

Financial Structure Change and Banking Income: a Canada-U.S. Comparison

Christian P. A. Calmès

Département des Sciences Administratives

Université du Québec en Outaouais

Laboratory for Research in Statistics and Probability

Ying Liu

Department of Monetary and Financial Analysis

Bank of Canada

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*Postal: Christian Calmès, Département des Sciences Administratives, Université du Québec en Outaouais, Pavillon Lucien Brault, 101 rue Saint Jean Bosco, Gatineau, Québec, Canada, J8Y 3G5.

Correspondence: christian.calmes@uqo.ca. Telephone: (819) 595 3900 -1893. Fax: (819) 773-1747.

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Financial Structure Change and Banking Income: a Canada-U.S. Comparison

Abstract

Data suggest that the Canadian financial structure, and particularly indirect finance (e.g., banking), have become more market-oriented. We associate this financial trend in part with the regulatory changes that have occurred in Canada since the 1980s. Financial intermediaries are increasingly involved with financial market activities —e.g. off-balance sheet (OBS) activities such as underwriting securities. For this reason, we analyze the noninterest income attributable to financial market activities. We find that the variance of Canadian banks' aggregate operating-income growth is rising because of the increased contribution of noninterest income. This component is by nature quite volatile compared to interest income. Consequently, our analysis corroborates the U.S. findings of Stiroh 2004, and Stiroh and Rumble 2005: By contributing to banking income volatility, market-oriented activities do not necessarily yield straightforward diversification benefits to Canadian banks.

Keywords: *Regulatory changes, indirect finance, noninterest income, diversification*

JEL: G20, G21

1 Introduction

Over the 1990s, Canadian businesses relied increasingly on financial markets as their primary source of external funding (Calmès and Dolar 2002, Calmès 2004). Data display a trend towards a more market-oriented financial structure. In parallel, Canadian banks have become increasingly involved with non-traditional activities, e.g. OBS activities. This trend is partly related to the regulatory changes that occurred in Canadian banking. It started after the 1980 banking legislation amendments and was accentuated after the 1992 amendments. A complex combination of legislative modifications (e.g. the Basle accords) and various market conditions explains the current situation.

In the U.S, Boyd and Gertler (1994) observe a similar shift in banking. Going a step further, Stiroh (2004) and Stiroh and Rumble (2005) investigate the consequence of the market-oriented trend on U.S. banking riskiness –as measured by net operating revenue volatility. Surprisingly, these authors find “little obvious diversification benefit” from this ongoing phenomenon.

To our knowledge, the approach proposed by Stiroh (2004) has not yet been used to assess the case of Canadian banking riskiness. Dionne and Harchaoui (2003) find that there is a positive relationship between regulatory capital standards and a bank’s decision to engage in risky activities, notably securitization with partial recourse. With a simultaneous equations model, the authors conclude that securitization has a negative impact on the bank’s capital ratios and that there is a positive link between securitization and bank risk. While their results relate to our argument, the authors focus on credit risk. They do not frame banking riskiness in terms of income volatility. D’Souza and Lai (2003) focus on Canadian bank portfolio efficiency and the impact of regional and industrial portfolio concentration. They find that geographical diversification could have a positive impact on Canadian banks, but that more diversified business lines and industries would be somewhat detrimental to banks’ efficiency. However, concentrating on on-balance sheet activities, the authors cannot fully account for financial market activities.

This paper contributes to the perspective held by Stiroh (2004), Dionne and Harchaoui (2003) and Stiroh and Rumble (2005) regarding the current banking stance. Because non-traditional activities tend to account for an important part of the banking business volatility, we investigate the relationship between financial structure change and banking riskiness, with a particular emphasis on the increase in noninterest income¹ activities. More precisely, our primary focus is the study of the

¹Noninterest income is the income generated by banks outside of their traditional activities – i.e., OBS activities

nature of the diversification associated with market-oriented activities.

This research offers a contribution in addressing a delicate question: would the current trend be beneficial to Canadian banks? The question deserves particular attention in the current context of Canadian banking. Investigating this case might help shed some light on the merger debate. According to Van den Heuvel (2002), banks' capital distribution has an impact on the degree of efficacy of monetary policy. Therefore, *ceteris paribus*, regulators could favor mergers that induce better capital distribution within the banking system. According to D'Souza and Lai (2003), there are also efficiency gains associated with geographical diversification. Therefore, *ceteris paribus*, the regulators could favor mergers that increase geographical dispersion, fostering banking efficiency. Our preliminary results suggest that regulators wanting to reduce the volatility of banks noninterest income could consider mergers that minimize the non-traditional activities of the merged entity.

In this empirical study, we argue that financial market activities do not necessarily provide diversification benefits to Canadian banks, in the sense that they contribute to banks income volatility. We find that the contribution of noninterest income to the volatility of the aggregate net operating-revenue growth has increased since the early 1980s –and especially in recent years. This has nothing to do with a bad draw; instead, this persistent increase partly coincides with a regulatory change in the financial structure –particularly in the banking business. The next section describes this change and explains it in relation with the consecutive changes in regulation and market conditions. We establish that Canadian banks increasingly rely on non-traditional activities. Section 3 studies the impact of this trend on banking.

Our empirical analysis suggests that Canadian aggregate bank revenue is volatile both because of the increased reliance on noninterest income and because of the important volatility of this component. In this section, we also report estimates suggesting that banking is procyclical with respect to both GDP and the TSE, owing in part to the influence of noninterest income. The last section concludes with a discussion on some policy implications and possible extensions of this study.

including market-related activities.

2 The Change in the Canadian Financial Structure

When focussing on Canadian banking, our study reveals that its structure is becoming more market-based, with a greater proportion of financing being done through corporate bonds and equity. We analyze this banking trend in the context of the Canadian legislative developments, because regulatory changes help explain why and when financial intermediaries, especially banks, became more market-oriented. The regular revisions in Canadian financial legislation, the results of which are often influenced by market conditions, are usually followed by a series of financial innovations. In turn, these financial innovations can potentially contribute to a structural break in the nature of external financing. Obviously, the regulatory changes are endogenous, as they often accommodate the needs of the financial system. However, it is reasonable to think that there is a direct relationship between the regulatory changes and the structure of the Canadian financial system (Calmès and Dolar 2002, Calmès 2004). In particular, these changes, along with the evolution in the market conditions, have an impact on banking. In the following section, we associate these regulatory changes to the structural breaks and characterize the current Canadian banking trend.

2.1 The Regulatory Changes

The “sunset” clause of the Canadian Bank Act requires a periodic reassessment of the legislation ruling the national chartered banks. This clause led to significant revisions which might have helped foster bank profits while also responding to the changes in market conditions. A priori, we can also think that the amendments would create some diversification benefits along the way. In any case, these legislative revisions and various market conditions were intimately intertwined, and there is little doubt that both contributed to the change in the financial industry.

The 1980 amendments were the first of a series that had a persistent effect on banks and other financial institutions. It allowed banks to have subsidiaries in different areas such as venture capital and mortgage loans. In 1987 and 1992, banks entered into a range of new businesses such as new OBS activities (see Table 1). Canadian banks were permitted to invest in corporate securities, and to distribute government bonds. They made substantial investments in the securities business and gained control of most investment dealers. Financial intermediaries were also allowed to conduct brokerage activities.

Consequently, the financial structure is more market-oriented, with a pronounced change associ-

Table 1: The Amendments in a Nutshell

1980	Subsidiaries are allowed, e.g. venture capital, mortgage loans
1987	Distribution of government bonds is allowed Investment in corporate securities is allowed Banks purchase control of the investment dealers Banks make investments in the securities business
1992	Banks buy the trust companies Banks are permitted to offer in-house activities: Portfolio management, investment advice etc.
1997	Update and refinement of the 1992 amendment

ated with the 1987 amendments. The transition occurred between 1987 and 1989, as bank customers began to be able to invest in financial markets directly through their banks. The situation evolved further in 1992. Among other things, the 1992 amendment allowed banks to offer a number of in-house activities such as portfolio management and investment advice.

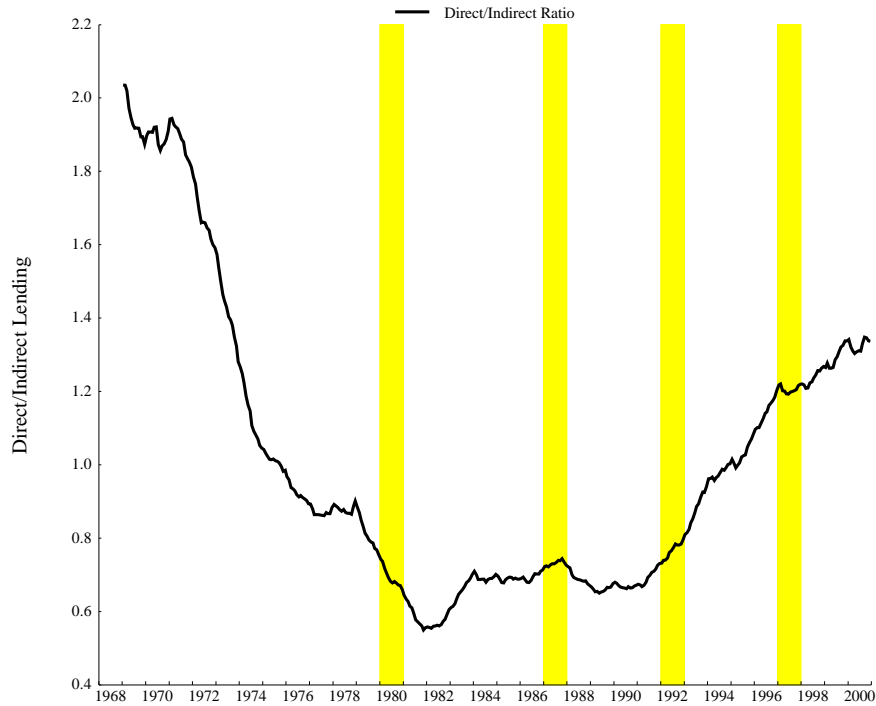
2.2 The Relative Decline of the Canadian Loan Business

In recent years, the share of Canadian banks has been stable relative to other lending institutions. However, in relation to the amendments, the financial institutions together have been losing market share to the financial markets. In the 1990s, indirect financing sharply decreased². Canadian financial institutions have been experiencing a relative drop in loan business, from approximately 60 per cent of external financing in the 1980s to just under 40 per cent in recent years³. Figure 1 shows this pattern quite clearly. We construct a direct/indirect ratio by dividing bonds, shares and other by loans extended by financial institutions. The figure displays a U-shaped direct/indirect financing ratio: the financial structure is currently characterized by a trend toward a more market-oriented system, more pronounced since the implementation phase of the 1987 amendments. More precisely,

²The overall picture does not change much when the same four series (loans, bonds, stocks, other) are expressed relative to nominal GDP.

³As illustrated in Figure 4 (in appendix), the trend in the Canadian financial structure is towards a more market-based system.

Figure 1: Direct/Indirect Private Finance



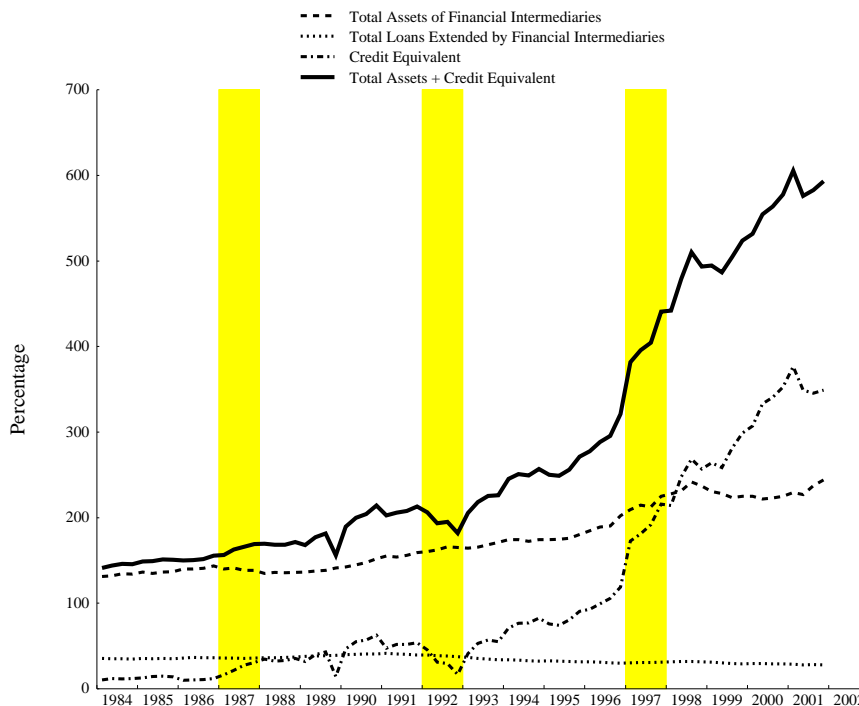
Note: The vertical lines represent the years in which significant revisions of the Bank Act were made.
Source: Calmès (2004).

the transition occurred between 1987 and 1989, as banks' customers began to be able to invest in financial markets directly through their banks.

2.3 Stylized Facts

It is quite understandable that regulatory changes, by allowing banks to enter the brokerage business, have de facto initiated the growth of banks' non-traditional activities. As discussed below, these activities likely contribute to Canadian banks prosperity.

Figure 2: Total Assets, Credit Equivalent, and Commercial Loans Extended by Financial Intermediaries as a Percentage of Nominal Gross Domestic Product



Note: The vertical lines represent the years in which significant revisions of the Bank Act were made.
 Source: Calmès (2004).

2.3.1 The Increase in Non-Traditional Activities

The growth in Canadian banks' total assets shares the same pattern as its U.S. counterpart (Boyd and Gertler 1994). Of particular interest is the growth in non-traditional activities (such as OBS activities for example). These activities generate noninterest income without relying on traditional lending. In the last decades, noninterest income has grown much faster than net-interest income. This has been particularly true since the 1992 (and 1997) Bank Act amendments.

Surprisingly however, non-traditional activities are sometimes overlooked. One of the reasons might be the fact that noninterest income activities, by definition, are not reported as traditional lending, so it is more difficult to get a somewhat compatible financial indicator of bank activities in these areas.

Consequently, as Boyd and Gertler (1994), we use the noninterest income series to assess the importance of noninterest income activities in term of *assets*⁴. We transform the noninterest income series into a credit equivalent series, as if this noninterest income had been generated from regular assets. Figure 2 shows that, after the 1992 and 1997 amendments, this financial indicator grew rapidly. In recent years, much of the growth in total (adjusted) banks assets, on- and off-balance sheet, has actually come from noninterest income. It is a global phenomenon taking place in Canada, in the U.S. (Boyd and Gertler 1994) and Europe (Rajan and Zingales 2003).

3 Analysis

While documenting facts regarding the financial structure, we have established that regulatory changes have allowed the system to become more market-oriented. In particular, banks have increased their non-traditional businesses. However, little attention has been paid to the consequence of this situation in terms of diversification of Canadian banking. The aim of this section is to provide a preliminary analysis of this question, with a particular focus on banking income.

3.1 Summary Statistics

Two types of data are used in our analysis: the banks' consolidated monthly balance sheet data and the quarterly consolidated statement of income collected by the Office of the Superintendent of Financial Institutions Canada. Aggregate levels for balance sheet data are taken from the Banking and Financial Statistics (Bank of Canada, Tables C1 and C2). For statement of income, we rely on the same source (Table K2). Both types of data are on a quarterly frequency from 1983:Q1 to 2002:Q4, the longest period available on a consistent basis, deflated with the GDP deflator (1997=100) and seasonally adjusted. Noninterest income is a heterogenous aggregate that includes different activities: trading income, gains (losses) on instruments held for other than trading purposes, fiduciary income, service fees, investment banking related fees, insurance, and other fees and commissions. In practise, we subtract net interest income from net operating income to retrieve the aggregate series.

⁴Boyd and Gertler (1994) implicitly assume a perfect mapping between OBS activities and noninterest income. Since noninterest income actually involves some on-balance sheet items, the method only provides an approximate indicator of OBS activities.

Table 2: Canadian and U.S Banks Net Operating Revenue by Source and Year

Canadian Banks	1980		1990		2000	
	Level	%	Level	%	Level	%
Net Operating Revenue	15.7	100	22.97	100	52.52	100
Net Interest Income	12.41	79.0	15.86	69.0	23.01	43.8
Noninterest Income	3.29	21.0	7.11	31.0	29.351	56.2
U.S banks						
Net Operating Revenue	123.4	100	196.9	100	333.7	100
Net Interest Income	98.2	79.6	132.9	67.5	188.9	56.6
Noninterest Income	25.2	20.4	64.0	32.5	144.8	43.4

Note: In 1997 national currencies (\$b).

The bottom panel is taken from Stiroh (2004).

To facilitate a comparison with the U.S. experience, Table 2 shows the breakdown of net operating revenue for Canadian banks for 1980, 1990 and 2000. Net operating revenue, net interest income and noninterest income are reported. Net Operating Revenue is the sum of net interest income and noninterest income. Net interest income comprises interest income minus interest expense, before loan loss provisions. Interest income includes income from interbank deposits, government and corporate bond and security holdings, loans and other interest-earning assets. Interest expense includes interest paid on deposits, subordinated debt and other interest bearing liabilities.

As shown in Table 2, aggregate noninterest income of Canadian banks has increased as a share of net operating revenue, from 21% in 1980 to 31% in 1990 to 56.2% in 2000. The trend identified by Boyd and Gertler (1994), Stiroh (2004) and Stiroh and Rumble (2005) for the U.S is even more pronounced in Canada. On the other hand, net operating revenue of U.S. banking is more than six times that of the Canadian banking. However, in Canada, it has more than tripled in the last couple of decades, from \$15.7b to \$52.52b, whereas in the U.S. the increase has been more moderate, from \$U.S.123.4b to \$U.S.333.7b.

One explanation of the difference between the two countries comes from the evolution of Canadian noninterest income share. In Canada, the percentage of net operating revenue attributable to

noninterest income has increased significantly, while the increase in the U.S. was more moderate. This result suggests that, in recent episodes, the increase in net operating revenue have been mainly driven by the increase in the noninterest component. This is consistent with the observation that net operating revenue increase has been greater in Canada than in the U.S.

In this context, it is particularly interesting to investigate whether the increased contribution of non-interest income to net operating revenue is a “neutral” substitution (in terms of risk) or not. What follows is then an assessment of net operating revenue volatility.

3.2 Banks Income Volatility: a Canada-U.S. Comparison

We expect that an increased volatility coincides with a growing share of financial market activities. This should be the case since noninterest income tends to be more volatile than the net interest income component of net operating revenue (cf Figure 5 in appendix). So, if noninterest income increasingly contributes to banks revenue, then it can be suspected that it increases fluctuations in net operating revenue as well. The analysis carried below investigates this idea.

In this analysis, it helps think of net operating revenue as a portfolio composed of two types of assets. First, a bank’s regular assets generate net interest income. Second, a bank’s asset equivalent yields noninterest income. A standard examination of the volatility of aggregate return of this kind of portfolio would require some asset equivalent indicator of non-interest income. Instead, following Stiroh (2004) and Stiroh and Rumble (2005), we consider a direct approach based on a modification of the standard portfolio analysis. Rather than computing a regular decomposition of return volatility and rely on some asset equivalent series, we directly compute a decomposition of *portfolio growth* volatility.

In standard portfolio theory, the volatility of a portfolio aggregate return is a function of the volatilities of each of its components, and also a function of their covariance. Hence, adapting this idea to banks’ revenue boils down to specifying the volatility of the growth rate of net operating revenue (*NOR*) as the weighted average of the variance of the growth rate of noninterest income (*NONIN*) and of the variance of the growth rate of net interest income (*NI*), plus the covariance between these two components. More precisely, since $NOR = NONIN + NI$ we have:

$$\begin{aligned} \sigma_{d\ln(NOR)}^2 &= \alpha^2 \sigma_{d\ln(NONIN)}^2 + (1 - \alpha)^2 \sigma_{d\ln(NI)}^2 \\ &\quad + 2\alpha(1 - \alpha) \text{cov}(d\ln(NONIN), d\ln(NI)) \end{aligned} \tag{1}$$

Table 3: Decomposition of the Variance of Net Operating Revenue, Canada versus U.S.

Canadian Banks	1984:Q1 to 1989:Q4			1990:Q1 to 2001:Q3		
	Average Share	Variance	Contribution to Variance	Average Share	Variance	Contribution to Variance
Net Operating Revenue	16.6			27.4		
Net Interest Income	0.74	19.5	10.7	0.60	10.0	3.6
Noninterest Income	0.26	28.9	2.0	0.40	101.7	16.3
Covariance	9.3		3.6	2.8		1.3
Correlation	0.39			0.09		
U.S banks						
Net Operating Revenue	50.4			46.2		
Net Interest Income	0.72	100.2	51.9	0.63	14.2	5.7
Noninterest Income	0.28	228.9	18.2	0.37	259.1	35.8
Covariance	-29.0		-11.7	5.6		2.6
Correlation	-0.19			0.09		

Note: The bottom panel is taken from Stiroh (2004).

where $\alpha = NONIN/(NI + NONIN)$ is the share of noninterest income in banks' net operating revenue, $(1 - \alpha)$ is the share of net interest income, and the growth rate of each variable is simply its *log* total differential. The contribution of noninterest income is then captured by the term $\alpha^2 \sigma_{d\ln(NONIN)}^2$. The intuition behind this equation is straightforward. The overall variance of the endogenous variable will increase with the growth of noninterest income share and volatility if noninterest income is more volatile than net interest income. Furthermore, if the covariance between the two explanatory variables (the growth rate volatilities of noninterest income and net interest income) is positive then this directly increases further the variance of bank revenue growth. However, as long as the covariance is not one, the trade-off between net operating revenue growth and volatility can improve because the standard deviation of the volatility of net operating revenue growth rate is less than the weighted average of the two exogenous variables.

Table 3 shows results for the components of equation (2) for the periods 1984:1 to 1989:4 and

1990:1 to 2001:3. We take the same periods as Stiroh and Rumble (2005) to enable a direct comparison with the U.S. experience. For each period, the first subcolumns display α , the average of the shares of noninterest income over the periods, and $1 - \alpha$ (for net interest income). The second subcolumns provide the variances, covariance and correlation, while the third subcolumns give the share-weighted variances –i.e. the contribution to the overall variance of net operating revenue. Table 3 provides a comparison between the estimates of the two countries. In the U.S., bank revenue has become less volatile as the variance of net operating revenue growth fell from 50.4 to 46.2, but the difference is not significant. Contrary to the finding in the U.S., the variance of net operating revenue actually *increased* in Canada, from 16.6 for 1984:1-1989:4 to 27.4 for 1990:1-2001:3. This increase comes essentially from an increase in the variance of noninterest income, an increase substantially larger than the one observed in the U.S. Indeed, for Canada, the volatility of noninterest income growth rate went from 28.9 in the first period to 101.7 in the second period, whereas in the U.S. it increased from 228.9 to 259.1 only⁵.

Another dimension along which the Canadian experience is different comes from the growth in α . In Canada, the noninterest income component is more volatile than its U.S. counterpart and growing more in relative size. The difference however is not very large on average. In Canada, the share increased from 26% to 40%, whereas it increased from 28% to 37% in the U.S. Hence, the fact that net operating revenue is more volatile in Canada comes mainly from the fact that the noninterest income component is more volatile than in the U.S., and, to a minor extent, it also comes from the fact that the rise in noninterest income share has been slightly more pronounced than in the U.S.

Regardless of the country considered, the increased volatility in noninterest income leads to a greater contribution of this component to the overall variance of net operating income growth (from 18.2 to 35.8, and 2.0 to 16.3 in the U.S. and Canada, respectively). Should the volatility in net interest income have been increasing instead of decreasing, the net operating income would have been even more volatile. In the U.S., this volatility came down from 100.2 to 14.2. By contrast, in Canada, it decreased from 19.5 to 10.0 only. In other words, if Canada has experienced a relative increase in bank revenue volatility, it is both because noninterest income has contributed more to this volatility, but also because the decrease in net interest income volatility has been far less pronounced than in the U.S.

⁵Stiroh (2004) finds this difference to be not statistically significant.

In the U.S., because the covariance between net interest income and noninterest income actually increased from -29.0 to 5.6, Stiroh (2004) argues that there has been no clear diversification benefits in the U.S. across the two periods. In that respect, the case of Canada is more complicated to analyze. On the one hand, we observe that the volatility of bank revenue partly stems from the volatility of noninterest income. On the other hand, the covariance between the two components of net operating revenue has decreased between the periods 1984:1 to 1989:4 and 1990:1 to 2001:3. This is the opposite of what happened in the U.S.

3.3 Income Volatility of Canadian Banks

For this reason, we investigate the eventual influence of the choice of the time periods. Table 5 looks further into the variance decomposition over shorter sub-periods. It reports results for 1983 to 1987, 1988 to 1992, 1993 to 1997 and finally 1998 to 2002 -i.e time intervals corresponding to different legislative periods. The first observation to note is that the decrease in covariance between the noninterest income and net interest income components occurred in all sub-periods. 1993 to 1997 is a period for which we can argue that there has been some diversification benefits. In this period, the volatility of Canadian bank revenue was lower and the covariance between its two components was slightly negative.

However, the variance of net operating revenue growth increased more during the last period. Not surprisingly, this increase coincides with a large increase in the variance of noninterest income growth, as its correlation with net operating revenue became positive again.

While the covariance between the two components of the volatility of Canadian bank revenue growth has decreased, bank revenue growth volatility is clearly impacted by noninterest income activities. More importantly, there does not seem to exist straightforward diversification benefits associated with market-oriented activities, as the covariance between net interest income and non-interest income is actually positive most of the time. For example, trading income contributes to banking revenue without adding much in terms of diversification -its correlation with net interest income is almost zero.

To further assess the volatility of Canadian banks net operating revenue, a complementary analysis consists in analyzing the composition of noninterest income. Obviously, the goal here is to find

out which component of noninterest income is driving its volatility (and consequently the volatility of bank revenue). Table 6 (cf appendix) shows this for the period 1998 to 2002 (data for some noninterest income items is only available since 1998). Gains and losses from transaction is the most volatile component of noninterest income. One of the reasons for this is that gains and losses are calculated based on book value of the assets, as opposed to marked-to-market in the case of trading income for example.

Moreover, and consistent with the results obtained for the U.S., trading income is one of the major contributors to noninterest income volatility. Even though trading income share of total revenue before provision accounts only for 6.5% of total revenue, its volatility is quite substantial (1311.0 over the period). Table 6 also reports the covariance and correlation between components of noninterest income and net interest income. Trading income is the least (negatively) correlated, while service fees is one of the most positively correlated with net interest income. Insurance and investment banking (and fiduciary income to less extent) display a negative correlation with net interest income -hence suggesting potential diversification benefits from these three business lines.

Overall, the volatility of banks revenue is importantly explained by the growth, (both in share and volatility), of the noninterest income component, and it is particularly driven by the volatility of trading income. However, there is no clear indication of diversification benefits for Canadian banks, and the puzzle identified for the U.S. seems to prevail in Canada too.

3.4 Bank Revenue Fluctuations

Despite these observations, there might be possible explanations of the banks' increased involvement in noninterest income activities. For example, the trend could be related to the belief that noninterest income may be less procyclical and hence may bring diversification benefits. It is possible that economic cycles lead to more fluctuations in loan demand than in the demand for a bank's other business lines. For example, while the demand for loans may decrease in an economic downturn, the demand for safe deposit boxes may be quite constant regardless of economic cycles. As a result, noninterest income may provide a buffer against cyclical effects. To check this prior, we study the correlation between different types of bank revenues and economic cycles in several ways.

As a first step, we look at the dynamic correlations between each type of bank revenue and GDP growth. We also look at the correlation between bank revenue and the stock market to investigate

which type of bank revenue is more affected by fluctuations in the financial markets. The results of this experiment are presented in Table 4. As shown in the middle column, the contemporaneous correlations between all types of bank revenue and GDP growth are positive, indicating that both interest income and noninterest income are to a certain extent procyclical. Although quite small in absolute value, the correlation is much stronger between noninterest income and output than between net interest income and output. This casts doubts about the assumption that noninterest income is less affected by economic cycles. While the positive relationship holds also between the leads of GDP growth and banks' revenue, the sign of the correlation between the lags of GDP growth and bank revenue is less clear.

Given our previous findings, we were not surprised to see that the contemporaneous correlations between bank revenues and stock market growth are also positive and stronger than those between bank revenues and GDP growth. The contemporaneous correlations are on average four times stronger than those between bank revenues and GDP growth. This suggests that bank revenues are more in tandem with the stock market than with the business cycles, because of noninterest income, which shows the highest same-period correlation (0.232) with stock market growth. The correlation between the first lag of TSE growth and noninterest income is also positive and quite high (0.337) compared to other correlations. gains.

3.4.1 Time Series Analysis

In order to further study the relationship between the nature of bank revenue and exogenous shocks (business cycles and financial market fluctuations), we use the following model:

$$dlnY_t = \alpha + \sum_{i=1}^4 \beta_i dlnY_{t-i} + \sum_{j=0}^4 \theta_j dlnX_{t-j} + \epsilon_t,$$

Here Y_t is one of the three measures of bank revenue (total revenue, net interest income, and noninterest income). X is GDP or TSE. We thus have a total of six regressions to run. Unit root tests suggest that all variables used are nonstationary, so they are modeled in first difference. In a lag selection process, we start with six lags and include lagged values of each variable up to the last significant lag.

The experiment is based on aggregate bank data from 1983:Q1 to 2002:Q4, with all variables expressed in logged difference (*, **, and *** denoting significance at 1%, 5% and 10%, respectively). The individual coefficients and their joint significance levels are reported in Table 7 (cf appendix).

Table 4: Dynamic Correlation between Bank Revenue, GDP and Stock Market Price

	k=3	k=2	k=1	k=0	k=-1	k=-2	k=-3
Correlations with TSE(t-k)							
Total Reveue	0.038	-0.138	0.216	0.214	-0.013	0.093	0.017
Net Interest Income	0.004	-0.125	-0.160	0.077	0.018	0.032	0.020
Noninterest Income	0.012	-0.084	0.337	0.232	-0.044	0.093	-0.016
Correlations with GDP(t-k)							
Total Reveue	0.020	0.068	-0.057	0.052	0.093	0.060	0.096
Net Interest Income	0.072	-0.073	-0.244	0.018	0.015	0.015	0.037
Noninterest Income	-0.046	0.131	0.043	0.057	0.108	0.079	0.119

As expected, noninterest income is positively and significantly related to TSE and GDP growth, confirming that this type of revenue is procyclical and strongly affected by financial market fluctuations. In contrast, the coefficients on GDP and TSE are negative in the net interest income equation, helping to offset somewhat the positive relationship between noninterest income and exogenous shocks. This finding does not support the idea that noninterest income may be less procyclical than net interest income and help smooth the effect of fluctuations on bank revenue. The impact that the stock market has on noninterest income is so large that regardless of the negative impact on net interest income, total revenue is positively related with the stock market. Instead, the results of this experiment seem to support our earlier finding that the banks' involvement in noninterest income activities, such as market-oriented activities, may lead to higher volatility in bank revenue. They also reinforce our previous finding that noninterest income may contribute more to the volatility of net operating revenue than net interest income.

Overall, TSE growth is more significant in explaining the three types of bank revenues than GDP growth. In the regressions using GDP as the explanatory variable, only noninterest income is significantly explained by GDP growth. In the regressions using TSE as the explanatory variable, all three types of revenue are significantly explained by TSE growth. More importantly, we find that net interest income is negatively correlated with TSE growth, while total revenue and noninterest

income are positively correlated with TSE growth⁶. The R-square measures suggest that the total revenue and noninterest income equations using TSE as an explanatory variable have a better fit than the equation using GDP.

These findings are consistent with those of our earlier experiments in that bank revenue, especially noninterest income, is more related to the stock market than output growth, and that, in this respect, noninterest income does not bring significant diversification benefits.

To investigate the relationship between bank revenue and macroeconomic variables it is also useful to complement the analysis with a vector autoregression (VAR) approach and study the impulse response functions of a bank's income to a shock to GDP and to the TSE. We include three variables, GDP (or TSE), net interest income and noninterest income into a VAR. Since the two macroeconomic variables are most likely to be exogenous to bank revenue, they are placed first in the ordering. The ordering between net interest income and noninterest income is less obvious. We present the results where net interest income is placed before noninterest income⁷. The VAR is estimated in logged differences using data from 1983:Q1 to 2002:Q4. The lag lengths of two and four for the models with GDP and with TSE, respectively, were determined by a joint maximum likelihood test⁸.

Figure 3 shows the impulse response functions (IRF) of noninterest income growth and net interest income growth to a one-percent innovation to GDP growth and to TSE growth. The top two graphs show the impulse response functions of noninterest income growth and net interest income growth to a one-percent shock to TSE growth. The response of noninterest income growth to the shock is much more pronounced than that of the net interest income growth. In the first two quarters after the one-percent shock to TSE growth, noninterest income increases by two to three percent. The following response is in general positive. In contrast, a shock to the TSE growth leads to an overall negative response in net interest income. The response is also quite close to zero.

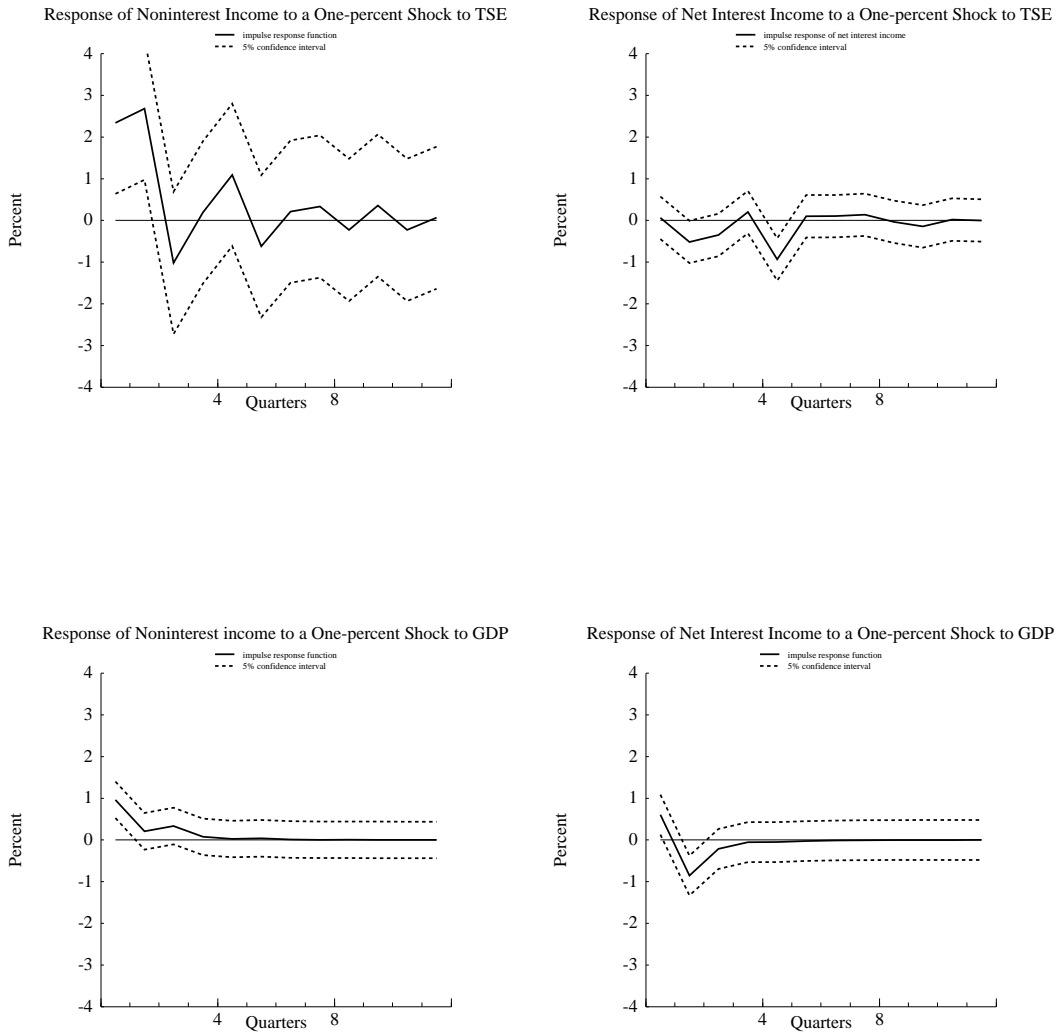
The bottom two graphs are the results from a transitory shock to GDP growth. While both net interest income and noninterest income respond positively to a shock on GDP growth in the first

⁶The joint coefficient of TSE growth in the noninterest income equation is much higher (1.474) than that in the total revenue equation (0.357).

⁷We conduct robustness checks by putting noninterest income before net interest income. The impulse response functions remain largely the same.

⁸The lag length of two, for example, is tested against alternative lengths of 3, 4, 6 and 8.

Figure 3: IRF of Net Interest Income and Noninterest Income to a transitory Shock to GDP and TSE



quarter, the response of noninterest income is more pronounced. The positive response of noninterest income is also more persistent than that of net interest income. In fact, the latter becomes negative in the second quarter, while the former remains positive throughout. This supports our view that noninterest income is more procyclical than net interest income.

Even if the IRF are only significant in the two first quarters⁹, these findings are quite consistent with our results using the single-equation analysis: noninterest income is strongly and positively correlated with stock market activities, while net interest income is slightly negatively correlated with the growth in TSE. Consistent with the results from the dynamic correlation exercise and the single-equation regressions, the responses to a shock to the TSE growth are more pronounced than those to a shock to GDP growth. This is true even in the case of net interest income. This seems to support the view that market activities play a more important role in determining both sources of bank revenue than real economic activities.

To discuss time series results comparable to Stiroh (2004), we present the confidence intervals based on the variance of the impulse response functions. According to these confidence intervals, at impact, both sources of income respond more significantly to a shock on GDP than those in Stiroh (2004), which did not find either of the responses to be statistically significant¹⁰.

We also conduct a robust test applying Stiroh's specification. When conducting Monte Carlo experiments to generate the confidence intervals, none of the responses were found statistically significant; yet, we can state that overall, the time series evidence tends to go in the same direction as Stiroh (2004) findings.

3.5 Noninterest Income Share and Bank Profitability

Even if noninterest income activities do not bring clear diversification benefits, they can still bring a higher average return to the bank's capital or asset. Therefore, a natural question to ask is whether engaging in such non-traditional activities can at least yield a higher risk-adjusted profit. This section investigates this efficiency issue. We consider four measures of bank profitability: return on equity (ROE), risk-adjusted ROE, return on asset (ROA), and risk-adjusted ROA, where,

⁹Note also that the responses often return to zero before the fourth quarter.

¹⁰The author did not look at a shock to the stock market. He uses a VAR with the logged levels of the data and a time trend and includes four lags in the model.

$$risk - adjusted_{ROE} = \frac{ROE}{\sigma_{ROE}}$$

and

$$risk - adjusted_{ROA} = \frac{ROA}{\sigma_{ROA}}$$

σ_{ROE} (σ_{ROA} respectively) is the four quarter moving standard deviation of ROE (ROA) and is used as a measure of risk. We regress one of these four measures on its own lags, contemporaneous and lagged values of the share of noninterest income in total revenue, and a set of control variables as follows:

$$Y_t = \alpha + \sum_{i=1}^m \beta_i Y_{t-i} + \sum_{j=1}^n \theta_j snonin_{t-j} + \sum_{k=1}^p \gamma_k Z_{kt} + \epsilon_t,$$

where Y is one of the four measures of bank profitability; $snonin$ is the share of noninterest income in a bank's net operating revenue, and \mathbf{Z} is a vector of control variables including the equity over asset ratio, log of asset, growth of asset and the ratio of loan loss provisions to total asset. A constant is also included to capture scaling effect in the dependent variable. The lag length of each variable is chosen using a selection criterion in which lags up to the last significant one are kept. The model is run using data from 1983:Q1 to 2002:Q4 for the aggregate of the eight publicly traded Canadian banks. All data are stationary, so they are modeled in levels.

The results of the regressions are presented in Table 8 (cf appendix). Control variables are eliminated whenever they are insignificant. Not surprisingly, the only one left is the ratio of loan loss provisions to total asset. Consistent with expectations that loan loss provisions lower profits, the ratio of loan loss provisions to total asset is negative in all equations. As reported in the table, the sum of coefficients of noninterest income share in all four specifications is negative and statistically significant. This suggests that an increase in noninterest income share significantly *decreases* the profitability of a bank. This holds when profitability is measured as the level of ROE and ROA, and risk-adjusted ROE and ROA. Even though the control variable is not perfectly orthogonal to $snonin$, these additional findings, again, tend to cast doubt on the notion that noninterest income activities can bring better bank performance through diversification benefit (reduction in risk) and/or higher returns.

4 Conclusion

In this paper, we report some stylized facts regarding the Canadian financial structure. In particular, we establish that the regulatory changes that allowed banks to operate non-traditional activities –e.g. OBS activities– have consequently changed bank income volatility. The volatility of Canadian aggregate bank revenue growth seems to be increasingly impacted by noninterest income, both because of the increased reliance on noninterest income and because of the increased volatility of this component. Overall, the empirical evidence we gather tends to suggest that market-oriented activities, such as trading services, do not bring any clear diversification benefits to Canadian banks. As a matter of fact, noninterest income seems to comove with both the business cycle and financial markets. Hence, this Canadian study corroborates the U.S. findings of Stiroh (2004) and Stiroh and Rumble (2005).

Considering the facts we document, several research questions come into mind. First, while we investigate the diversification that financial market activities constitute, the question of optimality is still somewhat opened to debate. To further address the question of efficiency, it is possible, in principle, to exploit the asset equivalent series we built¹¹, and then follow a methodology similar to Clark and Siems (2002) for example.

Another question would consist in investigating whether the financial trend we document can correspond to a weakening of the credit channel. Empirical evidence would tend to suggest that this channel is rather weak in Canada, but it might have weakened further in recent years —because of the relative decline in the borrowing business (Calmès 2004). Indeed, if Canadian firms are relatively more inclined to rely on financial markets than before, then the traditional effect of monetary policy (operating through the cost of borrowing) might have lost some steam. It would be interesting to confirm this intuition empirically.

The third possible research avenue that comes into mind is related to the former, and more specifically related to the debate regarding the role of central banks in dampening inflation volatility.

¹¹This can be achieved by relying on the Boyd and Gertler (1994) transformation. This transformation can be used not only as a financial indicator, like in Boyd and Gertler (1994) or in the current study, but it can also be used for other purposes, like assessing x-efficiency. Note however that our preliminary results point to a suboptimal behaviour of Canadian banks.

Clarida Galí and Gertler (1999), Cecchetti et al. (2004) and others suggest that better monetary policy has helped in dampening inflation volatility. However, in the U.S., around 50 percent of the decrease in inflation volatility seem only attributable to “luck” (Stock and Watson 2002). Since Canadian firms tend to rely increasingly on financial markets rather than loans, a question then is whether the new trend in dampened inflation’s volatility can be partly explained by the financial change we document.

Relatedly, according to Lettau et al. (2004), the dampening of macroeconomic risk has lowered the equity premium in the U.S. It is also likely that banks’ level of trading income has decreased because of the consecutive change in the consumption-wealth ratio (i.e. consumption risk). In an extension, we could investigate whether the market-oriented activities can contribute to the observed decrease in macroeconomic uncertainty. We know for a fact that banks do adjust their asset portfolios in a coordinate order when there is an increase in systemic riskiness (García and Calmès 2005). One can wonder about a complementary role noninterest income activities may play. These questions are left for future work.

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Appendix

Figure 4: Sources of External Funds for Canadian Non-Financial Businesses

Figure 5: 4-Quarter Moving Variance of the Growth Rate of Net Operating Revenue, Noninterest Income and Net Interest Income

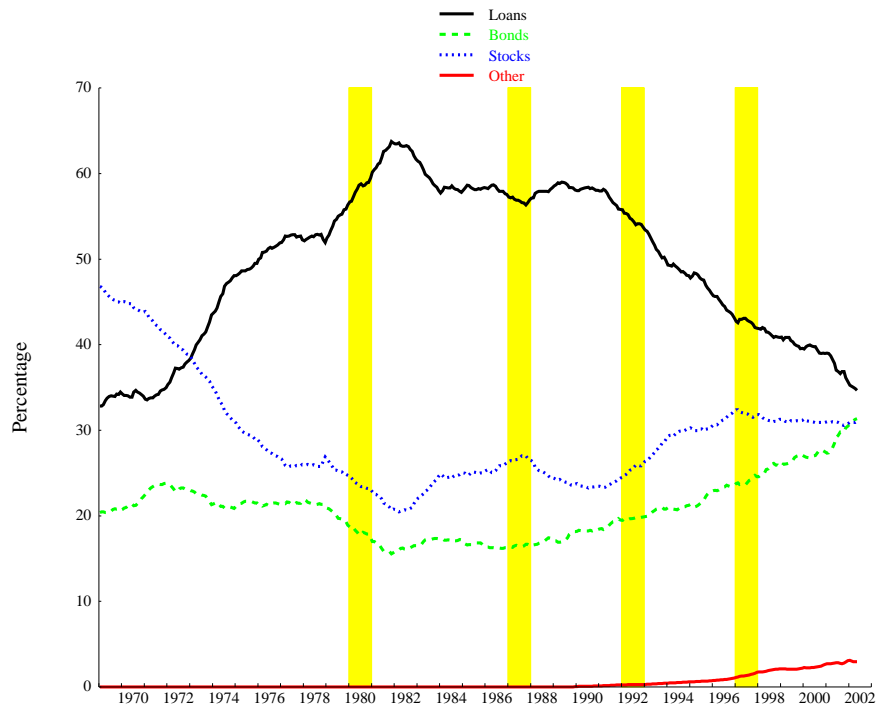
Table 5: Decomposition of the Variance of Net Operating Revenue, Before Provision (Canadian Banks)

Table 6: Relationship Between the Components of Noninterest Income and Net Interest Income

Table 7: Bank Income Growth versus Growth in GDP and Stock Market Price

Table 8: Bank Profitability versus Noninterest Income Share

Figure 4: Sources of External Funds for Canadian Non-Financial Businesses



Note: The vertical lines represent the years in which significant revisions of the Bank Act were made.

Source: Calmès (2004).

Figure 5: 4-Quarter Moving Variance of the Growth Rate of Net Operating Revenue, Noninterest Income and Net Interest Income

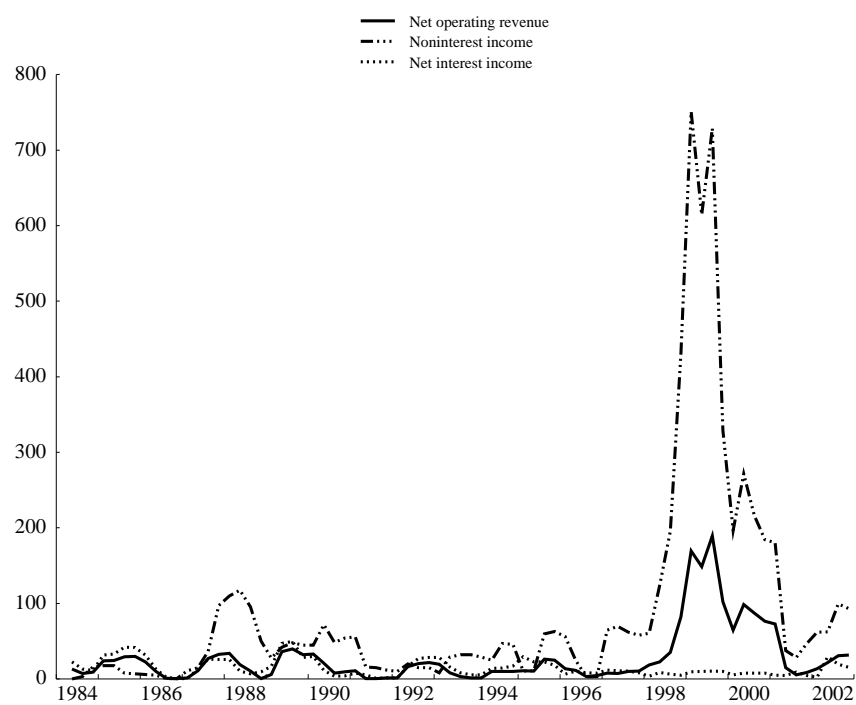


Table 5: Decomposition of the Variance of Net Operating Revenue, Before Provision (Canadian Banks)

	1983 to 1987			1988 to 1992		
	Average Share	Variance	Contribution to Variance	Average Share	Variance	Contribution to Variance
Net Operating Revenue		13.6			14.2	
Net Interest Income	0.74	15.5	9.0	0.6	16.9	8.3
Noninterest Income	0.26	25.3	1.5	0.4	30.2	2.7
Covariance		7.9	2.9		7.5	3.2
Correlation		0.4			0.33	
	1993 to 1997			1998 to 2002		
Net Operating Revenue		9.4			57.1	
Net Interest Income	0.66	9.8	3.9	0.55	10.2	2.4
Noninterest Income	0.34	40.4	5.5	0.45	212.6	55.3
Covariance		-0.9	-0.4		5.1	2.5
Correlation		-0.04			0.11	

Table 6: Relationship Between the Components of Noninterest Income and Net Interest Income

	1998 to 2002				
	Share of total revenue before provision	1997 \$b	Variance	Covariance with net interest income	Correlation with net interest income
Noninterest Income	51.3	23.5	212.6	5.0	0.11
Trading Income	6.5	2.7	1311.0	-3.0	-0.02
Gains and Losses	2.6	1.1	12625.0	44.0	0.12
Fiduciary income	7.0	5.7	90.0	-44.0	-0.14
Service Fees	15.0	7.0	40.0	6.0	0.28
Investment Banking	14.9	7.1	232.0	-10.0	-0.20
Insurance	1.4	1.2	107.0	-0.06	-0.19
Other Fees	3.6	1.7	1843.0	5.0	0.03

Table 7: Bank Income Growth versus Growth in GDP and Stock Market Price

	Explanatory Variable $X = GDP$			Explanatory Variable $X = TSE$		
	Total Revenue	Net Interest Income	Noninterest Income	Total Revenue	Net Interest Income	Noninterest Income
Y_{t-1}	-0.404***	-0.168	-0.325***	-0.487***	-0.216**	-0.557***
Y_{t-2}	-0.187	-0.001*	-	-0.229**	-0.121	-0.340***
Y_{t-3}	-0.001***	-	-	-	-0.075	-0.208
Y_{t-4}	-	-	-	-	0.074**	-0.155**
X_t	-	0.945**	1.462	0.146**	0.032	0.356***
X_{t-1}	-	-1.666***	0.211	0.221**	-0.065	0.570**
X_{t-2}	-	-	-0.003**	-0.007*	-0.079	0.167*
X_{t-3}	-	-	-	-0.003**	-0.008	0.119
X_{t-4}	-	-	-	-	-0.138**	0.261**
Constant	0.026	0.019***	0.022	0.026***	0.018***	0.042***
Jt. Sig. of Lagged X	-	0.246	0.042	0.002	0.058	0.000
Adjusted R^2	0.11	0.07	0.063	0.243	0.033	0.330

Note: Dependent Variable: Y_t ; Explanatory Variables: X_t (GDP and TSE).

Table 8: Bank Profitability versus Noninterest Income Share

	Dependent Variables (Y_t)			
	ROE	Risk-adjusted ROE	ROA	Risk-adjusted ROA
Y_{t-1}	0.037	0.604***	0.057	0.475***
Y_{t-2}	0.091***	-	0.113**	-
Y_{t-3}	0.055	-	0.075	-
Y_{t-4}	0.081**	-	0.087**	-
$snoin_t$	0.432***	-30.87**	0.017	-27.008*
$snoin_{t-1}$	-0.301**	-	-0.019**	-
$snoin_{t-2}$	-0.337***	-	-0.010	-
$snoin_{t-3}$	-	-	-0.010	-
$snoin_{t-4}$	-	-	-0.011**	-
$Prov_t$	-0.779***	-46.393	-0.037***	-21.335**
$Prov_{t-1}$	-	-7.745	-	-10.519***
$Prov_{t-2}$	-	-18.350***	-	-19.622**
Constant	0.308***	25.201***	0.014***	21.617***
Lagged $snoin$ sum	-0.206	-30.87	-0.010	-27.008
$snoin$ jt. sig.	0.001	0.0456	0.014	0.069
Ad. R^2	0.83	0.36	0.76	0.34

Note: Explanatory Variables: $snoin$, share of noninterest income; $Prov$, ratio of loan loss provision over total asset.