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Banks' Capital, Securitization and Credit Risk: An Empirical Evidence for Canada

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Abstract

This paper is the first attempt that empirically investigates the relationship between banks capital, securitization and risk in the context of the rapid growth of off-balance-sheet activities in the Canadian financial sector. The evidence over the 1988-1998 period indicates that a) securitization has negative effects on both Tier 1 and Total risk-based capital ratios, and b) there exists a positive statistical link between securitization and banks' risk. These results seem to accord with Kim and Santomero (1988) who concluded that banks might be induced to shift to more risky assets under the current capital requirements for credit risk.

Keywords: Securitization, Credit Risk, Capital Regulation, Basel Committee, Banks' Regulation.

JEL classification: G18, G21, G28.

Résumé

La croissance rapide des activités hors bilan soulève un nombre intéressant de questions au sujet de la relation entre le capital des banques, la titrisation et le risque. Cet article est le premier qui étudie cette relation empiriquement. Les résultats pour le Canada durant la période 1988–1998 montrent que : a) la titrisation a des effets négatifs sur les ratios de capital, et b) il existe un lien statistique positif entre la titrisation et le risque des banques. Ces résultats semblent confirmer la prédiction de Kim et Santomero (1988) à l'effet que les banques peuvent être induites à augmenter leur risque sous les règles actuelles de capital pour le risque de crédit.

Mots clés : Titrisation, risque de crédit, réglementation du capital, Comité de Bâle, réglementation des banques.

Classification JEL : G18, G21, G28.

Introduction

In the late 1980s, the Canadian banking regulatory agency, as part of the international Basel Committee on Banking Regulation and Supervisory Practices, adopted minimum capital requirements. One of the primary purposes of the new regulation was to incorporate off-balance-sheet activities' risk into banks' capital assessments. Prior to risk-based capital, banks were subject to a leverage ratio that required them to hold, at a minimum, a capital equal to a fixed percentage of their total on-balance-sheet assets. But the leverage ratio did not adequately recognize risk variations among various on-balance-sheet assets nor did it account for the risk of off-balance-sheet activities. Moreover, it did not create enough incentives for banks to hold low-risk assets (Jackson et al., 1999).

The rapid growth of off-balance-sheet activities in the 1980s, and the adoption of the risk-based capital standards in the later part of the decade, raise a number of interesting issues regarding the relationship between capital, off-balance-sheet activities, and risk. These issues include the question of how securitization activity relates to capital in general, and to risk-based capital ratios, in particular. A second question of interest involves how changes in securitization affect risk. None of these aspects have been addressed in the existing literature.

This study makes several original contributions to the literature. First, we examine the relationship between risk-based capital ratios and securitization. Then, using an instrumental variable model, we not only examine the impact of total risk-based capital ratio on securitization activity but also how the predicted level of securitization influences banks' risk. As a by-product we also propose a description of the evolution of the securitization market during the 1987-1998 time period in Canada. In light of current efforts to revise credit risk regulation, this study has potentially important implications for the reform of regulatory capital standards currently underway.

The remainder of the paper is organized as follows. Section 1 reviews the theoretical links between banks regulation and securitization activity. Then, Sections 2 and 3 document different aspects of securitization for Canada during the 1987-1998 period. Section 4 proposes a basic model that establishes a statistical relationship between both Tier 1 and Total capital ratios and securitization activity. Finally, Section 5 uses an instrumental variable estimation model to ascertain the relationship between securitization and risk. A short conclusion summarizes the results and discusses their implications in terms of capital regulation.

1. Bank Regulation and Securitization

The remarkable feature of banks is that their balance sheet combines liabilities that can be withdrawn at any time (deposits), whereas many of their assets are not highly marketable (corporate loans). This situation puts these institutions – even solvent banks – in a vulnerable position when facing changes in depositor confidence. Maintaining sufficient solvency is one way for banks to deal with this problem, as this may generate confidence in the banking sector as a whole.

However, theory suggests that, owing to asymmetric-information problems generated partly by the fixed-rate deposit insurance system, limited liability banks may tend to take on too much risk. In a perfect-information scenario, market discipline would ensure that a bank engaging in riskier behavior would have to compensate its stockholders and depositors with a higher rate of return (Rochet, 1992). But small depositors are unable to monitor banks, and there is a free-rider obstacle to acquiring information. Also, full deposit insurance takes away any incentive for depositors (with $60,000 or less in their account in Canada) to monitor their bank.

Capital requirements by the regulator are regarded as one of the solutions to this problem. It is important for the governments to prevent bank failures, because the burdens of such failures will fall on them. Moreover, bank failures tend to spread contagiously through the financial services sector (Crouhy et al. 2001). In order to ensure a sufficient level of solvency in the business, banks are asked to hold a prescribed amount of capital in proportion to their asset portfolio. This may also lead depositors to have more confidence in the banking system.

The primary objective of regulators in adopting the 1988 Basel Accord was to reinforce financial stability[1]. Secondly, there was also a need to establish a level playing field for banks from different countries and, in the case of some countries, to reduce the explicit or implicit costs of government-backed deposit guarantees. In other words, regulation privatizes part of the burden by asking banks to retain regulatory capital. But when bank supervisors rely extensively on capital requirements and discretionary rules that may set capital requirements at odd with economic (or optimal) capital, may inevitably beg the question about the possibly distortionary impact of such arrangements on bank behavior, particularly for the management of credit risk (Dahen and Dionne, 2002).

One of the possible impacts of risk-weighted capital requirements on bank behavior is that excessive differentials in the weights applied to different categories of assets might induce banks to shy away from highly risk-weighted assets. In the early 1990s, U.S. banks shifted sharply from corporate lending to investing in government securities, and many commentators and researchers have attributed this shift to the post–Basel Accord system of capital requirements.

While papers such as those by Hall (1993), Haubrich and Wachtel (1993), and by Calem and Rob (1996), and Thakor (1996) made a persuasive case for the role played by capital requirements in this switch, this conclusion has been challenged. Hancock and Wilcox (1997), for example, presented evidence that U.S. banks' own internal capital targets explain the decline in private sector lending better than do the capital requirements imposed by regulators. Furthermore, the fact that capital requirements affect bank behavior does not in any way imply that their impact is undesirable. Bank supervisors must judge whether or not the levels of capital induced are adequate, given the broad goals of regulation.

Another potential impact on banks comes from risk-weighted capital requirements of the Basel Accord–type: They may prompt banks to shift towards riskier assets within each asset category whenever there is a gap between regulated capital and economic capital. Imposing equal-risk weights on different private sector loans may make safer lower yielding assets look less attractive, leading to substitution toward higher risk investments. Kim and Santomero (1988) show formally how a bank maximizing mean-variance preferences and facing uniform proportional capital requirements may substitute toward higher risky assets.

For example, banks can use securitization for capital arbitrage (cherry-picking and securitization with partial recourse; see Jackson et al., 1999). Capital arbitrage may help banks keep their funding costs as low as possible. It may also affect banks' risk: Cherry-picking a bank may keep regulatory capital ratios unchanged (substitution among different private loans with different ratings) but increase its overall riskiness. Jackson et al. (1999) show how securitization with partial recourse may be interpreted as cherry-picking. Another form of substitution occurs between long-term and short-term issues (less than one year) since the latter-category does not need any corresponding capital. Finally, securitization may also make highly risk-weighted assets seem more attractive because of the additional balance between return and protection they offer. Consequently, when banks are active in securitization, reported capital ratios may not represent their true risk.

Theoretical contributions by Keeley and Furlong (1989, 1990) and Rochet (1992) obtain, however, that such substitution effects are sensitive to assumptions about banks' objective functions and to whether or not asset markets are complete. The extent to which banks are affected by this kind of distortion therefore remains an empirical question. Several recent econometric studies have used data on U.S. banks to look for substitution effects attributable to capital requirements. See, for example, Shrieves and Dahl (1992), Haubrich and Wachtel (1993), Jacques and Nigro (1997), and Aggarwal and Jacques (2001). Blum (1999) presents results that suggest a positive link between regulatory capital standards for banks and a bank's decisions to engage in more risky activities.[2] More recently, however, Aggarwal and Jacques (2001), using a simultaneous equations model, obtained that the Federal Deposit Corporation Improvement Act (US Congress, 1991) raised capital ratios and reduced credit risk for banks. In this article, because the data come from a time period

without a significant change in regulation, we are not concerned with the direct impact of regulation change on banks behavior. We rather study how securitization activity affects banks capital ratios and its level of risk.

All the empirical literature we referred to above draws on the U.S. experience. U.S. data have many advantages; most notably the very large number of banks for which data are available and the detailed information one may obtain on individual institutions. Nevertheless, it is important to examine the impact of capital requirement systems operating in other countries. Although the Basel approach provides a basic framework of minimum capital standards, regulators in different countries have supplemented it with a range of other requirements that deserve empirical investigation (see Rime, 2001 for Swiss banks; Ediz, Michael and Perraudin, 1998, for UK banks).

Furthermore, data from other (that is, non-U.S.) banking markets may shed interesting light on the effects of capital requirements simply because they constitute a largely independent sample. Since U.S. banks are inevitably subject to large common shocks, banking industries in other countries provide a valuable additional source of evidence. This is precisely one of the purpose of our paper.

2. Securitization Activity in Canada

Securitization is one of the more prominent developments to emerge in Canadian financial markets over the past decade. This innovation enables financial institutions to raise funds through the issuance of debt (asset-backed securities) that is secured by their receivables (securitized assets). For investors, these asset-backed securities offer a balance of safety and return that rival many traditional high-quality fixed-income investments. Over the past decade, the term securitization has been used to describe any issue of fixed-income securities whose payments are linked to a specific pool of financial assets. This definition included: (i) on-balance sheet securitization, where the securitized assets are retained on the original lender's balance sheet; and (ii) off-balance sheet securitization, where the assets are segregated and removed from, or in some cases never appear on, the lender's balance sheet. There appears to be a growing trend towards narrowing this definition to refer only to the dominant off-balance sheet variety. It is this type of activity that impacts the credit-market estimates. Unless otherwise specified, this paper refers to securitization in this second sense.

A securitized asset can be any form of receivable with a predictable cash flow, such as a loan, lease or a mortgage.[3] Due to the nature of these receivables, the original lenders are typically financial institutions, such as banks, near-banks, sales financing and consumer loan companies, and other types of financial intermediaries. The fixed-income securities that arise from the pooling of these receivables are called asset-backed securities. The return on these instruments is collateralized by the expected cash flows on the securitized assets rather than the obligation of the lending institution. While these securities resemble conventional

corporate debt, they do not carry legal title to the lender's assets should these cash flows weaken. Therefore, the investors may bear some degree of credit risk. In addition, they may be subject to market and prepayment risks but may be compensated with an appropriate rate of expected return.

There exist two broad classes of asset-backed securities in Canada: (i) National Housing Act-insured Mortgage-Backed Securities (NHA-MBS); and (ii) securities backed by other types of assets, broadly referred to as other Asset-Backed Securities (ABS). Each is structured uniquely, and is host to a different range of investors.

2.1 National Housing Act Mortgage-Backed Securities

Securitization in Canada can be traced back to a federal policy initiative during the mid-eighties. In December 1986, the Government of Canada instituted a mortgage-backed securities program[4] similar to an existing federally sponsored plan in the United States. The purpose of this program is to provide additional sources of funds for residential mortgage financing (including social housing), while encouraging lower interest rates and longer-term mortgage financing.[5]

This program enables financial institutions to securitize residential mortgages that are insured by the Canada Mortgage and Housing Corporation (CMHC) under the provisions of the National Housing Act. In order to qualify, a financial institution (i.e. bank, life insurance company, credit union, caisse populaire, trust or mortgage loan company) must be registered with the CMHC. Under this program, an approved issuer removes a pool of NHA-insured mortgages from its balance sheet and issues mortgage-backed securities (Figure 1). Similar to the securitized mortgages, the NHA-MBSs are not reported by the issuer.

NHA-MBS securities are currently issued on four types of residential mortgage pools: exclusive homeowner, multi-family, social housing[6], and mixed (i.e. any combination of the above). These instruments are sold in denominations of $5,000 and may be issued in terms of six months to 25 years to reflect the maturity of the underlying pool of mortgages.[7]

(Insert Figure 1 about here)

The mortgagees are generally unaffected by and even unaware of the transaction. In almost all cases, the lender continues to collect the principal and interest payments. A portion of these payments is remitted on a monthly basis to a Central Payor and Transfer Agent (CPTA)[8], which acts as a pass-through vehicle[9] for the remittance of these funds to investors.

NHA-MBSs are sold either by the issuer or by an investment dealer. The investor, an individual or an institution, acquires a mortgage-related, fixed-income investment. Timely payment of principal and interest to investors is guaranteed by the CMHC on behalf of the

federal government. The safety of this instrument is complemented by its return, liquidity and other features. Rates of interest paid on NHA-MBSs reflect market conditions, and are generally equal to or greater than those offered on Guaranteed Investment Certificates and Government of Canada bonds with comparable features. NHA-MBSs are actively traded on over-the counter markets, making them liquid investments. In addition, these securities are eligible for inclusion in Registered Retirement Savings Plans and Registered Retirement Income Funds and are exempt from non-resident withholding tax.[10] These marketable characteristics attract an extensive range of retail (or personal) and increasingly, institutional investors.[11]

2.2 Other Asset-Backed Securities

Although the securitization of other receivables was initiated in 1989, different factors combined to restrain the size of this market until the mid-nineties. The factors were primarily to existing accounting guidelines and regulatory arrangements written prior to the development of and without any provisions for securitization.[12] This generated uncertainty about the treatment of securitized receivables. Accounting issues revolved around the recognition and transfer/sale of assets, while regulatory concerns kept an eye on credit and other enhancements of the asset-backed securities. In addition, investor demand for these new instruments emerged slowly and was, in some cases, constrained by the investment eligibility criteria set by certain institutions.[13] As these issues were addressed and resolved, the market expanded.

(Insert Figure 2 about here)

Unlike NHA-MBSs, asset-backed securities are not issued by the lending institution, but rather by a separate legal entity called a special purpose vehicle (SPV).[14] This process begins with the transfer of receivables to an SPV, which can be established either by the original lender or by another financial institution (Figure 2). By qualifying this transfer as a sale, the lender may remove the securitized assets from its balance sheet. To do so, the lender must transfer all interest, rights, and title to the receivables and renounce any future recourse to the assets.[15]

The debtors are unaware of the transaction between the lending institution and the special-purpose trust. In almost all cases, the original lender is contracted to be the servicing agent with respect to the receivables. In other words, the lender continues to administer the collection of principal and interests payments, which are periodically remitted (net of a service fee) to the securitization vehicle. This enables the lender to generate additional revenue without adjusting their capital base or affecting customer relations.

Securitization vehicles in Canada have a number of unique features. SPVs may be structured as either single-sellers, which securitize the receivables of their “parent” company only; or as multi-sellers, which provide a financial service to other companies by securitizing their

receivables for a fee. These vehicles are usually managed by a division of the parent company, or in the case of a bank, by an investment dealer subsidiary. In most cases, these vehicles are setup as trusts[16], which under Canadian tax laws may be both capital-and income-tax exempt.

To enhance the marketability of the asset-backed securities, the instruments are structured by an investment dealer and in most cases,[17] evaluated by a national bond-ratings agency. The ratings agency assigns an appropriate credit rating, which is determined by the quality of the underlying pool of assets and the level of investor protection.[18] These securities generally carry financial guarantees in the form of credit enhancements, such as: (i) reserve accounts, where collateral is held in the form of cash deposits or short-term investments; (ii) lines of credit, where a bank or insurance company provides third-party support; (iii) over-collateralization, where the balance of the securitized receivables exceeds that of the issued ABS; and (iv) spread accounts, where the SPV retains some of the proceeds from the issue as additional collateral. As a result of these enhancements, ABSs typically receive high quality credit ratings.

ABSs are normally underwritten by an investment dealer and sold through public or private offer. Depending on the type of asset being securitized, the securities may take the form of short-term (or commercial) paper or long-term notes or bonds.[19] If the life span of the underlying pool of receivables is shorter than the selected maturity of the issue, the ABS may be setup as a revolving contract, where groups of assets are purchased by the trust on a periodic basis. While these instruments are available in a wide variety of denominations, they often carry minimum acquisition costs in the range of $75,000 and upwards. These securities typically offer returns that are comparable or higher than those on government securities, with often less credit volatility than corporate debt. Safety is promoted through credit enhancements, and an over-the-counter market promotes the liquidity of ABS. These characteristics attract an extensive range of largely institutional investors in Canada, and more recently, abroad.[20]

3. Trends and Developments of Securitization in Canada (1997-1998)

3.1 Overview of the Market

Over the past decade, the Canadian market for securitization experienced significant growth. Correspondingly, outstanding securitized assets in Canada rose from under half a billion dollars in 1987 to over $63 billion by year-end 1998 (Chart 1). This can be depicted in terms of four development phases. The first phase from 1987-89 represented the initiation of the securitization market with the introduction of NHA-MBSs. The second phase from 1989-94 was marked by the continued growth of NHA-MBSs and the introduction of other asset-backed securities. The acceleration in 1992 largely reflected a pick-up in the issuance of mortgage-backed securities. The third phase, in which activity seemed to come to a halt from 1994-96, was marked by a decline in the issuance of NHA mortgage-backed securities,

which was offset by continued growth in other ABSs. In contrast, the boom in the final phase in 1997 and 1998 was led by securitizations of loans, credit-card receivables, and conventional residential mortgages, and saw a modest recovery for NHA mortgage-backed securities.

(Chart 1, about here)

A notable trend in these securities has been the move towards shorter-term issues (Chart 2), with maturities of less than one year. Originally, a tendency existed for financial institutions to shape the maturity and payments of the security to that of the underlying pool of assets. Since most types of securitized receivables do not expire within the time frame of a year, asset-backed securities were generally structured as medium-and longer-term investments. By the end of 1994, longer-term ABSs stood at $20.3 billion, accounting for over ninety percent of the Canadian market for these instruments.

(Chart 2, about here)

By the mid-nineties, financial institutions began shifting toward shorter-term asset-backed securities. This phenomenon stemmed in part from recognition of investor demand for money-market instruments, given the reduction in the amount of Government of Canada Treasury bills outstanding. Another contributing factor was the robust growth in non-mortgage loan activity over this period. By year-end 1998, short-term ABSs amounted to $39.3 billion, almost one-and-a-half times that of their longer-term counterparts. It should be mentioned that the conversion factor for off-balanced-sheet exposure is nil for commitments with an original maturity of one year or less. In other words, capital requirement is nil for these exposures (Crouhy et al., 2001; Aqdim et al., 2002).

3.2 National Housing Act Mortgage-Backed Securities, 1987-1998

During its first year of operation, the NHA-MBS program involved the participation of fourteen financial institutions. The majority of these participants were trust companies, followed by chartered banks. By 1998, the number of approved issuers had risen to over 65, including a wide selection of credit unions and life insurance companies. However, with the bank acquisition of various trust companies during the early nineties, most of this activity shifted to the banking sector.

(Chart 3, about here)

The outstanding amount of securitized NHA-insured mortgages grew steadily up to 1993 and peaked by year-end 1994 at $17.5 billion (Chart 3). Over the period of 1994 to 1996, the market declined by over 20 percent, coinciding with a slowdown in mortgage lending activity and reduced investor demand for these securities.[21] Since the first quarter of 1997, this market has recovered due to a succession of NHA-MBS deals by chartered banks and

trust companies, in line with improvements in the housing market. By year-end 1998, the value of outstanding securitized NHA-insured mortgages amounted to $19.1 billion. Still, relative to the overall asset-backed securities market, these instruments have lost considerable ground, particularly since 1996-97. This may have reflected a growing preference by lending institutions to securitize other assets.

3.3 Other Asset-Backed Securities, 1989-1998

The first non-NHA-MBS securitization was performed in 1989 by a major bank. This transaction involved the creation of a trust, which offered other financial institutions the opportunity to securitize their commercial loans. The success of this multi-seller vehicle set off a wave of similar securitization programs by other financial institutions. To date, securitizations have been performed by over ninety different vehicles and have involved an extensive range of assets, including: agricultural and equipment retail sales contracts; inventory credit; franchise loans; heavy equipment leases; office equipment leases; automobile leases; credit card balances; non-NHA-insured residential and commercial mortgages; and other miscellaneous receivables.

(Chart 4, about here)

In recent years, these other asset-backed securities have overtaken NHA-MBSs to account for over 60 percent of the overall securitization market in Canada (Charts 4 and 5). By year-end 1998, the amount of other securitized assets reached almost $44 billion, led by commercial loans and leases in 1996 and consumer credit and conventional residential mortgages in 1997 and 1998.

(Chart 5, about here)

4. Motivation: the Effect of Securitization on Capital Ratios

4.1 Basic Model

The nature of efficient bank regulation is still an open question in the literature. Discretionary measures by the bank to change its capital ratios, whether or not in response to regulatory prescriptions (or market discipline), may come in various ways. A bank may wish to change its capital ratios because it deviates from the target chosen by the bank itself – a target which may of course be affected by regulation (in practice banks have a degree of capitalization well above the minimum requirements) – or comes too near the minimum regulatory standards. As already indicated, this study is not concerned with how a direct exogenous change in regulation affects banks' behavior, but rather it examines the effect of securitization on capital ratios and, in turn, the effect of securitization on banks' risk. Let us begin by the effect of securitization on capital ratios.

The ratio C/RWA (where C and RWA represent, respectively, capital and risk-weighted assets) can be regarded as the bank's own capital-ratio target or, when capital requirements are binding, as the regulatory requirements. The variable RWA can be interpreted as that defined by regulatory standards, or as the one chosen by the bank itself, for example based on its internal risk model. For reasons of data availability, in our empirical analysis we shall use for RWA the risk weighting implied by the Basel Capital accord.

If the capitalization relative to risk-weighted assets (C/RWA) increases either in order to obey regulatory standards or because of the bank's own preferred risk/return profile, this can be achieved by increasing capital, by reducing the risky assets in proportion to total assets, and by reducing total assets.

As far as the change in the bank's risk profile is concerned, it is important to distinguish between changes in the direction of the bank's own capital target and changes induced by regulatory requirements. In the latter case, banks may be forced to take on less risk than they would have chosen themselves. Depending on its shareholders' risk/return appetite, the bank may react to capital requirements by complying with minimum solvency requirements by reducing the size of its risky portfolio (size effect) or by refusing to reduce (and maybe even increasing) the riskiness of the bank by choosing riskier projects (reshuffling effect) (Kim and Santomero, 1988).

The capital adequacy requirements set by the Basel Agreement of 1988 imply that banks must have own funds (capital) amounting to at least 8% of a weighted sum of its risky assets and of their OBS activities. The purpose of the Accord was to standardize capital requirements internationally, in order to create a level playing field for banks. Bank's assets and OBS activities are allocated into four different categories, according to their credit risk (default risk). The weighted-asset portfolio for the application of the capital/asset ratio is computed according to the formula:

$$\text{RWA} = 0 \cdot (\text{category 1}) + 0.2 \cdot (\text{category 2}) + 0.5 \cdot (\text{category 3}) + 1.0 \cdot (\text{category 4}) \qquad (1)$$

and the bank has to meet two capital requirements, namely:

Tier 1:

$$\text{Stockholder equity capital (Tier 1)} = 0.04 \cdot \text{RWA} \qquad (2)$$

and

Total risk-based capital:

$$\text{Stockholder equity capital + loan loss reserves + subordinated debt} = 0.08 \cdot \text{RWA}. \qquad (3)$$

Category 1 consists of assets with zero default risk (government securities, reserves) and category 2 of assets with a low default risk (e.g. interbank deposits), category 3 consists of medium-risk assets (mortgage loans) and the remaining assets fall into category 4

(commercial loans). OBS activities are also assigned to one of these categories, depending on their risk.

The minimum requirements of the Basel Accord (4% for Tier 1 and 8% for total capital) are usually not binding, i.e. most banks are more capitalized than is required. Some authors therefore argue that the requirements are ineffective. Still, it could be that lower requirements would induce banks to hold less capital, i.e. it may be that banks apply a standard mark-up to the minimum requirements, for example to maintain their image. Also, a bank can be officially classified as well-capitalized. The condition is that it has a stockholder equity capital ratio (Tier 1) of 6%, and a total capital ratio of 10%. Furthermore, it should be kept in mind that in some countries the Basel requirements are complemented with additional regulatory standards. (See Aggarwal and Jacques, 2001, on US regulation, and Rime, 2001, on Switzerland regulation.)

In light of the above discussion, it is clear that capital requirements based on credit-risk weights may create a variety of reaction patterns by banks. The theory is not conclusive, empirical studies have mixed results and, for many countries, no empirical evidence has been presented thus far. The previous literature has reviewed what banking theory considers as determinants of bank-capital variations. This section of the article examines the extent to which securitization affects the risk-adjusted capital ratios (RACRs) that the BIS has developed.

4.2 The econometric implementation

The RACRs analyzed are the Tier 1 ratio and the Total risk-based capital ratio, as described above. We assume that the unobservable bank-specific effects are fixed and that they capture all factors, such as management philosophy, autonomous changes in risk aversion and capital preference, not taken into account explicitly. The other explanatory variables are divided into factors at the bank level, at the banking industry level, and a time trend and a capitalization dummy.

The explanatory variables used in our econometric model (see equation (4) below), their definitions and economic rationale are now presented in detail. The first bank-specific characteristic focuses on changes in capital, mainly determined by its cost. The *Cost of Capital* is captured by the return on equity. In theory, the higher the cost of core capital (equity), the more expensive capital increase becomes and, *ceteris paribus*, the lower the change in RACRs (negative coefficient). The next two bank-specific variables focus on the riskiness of bank assets, namely on-balance-sheet and OBS riskiness. Both variables certainly influence the RWA, but banks may also react to changes in the risk profile by changing their capital.

The *Loan Ratio*, defined as loans divided by total assets, takes into account the bank's major high-risk assets. An increase in the *Loan Ratio* may imply a higher risk profile for

the bank's balance sheet and therefore a rise in RWAs and, if bank capital remains unchanged, RACRs will decline. RACRs will rise, however, if bank managers increase bank capital more than strictly required by the BIS-weighting scheme. In other words, a positive relationship between the RACR and the loan ratio implies that the credit risk of the bank portfolio is estimated higher by bank managers than according to the BIS-standards.

In addition, banks that are involved in securitization activities are affected by the same arguments as those applying to the bank's most important assets–loans. An increase in the *Securitization Ratio* may imply a rise in RWAs and therefore, given capital, a decline in RACRs. However, when securitization is taken into account by risk-adjusted BIS capital ratios, an increase in securitization risk may not make capital rise so much that the RACR ratio increases or remains constant.

The fourth and final bank-specific variable considered is *Asset Growth* that is the percentage change in the total asset held by banks. We take this variable into account to investigate how RACRs are changed by the direction in growth of on-balance-sheet activities (in contrast to the former bank-specific variable that measures the growth of OBS activities relative to on-balance-sheet activities). Asset growth may imply an increase in RWAs and, *ceteris paribus*, a decline in the RACR, much like the two bank-risk proxies. Asset growth may also change bank capital. Both capital augmentation and deterioration are possible. Capital ratios are subject to influence of market forces at the bank level, as well as to conditions of banking industry (market discipline) level.

Of course, a variety of developments within the banking industry (interest rate movements, for example), the stance of monetary policy, and the business cycle, may all have an impact on bank capital behavior and are also (partially) reflected in bank-specific variables such as the cost of capital. The banking-industry variable included in our empirical analysis reflects increasing competition that forces banks to use their capital more efficiently, leading to a decrease in RACR. This effect is captured by a linear time trend (*Trend*).

We also considered a *Bank Relative Performance* variable in the capital ratios regression. This variable takes into account the banking perception of macroeconomic activity. For example, banks may adjust their capital in response to anticipated changes in interest rate, monetary policy, and even business cycles. This variable is measured by the difference between banks' returns on capital observed and the returns on capital observed by the whole corporate sector. More optimistic the banks, the more risks they take (RWAs increase) and the more they invest (reduction of capital). So, we anticipate a negative relationship between the variable *Bank Relative Performance* and capital ratios.

The seventh and last factor taken into account is that banks capital is regulated. One may therefore suspect that relatively undercapitalized banks, either forced by the regulator or

voluntary, will try harder to increase their capital (Jackson et al., 1999). This effect is taken into account by a *Capitalization Dummy*, which is 1 if the RACR drop below the banking sector's 'normal' level, proxied by the overall median, and 0 otherwise. The use of the median as the threshold value is somewhat arbitrary, but unfortunately there is no information about the threshold values used by the banks and the BIS threshold values of 4% and 8% are rarely binding. Finally, dummy variables were introduced in the regression in order to take into account of the firm-specific effects.

The estimated equation for capital ratios can then be written as:

$$RACR_{it} = \beta_0 + \beta_1 B_t + \beta_2 \text{ Cost of Capital}_{it} + \beta_3 \text{ Loan Ratio}_{it} + \beta_4 \text{ Securitization Ratio}_{it} + \beta_5 \text{ Asset Growth}_{it} + \beta_6 \text{ Bank Relative Performance}_{it} + \beta_7 \text{ Trend}_{it} + \beta_8 \text{ Capitalization Dummy}_{it} + \varepsilon_{it} \quad (4)$$

where β_1 is a vector of coefficients for banks' fixed effects and B_t is a vector of banks' identification dummies.

4.3 Data and Results

Bank-specific data are obtained from the Canadian Banking Association. If both consolidated and unconsolidated account data are available, consolidated figures are used because we want to study the capital behavior of the parent company. Movements within a year are not analyzed. We focused on annual data, as we are interested in long-term trends in banks capital rather than short-run fluctuations in capital ratios. In other words, by using annual data, we capture more discretionary than autonomous behavior.

A panel data set is constructed, consisting of individual commercial bank data for the years 1988–1998. The main benefit of considering foreign and national commercial banks within the same country is that they face more or less the same accounting standards and national regulatory conditions. We analyzed commercial banks, the most common banks in Canada. In addition, issues on capital behavior are more interesting to study for these sorts of banks. Banks that did not report both the Tier 1 ratio and the Total risk-based, capital-adequacy ratio for three consecutive years are omitted from the data set. Also, capital ratios above 50% are deleted from the sample. Moreover, mergers and acquisitions in the 1990s cause some imbalances in our panel. Banks that disappeared through mergers or takeovers do, however, remain part of the sample, because their assets and liabilities appear on the balance sheet of the acquiring bank.

Table 1 lists the median of the Tier 1 ratio and Total risk-based capital-adequacy ratio across the years 1988–1998[22]. The median of the RACR is far above the minimum required level of 4% and 8%, respectively.

(Insert Table 1 about here)

Looking at the distribution across years, it becomes clear that capital ratios are not constant over time. The median in the late 1980s is lower than the overall median, and we observe a constant increase during the 1988-1996 period, followed by a decline during the last two periods.

(Insert Table 2 about here)

Table 2 presents the median of the bank-specific model variables. The capital ratios are already described above. The median of the cost of capital indicates a relatively high return on equity. Loans account for close to 70% of total assets. The median of securitization items is about 8% of total assets.

The most striking observation about the banks' relative performance is that they outperform all sectors. This suggests that banks are engaged in risky activities and, accordingly, are compensated with higher returns. Moreover, the high riskiness of commercial banking activities together with their high total capital adequacy ratio, suggest that the riskiness of banks may be inadequately captured by the BIS-risk weights. We now turn to the econometric results.

Table 3 shows the ordinary least squares estimation results for both Tier 1 Ratio and Total risk-based capital ratio as dependent variables. Bank-specific parameters are not reported. The model equation explains about 85% of the variation in both ratios. Many bank-specific factors significantly explain bank-capital behavior. The impact of the cost of capital on both ratios is significantly negative: an increase in the cost of capital lowers capital itself. The loan ratio has a significant positive impact on the ratios. For example, increasing the loan ratio by 1 percentage point results in a 0.05 percentage point rise in the Total risk-based capital ratio. This may imply that the bank themselves view the BIS risk-weights as inadequate, since banks raise the two ratios when the loan ratio increases. Any increase in securitization activities relative to on-balance-sheet activities causes a decline in both ratios. This suggests, again, that the risk of securitization products is inefficiently taken into account in capital ratios. Bank's Relative Performance does not have a significant effect (at 5%) nor does the trend variable.

(Insert Table 3 about here)

The impact of the last bank-specific variable considered, asset growth, is positive for the Tier 1 ratio and not significant for Total risk-based ratio. Finally, there is a positive relationship between the capitalization dummy and the change in the capital ratios. Based on our data it is, however, unclear whether this is forced by the (inter)national regulators or voluntarily implemented for market discipline reasons. It indicates that a Tier 1 ratio below the banking industry's 'normal' level will result in a rise of 1.3 percentage points. The corresponding increase in the total capital ratio is much higher (2.18). The next questions

are: "How these capital ratios adjust to securitization? Does securitization introduce more risk? Since both ratios show somewhat similar results in Table 3, we shall now concentrate the analysis on Total risk-based ratio.

5. Securitization and Risk

The previous section suggests that banks use of securitization activity affects their risk-adjusted capital ratios. However, this analysis does not allow us to draw any conclusions on the extent to which securitization affects banks risk. In recent years, a number of studies, including those of Shrieves and Dahl (1992) and Aggarwal and Jacques (2001), have modeled the response of banks to regulatory capital standards by using simultaneous equation models that allow bank-risk levels to be influenced both directly and indirectly by regulatory capital requirements.

Building on these studies, the system of equations developed herein recognizes not only the indirect regulatory pressure brought about by the risk-based capital standards, but also the fact that both securitization and credit risk may be influenced by these same risk-based capital ratios. Moreover, since we are interested in the direct relationship between two endogenous variables, we first estimate the securitization equation and then use the predicted level of securitization as an instrument for the estimation of the risk equation. Specifically, the model is of the form:

$$\Delta SEC_{it} = b_0 + b_1\, SIZE_{it} + b_2\, CAP_{it-1} + b_3\, CAP_{it} + b_4\, TREND_{it} + b_5\, RBCC_{it} + b_6\, LEVC_{it} + b_7\, CC_{it} + \beta_1 B_t + \mu_{it} \quad (5)$$

$$\Delta RISK_{it} = a_0 + a_1\, SIZE_{it} + a_2\, CAP_{it-1} + a_3\, CAP_{it} + a_4\, TREND_{it} + a_5\, RBCC_{it} + a_6\, LEVC_{it} + a_7\, CC_{it} + a_8\, \overline{\Delta SEC_{it}} + \beta_1 B_t + \eta_{it} \quad (6)$$

where

$\Delta RISK_{it}$ = Change in credit risk. Credit risk is measured by two alternative variables: the provisions for banks uncoverable loans ($\Delta RISK_1$) to total assets or by the total of risk-weighted assets to total assets ($\Delta RISK_2$).[23]

$SIZE_{it}$ = Log of total assets.

ΔSEC_{it} = Change in securitization activity. Securitization activity is measured by the ratio of securitized assets to total assets. $\overline{\Delta SEC_{it}}$ in (6) is the predicted level of securitization obtained from Equation (5).

CAP_{it} = Banks' Total risk-based capital ratio as defined in Section 4.

CAP_{it-1} = Lagged banks' Total risk-based capital ratio.

CC_{it} = Cost of capital as defined in Section 4.

TREND = Time trend

$LEVC_{it}$ = Regulatory pressure variable =1 if a bank failed to meet the minimum leverage ratio, 0 otherwise

$RBCC_{it}$ = Regulatory pressure variable = 1 if a bank failed to meet either the Tier 1 risk-based capital ratio or the Total risk-based capital ratio, 0 otherwise

B_t = Vector of banks participation dummies as defined in (4).

In the system of equations corresponding to an instrumental variable model, SIZE is used to take into account the greater diversification possibilities enjoyed by larger banks. So, larger banks must make more frequent use of the securitization instrument and must bear larger risks. Banks' Total risk-based capital ratios are control variables for the effects of capital on decisions to securitize and to take risky positions. As measured in the previous section, banks with large securitization activities in the previous period have less capital in the current period. Here, we consider both capital in the current and in the previous period as explanatory variables of both securitization and risk. To be consistent with, let say, a positive relationship between securitization and risk, we must expect that banks with, higher capital ratios should have lower securitization activities and lower risk (via the predicted securitization variable). However, the direct effect of higher capital ratio may itself have a positive effect on risk, when we control for securitization.

The two regulatory dummy variables that account for regulatory constraints should be binding for more risky banks with higher levels of securitization. The cost of capital (CC) variable is an opportunity cost variable and should have a positive effect on both variables.

Finally, for the purpose of this paper, we did instrument the predicted level of securitization to explain the risk levels of banks. The coefficient of $\overline{\Delta SEC}$ on $\Delta RISK$ will be positive if the securitization activity generates more risk. Such a positive relationship can be interpreted in the following way: Because the current regulatory measures of risk do not correspond to the optimal economic risk that internal models of credit risk may measure (we do not have access to this information), the current credit-risk regulation may not be appropriate. For example, the current regulation may be too costly in terms of capital for well diversified banks (particularly larger banks) and securitization activity may therefore be used to reduce this cost. In other words, a positive coefficient would ask the following question: "Is the current model of regulation for credit risk conceptually sound enough to introduce the appropriate incentives for credit-risk management?" Another related question would be: "Is the observed positive link between securitization and risk due to inappropriate measurement of credit risk by current regulatory ratios or to an appropriate measurement of off-setting behavior by banks?" Unfortunately, our data cannot separate the two effects.

(Insert Table 4 about here)

The system of equations is estimated using the instrumental variable method. The results are presented in Table 4. An examination of the results reveals that most of the variables that are considered to explain variations in securitization activity or credit risk (particularly $\Delta RISK_1$) are statistically significant. SIZE and CAP have a positive impact on risk. Examining the impact of regulatory capital constraints on bank-credit risk, the parameter

estimates in the risk equation ($\Delta RISK_1$) are positive and significant both for banks constrained by the leverage ratio (LEVC) and for those constrained by the risk-based capital ration (RBCC). This result is consistent with Aggarwal and Jacques (1998) who found that risk-based capital constrained banks take on more risk. In addition, the results also suggest that securitization activity has a positive impact on banks' credit risk. The parameter estimate of $\overline{\Delta SEC}$ in the credit-risk equation is significant (at 5% in $\Delta RISK_1$ and 10% in $\Delta RISK_2$), suggesting that banks that are active in the securitization market tend to be more risky.

The results in the ΔSEC equation provide estimates of the impact of regulatory pressures on banks' securitization activities. The parameter estimate of banks constrained by the leverage ratio (LEVC) is positive and significant in the ΔSEC equation, a finding that is also consistent with the literature who found that banks constrained by the leverage ratio increased their use of off-balance-sheet activities.

With respect to banks constrained by the risk-based capital standards (RBCC), the results also suggest that these banks increased their use of securitization activity. One possible explanation is that in cases where banks are constrained by risk-based capital standards, the positive parameter estimate may then show that the absolute risk weights are too low compared to the risk weights on other assets or activities, thereby creating an incentive for banks to engage in regulatory capital arbitrage and to increase their use of securitization, despite the existence of risk-based standards. Tables 5 and 6 indicate that the results of Table 4 are robust to the use of either short-term or long-term asset-backed securities for both equations. They indicate that the effect of securitization on credit risk is much stronger for Short-term Asset-backed securities a result in accordance with Crouhy et al. (2001) prediction.

(Insert Tables 5 and 6 about here)

Here, a careful examination is required as these results may contain an apparent contradiction since the CAP variable coefficient has a negative sign in ΔSEC equation and a positive one in ΔRISK equations. In the ΔSEC equation, just as for the capital-ratio equation in Section 4, the banks' risk is not controlled. So, a negative sign for CAP in the ΔSEC equation may simply mean that banks with high securitization are banks with high levels of risky assets in the denominator of CAP. In the ΔRISK equations, the risky assets variable is now part of the dependent variable. So, the more risky banks also have more capital than the other banks when securitization is controlled. Therefore, our results seem to support the prediction that strong capital restriction for credit risk with models that do not fix capital at its economic value may cause banks to increase their level of risk by using securitization.

Much like the methodology used by Aggrawal and Jacques (2001), ours considers that both securitization activity and risk level as endogenous variables for banks. Moreover, ours

makes it possible to isolate the effect of the predicted level of the securitization activity on the level of risk. We should mention that identical results (available on request) were obtained with a simultaneous equation model and three-stage least squares.

6. Concluding Remarks

This paper studied the capital behavior of commercial banks in Canada. To the best of our knowledge, this study is the first one that empirically investigates the relationship between securitization, capital regulation, and banks' risk. The results suggest that securitization activities had significant positive impacts on banks' risk during the period studied (1988-1998).

An empirical model of the change in the Tier 1 ratio and Total risk-based capital adequacy ratio was presented and reveals that securitization activity affects negatively both levels of capital ratios. This first result was strong enough to motivate a more detailed analysis on the relationship between securitization activity and banks' risk. The results in Section 5 clearly indicate that higher levels of securitization correspond to higher levels of risk.

These results challenge the nature of efficient credit-risk regulation. Some have argued that the current regulation forces well diversified banks to hold too much capital which, in turn, allow them to take on riskier activities. It was also documented that securitization activity might be a market activity making it possible to obtain a better balance between regulated capital and economic capital. Our results indicate clearly that securitization is negatively related to capital ratios and positively related to banks' risk in Canada. They also indicate that, once we control for securitization, banks with higher capital ratios are the more risky banks.

During recent years, securitization provided opportunities for banks to increase their regulated capital ratios with a direct corresponding increase in overall economic risk. So, reported regulated capital ratios may not represent the true financial conditions of banks. It seems that the current regulation encourages banks to securitize their low-risk assets. Therefore, one may ask whether the current regulatory capital ratios are sufficiently high to take securitization activity into account.

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Figure 1. NHA-MBS

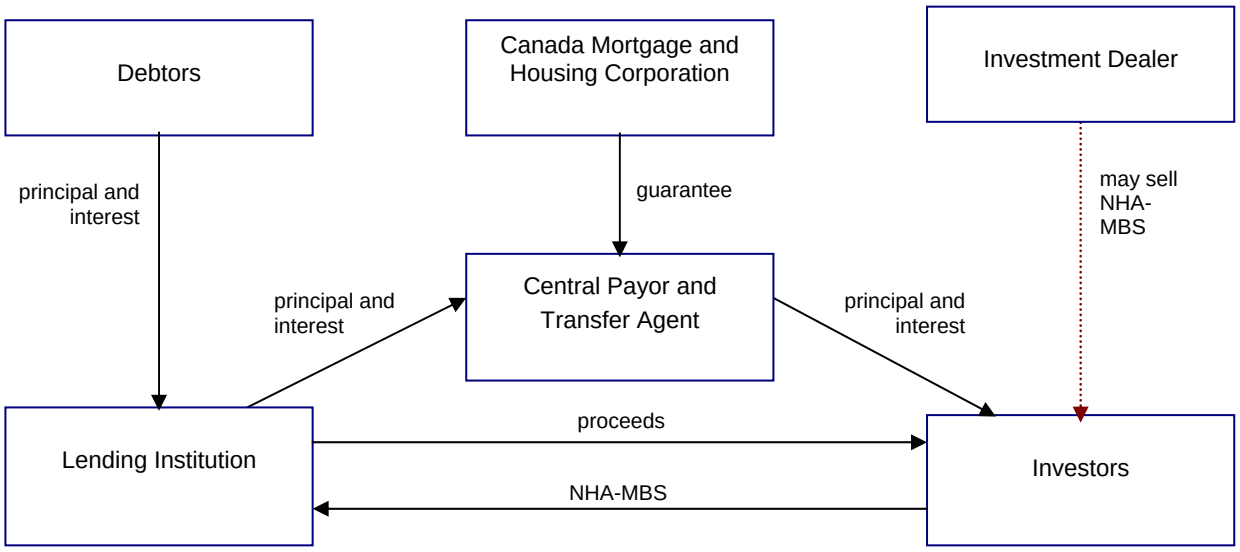


Figure 2. Other ABS

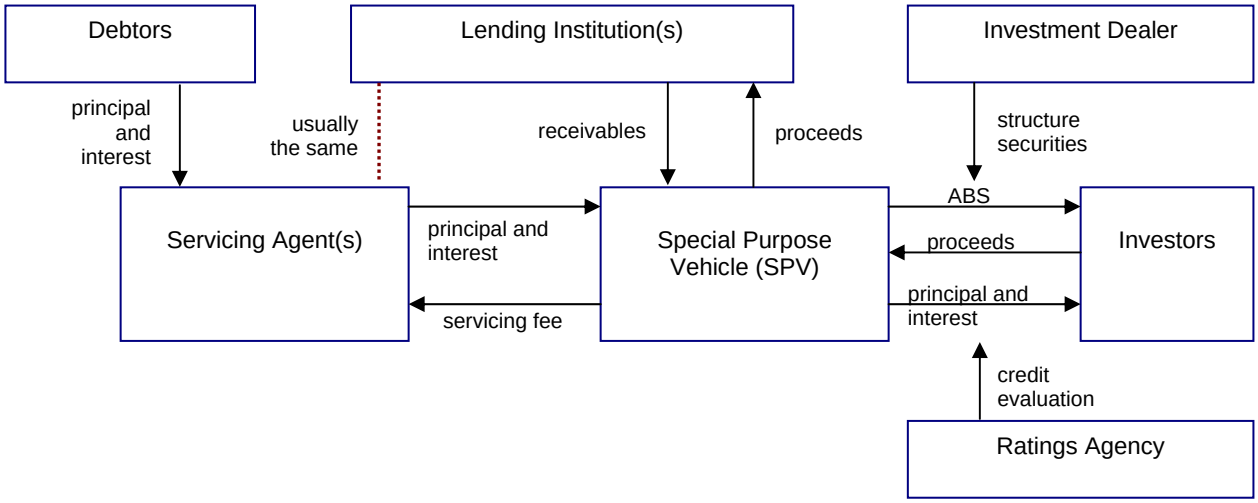
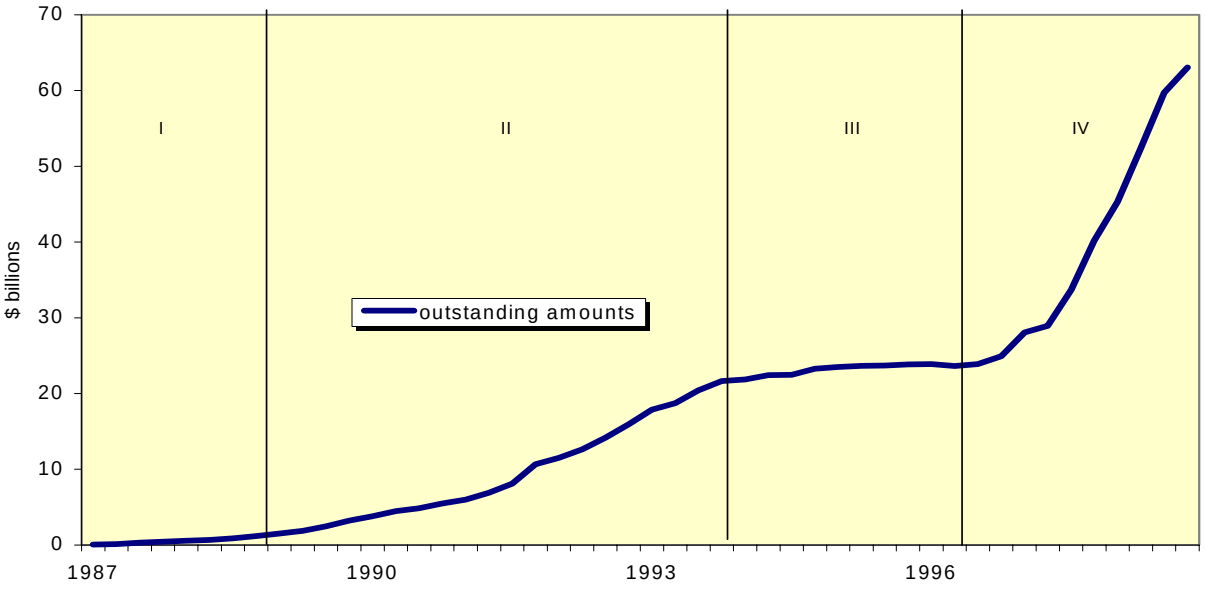
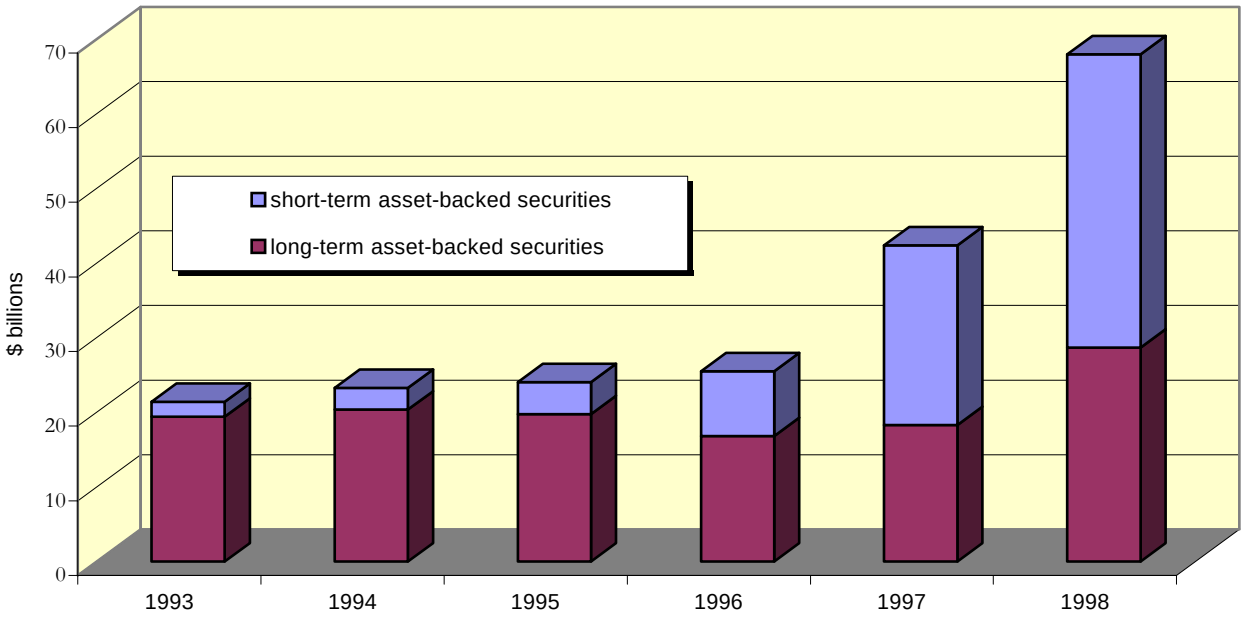


Chart 1. Securitized Receivables in Canada



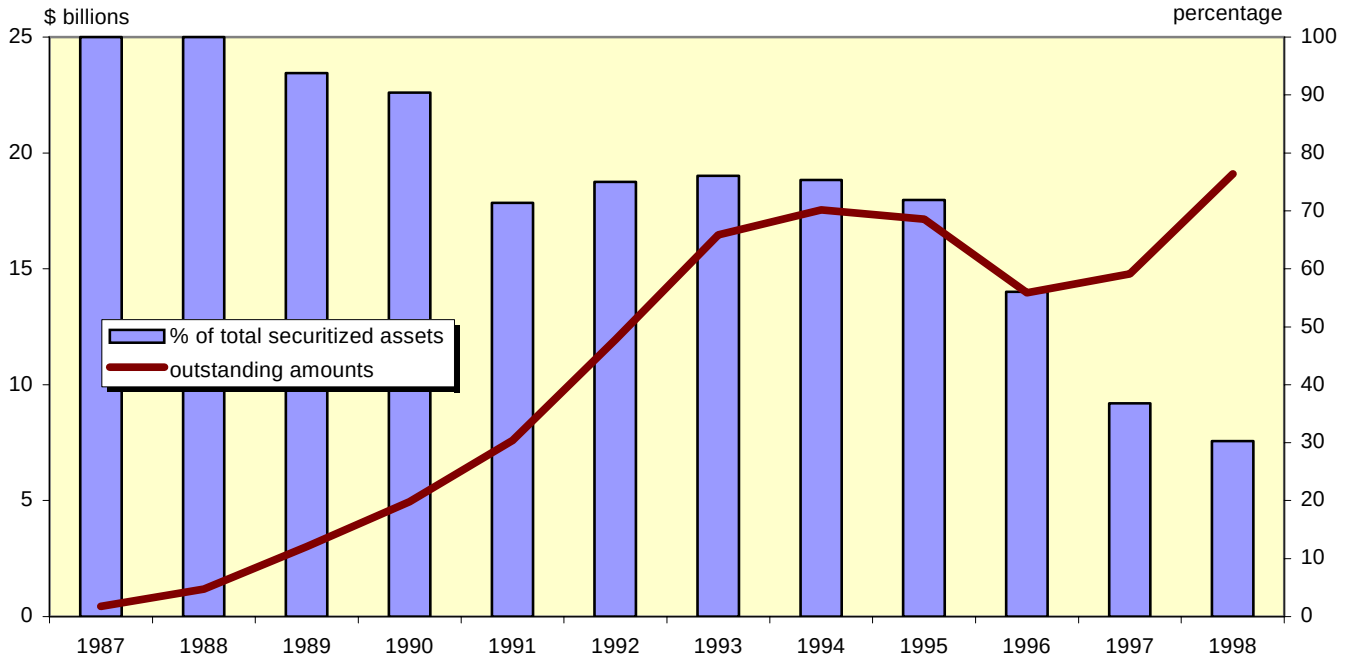
Source: Financial and Wealth Accounts, Statistics Canada

Chart 2. Short- Versus Long-term Asset-Backed Securities



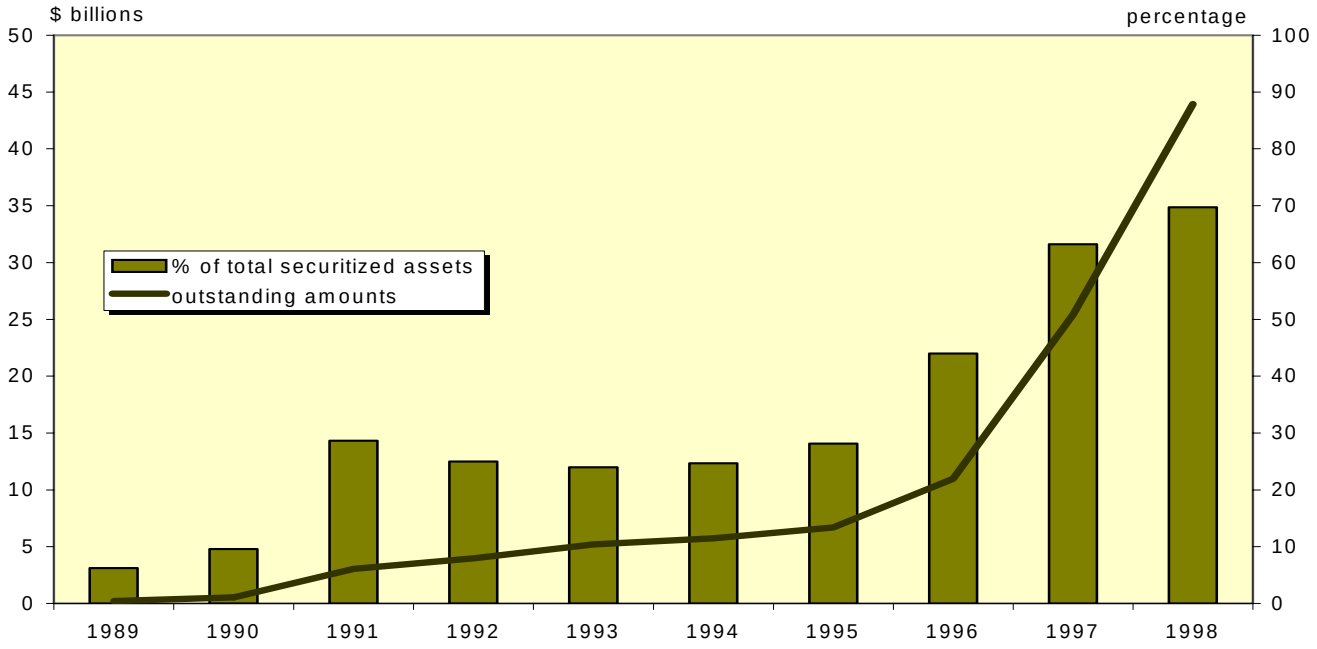
Source: Financial and Wealth Accounts, Statistics Canada.

Chart 3. Securitized NHA-insured Mortgages



Source: Financial and Wealth Accounts, Statistics Canada.

Chart 4. Other Securitized Assets



Source: Financial and Wealth Accounts, Statistics Canada.

Chart 5. Securitized Assets -- 1998

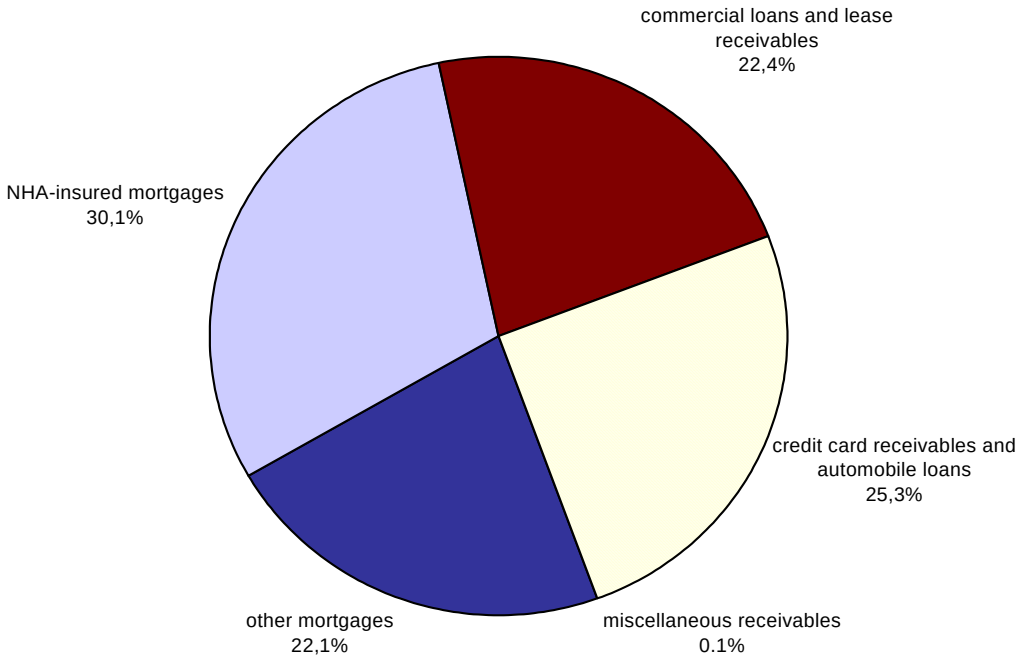


Table 1. Median Tier 1 and Total Capital Ratio Across Years

1988-98	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Tier 1 Ratio											
7.75	5.3	6.1	7.5	7.9	8.0	8.2	8.4	8.6	8.9	8.4	8.0
Total Capital Ratio											
9.64	8.3	8.4	8.6	8.8	9.3	9.6	9.9	10.2	11.3	10.6	11.0

Table 2. Median Bank-Specific Model Variables

Tier 1 Ratio	Total Capital Adequacy Ratio	Cost of Capital	Loan Ratio	Securitization Ratio	Asset Growth	Bank Relative Performance
7.75	9.64	16.9	69.6	7.9	7.9	6.32

Table 3. Determinants of Capital Ratio*

	Tier 1 Ratio	Total Capital Ratio
Intercept	0.171 (2.016)	0.91 (0.313)
Cost of Capital	-0.0201 (-3.114)	-0.0121 (-2.342)
Loan Ratio	0.0331 (4.133)	0.0551 (2.116)
Securitization Ratio	-0.0128 (-2.016)	-0.0111 (-2.004)
Asset Growth	0.0039 (3.017)	0.0051 (1.514)
Bank Relative Performance	-0.0025 (-1.954)	-0.0031 (-1.521)
Trend	-0.0016 (-1.881)	-0.0022 (-1.897)
Capitalization Dummy	1.324 (2.605)	2.117 (2.116)
R^2	0.84	0.86
R^2 Adjusted	0.81	0.83
SE	0.52	0.42
Number of observations	450	450

* T-statistics in parentheses; not shown but included in the regressions are dummy variables to control for banks fixed effects. A coefficient is statistically significant at 5% (10%) when the T-statistics is greater than 1.965 (1.65) in absolute value.

Table 4. Estimation of Securitization and Risk*

	Δ**SEC**	Δ**RISK**$_1$	Δ**RISK**$_2$
Intercept	-1.302 (-1.737)	0.114 (1.905)	-0.521 (-1.639)
SIZE	0.014 (2.714)	0.008 (2.109)	0.013 (1.921)
CAP	-0.021 (-2.108)	0.016 (2.014)	0.009 (2.107)
CAP_{-1}	0.008 (1.904)	0.010 (1.998)	-0.004 (-1.301)
TREND	0.0007 (1.707)	0.005 (1.982)	0.11(1.5205)
RBCC	0.019 (2.127)	0.011 (2.103)	0.023 (1.824)
LEVC	0.005 (1.973)	0.007 (1.917)	0.009 (1.704)
CC	0.012 (1.510)	0.001 (1.200)	0.019 (2.821)
$\overline{\Delta SEC}$		0.171 (2.334)	0.0054 (1.732)
R^2	0.32	0.61	0.55
Number of observations	449	449	449

* T-statistics in parentheses; not shown but included in the regressions are dummy variables to control for banks fixed effects. The coefficient is statistically significant at 5% (10%) when the T-statistics is greater than 1.965 (1.65) in absolute value.

Table 5. Short-term Asset-backed Securities*

	Δ**SEC**	Δ**RISK**$_1$
Intercept	0.114 (1.987)	0.074 (1.811)
SIZE	0.019 (2.506)	0.021 (2.147)
CAP	-0.033 (-2.914)	0.036 (2.109)
CAP (-1)	0.014 (2.308)	0.010 (1.952)
TREND	0.0018 (2.221)	0.005 (2.004)
RBCC	0.024 (2.514)	0.009 (2.308)
LEVC	0.011 (2.841)	0.017 (2.106)
CC	0.018 (1.410)	0.012 (1.807)
$\overline{\Delta SEC}$		0.214 (3.001)
R^2	0.65	0.81
Number of observations	449	449

* T-statistics in parentheses; not shown but included in the regressions are dummy variables to control for banks fixed effects. A coefficient is statistically significant at 5% (10%) when the T-statistics is greater than 1.965 (1.65) in absolute value.

Table 6. Long-term Asset-backed Securities*

	Δ**SEC**	Δ**RISK**$_1$
Intercept	-1.022 (1.601)	0.0501 (2.001)
SIZE	0.010 (1.914)	0.005 (2.114)
CAP	-0.015 (1.982)	0.016 (2.007)
CAP (-1)	0.004 (1.836)	0.011 (2.164)
TREND	0.0003 (1.923)	0.003 (1.704)
RBCC	0.011 (1.869)	0.002 (1.807)
LEVC	0.002 (1.765)	0.001 (1.739)
CC	0.009 (1.662)	0.005 (1.336)
$\overline{\Delta SEC}$		0.116 (2.306)
R^2	0.29	0.69
Number of observations	419	419

* T-statistics in parentheses; not shown but included in the regressions are dummy variables to control for banks fixed effects. A coefficient is statistically significant at 5% (10%) when the T-statistics is greater than 1.965 (1.65) in absolute value.

Notes

[1] Since our data set is for the period 1988-1998, we do not discuss here the 1996 amendment which became mandatory in 1998 and concerns mainly market risk.

[2] See also Jacques, Aggarwal and Rice (1998) who found for the US that capital constrained banks increase their use of stand by letters of credit and loan commitments and that these activities increase credit risk, but they mention other research coming to different conclusions.

[3] These receivables originate in Canada. The securitization of foreign assets in Canada or Canadian assets abroad has been hindered by a number of factors, including the withholding taxes associated with cross-border transfers of property, (the hedging costs associated with the reduction of) currency risk and international differences in issue and rating expenses.

[4] The first NHA-MBS were issued in January 1987.

[5] See the Canada Mortgage and Housing Corporation, NHA Mortgage-backed Securities: Your questions answered, 1990 and Strategic Plan 1992 – 1996, Ottawa: CMHC, 1991.

[6] This includes co-operatives, seniors' residences, and nursing homes.

[7] NHA-MBS generally carry terms greater than one year.

[8] The CPTA is currently managed by a major trust company in Canada under contract by the CMHC.

[9] The term 'pass-through' refers to the fact that homeowners' principal and interest payments pass to investors, net of service and administrative charges.

[10] This tax normally applies to non-residents with respect to receipt of investment income from Canadian investments and the receipt of proceeds from the sale of Canadian property.

[11] According to the CMHC, Canadian Housing Statistics: 1987, Ottawa: CMHC, 1988, approximately 80 percent of the NHA MB S issued in 1987 were purchased by retail investors. A recent study by Nesbitt Burns shows that most of the 1997 NHA-MBS were either retained by the issuing company as investments or sold to institutional investors.

[12] See Robert Cummings, Robert Logan, David Luckock and Richard Nesbitt (1993) and Canadian Bond Rating Service (CBRS), An Investor's Guide to Asset-Backed Securities in Canada, Toronto: CBRS, Fall 1993.

[13] For example, insurance companies were originally limited in their ability to become ABS investors due to restrictions that their investments qualify as 'legal for life'. To do so, the underlying institution had to pass a number of quantitative tests, including the generation of positive earnings over the previous five years.

[14] CMHC-approved issuers may also use SPVs to securitize NHA-insured mortgages.

[15] For a discussion of Canadian legal and accounting standards on securitization, see Mark Adams and Greg Nelson (1997).

[16] Various combinations of these trusts exist in Canada. Some are structured as flow-through vehicles, where all revenue (net of servicing and administrative expenses) flows to investors; others issue one or a series of securities with a defined coupon rate(s). In the latter case, all net incomes are remitted to a beneficiary (e.g. a charity or unitholders).

[17] Non-rated ABS include those sold through private offer.

[18] The rating is an important marketing feature as several industries, including life insurance companies and pension funds, are not permitted to purchase investments below a certain grade. Examples of bond ratings agencies in Canada are the Canadian Bond Rating Service and the Dominion Bond Rating Service. For more information on how ABS are rated, see the CBRS, An Investor's Guide to Asset-Backed Securities in Canada, Toronto: CBRS, 1993.

[19] A distinction is made between short and long-term securities at the one-year mark. ABS with terms less than 270 days are usually referred to as asset-backed commercial paper.

[20] Survey data indicates an increasing amount of non-resident activity in these investments.

[21] See CMHC, Market Trends, third quarter 1994.

[22] We do not consider the year 1987 in the econometric analysis in order to eliminate the 1988 regulatory change from the data.

[23] The median of $\Delta RISK_1$ is 11.6 and that of $\Delta RISK_2$ is 9.3.