed procyclical is relevant to support the view that booms and crises may be reinforced by some sort of supply side financial accelerator, whilst finding a plausible explanation of banks' behaviour is crucial to trace the road for a sensible reform of financial regulation and managers' incentives. Adrian and Shin (2010) have been able to show that a procyclical leverage characterises the major US investment

banks between 1997 and 2008, whilst US commercial banks' leverage, in the same period, was roughly constant. In the present paper we shall replicate Adrian and Shin's analysis for 13 European major banks over 1999-2009. The European banks in the sample - which are commonly labelled as mainly "commercial banks" - show the same pattern of active leverage management of US investment banks. Procyclical leverage appears to be well entrenched in European banks behaviour, which points to the fact that a financial accelerator mechanism may have been at work on the eastern side of the Atlantic as well as on the western side.

The paper is organised as follows. Section 2 presents our empirical research strategy and the main results on procyclical leverage of the European banking system, whilst Section 3 contains a tentative explanation of the results, arguing that the explanation advanced by Adrian and Shin (2010) for US investment banks - that is a combination of targeting the proportion of capital to VaR and of market value accounting - can be extended to European commercial banks.

2 The empirical analysis

An empirical analysis is performed using balance sheet data[1] of thirteen major European banks over the period 1999-2009: Santander and BBVA from Spain; Deutsche Bank and Commerzbank from Germany; Credit Suisse and Union de Banques Suisses (UBS) from Switzerland; Intesa San Paolo, Unicredit and Mediobanca from Italy; Societe Generale and Banque Nationale de Paris (BNP) from France; Royal Bank of Scotland and Barclays from the United Kingdom. For all these banks, we collected data[2] on total assets and leverage. A preliminary look at the data is quite informative. We report the scatter plot of the log difference (i.e. the rate of change between time t and $t+1$) of such variables (see Appendix): for some banks (see for example Mediobanca, Intesa SP and BNP) it is possible to observe a clear positive relationship, while for others the relationship is less definite.

In order to get more evidence on the possible positive relationship between total assets and leverage, we perform an econometric analysis. It seems natural, given our data set, to perform a panel data regression. The model

[1] Source: Bloomberg.

[2] Recorded on a quarterly base with the exception of SG, RBS, Barclays and BNP which are recorded on a six-month base.

we estimate is

$$y_{i,t} = c + \beta_{i,t} x_{i,t} + \epsilon_{i,t}, \tag{1}$$

where $y_{i,t}$ is the leverage (log difference) of bank i at time t; $x_{i,t}$ is total assets (log difference) for bank i at time t, and

$$\epsilon_{i,t} = \alpha_t + \eta_{i,t}.$$

The first unobservable component α_t, without the i subscript and hence common to all banks, is the fixed effect, while $\eta_{i,t} \sim i.i.d.(0, \sigma^2_{i,t})$, with $\sigma^2_{i,t} \neq \sigma^2_{j,s}$ for $t \neq s$, in general.

Table 1

coeff.	**value**
c	-0.012^{***} (0.0025)
β	0.612^{***} (0.088)
Adj. R^2	0.239
D.W.	2.02

Note: (***) denotes 1% significance level, based on HAC standard errors (shown in parenthesis).

The regression analysis provides quite strong results[3], which are shown in Table 1[4]. As we can see, the estimated β is positive and highly significant. These findings show that a number of large European financial institutions has followed a pro-cyclical management of their leverage: they seem to respond to a change in their asset value by changing their leverage in the same direction.

[3] As a robustness check, we have re-estimated the model adding some time dummy variables as regressors: the estimated values do not change. The results are available upon request

[4] The standard errors have been obtained by heteroskedasticity and autocorrelation consistent (HAC) covariance matrix estimators (see Andrews and Monahan 1992).

3 Interpreting the results

Adrian and Shin (2010) (AS) show that an active management of leverage introduces a pro-cyclicality into the behavior of financial institutions, even when such a policy aims at keeping leverage constant: if this is the case, intermediaries respond to an increase of their asset value by increasing the size of their balance sheets, namely by issuing more debt and buying more assets (doing the opposite in case of a reduction of asset value). If an intermediary pursues a pro-cyclical leverage policy, this adds a further component to its behavior, strengthening its pro-cyclicality.

AS show that large investment banks in the US have indeed followed a pro-cyclical leverage policy, while commercial banks in the same country seem to be targeting their leverage at some constant level. AS provide an explanation for their findings based on the Value-at-Risk (VaR): this may be defined as the equity capital (or net worth) needed to stay solvent for a given time span and with a given probability. AS show that if a bank wants to keep its equity capital proportional to its VaR, its leverage turns out to be pro-cyclical.

Following AS, let us define leverage (L) as

$$L = \frac{A}{A - D} = \frac{A}{K} \tag{2}$$

where A is the market value of bank assets, D is the amount of bank debt and K is its equity capital. It is easy to see that, absent any active policy of leverage management, an increase of A leads to a lower L. To the contrary, if a bank targets its capital to a fixed proportion of its VaR, L turns out to be increasing in A. To derive this result, let us define VaR as follows:

$$\Pr(A < A_0 - VaR) \leq 1 - c \tag{3}$$

so that if $K = VaR$ the bank is solvent − over a given time horizon − with probability c. Now suppose that a bank targets its ratio of capital to VaR to a specific value λ, implying that $K = \lambda \cdot VaR$. Then its leverage turns out to be:

$$L = \frac{A}{\lambda VaR} = \frac{1}{\lambda}\frac{1}{V} \tag{4}$$

where V is the "unit VaR": the value-at-risk per unit of assets. Hence the pro-cyclicality of L follows from the counter-cyclicality of V. For example, an increase of asset value lowers the unit VaR, leading to a higher leverage.

The argument made by AS is based on two ingredients. First, a bank is supposed to target its capital to a fixed proportion of its VaR; this may be justified by considering that the solvency regulation (1996 Market Risk Amendment to the Basel Accord) mandates a fixed proportion of such a kind. Second, market value accounting makes the value of bank assets strongly depend on the price changes of assets traded in financial markets. Both these elements directly apply to investment banks, since trading in financial markets is their core business. This can explain AS empirical findings, which are focussed on investment banking.

Our empirical findings differ from those obtained by AS, as we show that *commercial* banks exhibit a pro-cyclical leverage. Our sample is made up by institutions where the commercial banking activity is prevalent, with a few exceptions like Mediobanca and Deutsche Bank. We have two candidate explanations for our results.

A straightforward explanation is that the investment banking activity is a relevant component of the business mix of some intermediaries included in our sample, which are nonetheless classified as commercial banks. The widespread diffusion of the originate-to-distribute model might have played a key role under this regard: an increasing share of bank balance sheets is made up of traded securities, even if originated by loans to firms and households. If this is the case, the two above mentioned arguments − namely a target for the proportion of capital to VaR and market value accounting − can be directly applied to a large share of banks' balance sheets. This can explain why we observe a pro-cyclical behavior of their leverage.

Another explanation derives from the application of those two arguments to the commercial banking business. First, as far as bank loans to firms and households are concerned, the regulation in place during our sample period (the 1988 Basel Accord) does not impose any target related to VaR. However, a target of such a kind might be part of the risk management policy of a large bank, in order to enhance its reputation in financial markets and to improve its ratings. Second, a loss on the loan portfolio obviously implies a reduction of the value of bank assets. Thus adjusting the accounting value of bad loans to their recovery rate may have effects similar to market value accounting, although such adjustments are presumably less frequent than those applied to marketable securities under the mark-to-market regime.

These different explanations are not mutually exclusive, and they deserve a deeper analysis.

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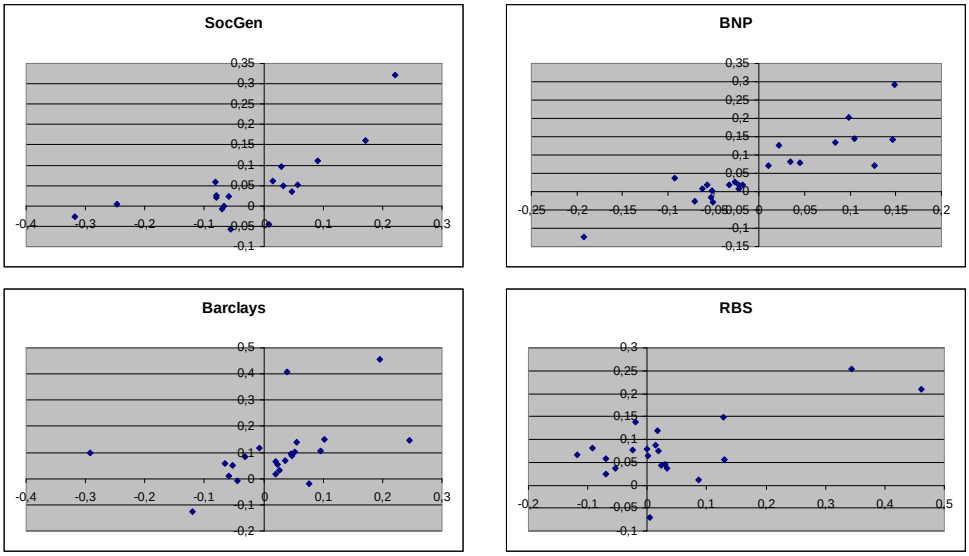
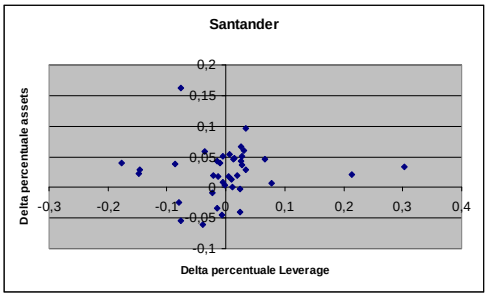
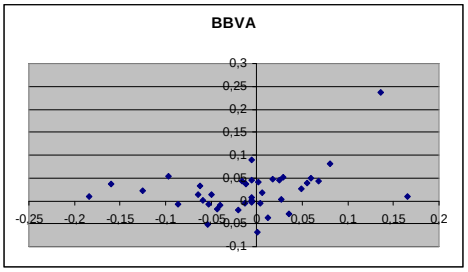
Appendix[5]



[5] On the x-axis: % change of leverage.
On the y-axis: % change of total assets.


Santander
Delta percentuale assets
Delta percentuale Leverage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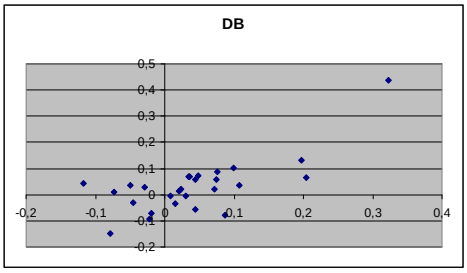
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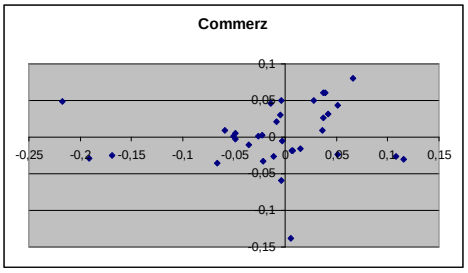
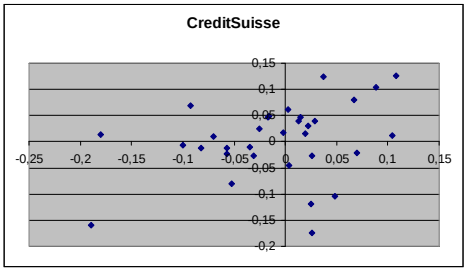
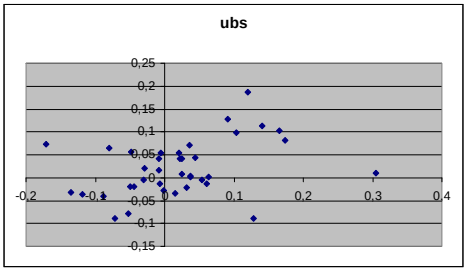

Commerz


CreditSuisse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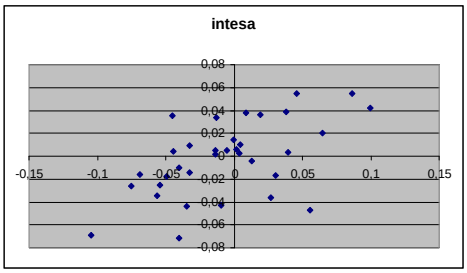
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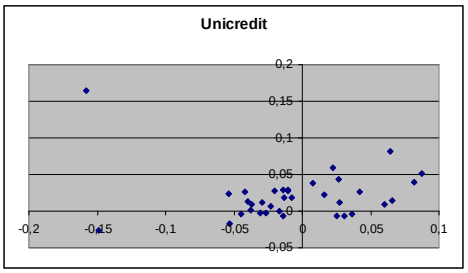
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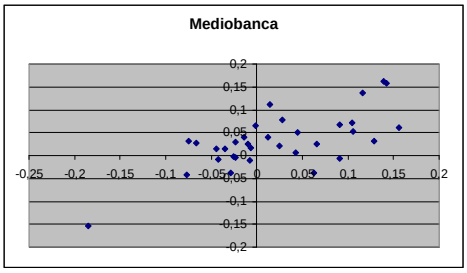
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