



# Banks' capital buffer, risk and performance in the Canadian banking system: Impact of business cycles and regulatory changes



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## ABSTRACT

Using quarterly financial statements and stock market data from 1982 to 2010 for the six largest Canadian chartered banks, this paper documents positive co-movement between Canadian banks' capital buffer and business cycles. The adoption of Basel Accords and the balance sheet leverage cap imposed by Canadian banking regulations did not change this cyclical behavior of Canadian bank capital. We find Canadian banks to be well-capitalized and that they hold a larger capital buffer in expansion than in recession, which may explain how they weathered the recent subprime financial crisis so well. This evidence that Canadian banks ride the business and regulatory periods underscores the appropriateness of a both micro- and a macro-prudential "through-the-cycle" approach to capital adequacy as advocated in the proposed Basel III framework to strengthen the resilience of the banking sector.

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## 1. Introduction

The 2007 subprime turmoil underscores the imperative for a sound micro- and macro-prudential framework for banking regulation and supervision to build up resilience against severe crises and to ensure the stability of the entire financial system.<sup>1</sup> During this crisis, Canada's banking system performed much better than other industrialized countries. Even as high-profile banks in Europe, the United States and elsewhere collapsed, were bailed out, or underwent imposed take-overs—Fortis, Citigroup, UBS and the Royal Bank of Scotland are a few examples—not one Canadian bank failed or was openly bailed out.

In this paper, we examine the relationship between bank capital buffers and business cycles in Canada's banking sector. We first examine the cyclicity of Canadian banks' capital buffer with respect to business cycles, where the buffer (excess capital) is the size of the capital cushion that exceeds the regulatory capital

requirement of the Office of the Superintendent of Financial Institutions (OSFI). Cyclicity of bank capital is defined as the co-movement between business cycles and bank capital. Positive co-movement implies counter-cyclicity and negative co-movement denotes procyclicality.<sup>2</sup> Therefore, to have counter-cyclicity between bank capital buffers and the business cycle, capital has to be accumulated in booms and lower in troughs.<sup>3</sup> Second, we analyze the impact of capital buffers on banks' risk and performance, controlling for business cycles as well as for capital regulatory environments, namely in the period preceding the Basel Accords, during Basel I, and during amendments to the Basel I and Basel II regimes.

<sup>2</sup> See for instance, Illing and Paulin (2004).

<sup>3</sup> Noteworthy empirical evidence on the dependence of capital buffer on business cycles, albeit still limited and conflicting, is as follows. Lindquist (2004), Jokipii and Milne (2008, 2011) and Stolz and Wedow (2011) find a negative co-movement of capital buffers of Western European banks and the business cycle. Shim (2013) also documents a negative relationship between the business cycle and US banks' capital buffers, implying that banks may increase capital buffers by shrinking their risk-weighted assets during business downturns. Further, Jokipii and Milne (2008) find that in recessions, large banks, commercial and savings banks increase their capital buffer, while small banks and co-operative banks as well as those in accession countries decrease their capital buffer, suggesting that the cyclical behavior of bank capital buffers varies according to the size, the type of bank, the country financial infrastructure and regulatory environment.

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<sup>1</sup> Micro-actions pertain to management actions at the bank level. Macro-actions refer to monetary and other policies at the country level or higher.

Our research questions are as follows: (1) Do Canadian banks' capital buffers run counter to business cycles? (2) Are Canadian banks' capital buffers sensitive to changes in capital regulations? (3) How sensitive are Canadian banks' risk to changes in their capital buffer? (4) How do induced changes in bank capital buffers affect the performance of Canadian banks?

Our work departs from the literature on capital buffers in several ways. First, it uses an extensive database of quarterly data over a relatively long period (1982–2010) to study Canada's banking sector. Second, unlike some previous research, our study period covers at least three regulatory environments. Third, we study the relationship between capital buffers, risk and performance simultaneously, developing a system of three simultaneous equations that link capital buffer, risk and performance within several business cycles and multiple regulatory changes. To our knowledge, this is the first paper to comprehensively address these issues relating to capital buffers in the Canadian context.

We find that Canadian banks are well-capitalized, exceed the minimum requirements for both the regulatory capital buffer (5.09%) and the leverage capital buffer (0.49%). These findings provide one possible explanation for how Canadian banks weathered the recent financial crisis better than banks in other countries.<sup>4</sup>

We also document positive co-movement between Canadian banks' capital buffer and business cycles (countercyclical effects): more capital is being accumulated during booms. In exploring the role played by the Basel regulations in this relationship, we find that this positive co-movement is still present after the 1996 amendment to the Basel I Accord adopted in 1998, although it is more pronounced over the 1988–1997 Basel I period. This may be one explanation for the resilience of the Canadian banking sector to the recent financial crisis. To contrast, most studies on European banking institutions (e.g., Jokipii and Milne (2008, 2011), Stolz and Wedow (2011)) and on US banks (e.g., Shim (2013)) find a negative co-movement between business cycles and banks' capital buffer. Since the negative co-movement between capital buffer and business cycles can exacerbate the procyclical impact of Basel regulation, these studies underline the need for capital provisioning during good economic times. We also find a negative but not statistically significant relationship between variations in banks' capital buffer and banks' risk exposure. This finding is similar to that of Lindquist (2004), who found support for the hypothesis that capital buffers may be considered as insurance against failure to meet capital requirements. Our results support the view that Basel and the leverage constraints imposed by Canadian regulators, principally the Office of the Superintendent of Financial Institutions (OSFI), have to some extent succeeded at better aligning Canadian banks' risk-taking with their capital base.

Finally, we find that the impact of capital buffer on the performance of Canadian banks depends on how performance is measured. When equity returns are used to measure performance, there is no effect. However, if returns on assets (ROA) or Tobin's Q are used as performance measures, capital buffers have a significant and positive impact on ROA and a negative impact on Tobin's Q.

We can then draw two main policy implications from the Canadian experience. First, rigorous and disciplined implementation of both risk-based and non-risk-based capital requirements may help mitigate the well-documented procyclicality associated with current Basel risk-based capital charges. Secondly, capital requirements should be higher during booming economic periods because this is when banks can accumulate more capital. Conversely, a reduction in capital requirements during recessionary

periods would be welcome since this may provide more room for banks to operate.

The rest of this paper is structured as follows. In Section 2, we discuss our empirical framework. In Section 3, we describe the data and present the descriptive statistics. In Section 4, we discuss and interpret the empirical results. In Section 5, we carry out robustness checks. We conclude in Section 6.

## 2. Empirical framework

Shrieves and Dahl (1992), Jacques and Nigro (1997), Rime (2001) and others have used systems of two simultaneous equations to study the relationship between banks' risk and their capital. Kwan and Eisenbeis (1997) and Altunbas et al. (2007), in contrast, formulated systems of three simultaneous equations to study banks' capital, risk and efficiency (derived from stochastic cost frontiers) endogenously. Note that while our specification follows the latter approach, we depart from it, first by focusing on capital buffers instead of capital ratios and second by superimposing the effect of business cycles under banking regulation changes. We use the following system of simultaneous equations:

$$\Delta \text{BUF}_{j,t} = f_1(\text{SIZE}_{j,t}, \text{CREDIT}_{j,t}, \text{OUTGAP}_t, \Delta \text{RISK}_{j,t}, \Delta \text{PERF}_{j,t}, \text{BUF}_{j,t-1}, \text{BUF}_{j,t-1}, \text{DREG}_t, \text{OUTGAP}_t \times \text{DREG}_t), \quad (1)$$

$$\Delta \text{RISK}_{j,t} = f_2(\text{VTSX}_t, \text{TERM}_t, \text{CV}_{j,t}, \text{OUTGAP}_t, \Delta \text{BUF}_{j,t}, \Delta \text{PERF}_{j,t}, \text{RISK}_{j,t-1}, \text{DREG}_t, \text{OUTGAP}_t \times \text{DREG}_t, \Delta \text{BUF}_{j,t} \times \text{DREG}_t), \quad (2)$$

$$\Delta \text{PERF}_{j,t} = f_3(\text{CR3}_t, \text{SIZE}_{j,t}, \text{TERM}_t, \text{OUTGAP}_t, \Delta \text{BUF}_{j,t}, \Delta \text{RISK}_{j,t}, \text{PERF}_{j,t-1}, \text{DREG}_t, \text{OUTGAP}_t \times \text{DREG}_t, \Delta \text{BUF}_{j,t} \Delta \text{DREG}_t), \quad (3)$$

where the dependent variables are as follows:  $\Delta \text{BUF}_{j,t}$  is the variation of the capital buffer of bank  $j$  at time  $t$ ;  $\Delta \text{RISK}_{j,t}$  the variation of risk of bank  $j$  at time  $t$ ;  $\Delta \text{PERF}_{j,t}$  the variation of performance of bank  $j$  at time  $t$ .

These variables and the other explanatory variables are defined below. But before describing the variables, we give a brief overview of the regulatory background in Canada.

### 2.1. Regulatory background

Canada's banking sector is regulated by the Bank Act and is enforced by Canada's Office of the Superintendent of Financial Institutions (OSFI). This law was passed in 1871 and was supposed to be reassessed and updated each decade (Calmès, 2004). The 1987 amendment to the Bank Act allowed banks to acquire investment dealers. In 1988, Basel regulations introduced credit risk-based capital requirements. Since then, Canadian banks have accounted for this risk when calculating their risk-weighted assets (RWA). In 1992, another amendment to the Bank Act allowed banks to buy trust companies. In addition, the Bank Act's review period was shortened from 10 to 5 years (Calmès, 2004).

In 1997, following the 1996 amendment to the Basel I, the Bank Act required banks to account for market risk when computing their RWA. This amendment started to be enforced in 1998.<sup>5</sup> In 2004, Basel II introduced operational risk into the RWA calculation and proposed the internal ratings-based approach for credit risk. Canada enforced the Basel II requirements starting in November 2007.

<sup>4</sup> Other reasons include conservative mortgage practices, non-reliance on money market wholesale funding, and higher liquidity ratios (e.g., Northcott et al., 2009; Ratnovski and Huang, 2009).

<sup>5</sup> An OSFI report states that "Beginning January 1st 1998, deposit-taking institutions with significant trading portfolios are required to maintain capital to cover market risks."

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