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Are regulatory capital adequacy ratios good indicators of bank failure? Evidence from US banks

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ABSTRACT

Motivated by massive bank failures during the financial crisis, this paper examines whether capital adequacy ratios required by regulators are associated with bank failure. It investigates whether the association is affected by the bank's proximity to the minimum required capital ratios. If results show a significant association between regulatory capital and failure of banks falling below the minimum capital ratios, then the ratios are set at an adequate level. Examining a sample of 560 US bank holding companies for the period 2003–2009, results reveal that the association between the core (Tier 1) capital ratio and bank failure becomes significant only if the bank holding company has a Tier 1 capital ratio of less than 6%. This is the level below which US bank regulators do not regard banks as being well capitalized. During the financial crisis period of 2007–2009, there is a significant association only when the criterion is set at or above 8%. Market-based probability of default is more significantly associated with failure relative to Tier 1 capital ratio. The findings of this paper are relevant to regulatory policy discussions and Basel III deliberations on capital adequacy at times of financial turmoil.

1. Introduction

Banking regulation mainly aims at mitigating the systemic risk resulting from bank failures, hence, protecting depositors' interests and maintaining the financial health of the overall economy. The importance of bank regulation stems from banks key function as creators of credit. Accordingly, one of the main reasons the financial crisis of late 2007 became so severe was that banks create credit for financial transactions that are unrelated to the creation of real assets (Werner, 2010). Bank regulators and the insurer body are interested in banks maintaining minimum capital ratios to reduce the probability of failure and systemic risk that jeopardize liquidity, monetary policy and economic stability. Here, the question of whether the risk-based capital ratios give regulators a true indicator of possible bank failure becomes crucial. This paper addresses this question while examining the association between regulatory capital requirements and bank failure. The paper does not seek to develop an early warning signal of failure but rather to provide an understanding and validation of the relevance of minimum capital ratios as a regulatory tool in association with early stages of bank failure, hereafter 'distress'. Reflecting concerns that helped prompt the Basel III deliberations, the paper investigates whether a higher minimum core capital ratio provides an indicator of bank distress during times of turmoil.

In earlier research, minimum capital ratios have been used indirectly, along with market-based measures that proxy for bank distress, to examine their association with default risk (Hall, King, Meyer, & Vaughan, 2002). However, the question of whether the minimum capital ratio itself is a valid proxy for distress has not been tested. In this regard, the paper does so after controlling for market-based default risk measures drawn from extant finance literature. Moreover, the components of the risk-based capital ratio are disentangled to better examine the overall relevance of the ratio to distress.

The US Board of Governors of the Federal Reserve System has expressed full support for the Basel III proposal of the Basel Committee on Banking Supervision (BCBS) that there should be more stringent capital and liquidity requirements. More specifically, federal and international efforts have been focusing on strengthening the quantity and quality of capital through more stringent minimum ratios (Basel Committee on Banking Supervision, 2010). As a key part of its proposal to strengthen the resilience of the banking sector, the BCBS has proposed that banks should maintain a minimum core capital ratio of 6%

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rather than the previously required ratio of 4% in order to be considered adequately capitalized.[1] Under new capital adequacy rules, banks are expected to maintain capital levels well above the minimum required ratios. Furthermore, for a bank to expand its activities under the financial holding company status, it needs to be well capitalized. Hence, the importance of a well-capitalized capital threshold is paramount.

Motivated by the proposals of the BCBS and the FDIC for revised capital requirements under Basel III, this paper examines the association between regulatory capital and bank distress. It finds that this association is more pronounced for banks for which the core capital ratios only narrowly exceed the required minimum. It uses the criterion currently used by US regulators that the ratio is in the range 2% to 6%.[2] Given that a period of financial turmoil might cause an association between regulatory capital and distress to be observed above that range, the paper tests the association between regulatory capital and bank distress during the financial crisis period of 2007–2009. In a follow-on test, higher ranges are used to provide results that are relevant to bank regulators and policy decisions.

The evidence provided in this paper contributes to the literature in a number of ways. First, this paper adds to the meager literature examining the direct association between the regulatory risk-based capital ratio and a leading indicator of bank distress. Unlike Ng and Roychowdhury (2011), who test the association between core regulatory capital or total risk-based capital and bank failure, this paper disentangles components of the regulatory capital ratio to further understand what drives the association. Second, this paper differs from the work of Ronn and Verma (1989) and Cordell and King (1995) by having an institution-specific default-risk focus rather than a market-wide deposit insurance-related emphasis. Rather than estimating a fair capital-to-asset ratio that rests on the pricing of deposit insurance as a put option (Ronn & Verma, 1989) or deriving a leverage ratio based on accounting or market data variations (Bichsel & Blum, 2004), it examines the nature of the association between the core capital ratio and bank distress as well as circumstances in which this association is more pronounced. Finally, unlike Bichsel and Blum (2004), bank distress is used as a dependent variable while using as a control variable a market-based probability of default, the BSM measure of Hillegeist, Keating, Cram, and Lundstead (2004), established in the finance literature. This measure controls for the default risk as assessed by the market through option pricing models.

The remainder of the paper is structured as follows. Section 2 reviews the literature on regulatory capital and default risk. Section 3 lays down the basis for hypotheses development. In section 4 the research design is presented. Section 5 introduces the sample and data sources. Then, the empirical results with a reference to robustness checks are discussed. Furthermore, the implications for further research and regulatory policies are introduced in Section 6. Finally, Section 7 concludes.

2. Background

As a response to bank failures coupled with a decline in bank capital holdings in the early 1980s, US regulators have required banks to hold minimum capital as a percentage of assets. However, these standards have been criticized for failing to take into account the risk in a bank's portfolio of assets. The old minimum capital requirements made no distinction between high-risk asset positions and low-risk asset positions, hence encouraging banks to take excessive risks (Hancock & Wilcox, 1994). In 1990 US bank regulators adopted risk-based capital requirements as part of the international Basel Accord. Accordingly, Tier 1 capital is an equity-like measure of capital. It consists of core capital representing common book equity, less certain disallowed reserves and intangible assets, plus minority interest and other items. Tier 2 capital is a junior debt-like measure of capital. It includes subordinated debt, plus cumulative perpetual preferred stock and certain reserves not included in Tier 1 capital, allowance for loan losses up to a limit, and other items includable in Tier 2 capital. Tier 3 capital consists mainly of short-term subordinated debt. It is usually a very small amount, if not zero. Total risk-based capital is the sum of Tier 1, Tier 2 and Tier 3 capital after some adjustments (Abou-El-Sood, 2012). The ratio of regulatory capital to risk-weighted assets forms the basis to measure the capital adequacy of banks.[3] The regulators' aim has been to match risk-based capital requirements to the real risk of banks. Nonetheless, many recent failures, and the preceding state of distress, occurred during the financial crisis of late 2007 irrelevant to the capital ratios banks disclosed. Therefore, the question is whether the minimum capital ratio required by bank regulators really reflects a true measure of bank vulnerability. In a US setting, the FDIC is the insurer against bank failures. During the financial crisis of 2007, the number of banks entering into the FDIC receivership has increased dramatically.[4]

Earlier research gives mixed results on whether maintaining regulatory capital requirements mitigates excessive risk taking by banks and reduces the probability of failure. The first strand of research rests on the buffer role of regulatory capital. Consistent with the regulatory capital acting as a deposit insurance premium, banks are motivated to incur lower risks the higher the amount of capital and reduce their capital charge at stake in case of default (Aggarwal & Jacques, 2001; Berger, Herring, & Szego, 1995; Furlong & Keeley, 1989; Furlong, 1992; Jacques & Nigro, 1997). Using the option-pricing model, Furlong and Keeley (1989) find that regulatory capital requirements achieve stability for the banking system. They show that banks have lower risk exposure when the regulatory capital ratio increases. Aggarwal and Jacques (2001) report an increase in regulatory capital ratios of banks under regulation without an offsetting increase in credit risk. Berger et al. (1995) point out that costs of failure are borne by debt-holders and partially by shareholders. Therefore, debt-holders might seek higher yields to offset the probability of failure and shift the expected cost of failure to shareholders. In turn, shareholders might reduce such cost by increasing regulatory capital to the point that the reduction in the expected likelihood of failure offsets the reduction in the tax benefits of debt.

The second strand of research is based on the notion that raising capital is costly. Therefore, a higher level of regulatory capital should be compensated by taking higher risks to achieve an adequate return to shareholders (Bichsel & Blum, 2004; Koehn & Santomero, 1980; Shrieves & Dahl, 1992). Koehn and Santomero (1980) describe the association between the regulatory capital ratio and the probability of failure as 'ambiguous'. When testing intra-industry effects, they find a higher intra-industry dispersion of the probability of failure. They point out that the regulatory capital requirements drive banks to reallocate their assets inefficiently and consequently increase risk taking. Gennotte and Pyle (1991) and Shrieves and Dahl (1992) find that portfolio risk increases as a result of increased capital requirements. Cordell and King (1995) regress the market-based capital adequacy ratio on risk-weighted asset classes to determine whether the regulatory risk-weights differ from those set by the market. They derive a market-based capital adequacy ratio based on the Ronn and Verma (1986) option pricing model to estimate deposit insurance premiums and extend

[1] It should be noted that, subsequent to the interval examined in this study, Basel III has mandated that 6% should become the minimum capital requirement for banks to be classified as adequately capitalized. The Federal Deposit Insurance Corporation (FDIC) has adopted a new rule requiring a minimum tier 1 capital ratio of 6% to be applied January 1, 2015.

[2] US bank holding companies are classified as critically undercapitalized when they fall at or below the regulatory capital ratio of 2%. Consequently, they are entered into conservatorship/receivership and are considered as failing.

[3] To be well capitalized under the proposed new federal bank regulatory agency definitions, a bank holding company must maintain a tier 1 capital ratio of at least 8%. A bank holding company is adequately capitalized with a tier 1 ratio of 6% or more; undercapitalized below 6%; significantly undercapitalized below 4%; and critically undercapitalized of 2% or less, where banks are put into conservatorship/receivership.

[4] Federal Deposit Insurance Corporation (FDIC) Failed Bank List (http://www.fdic.gov).