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THE IMPACT OF BANKING DEREGULATION ON CANADIAN BANKS RETURNS

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Abstract

This paper revisits the impact of OBS activities on Canadian banks risk-return trade-off. Recent studies (Stiroh and Rumble 2006, Calmès and Liu 2007) suggest that increasing OBS activities do not necessarily yield straightforward diversification benefits. However, adding a risk premium to earlier accounting returns models by resorting to an ARCH-M procedure, an updated sample reveals that the Canadian banks risk-return trade-off displays a structural break, around 1997. In the second subperiod (1997-2007) of our sample, we find that the share of noninterest income no longer negatively impacts banks returns. Relatedly, we find that a risk premium emerges while, in the first period (1988-1996), the volatility variable is not significant in any returns equations. Our results are thus consistent with a maturation process story.

JEL Classification: G20; G21.

Keywords: Regulatory changes; Noninterest income; Diversification; Structural break; Risk premium.

Résumé

Ce papier réexamine l'incidence des activités OBS sur l'arbitrage risque-rendement des banques canadiennes. Des études récentes (Stiroh et Rumble 2006, Calmès et Liu 2007) donnent à penser que l'essor des activités OBS ne conduit pas nécessairement à des bénéfices de diversification accrus. Cependant, grâce à l'ajout d'une prime de risque aux modèles antérieurs de rendements comptables à l'aide d'une procédure ARCH-M, un échantillon rajeuni révèle que l'arbitrage risque-rendement des banques a subi un bris structurel, que l'on peut situer aux environs de l'année 1997. Durant la deuxième partie de notre échantillon (1997-2007), nous constatons que la part des revenus autres que d'intérêt n'influe plus négativement sur les rendements bancaires. En parallèle, nous détectons l'émergence d'une prime de risque, alors qu'au cours de la première période (1988-1996), la volatilité conditionnelle n'a pas de pouvoir explicatif à l'intérieur des équations de rendements. Nos résultats sont donc cohérents avec un scénario d'apprentissage.

Classification JEL : G20; G21.

Mots-clefs : Changements réglementaires; Revenus autres que d'intérêt; Diversification; Bris structurel; prime de risque.

1. Introduction

Beginning in the 1980s in Canada, financial deepening[1] and financial innovations led to a more market-oriented structure with firms increasingly relying on financial markets to fund their investments, an evolution also observed in the United-States and elsewhere (Boyd and Gertler 1994, Calmès 2004, Roldos 2006). The evolution in the Canadian financial system gave way to a major change in corporate financing, characterized with a relative decreased share of banks loans (i.e. indirect financing) and an increased share of bonds and stocks. This financial transformation challenged the Canadian banking business and justified, in part, the successive amendments to the Canadian Bank Act. These amendments enabled banks to act as security dealers and offer fiduciary services and portfolio advices to investors[2]. They also allowed banks to securitize loans, a move in line with the on-going financial deepening process. This kind of non traditional activities, previously the "chasse gardée" of the three other pillars of the Canadian financial system, are loosely classified as OBS (off-balance sheet) activities. At first, banks might have thought that these new types of activities would have led to important diversification benefits, with an improvement in their risk-return trade-off (Rose 1989, Sauders and Walters 1994). Indeed, the decision to diversify might be considered endogenous (Campa and Kedia 2002, Stiroh and Rumble 2006) and the result of an optimization process, theoretically leading to a better risk-return trade-off on an expanded efficient frontier.

[1] The expression "financial deepening" refers here not only to desintermediation and increased liquidity but also to greater market completeness.

[2] The move towards off-balance sheet activities is partly endogenous, in the sense that it has been originated by banks themselves.

However, both in Canada and the United-States, researchers find quite the opposite: OBS activities triggered a substantial increase in the volatility of banks' net operating revenue growth (Acharya et al. 2002, Stiroh 2004, Stiroh 2006, Stiroh and Rumble 2006, Calmès and Liu 2007, Calmès and Théoret 2009). Furthermore, this volatility surge does not seem to be associated to greater absolute or risk-adjusted (accounting) measures of bank returns − i.e. the return on assets or the return on equity. Actually, these measures of banks returns decreased with the upward trend in the share of noninterest income. Given the direct link between accounting measures of bank performance and the level and volatility of bank market returns, this situation might be perceived as problematic by banks stakeholders.

In this paper, we first confirm that the surge in the OBS activities actually increases the banking system riskiness. To explain the paradoxical weakness of the diversification benefits associated to OBS activities, we provide a conjecture rationalizing the deterioration of the risk-return trade-off over the 1988-2007 period (Calmès and Théoret 2009). We argue that noninterest income, being more related to aggregate shocks compared to interest income, increases the exposure of Canadian banks to market conditions, and more generally to macroeconomic shocks, which are not easily diversifiable and whose relative importance tends to grow relative to idiosyncratic shocks (Houston and Stiroh 2006). The risk-return worsening might also partly be explained by bank herding behaviour ─ a collective reaction of banks to aggregate shocks ─ which contributes to increase the risk exposure of the whole banking system (Baum et al. 2002, Baum et al.

2005, Calmès and Salazar 2006, Quagliariello 2006). This is bad news for financial stability but also a cause of concern for financial supervision agencies, and more generally for banks shareholders.

Second, we focus on the change in the risk-return trade-off and the integration of traditional lending and OBS activities. Contrary to what was observed before 1997, we find that, over the period 1997-2007, there is no longer a negative correlation between banks returns and the share of noninterest income ─ the revenues associated to OBS activities (Pellerin 2008). Our results are consistent with a maturation process story. As it is usually the case, financial markets and institutions eventually adjust to financial innovations, even if the adjustment is generally slow to materialize (Caballero and Engle 2003).

In this respect, the main contribution of this paper is to resort to a new empirical framework to study the recent change in the relationship between various measures of banks returns and the share of noninterest income. We analyze the emergence of a risk premium accounting for the OBS activities riskiness by estimating a model of banks returns with an ARCH-M procedure (Engle et al. 1986), a novelty in this literature. This risk was not explicitely modeled in previous studies, an important omission from the standpoint of the asset pricing theory. Indeed, considering risk-adjusted measures only is not completely satisfying when returns are not first-degree homogenous in volatility. Instead, the volatility should appear on the RHS of the returns equations, as it is usually the case in asset pricing. Running this experiment unveils a maturation process with banks starting to price the new type of risk in 1997 when the net

interest and noninterest revenues correlation changed sign. DeYoung and Roland (2001) conjectured that the surging volatility of banks revenues should eventually give rise to the incorporation of risk premia in various measures of bank accounting returns, however, they did not test this conjecture. Our contribution here is precisely to fill this gap with the introduction of the returns conditional volatilities directly in banks returns equations.

Our empirical study runs from the first fiscal quarter of 1988 to the fourth fiscal quarter of 2007. We find that the banks risk-return trade-off presents a structural break, which may be dated around 1997. In the second subperiod (1997-2007) of our sample, the share of noninterest income no longer impacts negatively the two retained measures of banks returns, as was previously the case. Relatedly, we find that a risk premium emerges in the second subperiod (1997-2007) while in the first subperiod (1988-1996), the volatility variable is not significant in any returns equations. These results are consistent with a maturation process story.

This paper is organized as follows. In section 2, we present the stylized facts associated to the banking deregulation process. In section 3, we present a conjecture explaining the increased riskiness of the Canadian financial system. In section 4, we go on with the pricing of risk premia in banks returns. In this section, an ARCH-M estimation procedure is described and then we discuss the empirical results before concluding.

2. Banking Stylized Facts

2.1 A Changing Financial Landscape

Before examining the stylized facts related to the increased riskiness in Canadian banking, we survey the evolution of the Canadian financial system over the last decades. This evolution explains in part the various amendments to the Canadian Bank Act which have taken place since the beginning of the 1980s.

Insert figure 1 here

Figure 1 shows that a financial deepening process (as measured by the ratio of direct to indirect finance) is developing in the Canadian financial system, since 1980.

Insert figure 2 here

Consequently, and as presented in figure 2, the share of banks loans in Canadian corporate financing has decreased progressively since 1980. In relative terms, the shares of stocks and bonds have risen. The various amendments to the Bank Act somewhat loosen the new constraints faced by the Canadian banking industry. In figures 1 and 2, the dates associated to the Bank Act amendments are shaded. Note that the market-oriented trend tends to coincide with these dates[3]. Incidentally, the amendments made in 1992 and 1997 are very important in the deregulation process, considering the changes observed thereafter.

Insert figure 3 here

[3] The synchronism between the Bank Act amendments and the structural breaks dates might suggest that financial deregulation is in part endogenous.

With deregulation, banks were also allowed to securitize their loans. According to figure 3, the securitization process really took off in 1997[4]. It exploded thereafter. This non traditional activity illustrates the new type of banking business begun after the recent changes in the Bank Act.

As a matter of fact, the Canadian banking deregulation process and the concomitant changes in the financial system gave way to a number of OBS activities, each generating new noninterest income. Noninterest income is a heterogeneous aggregate that includes different components: trading income, gains (losses) on instruments held for other than trading purposes, fiduciary income, service fees, insurance and other fees and commissions. In the following subsections, we detail OBS banks activities relatively to their assets and document the resulting increased riskiness in the banking business.

2.2 Valuing Banks OBS Activities

The valuation of OBS activities presents many measurement problems (Calmès 2004) but we can tackle them by resorting to the method suggested by Boyd and Gertler (1994) who proposed to compute an asset-equivalent measure of OBS activities. Let r_{BS} be the mean return on balance sheet activities, A_{BS} be the value of balance sheet assets, and N_{BS} the net revenue associated to balance sheet activities. We have:

$$r_{BS}\ A_{BS} = N_{BS}$$

[4] The timing of securitization in Canada is partly related to the innovations made by the Canadian Mortgage and Housing Corporation (CMHC). The securitization process in Canada began in 1987 with the launching of the NHA MBS (National Housing Act – Mortgage-backed securities) by the CMHC. Securitization is much more developed in the United-States than in Canada, especially because of the earlier presence there of government-backed conduits such as Fannie Mae and Freddie Mac.

so

$$A_{BS} = \frac{N_{BS}}{r_{BS}}$$

The balance sheet assets are thus the capitalization, at the r_{BS} rate, of the net revenue generated by these assets. Similarly, we can write

$$A_{OBS} = \frac{N_{OBS}}{r_{OBS}}$$

where A_{OBS} is the asset-equivalent of OBS activities, N_{OBS} is the net revenue associated to OBS activities and r_{OBS} is the mean return on OBS activities. Assume that

$$r_{BS} = r_{OBS}$$

that is the capitalization rate of balance sheet assets is the same as the one of OBS assets. We can thus write

$$A_{OBS} = \frac{N_{OBS}}{N_{BS}} A_{BS} = \frac{N_{OBS}/NOR}{N_{BS}/NOR} A_{BS}$$

where *NOR* stands for net operating revenue. We measure respectively the ratio (N_{OBS}/NOR) by the share of noninterest income and the ratio (N_{BS}/NOR) by the share of net interest income in net operating revenue. We thus arrive at the following measure of OBS activities, for the eight Canadian most important banks, computed over the fourth quarter of 2007

$$A_{OBS} = \frac{snonin}{sni} \times A_{BS} = \frac{0.55}{0.45} 2283 = 2790$$

where *snonin* represents the share of noninterest income, and *sni* the share of net interest income. According to the asset equivalent computation, the assets related to Canadian banks OBS activities are equal to 2790 billion $, an amount 122%

larger than the level of balance sheet assets. By comparison, they only represented 39% of balance sheet assets in 1988. Hence, we can state that similarly to the American banks, Canadian banks activities are increasingly dominated by OBS activities.

Insert figure 4 here

Figure 4 shows the resulting growing importance of the share of noninterest income in Canadian banks' net operating revenue. Its upward trend began in 1992 and lasted until the bursting of the market bubble at the opening of the second millennium. By 2000, noninterest income accounted for 57% of net operating revenue, up from only 25% in 1988. This ratio seems to have stabilized thereafter, our first evidence of a maturation process story. It recovered somewhat after the high tech bubble burst, culminating at 60% in the first quarter of 2006 before decreasing again with the recent credit crisis. Note also that the fluctuations of the share of noninterest income are much larger after 1997 than before. Indeed, this share became increasingly sensitive to the fluctuations of financial markets (Calmès 2004, Calmès and Liu 2007).

Insert figure 5 about here

As suggested by figure 5, the growing share of noninterest income in banks' net operating revenue has boosted the bank ratio of noninterest income (per 100$ of balance sheet assets). Excluding the drop of this ratio during the 1998 financial crisis (the Russian debt episode), this ratio doubled between 1988 and 2001. It decreased steeply during the financial markets collapse of the beginning of the second millennium and did not really recover thereafter. There is thus also

evidence of a maturation process here. Again, and similarly to the share of noninterest income, this ratio is increasingly dependent on financial markets fluctuations.

Insert figure 6 here

The post 1997 increased volatility of the noninterest income share is much more striking if we consider individual banks instead of the pool of the eight Canadian domestic banks. Figure 6 provides a comparison of the noninterest shares for three Canadian banks differing by size: a relatively small-sized bank, the National Bank of Canada (NBC); a medium-sized bank, the Toronto-Dominion Bank (TD), and a large-sized bank, the Royal Bank of Canada (RBC). Contrary to the RBC share, which is much more representative of the pool, the NBC and especially the TD share have become very volatile since the financial crisis of 1997. While the NBC share has remained on a volatile upward trend before collapsing on the fourth quarter of 2007, the TD share has decreased substantially since 2000. The dispersion between banks shares has also greatly increased since 1997, perhaps an additional indication of improved diversification in the Canadian banking industry since that year.

Insert figure 7 here

2.3 The Increase in Operating Revenue Growth Volatility

The noninterest income share of banks operating revenue is thus increasing. And as shown at figure 7, the noninterest income component of banks net operating revenue is more volatile than the net interest income one. The volatility of the noninterest income growth was exacerbated by the market turmoil which

took place around the turn of the second millennium, which suggests that noninterest income is becoming very sensitive to stock markets.

Hence, the direct impact of the growing share of noninterest income is the increase in the volatility of banks' net operating revenue growth. Indeed, activities related to noninterest income are much more volatile than those associated associated to net interest income (Stiroh 2004, Calmès and Liu 2007). There is actually a diversification effect due to the fact that the correlation between interest and noninterest income is less than one, but this indirect effect is quite low in comparison to the direct one (Calmès and Liu 2007). Moreover, the correlation between these two forms of income is quite unstable. Hence, the direct contribution of noninterest income to the volatility of net operating revenue growth largely dominates. By increasing the operating leverage, this effect magnifies the volatility of profits growth (De Young and Roland 2001).

A decomposition of the variance of Canadian banks net operating revenue growth will shed more light on the relative contribution of noninterest income to the increased volatility of total income growth.

Following Stiroh (2006) and Calmès and Liu (2007), we decompose the net operating revenue growth with a portfolio approach in order to analyze its volatility with two components: volatility of net interest income growth and volatility of noninterest income growth. The growth of net operating revenue (*NOR*) is computed as:

$$d\ln(NOR) = \ln\left(\frac{NOR_t}{NOR_{t-1}}\right) = \ln\left(NOR_t\right) - \ln\left(NOR_{t-1}\right)$$

Its variance may thus be decomposed as follows:

$$\sigma^2_{d\ln(NOR)} = w^2\sigma^2_{d\ln(NONIN)} + (1-w)^2\sigma^2_{d\ln(NI)} + 2w(1-w)\mathrm{cov}(d\ln(NONIN), d\ln(NI))$$

where *NONIN* stands for noninterest income, *NI,* for net interest income, and where $w = \frac{NONIN}{NONIN + NI}$ the share of noninterest income in banks net operating revenue. The direct contribution of noninterest income to $\sigma^2_{d\,ln(\,NOR\,)}$ is given by $w^2\sigma^2_{d\ln(NONIN)}$, while the contribution of net interest income to $\sigma^2_{d\ln(NOR)}$ is equal to $(1-w)^2\sigma^2_{d\ln(NI)}$. Since noninterest income is usually more volatile than net interest income, the growing importance of noninterest income in bank net operating revenue directly increases $\sigma^2_{d\ln(NOR)}$. But as long as the correlation between the growth rates of noninterest income and net interest income is not equal to 1, the trade-off between net operating revenue growth and volatility can improve.

Insert table 1 here

Table 1 reports the variance decomposition of net operating revenue growth over sub-periods ranging from 1988 to 2007. Time intervals correspond to different legislative periods. In the sub-periods 1988-1992 and 1993-1997, noninterest income seems to help reduce net operating revenue variance below what it would have been if banks relied solely on interest income. For example, in the 1988-1992 episode, net operating revenue variance was 14.2, lower than the 16.9 variance of net interest income. It can even be argued that from 1993 to 1997, there were clearly diversification benefits, net interest income volatility being

higher than that of net operating revenue, and the correlation between the two components of net operating revenue being slightly negative.

However, the two following sub-periods are quite different. During both sub-periods, the variance of net operating revenue growth is much higher than the variance of net interest income growth, which means that noninterest income growth increased substantially the volatility of net operating revenue growth. The variance of net operating revenue growth also jumped compared to the previous subperiods. The subperiod 1998-2002, which was plagued by excessive financial market fluctuations, is particularly symptomatic. The variance of noninterest income growth jumped to 212.3, while it was not higher than 40 before. During this subperiod, income from trading and investment activities was one of the major contributors to noninterest income volatility both in Canada (Calmès and Liu 2007) and in the United- States (Stiroh 2006). This subperiod, associated to a financial turmoil, seems to have helped consolidate traditional lending activities and OBS ones.

Indeed, during the sub-period 2003-2007, the volatility of net operating revenue growth receded, but it remained much higher than before the 1998-2002 financial crisis. In fact, the volatility of noninterest income growth has approximately doubled with respect to its level before the 1998-2002 subperiod. However, note that during this subperiod, the correlation between net interest and noninterest income growth became clearly negative, a rather new trend which contributes to dampen the direct pervasive impact of noninterest income on the volatility of net operating revenue growth. We might consider these recent

developments as the concretization of a maturation process. In other words, this observation is consistent with the idea that non traditional activities are now better understood and managed − a standard "learning by doing" took place. Note however that the volatility of noninterest income growth is increasingly related to the one of income from trading and investment activities, the highest among the components of noninterest income, a delicate situation from the standpoint of the risk-return trade-off.

To conclude, the Canadian banking system definitively became riskier following the successive deregulation waves, and this might be bad news from the standpoint of financial stability. But thanks to the financial market turmoil we recently went through, adjustments to deregulation are now on the way. We test these hypotheses in the next sections.

3. A Conjecture about the Deteriorating Risk-Return Trade-Off

OBS activities generate a specific systemic risk, which, by nature, is non-diversifiable. Consequently, Canadian banks have become more sensitive to aggregate shocks (both macroeconomic and financial). Our preliminary experiments results tend to suggest that financial aggregate shocks have gained momentum relative to indiosyncratic ones. Houston and Stiroh (2006) document the same phenomenon in the United-States. And data suggest that this situation is even more pronounced if we shift the analyis from individual banks to the whole set of Canadian banks. There also seems to be some evidence of a herding behaviour whereby banks tend to behave alike when faced by aggregate shocks,

which both add to and compound the existing systemic risk (Calmès and Salazar 2006).

In this context, net interest income, being related to physical stocks, (e.g. loans and other assets), tends to respond to idiosyncratic shocks, like borrower default, whereas noninterest income, being related to flows, (e.g. service fees and trading revenues) would react more to aggregate shocks, like unexpected changes in stock market indices and macroeconomic aggregates (Calmès 2003). Since the former shocks are diversifiable while the latter are not, this observation complements the idea that the changing structure of bank revenues is associated with increasingly volatile banks' net operating revenues growth, as already suggested in Calmès (2004) and Stiroh (2004). With a greater involvement in OBS activities, Canadian banks are more sensitive to financial aggregate shocks.

In this spirit, Houston and Stiroh (2006) find that financial aggregate risk has increased in the United-States since 1990 (relative to idiosyncratic risk). We still have to confirm this more formally, but if this is also the case for Canada, there would be an additional force driving banking risk and compounding the effect of higher banks sensitivity to risk[5]. We can represent the banks exposure to aggregate shocks by the simple following product:

Exposure to aggregate risk = sensitivity to aggregate shocks x level of aggregate risk

where the level of aggregate risk is itself the product of aggregate risk frequency and intensity. While the two factors on the RHS of this equation rise as it has been the case in recent episodes, it constitutes a situation unfavourable to financial stability.

[5] We are currently conducting research on that topic.

This picture gets even clearer when shifting the focus from individual banks to the whole Canadian banking network. Being more exposed to aggregate shocks, banks are also likely to have more often similar reactions to economic events, a trend which could obviously increase banking riskiness further. Indeed this bank herding behaviour, i.e. the tendency for banks to move together in periods of economic uncertainty, documented both in the United-States (Baum et al. 2002) and in Canada (Calmès and Salazar 2006), should contribute to the greater exposure of banks to aggregate shocks. About the studies investigating the issue of the link between macroeconomic uncertainty and bank herding, Quagliariello (2006) notes that Canadian intermediaries display this behaviour when facing more pronounced aggregate uncertainty. Quagliariello (2006) observes a similar herding behaviour for the Italian banks. His contribution is to distinguish aggregate uncertainty from the idiosyncratic one. In the case of Italian banks, he reports that the herding behaviour is at play when macroeconomic or aggregate uncertainty increases. Consistent with Baum et al. (2002) and Calmès and Salazar (2006), he confirms that when idiosyncratic risk rises, banks behave heterogeneously. According to the author, this observation is related to the competitive advantage of better informed banks behaving in a different way, compared to poorly informed intermediaries.

If aggregate shocks are increasingly important in Canadian banking, bank herding could become a structural and not just a cyclical phenomenon, as previously thought, and this would then translate into an increased correlation between banks accounting and equity returns. This is also bad news for the

investors in search of portfolio diversification, since herding is at the antipodes of diversification and it weakens banking stability.

4. Methodology and Empirical Results

4.1 Two Hypotheses about the Maturation Process

It is well-known that markets usually undertake the necessary adjustments when confronted with increased risk. According to the stylized facts we document, a structural break has taken place around 1997. In this respect, the hypotheses studied in this paper are the following.

We want first to examine whether there is a maturation process taking place in the Canadian banking sector, as expected by Calmès (2003). According to this hypothesis, in the long run, the share of noninterest income in banks' net operating revenue would no longer impact negatively on banks accounting performance measures. We confirm this idea and date the break-even point around 1997. A Chow test is run to check for this structural break.

Second, we want to confirm that, in light of the increased riskiness of their operations, Canadian banks have adjusted to this situation by incorporating a risk premium in the return of their OBS activities. This premium, pricing the risk associated to OBS activities, came with some delay, and emerged around the year 1997.

Note that De Young and Roland (2001) conjecture that the surging volatility of banks revenues should give rise to the incorporation of risk premia in various measures of bank accounting returns. However, they did not test this conjecture.

One of our main research contributions here is precisely to introduce a risk measure in the returns equations to test this hypothesis.

4.2 The Model

We test the impact of the growing share of noninterest income on bank performance by resorting to an empirical model used by Stiroh (2004) for the United-States and by Calmès and Liu (2007) and Calmès and Théoret (2009) for Canada. The general form of this model is[6]

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 snonin_t + \beta_3 X_t + \varepsilon_t \qquad (1)$$

where y_t is an accounting measure of bank performance – i.e *ROE* and *ROA* –, $snonin_t$ is the share of noninterest income in net operating revenue, X_t is a vector of control variables, and ε_t is the innovation or error term. X_t control for factors that impact banks performance (e.g. bank size, riskiness of loans or asset growth).

Following Stiroh (2004) and Calmès and Liu (2007), equation (1) is also estimated on a risk-adjusted basis. In this equation, y_t is divided by a fourth-quarter moving average of its standard deviation. To scale down y_t, we also resort to a measure of risk used in Calmès and Théoret (2009), deflating y_t by its conditional volatility as measured by a GARCH(1,1) model, which constitutes, to our knowledge, a novelty in this literature. We also test for other well-known econometric specifications of conditional volatility, like GARCH(p,q), TARCH, EGARCH and PARCH, using also different distributions for the error term (normal, Student and generalized error (GED)), but find that the standard

[6] For an alternative model concerning bank performance see Théoret (1991).

GARCH(1,1) specification is the best measure of conditional volatility according to traditional measures of econometric fit (e.g. the Akaike and Schwarz criteria).

It is possible that the increasing volatility of banks operating revenues might have given rise to the introduction of a risk premium in equation (1). Actually, traditional finance establishes a risk-return trade-off such that

$$r_t = \theta_1 + \theta_2 risk_t + \mu_t$$

where r_t stands for return, $risk_t$ is a risk measure, and μ_t the innovation. This is the reason why, following Calmès and Théoret (2009), risk is *explicitly* introduced in equation (1) by resorting to an ARCH-M model[7], such that:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 snonin_t + \beta_3 X_t + \beta_4 \sigma_{c,t} + \varepsilon_t \qquad (2)$$

where $\sigma_{c,t}$, the conditional volatility, is computed using the following equation

$$\sigma^2_{c,t} = \theta_0 + \theta_1 \sigma^2_{c,t-1} + \theta_2 \varepsilon^2_{t-1}$$

The ARCH-M procedure is very appealing to estimate the risk premium in this context because it directly incorporates the conditional volatility, our measure of risk, in the return equation instead of running a regression on returns defined on a risk-adjusted basis, i.e. a measure of return scaled down by an "ad hoc" measure of its volatility.

5. Empirical Results

5.1 The Data

Our sample is composed of the eight major Canadian domestic banks runs from the first fiscal quarter of 1988 to the fourth fiscal quarter of 2007. Data come

[7] The ARCH-M model is due to Engle et al. (1987).

from the Canadian Bankers Association and the Office of the Superintendent of Financial Institutions (Canada). Unit root tests suggest that all statistical series are stationary, so they are modelled in levels. Following Calmès and Liu (2007), we keep the ratio of loan loss provisions to total assets as the only control variable because the other ones are found not significant.

5.2 The Results over the Whole Sample

Table 2 reports the estimation of equations (1) and (2) for the whole sample period running from 1988 to 2007. Estimating equation (1) − which excludes a risk premium − for the ratios *ROE* and *ROA* gives good results with an adjusted R^2 equal to 0.72 for both ratios. Before adjusting for risk, estimation of equation (1) reveals that the coefficient of the share of noninterest income is significantly negative for the two performance ratios. This sign confirms that increased OBS activities tended to reduce Canadian banks mean returns over the whole period of analysis. It is equal to -0.11 in the *ROE* equation, and a much higher figure obtains for *ROA* one, -0.39, an expected result since the ratio of *ROA* to *ROE* is mean-reverting to a level of 4 over the period of analysis (this ratio is not very volatile except during extreme events[8]). These results suggest that OBS activities reduce the performance of Canadian banks in terms of mean returns over the whole sample period, while they also increase the volatility of bank net operating revenue growth.

Insert table 2 here

[8] For instance, for the fourth fiscal quarter of 2007, the eight major Canadian banks had a ROE of 0.18 and a ROA of 0.79.

These findings might cast doubt on the belief that noninterest income activities can lead to better bank performance through activities diversification (reduction in risk and/or higher returns). Consistent with the expectation that loan loss provisions lower profits, the coefficient of the ratio of loan loss provisions to total assets is significantly negative in all equations, being equal to -0.14 in the *ROE* equation and to -0.55 in the *ROA* one, this last coefficient being about four times higher than the former, as expected. Since the ratio of loan losses provisions jumps during recessions, it accentuates the procyclicality of *ROE* and *ROA*, − which, in other respects, became more procyclical following the banks increasing involvement in OBS activities.

According to table (1), regressing equation (1) using risk-adjusted performance ratios leads to a decrease of adjusted R^2, due to the fact that the scaling factor fluctuates greatly from one period to another. Results tend to improve when using conditional volatility (instead of the historical one) to scale the performance ratios, especially for *ROA* for which the adjusted R^2 increases from 0.15 to 0.70. In other respects, the results are similar to those obtained for the regressions without risk adjustment.

Running regressions with the returns variables scaled by volatilities, as done in previous studies (e.g. Stiroh 2006), helps account for the risk associated to OBS activities. However, the direct introduction of a risk measure in the returns equations, a standard procedure in asset pricing theory, tends to produce more accurate results. This is the reason why we propose the use of an ARCH-M procedure to explicitly account for the risk premium. Indeed, over the whole

sample period, this approach improves the adjusted R^2 for both equations of *ROE* and *ROA*. The sensitivity of *ROE* to the conditional volatility of the innovation is 1.85. At 9.78, it appears much higher for *ROA*, a normal situation, as explained earlier. More importantly, the rigorous incorporation of a risk premium in the returns equation leads to some significant changes in the sensitivities of *ROE* and *ROA* to the y_{t-1} and *snonin* variables. In both equations, following the addition of a risk premium, the coefficient of *snonin* almost double in absolute value, shifting from -0.11 to -0.20 in the *ROE* equation and from -0.39 to -0.72 in the *ROA* one. This shift is achieved at the expense of the autoregression coefficient. Before adding the risk premium, the coefficient of y_{t-1} is equal to 0.15 for ROE and 0.11 for *ROA,* and is significant for both returns measures. But when accounting for the risk premium, the coefficient of y_{t-1} is near 0 in both equations, and no longer significant. In summary, introducing the risk premium in the returns equation neutralizes the autoregressivity of the returns variables, transfering this impact to the *snonin* variable, which becomes even more potent. Hence, the standard specification of returns overstates the role of y_{t-1} relative to *snonin*. Using our approach instead, *snonin* appears to be the main factor for explaining banks returns over the whole sample.

5.3 The Maturation Process Story

As documented previously, a structural break took place around 1997 (Pellerin 2008). This break corresponds to the increase in the volatility of the net operating revenues growth and of the ratio of noninterest income (per 100$ of assets). We thus reestimate equation (2) over the two following subperiods: 1988-1996 and

1997-2007. The results are reported in table 3. A Chow test confirms that a structural break occurred around 1997. According to table 3, hypothesis 1 tends to be supported by the data. The strong negative effect of *snonin* on either *ROE* or *ROA* seems to have been only significant over the first subperiod, running from 1988 to 1996. Indeed, the estimated coefficients of the *snonin* variable are much higher over the first subperiod (1988-1996) than over the whole sample (1988-2007), being respectively -0.66 and -2.61 for *ROE* and *ROA* over the former period and -0.20 an -0.72 over the latter period. In the second subperiod (1997-2007), the coefficient of *snonin* is actually positive but not significant in both returns equations (i.e. for *ROE* and *ROA*). This evidence supports the hypothesis that a maturation process took place, which led to a better integration of the traditional bank lending activities with OBS ones. In other words, adjustment to the worsening risk-return trade-off was slow to materialize (Calmès 2003), but finally emerged in the second part of the sample.

The second hypothesis seems also supported by the empirical evidence. The ARCH-M procedure used in this paper proves very useful for capturing the nonlinearity created by the change in volatility of revenues. As table 3 shows, a significant risk premium, required to price the increasing risk related to the surging OBS activities, emerges in the second subperiod, the coefficients associated to the conditional volatility being respectively 1.04 and 5.49 for *ROE* and *ROA*, both significant at the 5% level. In contrast, over the first subperiod, this risk premium is not significant. The sign of the coefficients of the conditional volatility is even negative in both equations, suggesting that over this subperiod,

volatility was actually detrimental to returns. As noted previously, beginning around 1997, the volatility of the operating revenues growth and of the share of noninterest income have increased greatly. Finally note that, for both returns, the adjusted R^2 is much lower in the second subperiod because the idiosyncratic risk increased substantially during this second subperiod (1997-2007).

To conclude on these experiments, this evidence supports the idea that a maturation process took place, and that Canadian banks have adapted to the increased volatility of their operations.

6. Conclusion

Following deregulation, risk definitively increased in the Canadian banking system because the volatility of noninterest income growth is much higher than the one of net interest income growth. Even if the adequate pricing for this increased risk was slow to materialize, it finally emerged in 1997, and financial institutions adapted to the new situation. Previous studies on the subject (e.g. Stiroh 2006, Calmès and Liu 2007) were somewhat dubious about the diversification benefits associated to the rising share of OBS activities, and about their relative profitability. The new evidence we provide suggests that a maturation process is actually at play, leading to a better pricing of banks activities and a better integration of these activities with traditional lending in the more recent periods (after 1997). Actually, over the last period running from 2003 to 2007, a significant negative correlation appeared between interest and

noninterest income, which has been rarely the case before. This suggests that the OBS diversifications benefits finally unravels.

Concerning the need to re-regulate in order to control the increased risk in the Canadian banking system, we must realize that the move toward OBS activities might be endogenous to the banking industry, in the sense that it was originated by banks themselves. Under that scenario, banks initiated and even fostered the financial deregulation process, by shifting their activities toward, a priori, more profitable ones, like underwriting and securitization. Indeed, the branches network of Canadian banks was becoming less profitable. During the transition, banks have encouraged their customers to be more market-oriented, substituting securities issues for loans. Based on this plausible scenario and on the endogeneity of the deregulation process, re-regulation would not be a good idea. There is also evidence that banks engaged in new activities before having received the authorization to do so[9]. The legislators only sanctioned such moves, an example of banks and government intermingling interests.

Our results open the doors to very promising research avenues. First, the decision by a bank to diversify its activities has to be endogenized, as suggested by Campa and Kedia (2002), a research avenue previously mentioned by Stiroh (2006)[10].

Second, the pricing of OBS activities is still in its infancy in the setting of the literature related to our study. Our paper makes a first contribution in that

[9] This was the case for two Canadian banks engaged in brokerage activities before the 1987 Bank Act amendment. Banks capitalized on Bank Act loopholes at the time.
[10] We are presently conducting research on the subject.

direction. However, equations of banks returns must be improved further to shed more light on the banks risk-return trade-off.

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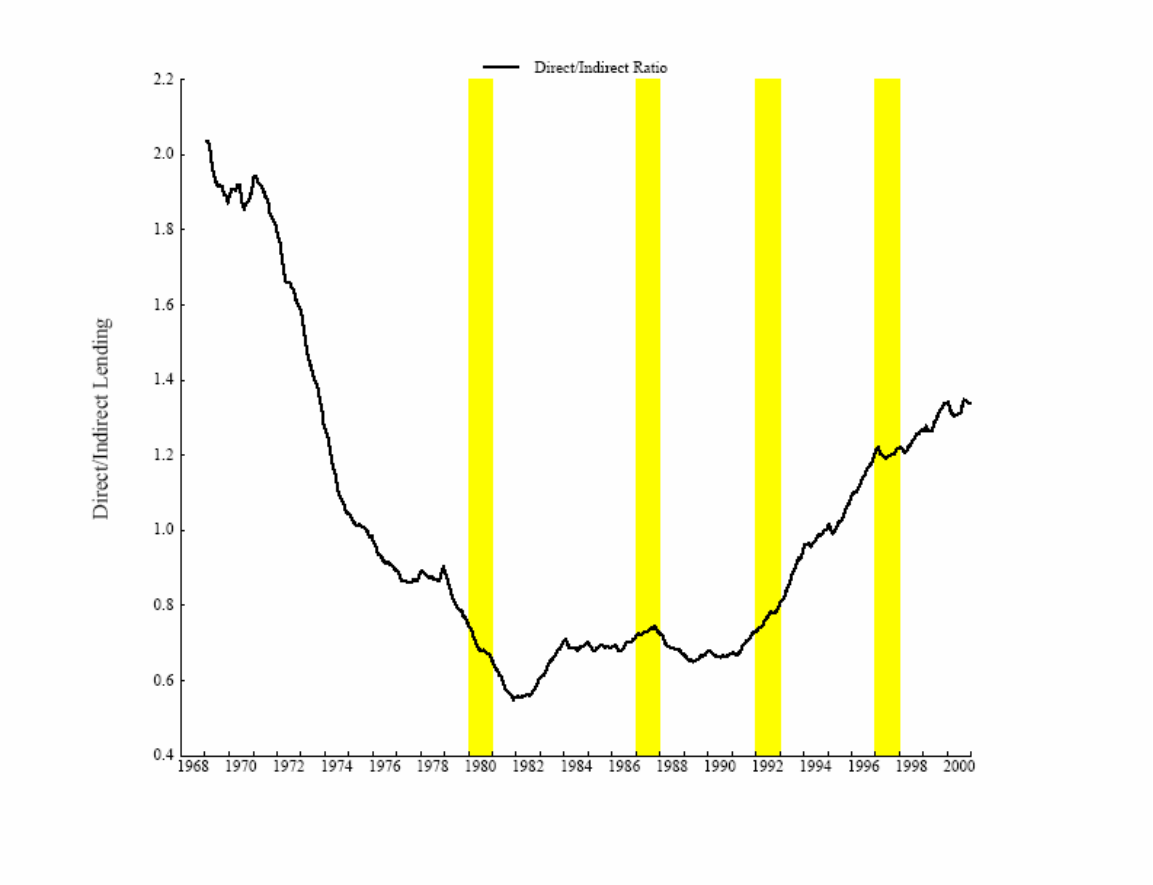
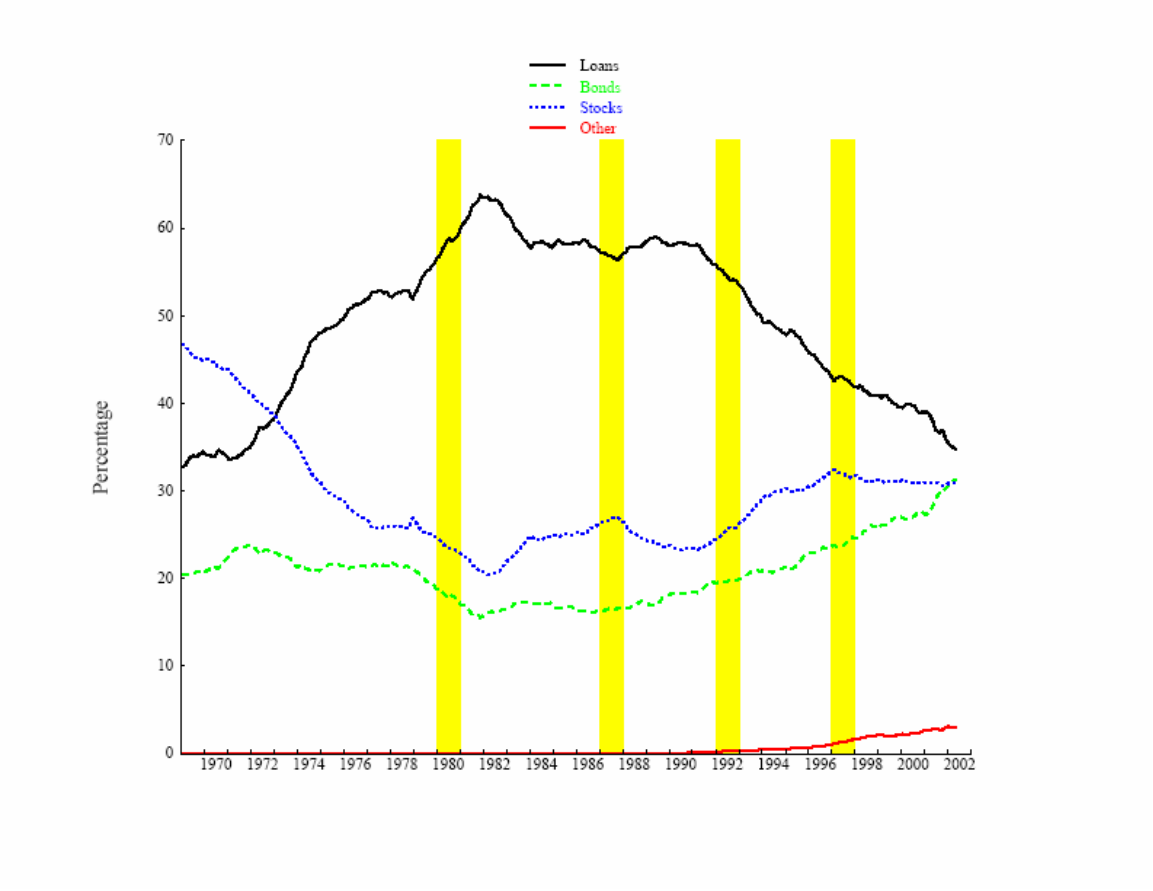
Figures

Figure 1 Direct to Indirect Finance, Canada, 1968-2002



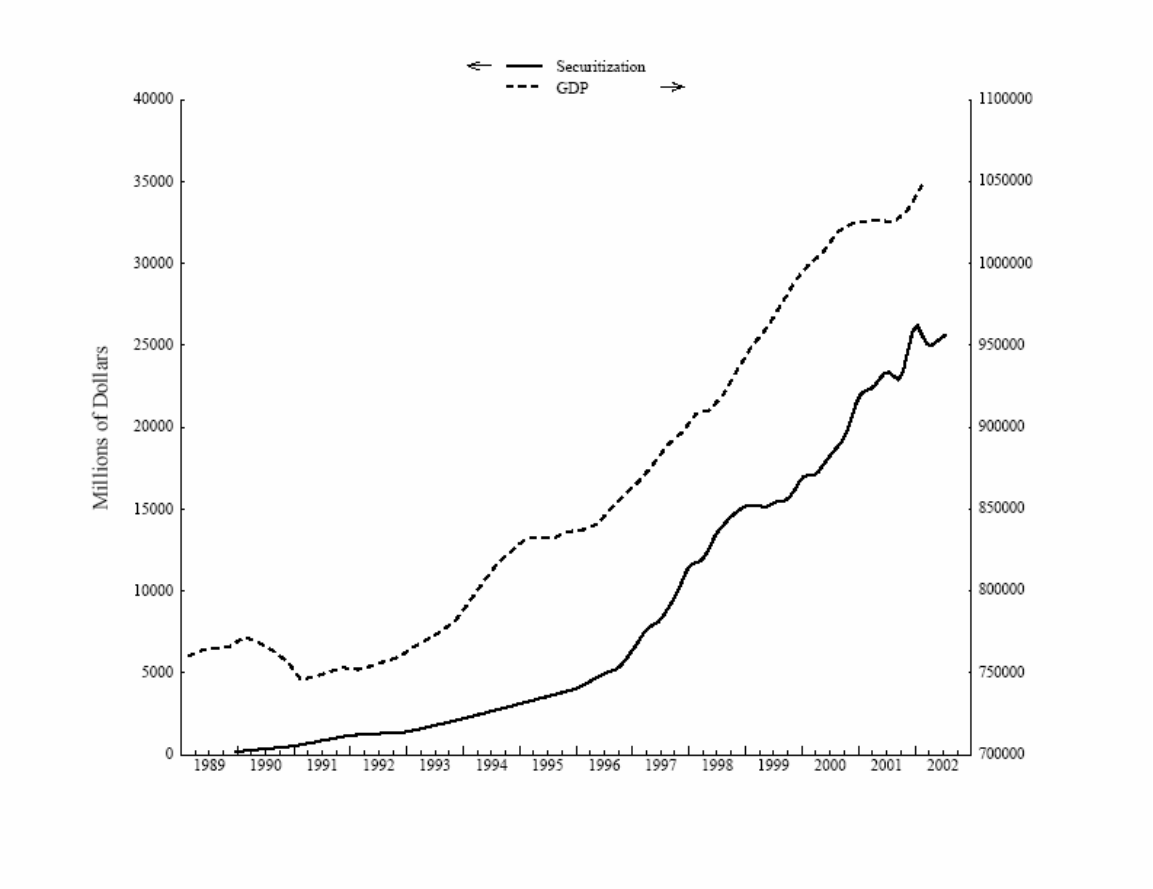
Source: Calmès (2004); Calmès and Salazar (2006)

Figure 2 Shares of loans, bonds and stocks in Canadian corporate financing, 1970-2002



Source: Calmès (2004)

Figure 3 Canadian banks securitization, 1989-2002



Source: Calmès (2004)

Figure 4 *Share of noninterest income for the eight domestic banks, 1988-2007.*

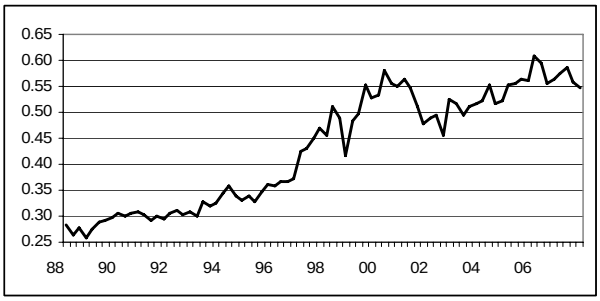


Figure 5 *Noninterest income per 100$ of assets for the eight Canadian domestic banks, 1988-2007.*

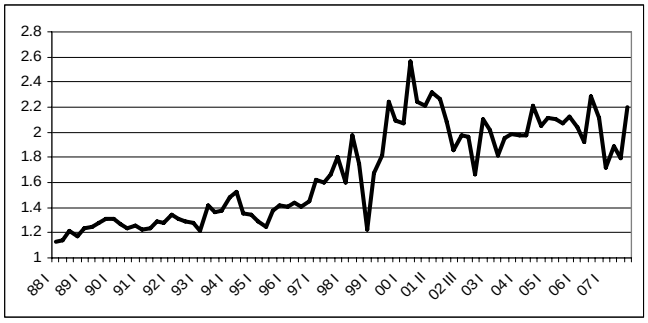
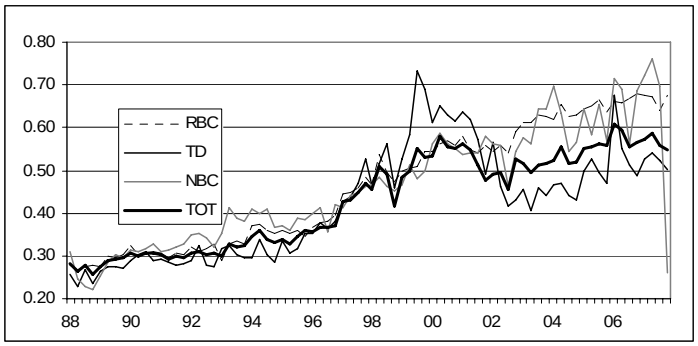
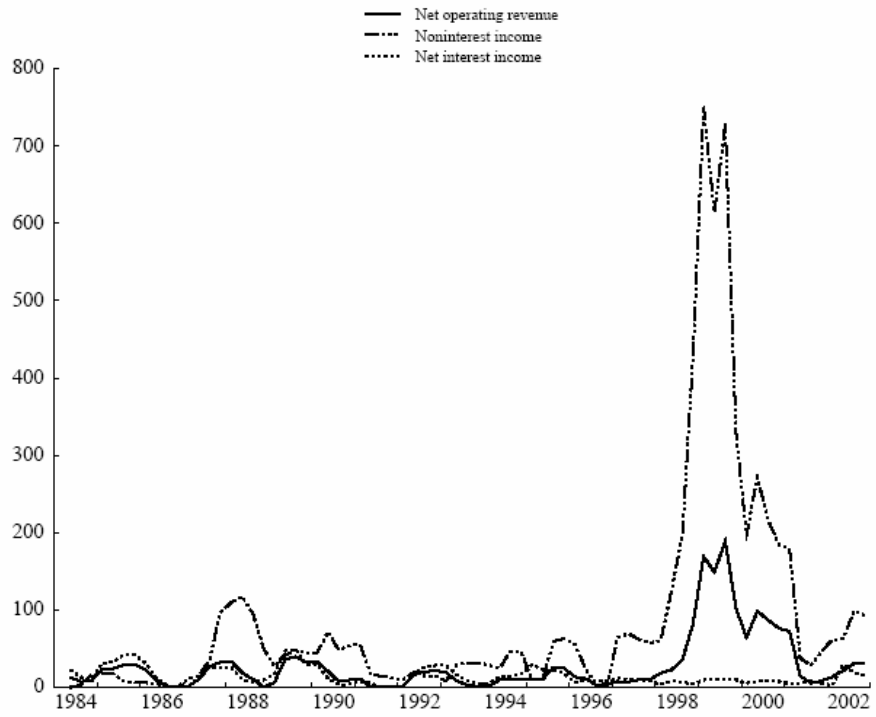


Figure 6 *Share of noninterest income in net operating revenue, three Canadian domestic banks, 1988 – 2007*



Note: RBC: Royal Bank of Canada; TD: Toronto Dominion Bank; NBC: National Bank of Canada; TOT: eight Canadian domestic banks.

Figure 7 Volatility of banks net operating revenue growth, 1984-2002



Source : Calmès (2004)

Tables

Table 1 *Decomposition of the variance of net operating revenue growth, before provisions, Canadian banks, 1988-2007*

	1988-1992			1993-1997		
	Average share	Variance	Contribution to variance	Average share	Variance	Contribution to variance
Net operating revenue		14.2			9.4	
Net interest income	0.70	16.9	8.4	0.64	9.8	4.0
Noninterest income	0.30	30.2	2.6	0.36	40.4	5.3
Covariance		7.5	3.1		-0.9	-0.4
Correlation		0.33			-0.04	

	1998-2002			2003-2007		
	Average share	Variance	Contribution to variance	Average share	Variance	Contribution to variance
Net operating revenue		57.4			22.3	
Net interest income	0.49	9.7	2.3	0.45	13.6	2.8
Noninterest income	0.51	212.3	55.9	0.55	75.7	22.6
Covariance		6.1	3.0		-4.2	-2.1
Correlation		0.14			-0.13	

Table 2 *Profitability of the eight Canadian domestic banks vs noninterest income share, 1988Q1 – 2007Q4*

	***ROE*(1)**	***ROE*(2)**	***ROE*/$\sigma_{uc,t}$**	***ROE*/$\sigma_{c,t}$**	***ROA*(1)**	***ROA*(2)**	***ROA*/$\sigma_{uc,t}$**	***ROA*/$\sigma_{c,t}$**
c	0.24***	0.25***	12.58**	2.94***	1.02***	0.21***	23.71***	5.16***
y_{t-1}	0.15**	-0.01	0.75***	0.60***	0.11*	0.01	-4.72**	0.11
snonin	-0.11**	-0.20***	-16.43**	-1.72	-0.39**	-0.72***	-22.32*	-2.20**
LLP	-0.14***	-0.15***	-7.97***	-1.99***	0.55***	-0.59***	-9.31**	-2.49***
DUM2Q	-0.02	-0.01	1.24	-0.60*	-0.06	-0.03	2.37	-0.37
DUM3Q	-0.02	-0.01	-0.51	-0.20	-0.05	-0.05	3.32	-0.28
DUM4Q	-0.03**	-0.02*	0.32	-0.65**	-0.11**	-0.09**	2.57	-0.55
$\sigma_{c,t}$	-	1.85**	-	-	-	9.78***	-	-
Adjusted R^2	0.72	0.80	0.67	0.68	0.72	0.83	0.15	0.70

Note: Explanatory variables: y_{t-1}, lagged dependent variable; *snonin*, share of noninterest income in net operating revenue; *LLP*, ratio of loan loss provisions over total assets; *DUMiQ*, dummy variable taking the value of 1 for the i^{th} quarter and 0 otherwise; $\sigma_{uc,t}$, unconditional volatility of the dependent variable computed using a rolling window of four quarters; $\sigma_{c,t}$, conditional volatility of the dependent variable using a GARCH(1,1) model. *ROE*(1) and *ROA*(1) are models without conditional volatility. *ROE*(2) and *ROA*(2) are ARCH-M models incorporating the conditional volatility of the dependent variable. Asterisks indicate the significance levels: * stands for 10%, ** stands for 5% and *** stands for 1%.

Table 3 *Profitability of three Canadian banks vs noninterest income share over subperiods 1988-1996 and 1997-2007*

	$ROE_{1988\text{-}1996}$	$ROE_{1997\text{-}2007}$	$ROA_{1988\text{-}1996}$	$ROA_{1997\text{-}2007}$
c	0.48***	0.44***	2.02***	0.39***
y(t-1)	0.07	-0.25	0.07**	-0.02
snonin	-0.66***	0.10	-2.61***	0.12
LLP	-0.16***	-0.07	-0.62***	-0.54*
DUM2Q	-0.01	0.01	-0.03	-0.03
DUM3Q	-0.01	-0.01	-0.01	-0.05
DUM4Q	-0.01	-0.01	-0.03	-0.11*
$\sigma_{t,c}$	-3.45	1.04***	-4.15	5.49**
Adjusted R^2	0.96	0.29	0.97	0.43

Note: Explanatory variables: y_{t-1}, lagged dependent variable; *snonin*, share of noninterest income in net operating revenue; *LLP*, ratio of loan loss provisions over total assets; *DUMiQ*, dummy variable taking the value of 1 for the i^{th} quarter and 0 otherwise; $\sigma_{c,t}$, conditional volatility of the dependent variable computed using an ARCH-M procedure (equation 2). Asterisks indicate the significance levels: * stands for 10%, ** stands for 5% and *** stands for 1%.