



# The effect of bank capital on lending: Does liquidity matter?



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## ABSTRACT

This paper uses a sample of quarterly observations of insured US commercial banks to examine whether the effect of bank capital on lending differs depending upon the level of bank liquidity. We find that the effect of an increase in bank capital on credit growth, defined as growth rate of net loans and unused commitments, is positively associated with the level of bank liquidity only for large banks and that this positive relationship has been more substantial during the recent financial crisis period. This result suggests that bank capital exerts a significantly positive effect on lending only after large banks retain sufficient liquid assets.

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## 1. Introduction

After the recent financial crisis, ensuring the financial stability of banking systems has been considered an imperative for regulators, academics, and policymakers. In particular, with the Basel Committee on Banking Supervision (BCBS) at the center of deliberations, regulators and policymakers have highlighted the critical importance to such stability of sufficient capital buffers and sound liquidity risk management. A result of these efforts is the international endorsement of Basel III, which requires enhanced quality and quantity of capital, a sufficient amount of stable funding, and the liquidity of bank assets. This initiative is based on the belief that banks with sufficient capital, liquid assets, and stable funding structures can more effectively maintain their intermediation capacity amid external negative economic shocks.

As emphasized by the Basel Committee, a main objective of reforms to strengthen global capital and liquidity rules is building a foundation for sustainable economic growth with a strong and resilient banking system (BCBS, 2011). That is, losses caused by spillovers from negative shocks in the financial sector to the real economy should be prevented. In this context, considerable research has examined the effects of financial shocks on real economic activity and the procyclical features of risk-based capital ra-

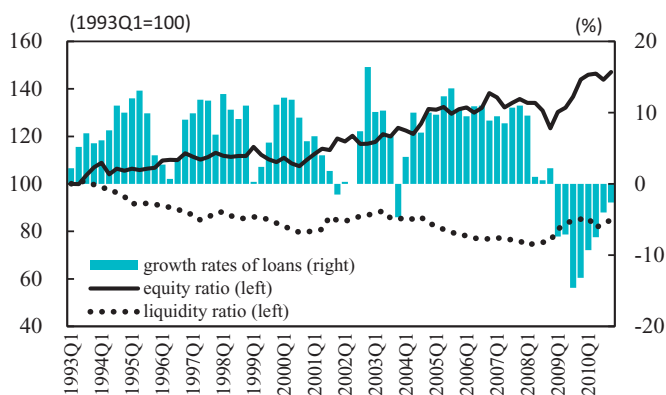
tios, which can further worsen financial shocks by forcing banks to reduce credit supply when such a supply is most required.

Understanding the relationship between bank capital and lending is a key issue discussed in other bank-related studies. As Berrospide and Edge (2010) highlight, quantifying the effect of bank capital on bank credit supply is one of the most fundamental research problems requiring resolution in verifying the link between the financial sector and real activity. For example, bank capital constitutes a principal component of Bayoumi and Malander's (2008) framework for macro-financial linkage. In this framework, the relationship between bank capital and lending standards is the first link. Banks make their lending standards more stringent following a negative shock to capital ratio, thereby reducing credit volume. Another important consideration is the "bank-capital channel" of monetary policy. Van den Heuvel (2002), Gambacorta and Mistrulli (2004), and Meh (2011) emphasize the importance of the bank-capital channel whereby monetary policy and shocks to bank capital affect bank lending. Comprehending the effect of monetary policy on the real economy is therefore challenging without verifying the relationship between bank capital and lending.

During the recent financial crisis, a shortage of capital was observed as a key factor limiting banks' ability to issue loans. Hence, many studies that examine the effect of bank capital on lending have recently emerged (see Berrospide and Edge, 2010; Gambacorta and Marques-Ibanez, 2011; Carlson et al., 2011; Brei et al., 2013). However, Fig. 1 indicates that a shortage of capital is

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**Fig. 1.** Growth rates of loans and the trend in proportions of liquid assets and equity.

Notes: Loans are total loans and leases on the balance sheet excluding federal funds sold to, reverse RPs with, and loans made to commercial banks. Liquidity ratio = (cash + securities + interbank loans + federal funds and reverse RPs with banks)/total assets. Equity = asset - liability.

Source: Federal Reserve Bank H.8. Assets and liabilities of commercial banks in the United States.

insufficient to explain sudden contractions in bank loans because equity ratio has gradually increased in every year except 2008, which is considered the most severe year of the crisis. Some scholars focus on other factors that have slowed bank lending during the recent financial crisis. For example, [Cornett et al. \(2011\)](#), [Berrospide \(2013\)](#), and [Ivashina and Scharfstein \(2010\)](#) highlight the effect of bank liquidity on lending. [Cornett et al. \(2011\)](#) and [Berrospide \(2013\)](#) find that banks' efforts to manage liquidity caused bank lending to decline during the recent crisis. Similarly, [Ivashina and Scharfstein \(2010\)](#) show that bank lending decreases more substantially for banks with less access to deposit financing and higher exposure to credit line drawdowns.

The current study is grounded in the conclusions asserted in the literature, which emphasize the importance of other bank-specific characteristics to bank lending ([Berrospide and Edge, 2010](#); [Gambacorta and Marques-Ibanez, 2011](#)). To date, research has focused on a linear relationship between bank capital and lending or has examined whether a structural change in response to external shocks occurs. To our knowledge, no studies have examined the interaction effect of bank capital and liquidity on lending. To examine this interaction, we use the 1993 Q1–2010 Q4 unbalanced quarterly observations of insured US commercial banks to determine whether the effect of bank capital on lending changes depending upon the level of bank liquidity.

The main findings are as follows. For large banks, the effect of an increase in bank capital ratio on credit growth, defined as growth rate of net loans on the balance sheet plus unused commitments unrepresented on the balance sheet, is positively associated with the level of bank liquidity. This finding suggests that the effect of an increase in capital ratio on credit growth is significantly negative for low liquidity ratios, becoming significantly positive only after large banks retain sufficient liquid assets. This interaction effect is found to be nonsignificant or negligibly negative for medium and small banks. Notably, this interaction effect is more substantial for large banks during the recent financial crisis, but the results remain steady only when unused commitments are included in the definition of lending.

These results suggest three important policy implications. First, policy actions such as capital injections and liquidity support to sustain bank lending are complementary and should be harmoniously implemented to be effective, particularly for large banks. Second, the results reinforce recent international regulatory reform efforts that emphasize the importance of both sufficient capital

and liquidity management to mitigate the effects of external negative economic shocks on banks' intermediation capacity.<sup>1</sup> Finally, large banks behave differently from medium and small banks. This behavioral difference might support the idea that policy actions and regulations should be applied differently according to bank size.

This paper makes two contributions to the literature. First, it shows a significant interaction effect of bank capital and liquidity on credit supply for large banks. This effect suggests, furthermore, that bank capital and lending exhibit a complicated relationship rather than a linear relationship, which has in contrast been the focus in the literature. Second, the present study demonstrates that the role of unused commitments should be considered in analyzing the effect of bank capital on lending. This recommendation is consistent with [Cornett et al. \(2011\)](#), [Ivashina and Scharfstein \(2010\)](#), and [Berger and Bouwman \(2009\)](#).

The remainder of the paper is organized as follows. [Section 2](#) presents a review of the literature, and [Section 3](#) discusses our hypotheses. [Section 4](#) briefly presents the data used and describes the empirical methodology and variables. [Section 5](#) discusses the regression results, and [Section 6](#) addresses robustness issues. [Section 7](#) presents the study's conclusions and discusses the policy implications of the results.

## 2. Literature review

Many empirical studies have examined the effect of bank capital on lending, with most indicating a positive effect, albeit to various degrees. In an early study, [Bernanke and Lown \(1991\)](#) estimate that the effect of a 1-percentage-point increase in bank capital results in approximately 2–3 percentage point increases annually in loan growth.<sup>2</sup> [Furlong \(1992\)](#) and [Hancock and Wilcox \(1994\)](#) also suggest a positive effect of bank capital on lending. [Furlong \(1992\)](#) finds that the ratio of bank capital to target capital is positively associated with the growth of bank loans. [Hancock and Wilcox's \(1994\)](#) estimate shows that in 1991 in the US, a shortfall in each US\$1 of bank capital resulted in a reduction of approximately US\$4.50 in bank credit. In a recent study, [Berrospide and Edge \(2010\)](#) estimate an increase of approximately 0.7–1.2 percentage points in loan growth in response to a 1-percentage-point increase in bank capital ratio annually. Nonlinear and interaction effects with the output gap are also examined; however, none of these factors was found to be statistically significant.

The effect of an increase in capital ratio on loan growth estimated by [Carlson et al. \(2011\)](#) is less than that reported in previous studies. Based on annual US bank data from 2001 to 2009, the authors find that a 1-percentage-point increase in the capital ratio causes loan growth to increase approximately 0.05–0.2 percentage points annually. This positive relationship, however, was not observed prior to the recent financial crisis, in fact becoming significant only in 2008 and 2009. Thus, the researchers suggest that capital becomes more crucial for loan growth during the crisis period. This result corresponds to the results of [Gambacorta and Marques-Ibanez \(2011\)](#) and [Cornett et al. \(2011\)](#), although capital is not a focal point in these studies.

<sup>1</sup> BCBS (2011) emphasizes the importance of liquidity management because banks that do not effectively manage their liquidity suffered during the recent financial crisis despite possessing adequate capital.

<sup>2</sup> Although the authors conclude that bank capital and lending exhibit a lesser relationship than expected and that capital shortage is a minor factor in lending slowdown, their estimates are somewhat larger than those reported in related studies. [Berrospide and Edge \(2010\)](#) explain that the larger estimates by [Bernanke and Lown \(1991\)](#) can be attributed to their model's exclusion of other bank-specific control variables. In this model, then, the coefficient of capital ratio captures the effects of other variables.

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