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The Impact of Off-Balance-Sheet Activities on Banks Returns: An Application of the ARCH-M to Canadian Data

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The Impact of Off-Balance-Sheet Activities on Banks Returns:
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Abstract

This paper revisits the impact of off-balance-sheet (OBS) activities on banks risk-return trade-off. Recent studies (e.g., Stiroh and Rumble 2006) suggest that increasing OBS activities do not necessarily yield straightforward diversification benefits for banks. However, introducing a risk premium in the standard banks returns models, and resorting to an ARCH-M procedure, Canadian data suggest that banks risk-return trade-off displays a structural break around 1997. In the second subperiod of our sample (1997-2007), we find that the noninterest income generated by OBS activities no longer impacts banks returns negatively. While during the first period (1988-1996) the volatility variable is not significant in any returns equations, a risk premium eventually emerged, pricing the risk associated to OBS activities risks.

JEL Classification: G20; G21.

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

L'IMPACT DES ACTIVITÉS HORS-BILAN SUR LES RENDEMENTS BANCAIRES :
UNE APPLICATION DE LA TECHNIQUE ARCH-M AUX DONNÉES CANADIENNES

Résumé

Ce papier réexamine l'impact des opérations hors-bilan (OBS) sur l'arbitrage risque-rendement des banques. Des études récentes (e.g. Stiroh et Rumble 2006) suggèrent que l'augmentation des activités OBS ne génère pas nécessairement des bénéfices tangibles de diversification pour les banques. Cependant, en introduisant une prime de risque dans les modèles standards de rendements bancaires, et en recourant à une procédure ARCH-M, les données canadiennes suggèrent que l'arbitrage risque-rendement des banques a subi un changement structurel aux alentours de 1997. Au cours de la deuxième période de notre échantillon (1997-2007), nous trouvons que la part des revenus autres que d'intérêt émanant des activités OBS n'exerce plus un impact négatif sur les rendements bancaires. Alors qu'au cours de la première période (1988-1996) la variable de volatilité ne s'avère pas significative dans l'équation des rendements, une prime de risque s'est finalement fait jour, de manière à compenser le risque associé aux activités OBS.

Classification JEL : G20; G21.

Mots-clefs : Changements réglementaires; Revenu autre que d'intérêt; Diversification; Changement structurel; Prime de risque.

1. Introduction

Beginning in the 1980s, 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 observed both in Canada, the United-States and elsewhere (Boyd and Gertler 1994, Calmès 2004, Roldos 2006)[2]. This evolution gave way to a major change in corporate financing, characterized by a relative decrease in the share of banks loans (i.e. indirect financing) and an increased share of bonds and stocks. This financial transformation challenged the banking business and justified, in part, the financial deregulation waves. Banks were progressively allowed to act as security dealers and to offer fiduciary services and portfolio advices to investors. They also began to securitize loans, a move in line with the financial deepening process. These kinds of non-traditional activities are loosely classified as OBS (off-balance sheet) activities – i.e., activities related to commission and fee income, trading income and other noninterest income. At first, banks might have thought that these new types of activities could lead to important diversification benefits, with an improvement in their risk-return trade-off (Rose 1989, Saunders and Walters 1994). Indeed, the decision to diversify might be considered endogenous (Campa and Kedia 2002, Stiroh and Rumble 2006, De Jonghe 2009) 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 disintermediation and increased liquidity but also to greater market completeness.
[2] On this, see also the recent evidence in Brown and Petersen (2009).

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 2004a, Stiroh 2006b, Stiroh and Rumble 2006, Calmès and Liu 2009, Calmès and Théoret 2009a, De Jonghe, 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, and rationalize the deterioration of the risk-return trade-off observed in Canada over the 1988-2007 period (Calmès and Théoret 2009a, 2009b), we resort to the commonly accepted view that noninterest income, being more related to aggregate shocks (compared to interest income), increases the exposure of 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, Baele et al 2007)[3]. This risk-return worsening is also partly

[3] See also Wagner 2006, Wagner 2009, Coval 2009a, and Coval 2009b. Note, however, that these authors do not necessarily refer to the correlation of the share of noninterest income with aggregate shocks (both macroeconomic and financial) but rather to bank herding and the tendency they have to strategically imitate the behaviour of their competitors. The literature suggests that decision complementarities and externalities in the decision to get involved in OBS activities eventually generate an increase in banking risk,

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).

Second however, we also document a 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). Note that 1997 is a natural break since it is precisely at this time that Value-at-Risk (VaR) became the standard banks risk measure. The VaR, being based on returns volatility, has the tendency to underestimate the negative impact of fat tails. This may have induced banks to blindly increase their total leverage with riskier activities, and particularly OBS activities. It certainly explains a great deal of the increased bank income volatility in the immediate years following 1997. Our results are consistent with the recent changes observed in the banking industry and the gradual adaptation to new, non-traditional activities, what Adrian and Shin (2009) called the shadow banking system[4]. As it is usually the case, financial markets and institutions eventually adjust to financial innovations (Calmès 2003, Caballero and Engle 2003, Delong and DeYoung 2007). Incidentally, these results are in line with the study of Baele et al. (2007) who found diversification benefits in a large sample of European banks. The authors explain

such that the regulator should be more concerned by the consequence of one bank action on the system than by its specific risk-taking behaviour (DeJonghe 2009).

[4] Loosely speaking, this new banking is the result of a maturation process understood both as a progressive change in the banks activities mixture and a learning-by-doing or learning-by-observing adaptation to new business lines. For more on this, see Delong and DeYoung (2007).

their contradictory results in regard to the American experience by noting that European banks have more expertise in OBS activities than their US counterparts, these activities being allowed since 1989, i.e. ten years before the USA. Baele et al. (2007) also note that Europe has a long tradition with investment banking, which is not the case for US banks[5]. Compared to the US case, the Canadian banking experience is more in line with the European one because deregulation allowing OBS activities took place in 1987 in Canada, well before the US.

In this respect, the main contribution of this paper is to resort to a new empirical framework to study the recent changes 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 riskiness of OBS activities riskiness with a model of banks returns estimated by ARCH-M (Engle et al. 1987), a novelty in this literature. In the literature, this type of banking risk is not explicitly modeled. From the standpoint of asset pricing theory, this is an important omission because to consider risk-adjusted measures only is not completely satisfying when returns are not first-degree homogenous in volatility – precisely the case with banking data. Instead, the volatility should appear on the RHS of the returns equations, as it is usually the case in asset pricing. Running this kind of experiment reveals that banks started to price their OBS risk in 1997, when the net interest and noninterest revenues correlation changed sign. DeYoung and Roland (2001) conjecture that the surging volatility of banks revenues should

[5] Note that Stiroh (2004b) also gives this explanation for the diversification benefits of OBS activities when banks objective is profits maximization. He notes that gaining experience in their interest income generating activities also took a long time. The same process could be at play for non-interest generating activities. Eventually, the performance gap should close. But if banks have other objectives than profit maximization, the deterioration of the risk-return trade-off (due to OBS activities) could persist. This is the case when managers maximize their self-interests, the case of agency costs. But, in light of the European experience, which seems shared by Canada, we are inclined to prefer the former scenario, i.e. a maturation under way.

eventually give rise to the incorporation of risk premia in various measures of bank accounting returns. However, they did not test this conjecture. To the best of our knowledge, the studies of Stiroh (2006a) and Baele et al.(2007) are the only studies having examined, in a stock market context, the relation between the share of noninterest income and the risk premium required to price the risk associated to OBS activities. In Baele et al. (2007), a panel study of European banks, the authors found that beta, a systemic measure of market risk, increases with the share of noninterest income in banks accounting revenues[6]. Compared to the approach of Baele et al. (2007), we account for the higher volatility of noninterest income growth (relative to the interest one) by directly introducing the returns conditional volatilities in banks returns equations[7]. Doing so, we find that Canadian banks risk-return trade-off presents a structural break, which may be dated around 1997. In the second subperiod of our sample (1997-2007), the share of noninterest income no longer impacts negatively various measures of banks returns we examine, as was previously the case. More importantly, we indeed find that a risk premium emerges in the second subperiod (1997-2007) (as conjectured by DeYoung and Roland, 2001 and Stiroh, 2006a) while in the first subperiod (1988-1996), the volatility variable is not significant in any returns equations.

This paper is organized as follows. In section 2, we present some stylized facts regarding the banking deregulation process and its associated impact on the

[6] In a first set of regressions, Baele et al. (2007) explain market returns by the share of noninterest income and found a positive relationship. In a second set of experiments, they regress market beta on the same share and found also a positive relationship. These two equations give the same information about a positive relationship between returns and risk, but could also be the representation of the same phenomenon (Cochrane 2005).

[7] As noted by Cochrane (2005), there are many empirical representations of the basic asset pricing equation $p = E(mx)$ (e.g.the mean-variance framework and the CAPM). For the analysis of banking risk, we consider that the mean-variance approach is preferable because VaR is based on global risk (i.e., returns volatility) instead of systemic risk only (i.e. the covariance of individual returns with stock market return).

banking business – i.e. the so called Shadow Banking. In section 3, we go on with the pricing of risk premia in banks returns. In this section, we describe the ARCH-M procedure. We then discuss the empirical results and formulate some final remarks about the increased riskiness of banking before concluding.

2. Some Banking Stylized Facts

2.1 A Changing Financial Landscape

Before examining the stylized facts related to the increased riskiness in 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[8].

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

Incidentally, the amendments made in 1992 and 1997 are very important in the deregulation process, considering the changes observed thereafter.

Insert Figure 3 here

With deregulation, banks were also allowed to securitize their loans. As shown in Figure 3, the securitization process really took off in 1997. The timing of securitization impact in Canada is partly related to the *innovations* made by the Canadian Mortgage and Housing Corporation (CMHC). The securitization process in Canada actually began in 1987 with the launching of the NHA MBS (National Housing Act–Mortgage-backed securities) by the CMHC.[9] After 1997, securitization literally exploded. This non-traditional activity is one good example to illustrate the new types of banking business which 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 an heterogeneous aggregate which includes different components such as trading income, gains (losses) on instruments held for other than trading purposes, fiduciary income, service fees, insurance and other fees and commissions.

2.2 Valuing Banks OBS Activities

The valuation of OBS activities presents many measurement problems (Calmès 2004). However, according to a rough calculation based on the Boyd and

[9] 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.

Gertler (1994) methodology, the assets equivalents "related" to Canadian banks OBS activities total 2790 billion $ for the fourth fiscal quarter of 2007, an amount 122% larger than the level of balance sheet assets. Although this figure is only a simplistic approximation, what matters most is its evolution through time. Indeed, by comparison, these assets equivalents only represented 39% of balance sheet assets in 1988. Hence, similarly to what happened in Europe and 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 beginning 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, evidence of a consolidation of the new banking business. The ratio 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 2009). Note also that the adoption, in 1997, of the VaR as the standard banks risk measure has likely contributed to the increased banks income growth volatility because of its tendency to underestimate the negative impact of fat tails. Indeed, to compute their VaR, banks have been heavily inclined to rely on the middle range of their returns

distributions, where most of the losses are located. But this induced banks to blindly increase their total leverage with riskier activities, and particularly with OBS activities. It certainly explains a great deal of the increased banks income growth volatility, as banks overlooked the surging risk of their operations, in the immediate years following 1997, with their VaR understating their true risk.

Insert Figure 5 about here

As suggested by Figure 5, the growing share of noninterest income in banks' net operating revenue has boosted the banks 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. This corroborates the idea of a major transformation in the Canadian banking system. Again, and similarly to the share of noninterest income, this ratio is increasingly dependent on financial markets fluctuations.

Insert Figure 6 here

2.3 The Increase in Operating Revenue Growth Volatility

On the one hand, the noninterest income share of banks operating revenue is increasing. On the other hand, as shown in Figure 6, 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,

noninterest income becoming increasingly sensitive to stock markets. Overall, the direct impact of the growing share of noninterest income is an increase in the volatility of banks' net operating revenue growth. Indeed, activities related to noninterest income are much more volatile than those associated to net interest income (Stiroh 2004a). 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 2009). Moreover, the correlation between these two forms of income is quite unstable, and 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 (DeYoung and Roland 2001).

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

Following Stiroh (2006b), we decompose the net operating revenue growth with a portfolio approach in order to analyze its volatility with two components: the volatility of net interest income growth and the volatility of noninterest income growth. The growth of net operating revenue (*NOR*) is thus 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 then be decomposed as follows:

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

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 and in the United-States. 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 signs of the emergence of a new type of banking. However with this new environment, 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 for financial stability.

3. Methodology and Empirical Results

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, we investigate two questions in this paper.

First, we want to examine whether there are any sign of a change in the way banks run their businesses. In the long run, the share of noninterest income in banks' net operating revenue should no longer impact negatively 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 examine whether, in light of the increased riskiness of their operations, Canadian banks have adjusted to the new 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. De Young and Roland (2001) already conjectured 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. The main research contribution of this paper here is precisely to introduce a risk measure in the returns equations to test check their hypothesis.

3.1 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 (2004a) for the United-States and by Calmès and Liu (2007) and Calmès and Théoret (2009a) for Canada. The general form of this model is[10]

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

where y_t is an accounting measure of bank performance – i.e the return on equity (*ROE)* and the return on assets (*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 controls for factors that impact banks performance (e.g. bank size, riskiness of loans or asset growth).

Following Stiroh (2004a) and Calmès and Liu (2009), equation (1) is also estimated on a risk-adjusted basis. In this equation, y_t is thus 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 (2009a), 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 then test for other well-known econometric specifications of conditional volatility, like GARCH(p,q), TARCH, EGARCH and PARCH, also using different distributions for the error term (normal, Student and generalized error (GED)), but find that the standard 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).

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

We want to examine whether the increasing volatility of banks operating revenues has given rise to the introduction of a risk premium in equation (1). 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. Here, risk is *explicitly* introduced in equation (1), by resorting to an ARCH-M model[11], 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[12].

3.2 Empirical Results

3.2.1 The Data

Our sample, composed of the eight major Canadian domestic banks, runs from the first fiscal quarter of 1988 to the fourth fiscal quarter of 2007. At first, compared to the US or the European banking sectors, the Canadian banking sector

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

[12] Note also that in 1997, following the recommendations of the Basle Committee, VaR became the official banks risk measure. Yet the most important element of the computation of this statistic is precisely the volatility of returns. Thus, this volatility is a very relevant measure to account for banks risk.

might appear quite small to draw any meaningful inference about the emergence of a new banking environment. However, our methodological choice, based on *aggregate* time series, comprising more than 80 observations, and a very parsimonious model, is more than enough to derive reliable results. Besides, the Canadian banking system has the reputation of being one of the most robust system in the world[13] so that any trace of bank instability there is likely indication of a widespread phenomenon.[14].

Data come 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.

3.2.2 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. It is equal to -0.11 in the *ROE* equation, and a much higher figure for *ROA*, - 0.39, as expected, since the ratio of *ROA* to *ROE* is mean-reverting to a level of 4 over the

[13] On the relative resilience of the Canadian banking system, see Ratnovski and Huang (2009).
[14] In other words, if we successfully document the emergence of a risk-premium associated to OBS activities based on Canadian data, it should not be too surprising, applying the same ARCH-M methodology, to find the same pattern occurring elsewhere.

period of analysis (this ratio is not very volatile except during extreme events[15]). These results confirm our preliminary findings, the idea that OBS activities reduce the performance of Canadian banks, in terms of mean returns, while they also increase the volatility of bank net operating revenue growth over the whole sample period.

Insert Table 2 here

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 2, regressing equation (1) using risk-adjusted performance ratios leads to a decrease in the adjusted R^2, because the scaling factor fluctuates greatly from one period to another. The 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 and Rumble 2006), helps account for the risk

[15] 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.

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 rely on an ARCH-M procedure to explicitly account for the risk premium in the returns equations. 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. Not surprisingly, it appears much higher for *ROA*, at 9.78.

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 influential. Hence, the standard specification of returns overstates the role of y_{t-1} relative to *snonin*, whereas using our approach instead, *snonin* appears to be the main factor explaining banks returns over the whole sample.

3.2.3 The Emergence of a New Type of Banking

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, this hypothesis about a structural break 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 and -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 change in banking business occurred, leading 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, but finally emerged in the second part of the sample.

The main argument we raise in this paper, about the emergence of a risk premium associated to the OBS activities risk, seems also supported by the empirical evidence. The ARCH-M procedure we use 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, indeed 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, the evidence tends to support the idea that a major change in banking occurred, but also that Canadian banks have adapted to the increased volatility of their operations.

3.3 Final Remarks 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). Data tend to suggest that financial aggregate shocks have gained momentum relative to idiosyncratic ones. Houston and Stiroh (2006) document the same phenomenon in the United-States. There also seems to be some evidence of a herding behaviour whereby banks tend

to behave alike when faced by aggregate shocks, which add to, and compound the existing systemic risk. 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) tend to react more to aggregate shocks, like unexpected changes in stock market indices and macroeconomic aggregates. 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 Stiroh (2004a and 2004b)[16]. With a greater involvement in OBS activities, Canadian banks are more sensitive to financial 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 kind of behaviour when facing more pronounced aggregate uncertainty. Quagliariello (2006) observes such an 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.

[16] This argument is in line with Stiroh (2006a) who identified a turning point in banking risk in 2000. Around this year, the locus of banking risk, at least as perceived by US financial markets, has shifted off of the balance sheet and onto income statement. Incidentally, in their 1997 study, Demsetz and Strahan did not identify activities related to OBS activities as particularly risky. Stiroh's turning point is consistent with our argument of a decrease of idiosyncratic risk and a concomitant increase in banking aggregate risk.

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. 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 around 1997, as financial institutions eventually adapted to the new situation. Previous studies on the subject (e.g. Stiroh 2006a and 2006b, Calmès and Liu 2009, De Jonghe, 2009) were somewhat dubious about the diversification benefits associated to the rising share of OBS activities, and about their relative profitability. Corroborating DeYoung and Roland (2001), Baele et al. (2007) and De Jonghe (2009), the new evidence we provide with Canadian data suggests that an adjustment was 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 appears between interest and noninterest income growth, which has rarely been

the case before. This suggests that the OBS diversifications benefits finally unravel.

Concerning the temptation to re-regulate for controlling the increased risk of banking, we must realize that the move toward OBS activities might be endogenous to the banking industry, in the sense that it was first originated by banks themselves. Under this 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, in the 1980s, the branches network of Canadian banks entered in a phase of low profitability because the growth of deposits began to slow markedly. Preceding the deregulation phase, banks have encouraged their customers to be more market-oriented, substituting securities issues for loans. Based on this assumption, 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[17]. 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 Demsetz and Strahan (1997) and Campa and Kedia (2002). Considering *snonin* endogeneity is a research avenue already suggested in Stiroh (2004b), Stiroh and Rumble (2006) and more recently by Baele et al. (2007) and De Jonghe (2009)[18].

[17] 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. Reichert and Wall (2000) noted also that before 1999, the year corresponding to the launching of the GLBA Act, US banks also took advantage of loopholes to enter investment banking and insurance.

[18] According to Demsetz and Strahan (1997), one argument to justify the endogeneity of the activity of diversification in OBS activities goes as follows. Banks can use diversification benefits, which decrease the marginal cost of risk, to engage in more risky

Second, the pricing of OBS activities is still in its infancy, and our paper only makes a first contribution in this dimension. In this respect, equations of banks returns can be improved further to shed more light on the evolution of the banks risk-return trade-off.

activities. In the USA, larger banks are more diversified but may use the gains to pursue riskier strategies like increasing their leverage and/or the share of noninterest income. According to Stiroh (2004b), "this clouds the interpretation between diversification and risk and could lead the results to be biased upwards". The risk-return trade-off might thus show a greater deterioration, following the increase of *snonin*, when using estimation techniques like OLS which do not account for endogeneity.

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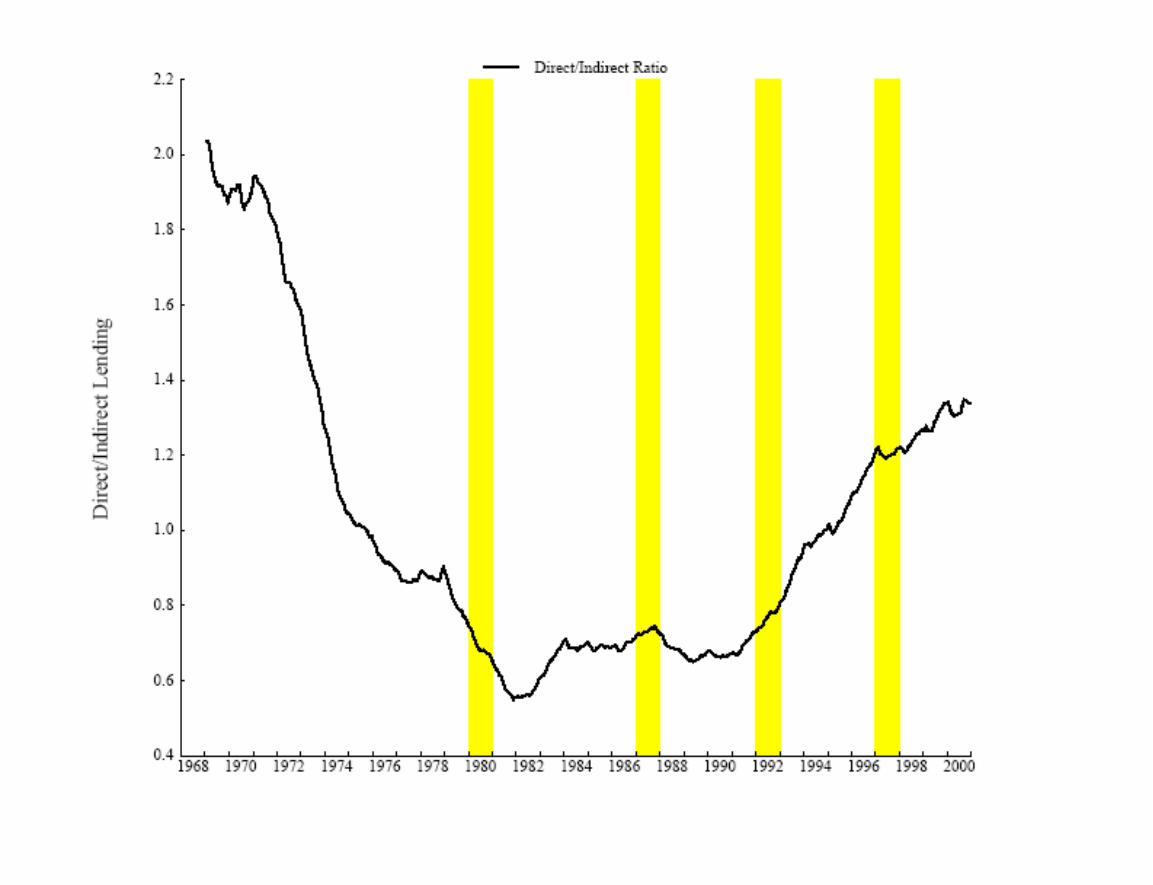
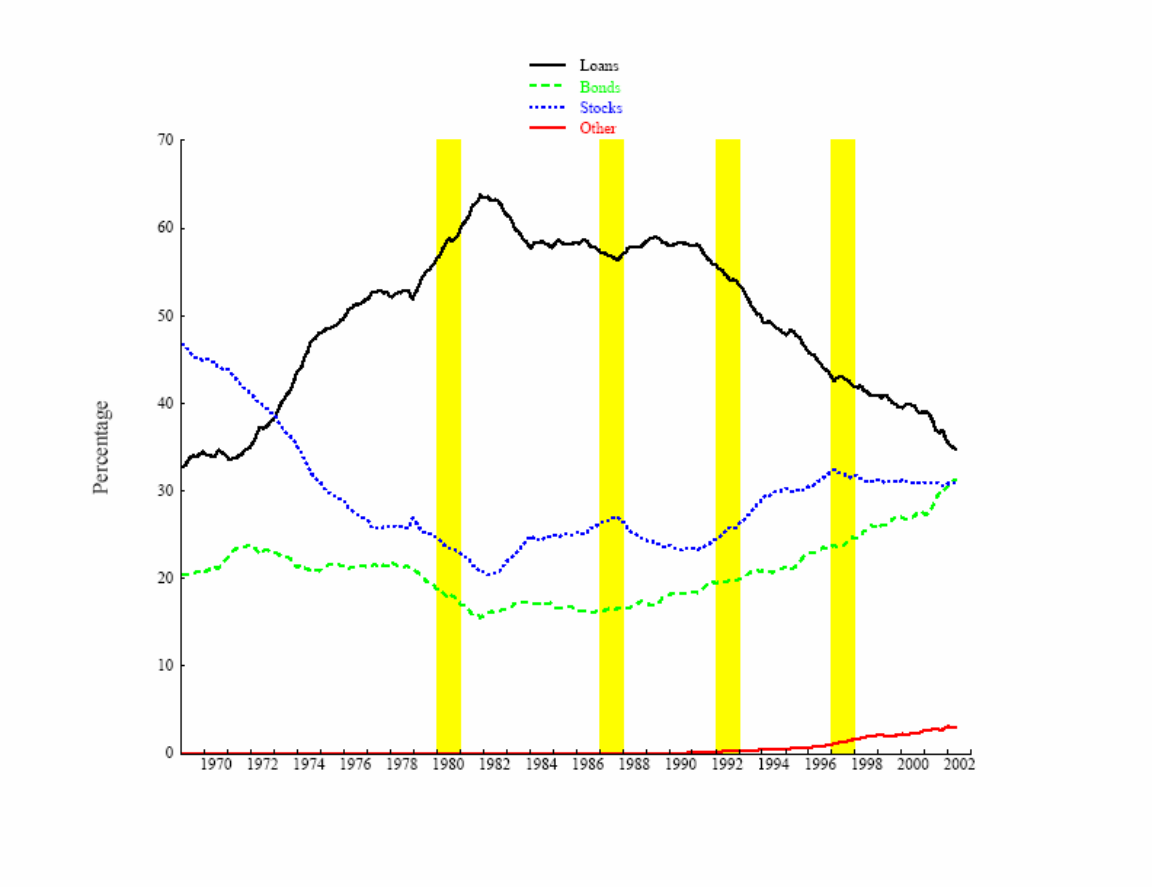
Figures

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



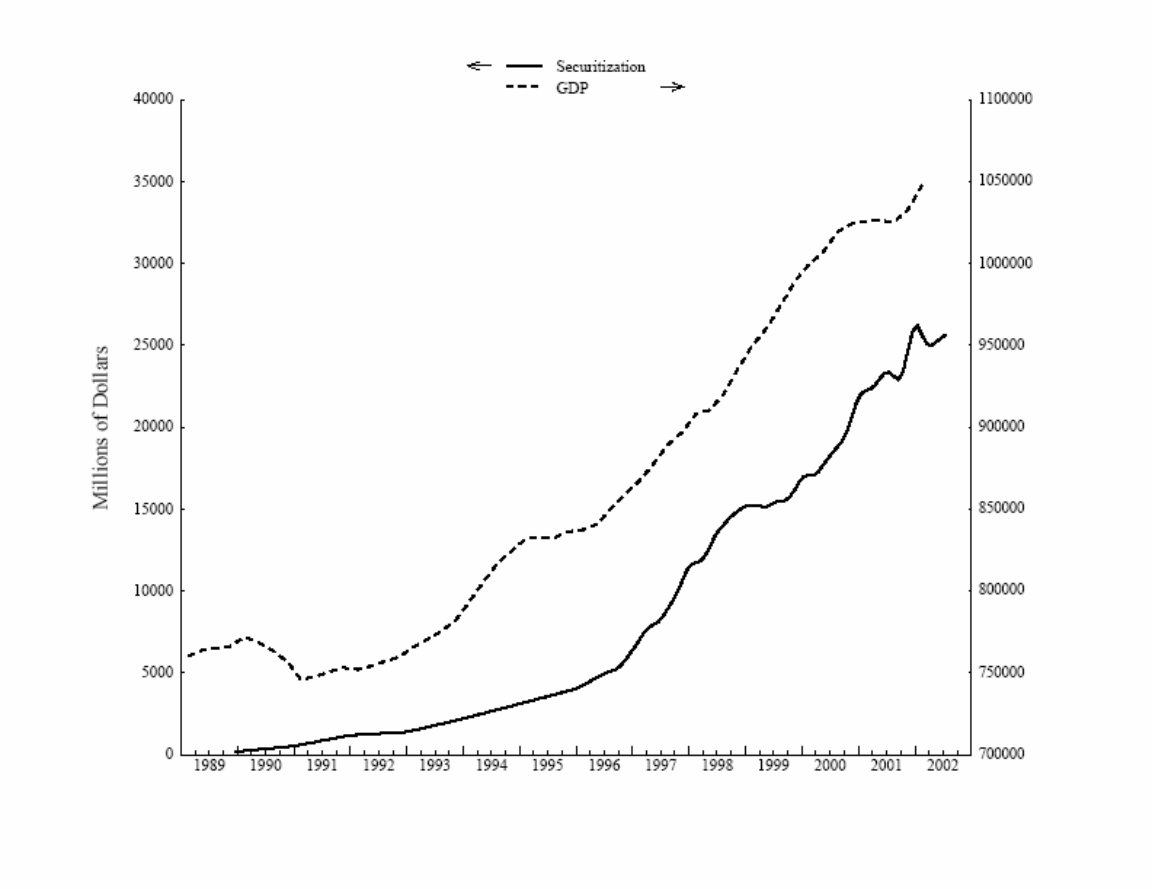
Source: Calmès (2004); Calmès and Salazar (2006)

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 Canadian domestic banks, 1988-2007.*

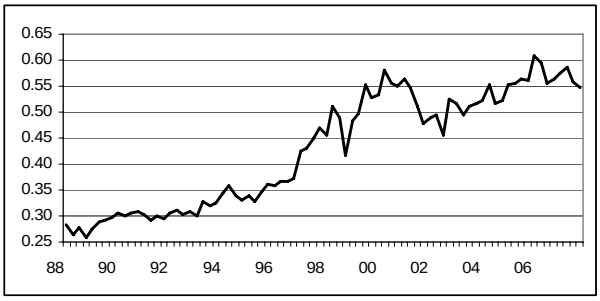


Figure 5 *Noninterest income per 100$ of assets for the eight Canadian domestic banks, 1988-2007.*

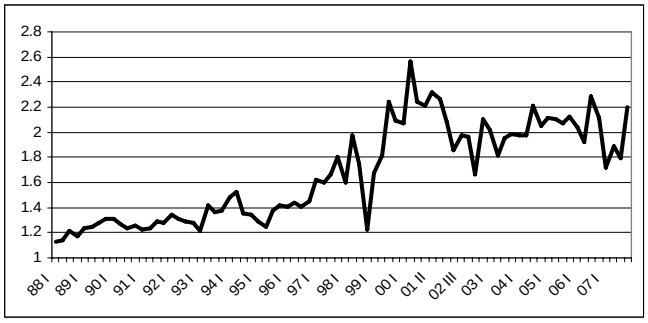
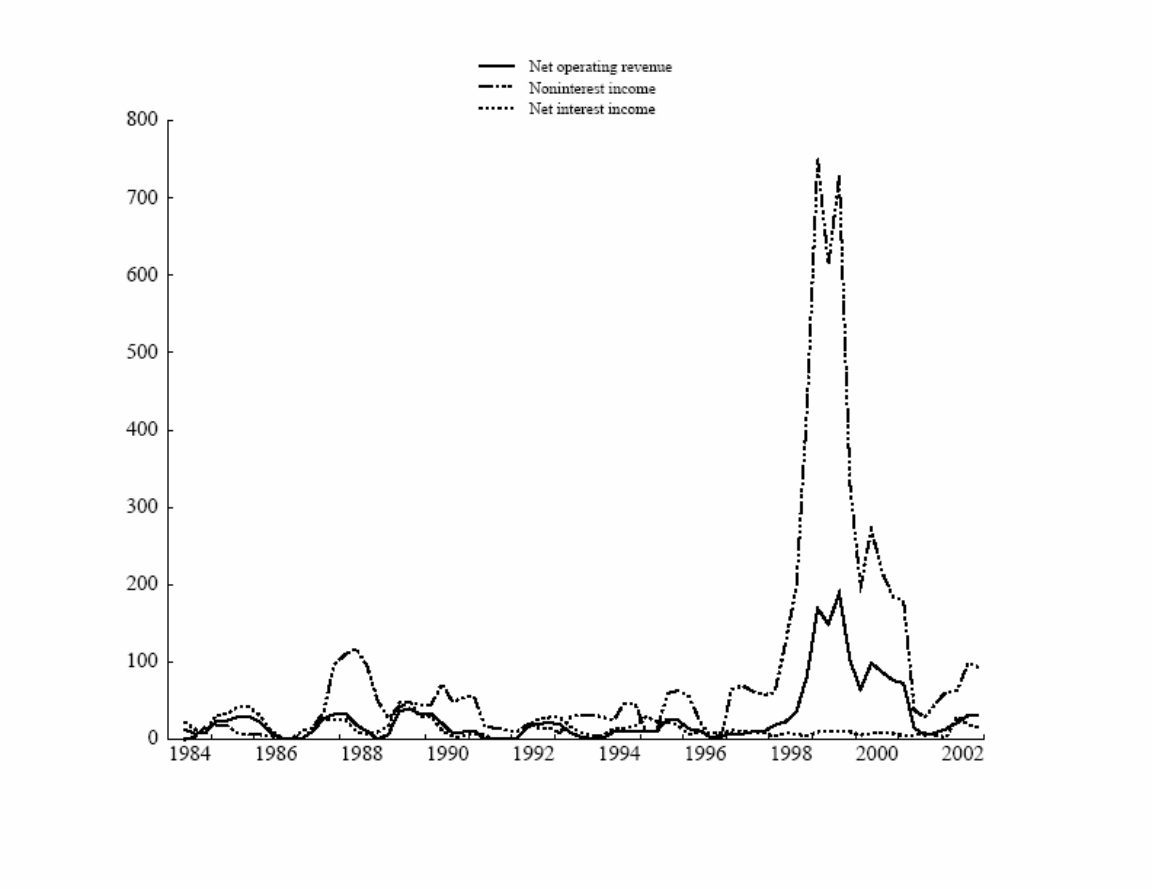


Figure 6 Volatility of banks net operating revenue growth, 1984-2002



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 ith 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%.