

4. COMPARING THE LINK BETWEEN MACROECONOMIC CONDITIONS AND LEVERAGE OF MONETARY FINANCIAL INSTITUTIONS IN EUROPEAN COUNTRIES AND LUXEMBOURG

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1. INTRODUCTION

In this contribution we discuss the relationship between macroeconomic conditions and leverage of monetary financial institutions (MFIs). Our focus will be on evaluating and contrasting the results for a set of European countries with those for Luxembourg.

The current state-of-the art in the literature suggests that favorable economic conditions induce MFIs to expand their balance sheets and leverage, while negative outlooks lead to contractions of balance sheets and deleveraging. This may trigger distressed selling followed by feedbacks in the form of asset price and collateral value reductions, subsequently leading to liquidity and solvency problems. These, then, in turn feed back into the cycle and worsen the previous outlook.

Though there exist many theoretical studies that investigate the links between macroeconomic variables (Bernanke and Blinder, 1992; Brunnermeier, 2009; Krishnamurthy, 2010; Shleifer and Vishny, 2010; Stein, 2011), in a general equilibrium framework it is difficult to precisely know which ones are endogenous and which ones are exogenous. Thus, in order to be able to empirically investigate these dynamic interactions between real, financial and expectational variables we rely on an approach that is specifically designed for this purpose, namely Vector Autoregressive modeling.

We collected country-aggregated, monthly data for European countries, ranging from January 2003 to June 2011. Our variables are country-specific indexes of industrial production, consumer sentiment and stock prices, as well as real interest rates and MFI sector's leverage. With these variables we cover the real and financial sector, both in terms of their actual situation and expectations. Industrial production reflects the economic activity of the real sector, while our confidence indicators reflect the expectation of the real sector. The stock market indexes give information on the valuation of companies active in a country as a whole, and include both information on their real value as well as investors' expectations on their potential value. Thus, while industrial production provides details on the economic activity of a country, the stock indexes give information on the financial valuation of the economy in that country. Finally, the real interest rate summarizes the response, in real terms, to monetary policy. It also provides information on the ability of the financial sector to raise short-term funding.

From an econometric perspective, we shall contrast results from a Panel Vector Autoregressive (PVAR) model for the European countries with results from a VAR model for Luxembourg. By exploiting the panel structure we are able to improve the efficiency of the estimates as we have more data points, less collinearity and control for unobserved individual fixed effects.

We study four models which distinguish themselves by sub-period and variables used. The sub-periods are the pre-crisis period, January 2003 to August 2008, and the crisis period, September 2008 to June 2011. For both sub-periods we investigate a model with leverage, dubbed the "leverage model", and one that contains both components of leverage, the "component model". Additionally, we compare the results for Luxembourg with our sample of European countries.

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2. THEORETICAL BACKGROUND

Between the years 2003 and 2008, European countries saw a steady improvement in the underlying fundamentals for investment. There was a substantial increase in industrial production, consumer confidence and stock prices. This environment was, until 2007, supported by a stable real interest rate. We also saw important trends in the financial sector. Financial innovations (like securitization and increased use of repos) allowed MFIs to extend their balance sheets at little extra cost. Banks increasingly adopted the new “originate-and-distribute” model, with a significant off-loading of risk and shortening of funding maturities (Brunnermeier, 2009; Pozsar, 2010). This period, dubbed the Great Moderation, allowed MFIs to level up their balance sheets with little concern from investors. In 2007 we witnessed the first turbulences in the financial sector, and the failures of AIG and Lehman Brothers in September 2008 are generally perceived to be the tipping point of the financial crisis. The leverage ratio started to be at the center of investors’ attention thereafter. Investors worried about the elevated leverage ratios and started to withdraw their funds. This reduction in funding liquidity required MFIs to adjust their balance sheets, with subsequent impacts on prices and re-sell values. This led to fire sales and thus diminished market liquidity. At the same time, MFIs were faced with large haircuts when trying to shed assets. The losses sustained then led to additional feedback rounds that worsened the previous balance sheet positions.

The theoretical literature tried to pinpoint the underlying mechanisms of the recent crisis. One can broadly distinguish between the following approaches.

In one approach, macroeconomic variables like expectations, industrial production, monetary policy or stock prices work as a positive amplification mechanism and drive MFIs’ leverage decisions. This line of causality has been studied extensively. Indeed, theoretical works tend to point towards a positive co-movement between leverage and macroeconomic variables. For example, increasing industrial production induces rises in firms’ valuations. This, in turn, leads to heightened expectations in MFIs due to lower expected counter-party default rates or higher collateral values (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Krishnamurthy, 2010), inclining them to expand their balance sheets. Thus, theory tends to predict a positive feedback loop between asset prices, sentiment and leverage. Most empirical research in this respect has been undertaken to study the impact of monetary policy. For example, Friedman and Schwartz (1963), Sims (1990), Christiano and Ljungqvist (1988) as well as Bernanke and Blinder (1992) show how monetary policy affects industrial production and GDP, with Bernanke and Gertler (1995) as well as Cecchetti (1995) illustrating how the banking sector functions as a vehicle for the transmission of monetary policy.

Empirical evidence by Jokipii and Milne (2008) suggests that capital buffers of EU15 banks have a negative co-movement with real GDP growth. Similarly, Jimenez et al. (2010) observe that worse economic conditions reduce loan supply from banks with lower capital or liquidity ratios. Additionally, expectations have been tied to stock returns (Jansen and Nahuis, 2003), while it has been shown that confidence positively co-moves with the real economic cycle (Taylor and McNabb, 2007).

Another approach looks more closely at the feedback loops in order to explain the recent crisis period. For example, theoretical models of fire-sales in financial assets provide the missing ingredients in order to account for the loss-spirals (Brunnermeier, 2009) and the uncertainty that can bring a market to collapse (Shleifer and Vishny, 1992, 1997; Gromb, 2010). More precisely, Stein (2011) describes the role of the bank lending channel in the reduction of real investment which followed the 2007-2008 liquidity crisis. The determinants and consequences of banks’ liquidity hoarding behavior are studied, among others, by Caballero and Smisek (2009), Shleifer and Vishny (2010), and Brunnermeier and Sannikov (2011). Caballero and Smisek (2009) characterize a “complexity externality”, pointing out the role of the interbank market as fueling the complexity in a highly interconnected financial market. The enhanced payoff uncertainty in such

an environment makes financial institutions prone to hold cash as a flight-to-quality effect. Brunnermeier and Sannikov (2011) considered the interaction of exogenous risk (which is driven by the fundamental determinants of assets' payoffs) and the endogenous risk which is linked to the endogenously determined level of leverage. They describe the "volatility paradox" as a situation where low levels of exogenous risk (or fundamental volatility) results in a higher payoff of leveraging-up which exposes banks to higher endogenous risk. While cash hoarding is still a flight-to-quality effect, it results from a speculative behavior as, in periods of dampening expected assets prices, it is more profitable to hold on and buy at depressed prices. Likewise, in Shleifer and Vishny (2010) the cash hoarding effect also comes as a consequence of the higher expected payoff of low asset prices. In order to explain the build-up of leverage and the subsequent credit crunch, they focus on investors' sentiments, which are channeled to banks through securitisation practices.

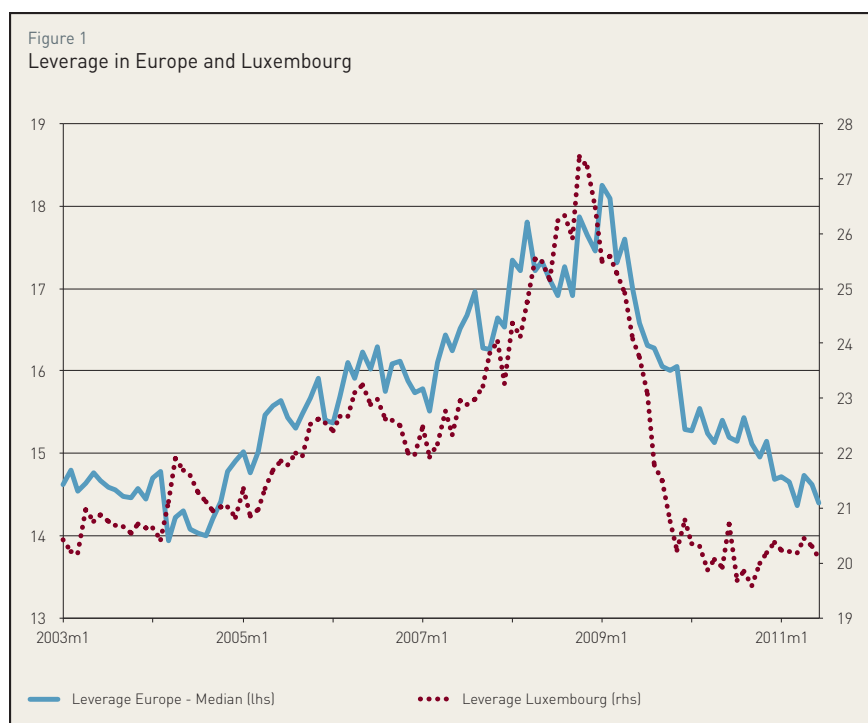
3. RESULTS OF THE STUDY

In Figure 1 we present the evolution of MFI leverage in our sample of European countries and Luxembourg. One can see that both MFI leverage in Europe and Luxembourg follow approximately the same evolution. We observe increasing MFI leverage from 2003 until its peak in late 2008, followed by a subsequent decrease to the levels seen in 2003. MFI leverage in Luxembourg is, on average, six to ten points higher than in Europe.

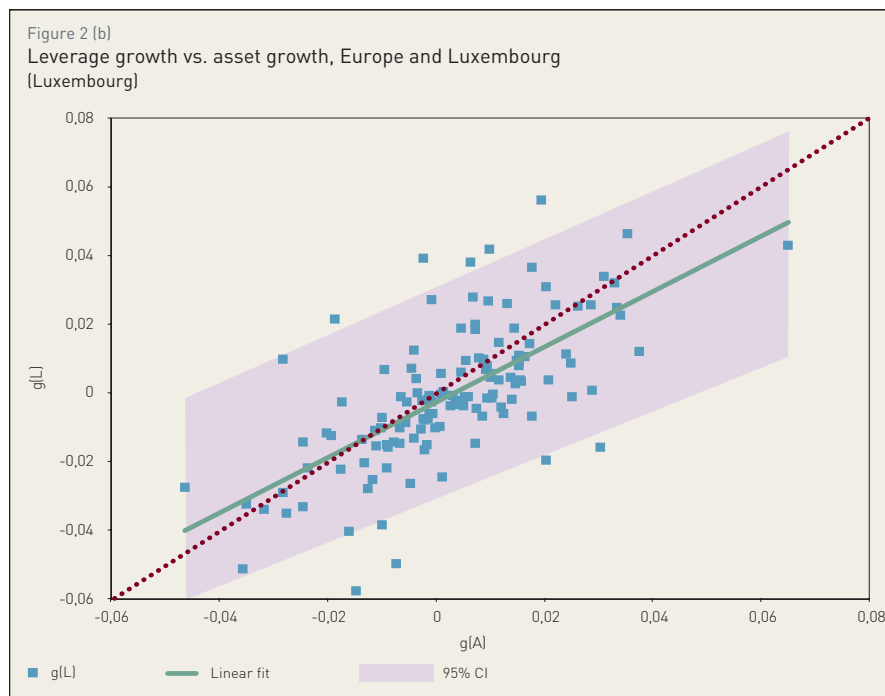
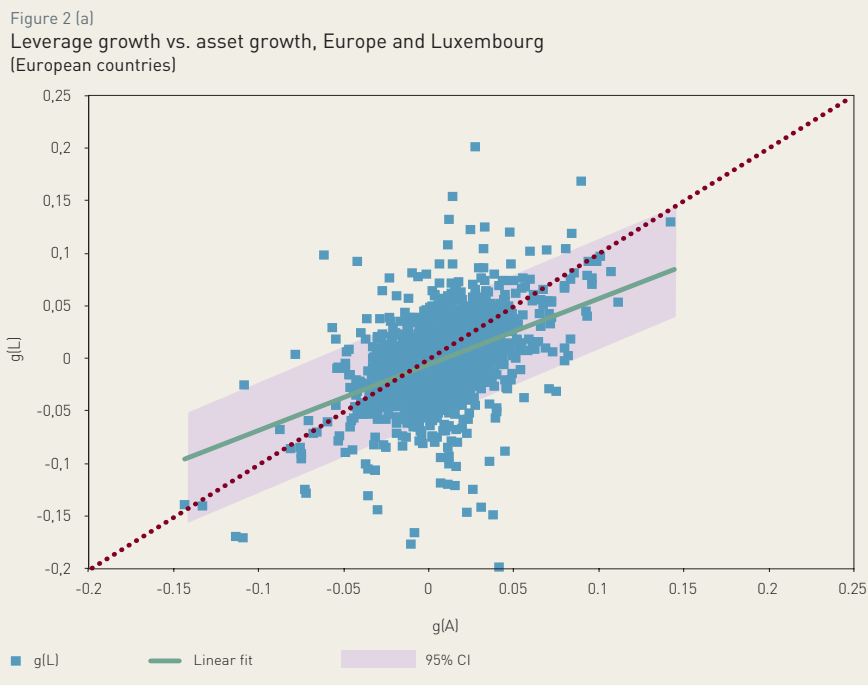
In Figure 2 we show that leverage in Europe's and Luxembourg's MFIs was procyclical during the last decade. Procyclicality is defined as a positive and significant correlation between the growth of assets and the growth of leverage. Thus, a balance sheet expansion is financed through increasing debt rather than equity. A similar result has been shown by Adrian and Shin (2010), but only for US investment banks, while they found that US commercial banks target a constant leverage.

We now present the results of the econometric estimations of the PVAR model for Europe and the VAR model for Luxembourg. In order to illustrate some results, a subset of the impulse response functions is plotted in Figure 3.

We find weak evidence for a relationship between macroeconomic variables and leverage in the pre-crisis period, with only real interest rates having a negative short-term impact on leverage growth. In contrast to this, we identify positive feedback loops between sentiment and stock prices as well as MFI assets in the pre-crisis period. This supports the theoretical models where heightened expectations due to lower expected counterparty default rates or higher collateral values drive balance sheet expansions (Bernanke, 1989; Kiyotaki and Moore, 1997; Krishnamurthy, 2010).



In addition, we find a positive impact of real interest rate changes on equity and asset growth. Thus, in an environment of low funding costs due to financial innovations (Brunnermeier, 2009), increasing real interest rates allowed MFIs to profit from higher spreads. This stands in contrast to the standard results of transmission channels of monetary policy, where increasing interest rates reduce MFIs' funding (Bernanke and Gertler, 1995; Cecchetti, 1995). However, studies on monetary policy transmission in Europe are more in line with our results. They show that financial innovations seemed to have reduced the sensitivity of bank lending to interest rate shocks (Altunbas et al. 2009). The differences in results comes about since we focus on the total asset side instead of only on subcomponents of the loan portfolios; we investigate MFIs, which includes both banks and money market funds, while the literature up to now focused mainly on banks; and we use higher frequency data (monthly compared to annually).



During the financial crisis, we observe a counter-cyclical impact from leverage on sentiment and stock prices, while sentiment and stock prices bear a pro-cyclical impact on leverage. We conclude that leverage drives expectations of financial instability (via e.g. default expectations), while sentiment and stock prices drive financial institutions' investment decisions (via e.g. collateral value effects). This is supported by our results that, during the pre-crisis period, asset growth both drove sentiment and stock prices, while, during the crisis, equity growth affected sentiment positively.

Our econometric results for Luxembourg indicate a weak relationship between the macroeconomic variables and leverage during the pre-crisis period, while we find a stronger interaction in the crisis

period. This basically conforms to our results on the European sub-sample. However, while we observe a statistically significant, two-way relationship between stock prices and assets for the European sample, we do not find the same results for Luxembourg. Instead, we can only find a one-way relationship from macroeconomic variables on leverage and asset growth during the crisis period in Luxembourg. This is consistent with the international orientation of Luxembourgish MFIs. Additionally, in comparison to the European sample, we find a stronger reaction of Luxembourg's MFIs leverage when stock prices change. We suggest that this is due to the relatively higher share of securities on MFI's portfolios in Luxembourg.

4. CONCLUSION

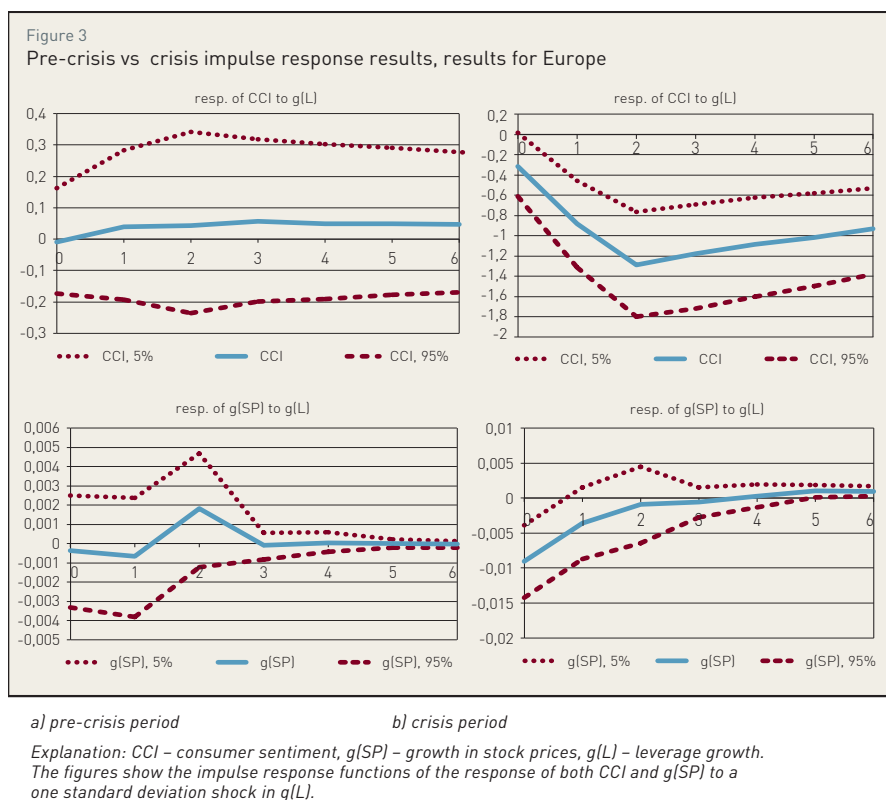
We conclude that leverage growth was not a concern (for investors) in the pre-crisis period, while it significantly drove investors' decisions during the crisis. The large impact of equity growth on sentiments during the crisis period is especially noteworthy here, since we did not find a significant impact from equity on sentiment during the pre-crisis period.

What we thus find is evidence that investors, in bull times, base their decisions to a lesser extent on fundamental indicators of financial health. In contrast, during a bear period, we find evidence for what one may dub pessimism, with investors being completely focused on default and financial stability, and where higher leverage reduces consumer sentiment and stock prices.

Our results are, therefore, more indicative of feedbacks between leverage and expectations during downturns, while we find that both lenders and borrowers are not concerned about leverage during upturning. We find, therefore, a stronger support for models that rely on an expectation-leverage feedback (like Kiyotaki and Moore, 1997; Brunnermeier and Sannikov, 2011) rather than on other channels.

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