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# DO BANK CHARACTERISTICS INFLUENCE THE EFFECT OF MONETARY POLICY ON BANK RISK?

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## **ABSTRACT**

We analyze whether the impact of monetary policy on bank risk depends upon bank characteristics. We relate the materialization of bank risk during the financial crisis to differences in the monetary policy stance and bank characteristics in the pre-crisis period for a large sample of listed banks operating in the European Union and the United States. We find that the insulation effect produced by capital and liquidity buffers on bank risk was lower for banks operating in countries that, prior to the crisis, experienced a particularly prolonged period of low interest rates.

**Keywords:** risk-taking channel; monetary policy; credit crisis; bank characteristics.

**JEL Classification:** E44, E52, G21.

## **EXECUTIVE SUMMARY**

Unusually low levels of short-term interest rates have often been named as one of the factors contributing to risk-taking by banks (Taylor, 2009; Adrian and Shin, 2009; Borio and Zhu, 2008). Excess liquidity created by loose monetary policy could have encouraged banks to increase their actual risk positions in at least two main ways. First, low interest rates impact valuations, incomes and cash flows, which in turn can modify how banks measure estimated risks. Second, low returns on investments, such as government securities, coupled with the lower cost of obtaining new debt for borrowers may increase incentives for investors (including banks) and borrowers to take on more risks. This could be due to contractual, behavioural or institutional reasons. For instance managers' compensation could be linked to absolute returns raising the incentives for managers to move towards riskier assets when rates are low.

If banks' incentives are at the centre of the workings of the risk-taking channel, it would be expected that individual bank characteristics would have a major impact on how the risk-taking channel operates (Dell'Ariccia, Laeven, Marquez, 2010). This is the objective of our work. We assume that, as banking is an opaque industry, it is difficult to ascertain actual bank risk-taking in real time. Hence the measurement of risk can only be gauged when it materializes. That is, when a crisis occurs. For this reason we consider how realized bank risk during the recent financial crisis relates to a range of pre-crisis individual bank characteristics. We use a comprehensive database of balance sheet information and risk measures for listed banks operating in the European Union and the United States in the last decade.

For each country, we construct a measure of monetary policy looseness, which we interact with certain bank characteristics: these interactions allow us to verify whether bank specific characteristics lead to heterogeneity in bank risk related to monetary policy. We focus on five major institution-specific characteristics likely to influence risk: liquidity, capital, market value, securitization intensity, traditional lending activity. We finally add a number of other factors likely to impact on bank risk.

We find that banks that were well-capitalized and highly liquid prior to the crisis suffered a lower level of erosion of their solvency during the 2007-2009 financial crisis. However, the insulation effects produced by capital and liquidity buffers were lower in those countries that, prior to the crisis, experienced a particularly prolonged period of low interest rates.

## 1. INTRODUCTION

While the causes of the 2007-2009 financial crisis were multifaceted, it has often been argued that monetary policy has been one of the factors contributing to excessive risk-taking by banks (Taylor, 2009). As a result, a number of authors have referred to a new transmission mechanism of monetary policy, coining the term: “the risk-taking channel” (Adrian and Shin, 2009; Borio and Zhu, 2008). Expressed simply, this channel exists where “low interest rates for too long” lead to an increase in “risk tolerance” by banks.

The risk-taking channel operates in two main ways. First, in periods of low interest rates there might be incentives for banks to “search for yield” more aggressively. In other words, when interest rates are subdued, banks might be more willing to invest in riskier assets, thereby lowering the yield from these assets. This could be due to contractual, behavioral or institutional reasons (see Rajan, 2005). For instance, managers’ compensation could be linked to absolute returns, raising the incentives for managers to move towards riskier assets when rates are low. Second, the positive effect of low interest rates on investment valuations and cash flows could also induce banks to take on more risks (Adrian and Shin, 2009).

There is increasing empirical evidence consistent with the existence of a risk-taking channel: using information from confidential credit registers from Spain and Bolivia, Jiménez et al. (2008) and Ioannidou et al. (2009) find that a “too accommodative” monetary policy led to additional risk-taking by banks prior to the crisis. In line with these findings, Altunbas et al. (2010) and Maddaloni and Peydro (2011) find evidence supportive of a risk-taking channel operating internationally.

If bank incentives are at the centre of the workings of the risk-taking channel, it would be expected that individual bank characteristics would have an impact on the effect of monetary policy on the banks’ exposure to risk. The aim of our study is to provide an analysis of the effects of these characteristics on risk exposure.

A caveat is warranted: we acknowledge that empirically it is very difficult to prove causality between monetary policy and bank risk. This is partly because it is difficult to fully address the problem of endogeneity with respect to monetary policy but mostly because it is not possible to reliably ascribe how much risk-taking by banks can be related to monetary policy, particularly in real time.

Our approach is to assume that the measurement of risk can only be gauged when an extreme event materializes; that is, when a crisis occurs. Hence, we consider how realized bank risk during the recent financial crisis relates to a range of pre-crisis individual bank characteristics obtained from a sample of listed banks operating in the European Union and the United States.

For each country, we construct a measure of monetary policy looseness, which we interact with certain bank characteristics: these interactions allow us to verify whether bank specific characteristics lead to heterogeneity in bank risk related to monetary policy. We focus on five major institution-specific characteristics likely to influence risk: liquidity, capital, market value, securitization intensity, traditional lending activity. We finally add a number of other factors likely to impact on bank risk (see Altunbas et al., 2011).

As the theoretical literature on the risk-taking channel is still being developed,<sup>1</sup> its differentiated impact across banks has generally not been considered. An exception is Dell’Ariccia et al. (2010), who find that, following a policy rate cut, well-capitalized banks tend to increase risk-taking to a larger extent than highly levered institutions.

Turning to the impact of bank characteristics on risk, our work is also related to recent studies that analyze the determinants of bank performance during the crisis. Findings indicate that banks with more Tier I capital and more liquid assets performed better in the initial stages of the crisis (Beltratti and Stulz, 2009; Demirguc-Kunt et al., 2010).

Focusing on the impact of capital on bank risk, the theory offers contradictory results. In principle, robust capital levels offer a stronger buffer to withstand losses. More capital also reduces risk-shifting incentives for shareholders towards riskier projects (Mehran and Thakor, 2011). In contrast, a positive relationship between capital and risk can also exist if agency problems between shareholders and managers lead to excessive risk-taking via managerial rent-seeking, or if regulators (or the markets) force riskier banks to build up capital. Overall, the empirical literature tends to support the view that more capital helps banks to increase their probability of survival and their profitability during crises (Berger and Bouwman, 2010).

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<sup>1</sup> See, for instance, Diamond and Rajan (2009), Dubecq et al. (2009) and González-Aguado and Suarez (2011). See also De Nicolò et al. (2010) for a useful overview.

## 2. MODEL, IDENTIFICATION STRATEGY AND RESULTS

We model the probability of a bank belonging to the group of riskier institutions during the crisis. We define as “risky” those banks that experienced the highest increase in their probability of default.<sup>2</sup> Hence our definition of risky banks refers only to those institutions more exposed to the risks that materialized during the crisis. Starting from a sample of 583 banks,<sup>3</sup> we create a binary variable (*risky*) that takes the value of 1 if the bank is on the top quartile of the distribution in terms of changes in the expected default probability in the 2007Q2-2008Q4 period, and 0 otherwise.

A bank’s probability of belonging to the riskier group is modeled as a function of a combination of factors that developed prior to the crisis. We relate this likelihood to the number of consecutive quarters in which the real monetary interest rate remained below the natural rate that measure monetary policy looseness (*LOOSE*),<sup>4</sup> a set of macro variables (*Y*), and bank specific characteristics (*X*).

The vector *Y* includes the annual growth rate in nominal GDP ( $\Delta GDPN$ ) and quarterly country changes in housing and stock market returns ( $\Delta HP$  and  $\Delta SM$ ).<sup>5</sup> The vector *X* includes 5 bank-specific characteristics that could influence bank risk-taking: liquid assets over total assets (*LIQ*), core capital-to-assets ratio (*CAP*), market to book value of equity (*TOBIN\_q*), securitization activity (*SEC*) and loan growth (*EXLEND*).<sup>6</sup>

More importantly for our purposes, we include the interaction between *LOOSE* and *X* to assess whether banks with different characteristics adopted different risk strategies in connection with the existence of low interest rates (*LOOSE\*X*).

The baseline empirical model is given by the following probit equation:

$$P[risky_{ik} = 1|X] = \Phi(\alpha LOOSE + Y'\beta + X'\gamma + LOOSE * X\lambda) \quad (1)$$

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<sup>2</sup> We use the 1 year-ahead probability of default (*EDF*) computed by Moody’s-KMV.

<sup>3</sup> The sample includes banks headquartered in the European Union (EU 15) and the United States. For a full description of the characteristics of the database and variable definitions see Altunbas et al. (2010).

<sup>4</sup> This measure considers the number of consecutive quarters in which the difference between the real short-term and “natural” interest rates, calculated using the Hodrick-Prescott filter, is negative. Similar results are obtained using different measures of the Taylor rule. For more details see Altunbas et al. (2010).

<sup>5</sup> Both asset returns are demeaned using their long term averages.

<sup>6</sup> We compute a bank-specific measure for credit expansion by subtracting from each bank’s lending growth the average expansion in bank lending for the whole banking industry in that country.

where  $P$  is the probability,  $\Phi$  is the standard cumulative normal probability distribution,  $Y$  is a vector of regressors that include macro-variables of country  $k$  where bank  $i$  has its main seat, and  $X$  a vector of bank-specific characteristics of the same bank  $i$  over the five years prior to the crisis (2002Q2–2007Q2). This approach limits endogeneity problems. The probit model is estimated by maximum likelihood.

Table 1 shows that, consistent with the existence of a risk-taking channel, the *LOOSE* variable is positive. This suggests that if the real interest rate is well below the natural rate for an extended period of time, banks are more likely to suffer a significant deterioration of solvency when the crisis arrives. It also shows that liquid and well-capitalized banks suffered less erosion of their solvency during the 2007-2009 financial crisis.

The interaction between monetary policy looseness (*LOOSE*) and bank characteristics (see top of Table1) indicates that banks with different characteristics adopted different risk positions in the period of unusually accommodative monetary policy. The findings suggest that the insulation effects produced by capital and liquidity buffers against bank risk were lower in countries that experienced a prolonged period of low interest rates.

We estimated the same model accounting for the initial level of *EDF* prior to the crisis and bank competition *COMP* (Boyd and De Niccoló, 2005; Matutes and Vives, 2000; Maddaloni and Peydrò, 2011). However, results remain unchanged (Columns II and III).

### 3. CONCLUSIONS

We analyze the link between monetary policy and bank risk using a unique database of listed banks. We find that banks that were well-capitalized and highly liquid prior to the crisis suffered a lower level of erosion of their solvency during the 2007-2009 financial crisis. However, the insulation effects produced by capital and liquidity buffers were lower in those countries that, prior to the crisis, experienced a particularly prolonged period of low interest rates.



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Table 1

## REGRESSION RESULTS

Dependent variable: P(risky <sub>ik</sub> =1)		(I)		(II)		(III)	
		Baseline equation		Initial EDF level effect		Competition	
		Coef.	Sig	Coef.	Sig	Coef.	Sig
<i>LOOSE</i>	number of consecutive quarters with interest rate below the benchmark	0.071 **	(0.033)	0.056 *	(0.031)	0.068 **	(0.031)
<i>LOOSE*LIQ</i>	interaction between <i>LOOSE</i> and liquidity	0.001 *	(0.0003)	0.000 *	(0.0003)	0.001 *	(0.0003)
<i>LOOSE*CAP</i>	interaction between <i>LOOSE</i> and capitalization	0.003 *	(0.002)	0.002 *	(0.0014)	0.003 *	(0.0015)
<i>LOOSE*TOBIN_q</i>	interaction between <i>LOOSE</i> and Tobin Q	-0.056 *	(0.030)	-0.043	(0.029)	-0.061 *	(0.035)
<i>LOOSE*SEC</i>	interaction between <i>LOOSE</i> and securitization activity	-0.001	(0.005)	-0.012	(0.008)	-0.001	(0.005)
<i>LOOSE*EXLEND</i>	interaction between <i>LOOSE</i> and excessive lending	0.000	(0.005)	0.000	(0.003)	0.000	(0.0044)
$\Delta HP$	quarterly changes in the housing price index (demeaned)	0.227 **	(0.091)	0.205 **	(0.083)	0.263 **	(0.115)
$\Delta SM$	quarterly changes in the stock price index (demeaned)	0.113 **	(0.046)	0.093 **	(0.038)	0.099 *	(0.053)
$\Delta GDPN$	changes in nominal <i>GDP</i>	-0.299 *	(0.169)	-0.210	(0.153)	-0.319 *	(0.172)
<i>LIQ</i>	liquidity-to-total assets *100	-0.020 **	(0.010)	-0.017 *	(0.009)	-0.020 **	(0.010)
<i>CAP</i>	capital-to-total asset ratio *100	-0.187 **	(0.075)	-0.156 **	(0.070)	-0.191 **	(0.0768)
<i>TOBIN_q</i>	Tobin's q: ratio between a bank's market value and replacement value	-0.379	(0.551)	-0.332	(0.482)	-0.322	(0.559)
<i>CAP*TOBIN_q</i>	interaction between capitalization and Tobin's q	0.080 ***	(0.027)	0.065 **	(0.026)	0.081 ***	(0.0276)
<i>SEC</i>	Securitized loans over total lending	0.083	(0.131)	0.240 *	(0.132)	0.082	(0.1369)
<i>EXLEND</i>	excessive credit expansion (demeaned)	0.055	(0.079)	0.046	(0.051)	0.054	(0.076)
<i>EDF_LEVEL</i>	expected default frequency (1 year ahead) in 2007:q2			0.107 ***	(0.032)		
<i>COMP</i>	competition index					0.007	(0.012)
Number of obs		583		583		583	
Pseudo R <sup>2</sup>		0.15		0.15		0.15	
Percent true positives/negatives		62.0/78.4		64.6/78.8		62.0/78.4	
Percent correctly classified		77.02		77.6		77.02	
Hosmer–Lemeshow test		3.47		11.630		4.68	
Hosmer–Lemeshow test p-value		0.9017		0.169		0.7916	

Notes: The equation models the probability for a bank  $i$  with head office in country  $k$  to become risky during the crisis (i.e. to be in the last quartile of the distribution). The table reports the marginal effects. Robust standard errors in parenthesis. All explanatory variables except *LOOSE* are expressed as average values over the period 2002 Q2- 2007 Q2. The symbols \*, \*\*, and \*\*\* represent significance levels of 10%, 5%, and 1% respectively.