

B THE IMPACT OF SHORT-TERM INTEREST RATES ON BANK CREDIT RISK-TAKING

This Special Feature discusses the effect of short-term interest rates on bank credit risk-taking. In addition, it examines the dynamic impact of monetary policy on the credit risk of loans. It presents evidence that low short-term interest rates encourage bank risk-taking and reduce the credit risk of outstanding loans. However, credit risk becomes high at times when interest rates return to or rise above their average level after having been very low for a long period.

INTRODUCTION

Does the level of short-term interest rates affect bank risk-taking? Do low rates encourage risk-taking? Do they reduce credit risk in the very short run but increase it in the medium run? Despite increased risk-taking, are risk premia lower? This Special Feature addresses these questions by reviewing the empirical evidence on the impact of monetary policy on financial stability.¹

Empirical evidence shows that when short-term interest rates are low, banks relax their lending standards and grant new loans with higher credit risk, but reduce the associated loan spreads.² This suggests that low interest rates increase banks' appetite for risk. Despite this increase in risk-taking, low interest rates are found to reduce credit risk in the very short run since they reduce refinancing costs and increase borrowers' net worth, thereby lowering the credit risk of outstanding bank loans. As the volume of outstanding bank loans is greater than that of new loans, low interest rates may make banks loan portfolios less risky in the very short run. In the medium run, however, interest rates that are too low encourage bank risk-taking which increases credit risk, thereby adversely affecting financial stability, especially if interest rates then return to or rise above average levels.³

The rest of this Special Feature briefly reviews the theoretical links between the level of short-term interest rates and risk-taking. It then considers the empirical evidence on the impact of the stance and path of monetary policy on bank risk-taking and credit risk. Finally, it summarises the main findings.

MONETARY POLICY, INTEREST RATES AND FINANCIAL STABILITY

Banks are at the core of the financial system and credit risk is the main risk that they face. Therefore, it is crucial for financial stability to understand the effects of monetary policy on bank risk-taking and credit risk. These effects have not been studied to any great extent. By contrast, the effects of monetary policy on the volume of bank credit in the economy have been widely studied.⁴ These studies have concluded that an expansionary monetary policy increases the volume of bank loans in the economy.

1 This Special Feature draws extensively on V.P. Ioannidou, S. Ongena and J.L. Peydró-Alcalde (2007), "Monetary Policy and Subprime Lending: A Tall Tale of Low Federal Funds Rates, Hazardous Loans and Reduced Loan Spreads", *CEPR Discussion Paper*, forthcoming.

2 See Ioannidou, Ongena and Peydró-Alcalde (2007), *op. cit.*

3 The term medium run refers to the median maturity of bank loans. Low rates mean (i) low nominal interest rates and (ii) (conditioning on GDP growth, general risk and inflation) low rates mean expansive monetary policy. Too low rates mean rates significantly below the averages levels.

4 See B.S. Bernanke, M. Gertler and S. Gilchrist (1996), "The Financial Accelerator and the Flight to Quality", *Review of Economics and Statistics*, 78, pp. 1-15; B.S. Bernanke and A.S. Blinder (1992), "The Federal Funds Rate and the Channels of Monetary Transmission", *American Economic Review*, 82, pp. 901-921; B.S. Bernanke and M. Gertler (1995), "Inside the Black Box: The Credit Channel of Monetary Policy Transmission", *Journal of Economic Perspectives*, 9, pp. 27-48; A.K. Kashyap and J.C. Stein (2000), "What Do a Million Banks Have to Say about the Transmission of Monetary Policy?", *American Economic Review*, 90, pp. 407-428; W.J. Den Haan, S. Sumner and G. Yamashiro (2007), "Bank Loan Portfolios and the Monetary Transmission Mechanism", *Journal of Monetary Economics*, forthcoming.

Recent theoretical studies provide a basis for understanding how changes in short-term interest rates may affect bank risk-taking. This section briefly reviews the findings.⁵

One recent contribution models the impact of borrowers' net worth on the composition of credit.⁶ Low interest rates increase borrowers' net worth, thereby reducing the agency costs of lending and making banks more willing to lend to higher risk borrowers who have less collateral. On the other hand, when borrowers have low net worth (e.g. interest rates are high), there may be a flight to quality on the part of banks.⁷ Low interest rates may also mitigate adverse selection problems in credit markets, causing banks to relax their lending standards and increase risk-taking.⁸ In addition, when interest rates are low and liquidity is high, banks are less concerned about their financing (deposits) and hence can lend more to riskier borrowers.⁹

In general, low interest rates make (ceteris paribus) risk-free assets less attractive for banks, increasing their demand for higher risk assets with higher potential returns, especially in financial institutions in which moral hazard is important.¹⁰ In addition, low short-term interest rates reduce the difference between the policy rate and deposit rates, thus reducing bank profits. Since loan contracts feature profit targets (that are not perfectly adjusted to changes in nominal interest rates), when policy rates are low, banks have more incentive to grant loans to higher risk borrowers (for higher potential returns) in order to boost profits.

EMPIRICAL EVIDENCE

An important question is whether low short-term interest rates encourage banks to grant loans to higher risk borrowers and relax their lending standards. This section reviews the empirical findings and considers the empirical context that enables inferences to be made regarding whether low interest rates encourage risk-taking and, if so, why.

ECONOMETRIC IDENTIFICATION

To carry out an empirical analysis of the impact of monetary policy (in particular, low interest rates) on risk-taking, monetary policy conditions must first be fairly exogenous. If they were endogenous - this could be the case when financial stability has been threatened and monetary policy responded by lowering interest rates - the econometric identification of the impact of monetary policy on financial stability would be rendered extremely difficult.¹¹

Another important aspect for econometric identification is the need to have access to very detailed loan data; in particular, new and outstanding loans at any given moment, with very detailed information on measures of risk such as loan performance, loan rates, lending standards, whether loans are collateralised or not and whether the borrower has a bad credit history or is graded sub-prime according to the bank's internal ratings.

A third requirement for econometric identification is to have a measure of loan default risk per unit of time. For an analysis of the impact of monetary policy on credit risk, to construct the ideal measure would require access to the precise and evolving assessments made by bank loan officers on the default

5 See K. Matsuyama (2007), "Credit Traps and Credit Cycles", *American Economic Review*, 97, pp. 503-516; D. Diamond and R. Rajan (2006) "Money in a Theory of Banking", *American Economic Review*, 96, pp. 30-53; R. Rajan, (2006), "Has Finance Made the World Riskier?", *European Financial Management*, 12, pp. 499-533; C. Borio, (2003), "Towards a Macroprudential Framework for Financial Supervision and Regulation", *BIS Working Paper*, No. 128; C. Borio and P. Lowe (2002), "Asset Prices, Financial and Monetary Stability: Exploring the Nexus", *BIS Working Paper*, No. 114; A. Crockett (2003), "Monetary Stability, Financial Stability and the Business Cycle: Five Views", *BIS Paper*, No. 18; G. Dell'Ariccia and R. Marquez (2006), "Lending Booms and Lending Standards", *Journal of Finance*, 61, pp. 2511-2546.

6 See Matsuyama (2007), op. cit.

7 See Bernanke, Gertler and Gilchrist (1996), op. cit.

8 See Dell'Ariccia and Marquez (2006), op. cit.

9 See Diamond and Rajan (2006), op. cit.

10 See Rajan (2006), op. cit.

11 For instance, the Federal Reserve System reduced interest rates because of the heightened uncertainty created by the collapse of LTCM in 1998.

probability of each individual loan at any given moment in time. Duration analysis provides an excellent measure of credit risk per unit of time (the hazard rate). This measure – in conjunction with the ex-ante lending standards – is an ideal basis for analysing risk-taking and credit risk.

DATA

The closest setting to an ideal econometric environment for analysing the impact of monetary policy on bank risk-taking is detailed in an analysis of Bolivian data.¹² During the sample period (1999-2004) the boliviano was pegged to the US dollar and the Bolivian banking sector was almost completely “dollarised”. More than 90% of deposits and credits were denominated in US dollars in Bolivia, which makes it one of the most dollarised economies among those that have stopped short of full dollarisation. This, together with the exchange rate regime, makes the federal funds rate an appropriate and exogenous measure of short-term interest rates in Bolivia.¹³

The Central de Información de Riesgos Crediticios, the public credit registry of Bolivia, is a database managed by the Bolivian banking superintendent in which all banks are required to participate. It contains detailed information, updated on a monthly basis, on all outstanding loans granted by banks operating in the country. For each loan, detailed information is supplied about the contract (e.g. date of loan origination, maturity, amount, loan interest rate, rating, currency denomination, value and type of collateral, type of loan, etc.) and about the borrower (e.g. region, industry, legal status, number and scope of banking relationships, total bank debt and, in particular, credit history and internal bank rating), as well as information on ex-post performance (e.g. whether a loan was downgraded to default status in a given month). To this dataset is added information on bank characteristics (e.g. capital ratios, non-performing loans, liquid assets, size, etc.) which is obtained from balance sheets and income statements.

The richness of the database allows several, complementary measures of bank risk-taking to be constructed. Since theoretical models show that monetary policy may affect risk-taking and lending standards and, therefore, also loan maturity, a measure of loan default that is normalised per unit of time – which in this case is a month – (hazard rate) is constructed. Within the framework of a fully specified duration model, the time to default is used as a dynamic measure of risk. In particular, the determinants of the hazard rate in each period are analysed (i.e. the probability that a loan will default in period $t+1$, conditional on surviving until period t). Default (the event to be modelled) is defined as occurring when a bank downgrades a loan to the lowest category, and the way in which monetary policy — both at origination and also during the “life” of the loan — affects the hazard rate is estimated.

In addition to the hazard rate, the static ex-ante measures of risk are analysed. Whether the stance of monetary policy affects the volume of lending to borrowers with sub-prime credit ratings or bad credit histories is studied. Finally, loan pricing is analysed and, in particular – given the level of risk of the borrowers – whether the stance of monetary policy affects loan risk premia.

MAIN RESULTS

Using a variety of duration models and controlling for bank, borrower, bank-borrower relationship, loan features and macroeconomic characteristics (e.g. GDP growth and inflation), the way in which short-term interest rates at origination and during the life of a loan affect the loan hazard rate is analysed (default probability per unit of time). The hazard rate is found to increase when interest rates are low at loan

¹² See Ioannidou, Ongena, and Peydró-Alcalde (2007), op. cit.

¹³ During the sample period, the correlation between the federal funds rate and GDP growth in Bolivia was -0.2 and inflation in Bolivia was low. Therefore, lower interest rates corresponded to expansive monetary policy.

origination but also when rates are higher during the life of the loan. That is, monetary policy has a dual impact on credit risk: low interest rates increase bank risk-taking (they grant new loans with higher credit risk) but reduce the credit risk of outstanding bank loans.

When interest rates are low at loan origination not only do banks grant loans with higher credit risk, but they also relax their lending standards and lend more to borrowers with bad credit histories and sub-prime credit ratings. All of these results suggest that bank risk-taking increases when interest rates are low at loan origination and that – in this way – monetary policy affects the composition of bank credit in the economy (i.e. the quality distribution of borrowers in banks' loan portfolios).

In addition, low interest rates reduce the credit risk of outstanding loans. Consequently, the impact of low interest rates on the credit risk of new loans is completely different from the impact on outstanding loans. In the short-term, low interest rates reduce the total credit risk of banks since the volume of outstanding loans is larger than the volume of new loans. In the medium-term, however, if interest rates are too low this increases the total credit risk of banks, especially if interest rates then return to or rise above average levels. The results, therefore, suggest that low interest rates encourage risk-taking and reduce credit risk in the short-term but may increase it in the medium-term. A related analysis that uses European data obtains very similar results.¹⁴

Another finding of this analysis is that when interest rates are low, not only do banks lend more to sub-prime borrowers and take on higher credit risk but they also reduce loan spreads. Hence, low short-term interest rates lead to increased risk-taking but lower risk premia.¹⁵

It is also found that banks that borrow more from foreign debtholders (which are financial institutions) reduce risk-taking when interest rates are low.¹⁶ This could suggest that banks which have more sophisticated depositors

(i.e. banks as depositors which are more sophisticated than retail depositors) – and, therefore, less subject to moral hazard – engage in less risk-taking when interest rates are low. This result suggests that low interest rates could imply excessive risk-taking and, in consequence, better banking regulation and corporate governance could reduce the impact of low short-term interest rates on bank risk-taking.

THE IMPACT OF THE PATH OF MONETARY POLICY ON CREDIT RISK

To quantify the impact of the stance and path of monetary policy on bank credit risk, it is necessary to analyse how different paths of monetary policy (i.e. different paths of short-term interest rates, controlling for the other macroeconomic and banking variables) affect the hazard rate.¹⁷ Employing the coefficients of the baseline model used in the study, the annualised hazard rate for a loan with a 12-month term but otherwise average characteristics is calculated for various short-term interest rate paths (see Figure B.1).

For example, if the federal funds rate is equal to its sample mean throughout the life of a loan, the annualised loan hazard rate is estimated at 1.84%. In sharp contrast, if the federal funds rate is equal to its sample minimum (1.01%) at origination, but increases to its sample maximum (6.54%) at maturity, the hazard rate more than doubles, to 4.98%. On the other hand, if the path of monetary policy is reversed and the federal funds rate drops from its sample maximum to its sample minimum, the hazard rate more than halves, to 0.72%. If the

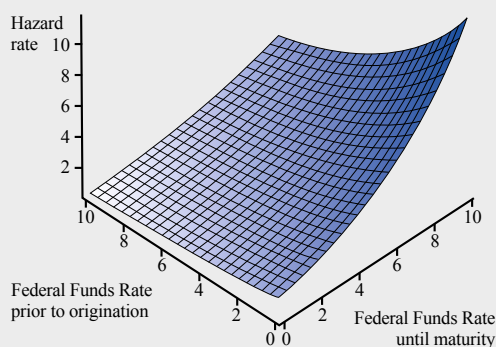
14 G. Jiménez, S. Ongena, J.L. Peydró-Alcalde and J. Saurina (2007), "Hazardous Times for Monetary Policy: What Do Twenty-Three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk?", *CEPR Discussion Paper* No 6514.

15 See Ioannidou, Ongena and Peydró-Alcalde (2007), op. cit.

16 See Ioannidou, Ongena and Peydró-Alcalde (2007), op. cit.

17 This section is based on Ioannidou, Ongena and Peydró-Alcalde (2007), op. cit. It is also shown that low levels of interest rate at origination increase credit risk even after controlling for the posterior change of interest rates over the life of the loan (see their table 2 – III).

Figure B.1 Paths of monetary policy and the loan hazard rate



Source: ECB calculations.

Note: The Figure displays various paths for the federal funds rate (in %) and the resulting annualised loan hazard rate (in %) calculated for a loan with a maturity of 12 months but otherwise average characteristics, based on the coefficients of Model II in Table 2 detailed in V.P. Ioannidou, S. Ongena and J.L. Peydró-Alcalde (2007), “Monetary Policy and Subprime Lending: A Tall Tale of Low Federal Funds Rates, Hazardous Loans and Reduced Loan Spreads”, *CEPR Discussion Paper*, forthcoming.

federal funds rate remains steady at 10%, the hazard rate is relatively low (2.50% compared with 4.98%), suggesting that risk-taking is significantly reduced when interest rates are high at loan origination.

These estimated effects of the federal funds rate on loan hazard rates are economically relevant. If short-term interest rates are too low for long periods, banks may take on more risk and relax their lending standards. The study suggests that exposing “hazardous” loans, granted when rates were too low, to swiftly increasing policy rates dramatically exacerbates their “toxicity”.

CONCLUDING REMARKS

Empirical evidence indicates that low short-term interest rates encourage bank risk-taking. Banks relax their lending standards and grant loans with higher credit risk but reduce loan spreads.¹⁸ Despite this increased risk-taking, low short-term interest rates reduce credit risk in the very short run since they reduce refinancing costs, thereby lowering the credit risk of outstanding bank loans. As the volume of outstanding bank loans is larger than that of new loans, low interest rates may make banks

safer in the very short run. In the medium run, however, interest rates that are too low encourage bank risk-taking and increase credit risk in banks, thereby threatening financial stability, especially if they then return to or rise above normal levels. It is also found that banks which are less well monitored – and therefore more subject to moral hazard – take on excessive risk when interest rates are low, thus suggesting that better banking regulation and corporate governance reduce the impact of low short-term interest rates on risk-taking.

¹⁸ Note that in some countries the impact of short-term interest rates on risk-taking depends on exchange rate developments and the share of tradable assets. In particular, the expansionary effects of low short-term interest rates may be partly curtailed by nominal appreciation of the domestic currency.