DETERMINANTS OF PROFITABILITY AND THE IMPACT OF DIVERSIFICATION ON BANKS' PROFITABILITY IN CANADA

by

Amin Kassam Ally
Masters of Business Administration,
Institute of Business Administration, Karachi, 1996

and

Jing Zhang
Bachelor of Business Administration,
Macau University of Science and Technology, 2015

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Name: **Amin Kassam Ally**

                                  Jing Zhang

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Supervisory Committee:

                              _____

                              Dr. Jijun Niu
                              Senior Supervisor
                              Associate Professor, Beedie School of Business

                              _____

                              Dr. Ying Duan
                              Second Reader
                              Assistant Professor, Beedie School of Business

Date Approved: _____

Abstract

This paper seeks to investigate the determinants of banks' profitability in Canada and the relationship between banks' profitability and income diversification using a sample of 8 Canadian bank holding companies from 2000Q1-2016Q2. We divide the 66 quarters into two periods which are pre-crisis (2000Q1-2007Q2) and post-crisis (2007Q3-2016Q2) and use the ordinary least squares estimation technique to run a series of panel regressions for the whole sample and two periods, respectively.

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Introduction

Banking sector plays an essential role in contributing to the country's economic growth and well-being. Banks are leading taxpayers, progressive employers and major purchasers of goods and services from suppliers as well as good corporate citizens. Due to its rigorous regulation, Canada's banking industry has proved itself to be one of the most stable banking systems all over the world. According to Canadian Bankers Association (CBA) a high degree of satisfaction and favourable impression allow the majority of Canadians to trust their banks to protect the privacy of their personal information and transactions.

In 2015, we have the following statistics with regard to the contributions of banking sector from Canadian Bankers Association (CBA):

1. It contributed about 3.3% to Canada's GDP.

2. It paid $ 7.3 billion in taxes to the federal governments and $ 15.9 billion in dividends to shareholders.

3. It employed 274,000 Canadians in the job market.

4. It provided financing to over 1 million small and medium-sized businesses.

In this paper, a sample of 8 Canadian banks (Bank of Montreal, Bank of Nova Scotia, Canadian Imperial Bank of Commerce, Canadian Western Bank, Laurentian Bank of Canada, National Bank of Canada, Royal Bank of Canada, and Toronto-Dominion Bank),

over the period 2000Q1-2016Q2 is used for two separate models. First model seeks to examine the determinants of Canadian bank profitability pre- and post- the financial crisis, as well as for the whole period (66 quarters in total). In order to find out the determinants of bank profitability, by applying the panel regression technique (Ordinary Least Squares), a model, which employs both ROA and ROE as proxy for profitability and various other bank-specific and macroeconomic factor as independent variables, is utilized. As for the second model, after including the time fixed effects and bank fixed effects, the relationship between income diversification and banks' profitability is investigated under the impacts of economic conditions and financial markets during different periods.

When it comes to the first model, our results show that although profitability, most of the time, is explained by several factors in the model, the bank size and GDP growth rate appear to be the most important contributing factors to the banks' portability in total period between 2000Q1 to 2016Q2, and in post-crisis period. For the pre-crisis period, however, capital ratio defined as bank's equity to total assets, replaces GDP growth rate and becomes one of the most significant factors that determine banks' profitability, along with bank size. The results are not surprising given the fact that economies of scale and overall stronger economic conditions enable banks to reduce its cost and have positive effect on profitability. This is evidenced by Alhassan (2015), suggesting that large banks have high efficiency in terms of cost and profit compared to small banks. In terms of a bank's capital, in general, highly capitalized banks are usually safer.

With regard to the second model, on the one hand, for the whole sample, a nonlinear relationship is found between banks' profitability and income diversification. On the other hand, we find no significant relationship between income diversification and banks' profitability for the pre-crisis period. As for the period after crisis, we observe that there is a significant positive and linear relationship between income diversification and bank profitability measured by ROA and ROE. This implies that banks with higher revenue diversification exhibit higher returns on both assets and equity.

Literature Review

Many researches have been conducted to study the determinants of profitability of banks in general and the impact of diversification in particular. Many researchers have focused on particular geographical areas, most of the time either focusing on the banking sector of one country or several countries in a specific region. Researchers have also addressed the research questions to find the change in relationship between profitability and those factors as the market went through different eras, such as pre and post financial crisis.

Researchers have found varied relationship between profitability and its determinants for different periods and markets, however, some of the determinants show similar effect as the periods and markets are moved. Here we summarize the findings of a few recent studies. Our objective is to identify the variables that affect bank profitability. We will then include these variables in our model.

Size: Alhassan (2015) estimates cost and profit efficiency scores of 26 Ghanaian banks from 2003 to 2011. He finds that large banks have high cost and profit efficiency than small banks. Dietrich and Wanzenried (2011) analyze the profitability of 372 banks in Switzerland from 1999 to 2009. They find that the effect of size on profitability changed over time. Before crisis, large and small banks are more profitable than medium-sized banks. However, after the crisis, large banks are less profitable than small and medium-sized banks. Trujillo-Ponce (2013) finds that size does not affect the profitability of Spanish banks. According to Dietrich and Wanzenried (2014) for 10,165 banks across

118 countries from 1998 to 2012, size has no effect on profitability for large and small banks. However, medium-sized banks seem to be slightly less profitable than small banks. Chronopoulos, McMillan and Wilson (2015), using data of US banks from 1984 to 2010, find a nonlinear relationship as up to certain asset size it is positively correlated with profitability and after that the relationship is reversed. In a paper by Djalilov and Piesse (2016), among Central and Eastern European bank from 2000 to 2013, size does not enter the equation in significant manner. Rumler and Waschiczek (2016) present finding on Austrian bank from 1996 to 2009, with no significant relationship between size and profitability. A paper by Saona (2016) shows a positive relationship between size and profitability for Latin American banks from 1995 to 2012. Tan (2016) examines a sample of Chinese banks from 2003 and 2011 and finds that bigger banks have lower profitability.

Capital Ratio: For 6851 US banks between 2008 and 2010, DeYoung and Torna (2013) find that equity tends to be associated with a reduced probability of failure. Brighi and Venturelli (2014) find capital ratio positively correlated to profitability and diversity, however, large bank can indulge into more diverse activities which can turn business more risk. Meslier and Tarazi (2014) find that an increase in capitalization translates into lower profits. Liu and Wilson (2010) suggest that for banks in Japan from 2000 to 2007 capital ratio is positively related to profitability. According to Dietrich and Wanzenried (2011), capital ratio does not have a significant impact on banks' profitability before the crisis. However, after the crisis, it has a negative impact on banks' profitability. Dietrich

and Wanzenried (2014) find a positive and significant effect on bank profitability for the high-income categories only while Chronopoulos, Liu, McMillan, and Wilson (2015) finds exactly opposite relationship. Results from Djalilov and Piesse (2016) suggest a positive relationship between capitalization and profitability for early transition countries and that for late transition countries the relationship is insignificant. According to Saona (2016), there is an inverse U-shaped relationship between the capital to assets ratio and banks' profitability, which is quite an interesting result.

Growth Rate of Customer Deposit: Dietrich and Wanzenried (2011) find growth of deposits has a significant and negative impact on bank profitability, while Dietrich and Wanzenried (2014) find it to be significant and positive.

Total Loan / Total Assets: Here the results are mixed: While Liu and Wilson (2010) find insignificant relationship with profitability, Trujillo-Ponce (2013) finds positive and highly significant and Rumler and Waschiczek (2016) report a significantly negative relationship.

GDP Growth: DeYoung and Torna (2013), Meslier, Tacneng, Tarazi (2014), Albert (2015), Kohler (2014), Trujillo-Ponce (2013), Dietrich and Wanzenried (2014), Chronopoulos, Liu, McMillan, and Wilson (2015), Rumler and Waschiczek (2016) and Tan (2016) all find a positive relationship between GDP growth and profitability. While Liu and Wilson (2010) and Saona (2016) find this relationship negative.

Inflation Rate: Trujillo-Ponce (2013), Dietrich and Wanzenried (2014), Rumler and Waschiczek (2016), Saona (2016) and Tan (2016) all find a positive relationship between inflation rate and profitability. On the other hand, Kohler (2014) observes a negative relationship.

Deposits to Assets Ratio: DeYoung and Torna (2013) find that core deposits reduce the probability of bank failure. Trujillo-Ponce (2013) finds that deposits increase bank profitability.

Diversification: Meslier, Tacneng, and Tarazi (2014) report a positive relationship between diversification and profitability of banks. Apergis (2014) reports a similar result, while Alhassan (2015) has to report somewhat opposite relationship. As per Albert (2015), diversification actually improves the expected risk-return. All other papers such as Kohler (2014), Liu and Wilson (2010), Chronopoulos, Liu, McMillan and Wilson (2015) and Tan (2016) find a negative relationship. As per Brighi and Ventrally (2014), doing a research on 52 Italian Banks during 2006-2011, if a bank increases its nontraditional revenue component as well as its size, profitability decreases. However, the risk adjusted profitability increases because this decreases the risk. A larger bank can invest more in the nontraditional segment because it can account for strategic experience in these activities; this means larger banks are better equipped to manage risk linked to non-interest income activities than smaller banks. A research done by Gambacorta, Scatigna and Yang (2014), finds a nonlinear relationship between diversification and

bank profitability, which is a very interesting result, as it can be seen that this paper also supports a similar result.

Cost over Income Ratio: Liu and Wilson (2010) find a negative effect of Cost-to-income ratio with profitability and so is the case with Trujillo-Ponce (2013) and Dietrich and Wanzenried (2014). However, Tan (2016) finds a positive and significant impact of overhead costs on the profitability of Chinese banks.

We have consulted three papers dealing with profitability of Canadian banks. In a paper by Xu and Tong (2012) they find loan to asset, equity to assets, deposits growth and total assets, all have positive coefficient with high significance. GDP growth comes out to be positive with coefficient of over 1 with high significance, which means it is one of the major factor affecting the profitability. Deposit to liability ratio shows a negative relationship with high significance while inflation rate does not have significant impact on profitability. According to Xu and Xie (2015), size, equity over total assets, loans to total assets, and GDP growth are highly significant and positive, while interest rate is positive and significant in terms of relationship with profitability in terms of ROA. Finally, Calmes and Theoret (2013) suggest that after properly scaling up performance for risk, the generally believed notion that "Canadian banking system is stronger than US banking system" does not hold water. However, it is important to mention here that the sample selected by them is up to 2009, as we do not know if same result can be obtained if data from the post-crisis period is evaluated.

To further the investigation on these factors specifically for Canadian banking industry, this paper undertakes a research to find the determinants of profitability and in particular the impact of diversification on profitability. We use quarterly data over the period 2000Q1 to 2016Q2 and also divide the whole period into two periods, i.e., pre-crisis (2000Q1-2007Q2) and post-crisis (2007Q3-2016Q2).

Data and Variables

Data

This paper analyzes quarterly data beginning from 2000Q1 till 2016Q2 of 8 Canadian banks. The data gathered are of two types: bank-specific variables and macroeconomic variables. Banks specific data is obtained from Bloomberg, while macroeconomic quarterly data for Canadian GDP growth and inflation rate based on quarterly CPI, are obtained from Organization of Economic Co-operation and Development website and Bank for Canada website, respectively. Following Xu and Xie (2015), we select 8 publicly-traded domestic bank holding companies ("banks") which have reported financial numbers from 2000Q1 to 2016Q2, including:

Bank of Montreal (BMO)

Bank of Nova Scotia (SCOTIA)

Canadian Imperial Bank of Commerce (CIBC)

Canadian Western Bank (CWB)

Laurentian Bank of Canada (LBC)

National Bank of Canada (NBC)

Royal Bank of Canada (RBC)

Toronto-Dominion Bank (TD)

There are altogether 66 quarters in our whole sample for each of 8 banks, which makes total number of observation 528 for each variable, except deposits growth where we lose

one observation for each bank for first observation as the base quarter deposit was beyond the sample size, which makes a total of 520 observations for deposits growth. Our preference for selecting quarterly data is due to the fact that by using yearly data, panel regression would not provide any meaningful conclusion due to its limited sample size.

Dependent Variables

This paper analyzes two separate models with first one concerning determinants of profitability and other related to impact of diversification on profitability of Canadian banks. Following Xu and Tong (2012) and Wu and Kachari (2015), we use return on assets (ROA) and return on equity (ROE) as measures of profitability. ROA is calculated as net income over total assets at the end of period and ROE is calculated as net income over book value of equity at the end of period. While ROA shows how much income is earned per dollar in assets and presented in percentage or ratio form, ROE basically shows the effect of leverage which results in magnified return per dollar book value of equity shown as either percentage or as ratio. ROE, also known as equity multiple, is the ratio of earning per dollar of equity (book value). Note that ROE is affected by leverage, and higher leverage is associated with higher risk. Therefore, ROA is our preferred measure of bank profitability, because ROA is not directly affected by leverage. Few other papers have also mentioned this, Golin (2001) points out that ROA emerges as a better and most common measure of profitability of banks. Gambacorta et al. (2014) also mainly use ROA as an indicator of profitability.

Figure 1 and 2 show the ROA and ROE of 8 Canadian banks over the sample period. It can be seen from these figures that both ROA and ROE follow the similar pattern, except that ROE follow the same patter with an amplified effect both in positive and negative directions. The maximum ROA is around 2.5% while ROE is above 40%, similarly, minimum ROA is little less than -2.5%, while ROE goes as low as below -60% for the same bank and time period. It can further be noted that amplification impact for each bank is different, which also varies for different time period, as it can be expected that with different level of leverage the impact of ROA on ROE varies. The summary statistics for the dependent variables are reported in Table 1.

Independent Variables

Common Variables

First, the independent variables which are common in both models, are presented here.

Size: Natural log (ln) of total assets for each year is used as a proxy for the size of any given bank. The reason for taking natural log is that, total assets are highly skewed, while the log of total assets is normally distributed, as this paper uses ordinary least square method for the panel regression. In many studies it was shown that size plays an important role, not only directly as determinant of profit but also, in determining the level of diversification and hence the profitability of a bank. Brighi and Valeria (2014) find that if a bank increases its size as well as non-traditional revenue component, profitability decreases, however, the risk adjusted profitability increases because of reduced risk.

According to research undertaken by Meslier and Tarazi (2014), bank size, measured by ln(Assets), has a positive impact on ROA, however, the impact decreases as the level of non-interest income increases. Generally, it is understood that as the size of a bank increases it gets benefit of economies of scale and there is positive impact on the profitability of the bank, however, after a certain level the benefit starts diminishing. Dietrich and Gabrielle (2011) find that before financial crisis large and small banks in Switzerland were more profitable as compared to medium-sized banks, however, post crisis large banks were less profitable than small and medium-sized banks. We therefore include size in the models to see its impact on bank profitability.

Capital Ratio: It is defined as total equity divided by total assets. This ratio shows the extent to which a bank uses internal funds to fund its assets. The higher the capital ratio, the safer the bank is. There is an inverse relationship between leverage, which is given by total liability over total equity, and capital ratio. It is widely known that higher leverage makes a bank financially riskier, which means in exact reverse order lower the capital ratio the riskier a bank financially. At the same time, it is intuitive to understand that higher capital ratio enters the profitability equation positively, in terms of ROA. This is because when the equity will be higher there will be lesser interest charges due to lower level of liabilities, resulting in a higher profit and a higher return on total assets. On the other hand, its impact is neutralized on ROE as equity enters into the denominator of the equation, while it is in numerator for Capital ratio. Liu and Wilson (2010) find that capital ratio has a positive and significant relationship with profitability for banks in

Japan. According to Dietrich and Wanzenried (2011), capital ratio does not have a significant impact on bank profitability before crisis, however after crisis it has a negative and significant effect on profitability in terms of ROAA. Saona (2016) finds an inverse U-shaped relationship between the capital ratio and profitability. In this paper we include capital ratio in both models to see whether it affects bank profitability.

Determinants of Profitability Model (Model 1) Specific Variables

Total Deposits to Total Liability Ratio: One can argue that the higher the total deposit to total Liability ratio, the more stable a bank in terms of sources of fund. Deposits normally tend to be more stable than other liabilities as during the economic downturn it is difficult to obtain funds from other sources and it may become more expensive. Based on this premise, the paper includes total deposits to total liability ratio in the first model to see if it has a positive impact on profitability and to what extent and significance level.

Growth Rate of Total Deposits: For a smaller bank attaining higher growth rate is relatively easier as compared to a large bank as large banks already have sizable deposit base. Having said that, the impact of growth rate of deposits can be two-edged sword, that is if a bank is able to translate higher growth of total deposit into higher growth in quality-assets then it would positively affect the profitability. In the event where a bank fails to deploy its increasing deposit base into profitable and more stable income generating business, then this could lead to negative relationship between given independent and dependent variables. This paper uses growth rate of total deposits in the

first model with the expectation that the impact of this variable would be positive and significant relationship with profitability. Analysis of the model will verify if the assumption is correct or if there is any other, or no, relationship between growth of deposits and profitability.

Total Loan to Total Assets Ratio: Liu and Wilson (2010) find that relationship between total loan to total assets ratio and profitability is insignificant. On the contrary, Trujillo-Ponce (2013) finds a positive and highly significant coefficient of loans to total assets with profitability, in terms of both ROA and ROE. Another paper by Rumler and Waschiczek (2016) presents significantly negative relationship with both. This means that as the period of research and geographic location of the banks change, they show a very diverse kind of result as far as relationship between total loan to total assets ratio and ROA or ROE is concerned. This paper includes this independent variable to see its relationship with profitability for Canadian bank during the period under analysis as whole and as well as pre and post crisis.

GDP Growth and Inflation Rate: Most of the paper consulted show a positive relationship and many show significant relationship between the GDP growth and profitability of banks. Similar relationship was found for inflation rate as well. This paper includes both the independent variable with an expectation that overall both will enter the profitability equation positively, but it is not sure if it will be significant or not. Analysis is undertaken here to see if same relationship holds pre and post-crisis period as well. Just

to show how GDP and inflation rate behaved during the period under analysis, a graph is presented in Figure 3 in appendix.

Diversification Model (Model 2) Specific Variables

Diversification and Diversification Squared ratio: This ratio is arrived through dividing non-interest income by total interest income plus non-interest income. The higher the ratio the more diversified a bank's revenue generation activities as the bank would be more involved in non-traditional income generation activities. As it is anticipated that the relationship between diversification ratio and profitability would be nonlinear, in this model diversification squared is entered as another independent variable.

Apergis (2014) finds a positive and significant relationship between bank diversity and profitability. According to Kohler (2014), substantial benefits are to be gained from income diversification and it has been shown by monetizing the per dollar impact of both traditional business vs nontraditional business and it was shown that nontraditional business effects profitability more per dollar. Many other papers have found similar relationships and this paper seeks the relationship between diversification and profitability by dedicating a separate model (Model 2) for this purpose. It is expected that result would show a nonlinear relationship as intuitively speaking first dollar of diversification business would have higher impact on profitability as compared to subsequent dollars of diversification business. So it is expected that this relationship will

be of diminishing return and after certain point further diversification might have

negative impact as then the banks would move too far from its core traditional business.

Methodology

To investigate the external and internal determinants of bank profitability and the impact of income diversification on banks' profitability and returns, a panel regression with the ordinary least squares (OLS) regression model is used for both the models under discussion.

Determinants of Profitability Model (Model 1)

ROA = α+ β1∗LNA+ β2∗EAR + β3∗DLR + β4∗GRD + β5∗LAR+ β6∗ GGR + β7∗IR + ε

ROE = α+ β1∗LNA+ β2∗EAR + β3∗DLR + β4∗GRD + β5∗LAR+ β6∗ GGR + β7∗IR + ε

1. LNA = Ln(Assets)

2. EAR = Equity / Total Assets Ratio

3. DLR = Total Deposits / Total Liability Ratio

4. GRD = Growth Rate of Total Deposit

5. LAR = Total Loan / Total Assets Ratio

6. GGR = Quarterly GDP Growth Rate

7. IR = Inflation Rate

8. α = intercept

9. ε = error term

We follow the model presented by Xu and Tong (2012) where they do a similar analysis for big five Canadian bank from 1994Q1 to 2012Q2. We also make comparisons between

our and their results in Empirical Results section to see how the results change when three more banks are included in sample and period is extended up to 2016Q2. It is expected that some interesting similarities in the results would be seen and where the results differ we can further delve into the possible reasons for such deviations.

Diversification Model (Model 2)

$$ROA = \alpha + \beta1*LNA + \beta2*EAR + \beta3*DAR + \beta4*DLA + \beta5*LDR + \beta6*DIV + \beta7*DIV^2 + \beta8*CIR + \varepsilon$$

$$ROE = \alpha + \beta1*LNA + \beta2*EAR + \beta3*DAR + \beta4*DLA + \beta5*LDR + \beta6*DIV + \beta7*DIV^2 + \beta8*CIR + \varepsilon$$

1. LNA = Ln(Assets)

2. EAR = Equity / Total Assets Ratio

3. DAR = Total Deposit / Total Assets Ratio

4. DLA = Total Deposits +Total Loan / Total Assets Ratio

5. LDR = Total Loan / Deposits Ratio

6. DIV = Non-interest Income / Total Operating Income Ratio

7. CIR= Operating Cost / Net Income Ratio

8. α = intercept

9. ε = error term

To arrive at above model we follow a similar research done by Gambacorta, Scatigna and Yang (2014) on nonlinear relationship between diversification and bank profitability for 98 international banks from 27 countries during 1994 to 2012, using annual financial results. Following the same model, we also include the time fixed effects and bank fixed effects in the second model. Time fixed effects are included to control for the aggregate economic environment. In the second model, the main objective is to find out the impact of noninterest income on banks' profitability. To do so, we need to control for other variables that may influence bank profitability. This is why we include control variables such as size and capital in the regression. However, there are other variables -- such as management quality -- that are difficult to measure but may also affect bank profitability. To control for such variables, we follow Gambacorta, Scatigna, and Yang (2014) and include bank fixed effects in the regression.

The first model includes macroeconomic independent variables such as GDP growth rate and inflation rate. The second model includes both time fixed effects and bank fixed effect instead. Both models have been used by previous researchers, and there is no consensus about which model is better, we therefore use both models in our paper.

For both models we further bifurcate data into pre and post financial crisis. This can be justified by Figure 4 from Citigroup High-Yield Index (Yield Book) which suggests that the US yield curve volatiles under the influence of different overall economic conditions. Since Canadian economy is highly related to the economic state of US, we expect that

Canadian banks' profitability and returns would show wide fluctuation under typical

economy. Therefore, we divide the sample period into two periods, which are before

crisis (2000Q1-2007Q2) and after crisis (2007Q3-2016Q2) and run regression for both

periods separately.

Empirical Results

Summary Statistics and Correlation Matrix

We have altogether 8 banks in panel data and when we put all of them together it is like one big panel data comprising of 528 observations. This is because we have 66 quarters from 2000Q1 to 2016Q2 for each bank. The summary statistics for our data is presented in Table 2.

Summary results of ROA and ROE are already presented in Dependent Variable subsection of Data which is subsection of Data and Variable section and presented in Table 1 and plotted in Figure 1 and 2. If we further compare our results in Table 1 and 2 with the results of Xu and Tong (2012) where they do a similar analysis for big five Canadian bank from 1994Q1 to 2012Q2 we find that as compared to mean ROA and ROE of 0.0073 and 0.1337 respectively, for our data, their mean ROA and ROE come out to be 0.0067 and 0.1553 respectively. Thus, the means of ROA and ROE for banks in our sample are close to those in their sample.

Mean of deposit to liability ratio is somewhat closer and has not changed much, which means this ratio is stable in Canadian banking market over the period and for smaller and larger banks alike. As far as the deposits growth is concerned, it is strikingly similar in terms of mean, minimum, maximum and standard deviation, suggesting that deposits has grown at a similar pace and change of period or sample banks have no significant impact on it.

For diversification model, we first compare our results with that of Gambacorta, Scatigna and Yang (2014). ROA, in their analysis, has a mean of 0.006 as compared to that in ours 0.0073 and diversification has a mean of 0.0735 as compared to that in our sample of 0.2738. This means ROA wise both the samples have shown somewhat similar results while diversification in case of Canadian banks is much higher than the selected 98 banks from 27 countries.

We also compare our results with the results of Wu and Kachari (2015) where they do a similar diversification model for 2,897 US bank holding companies between 2002 and 2014 using annual financial data. First of all, for US banks, ROA is 0.012 for large banks, 0.009 for medium sized banks and 0.010 for small banks. This means that Canadian Banks ROA remains lower than that of US banks generally. Similarly, for ROE, US banks have a mean of 0.121 for large banks, 0.092 for medium sized banks and 0.114 for small banks. This shows a contrasting result as we see that Canadian banks has a mean higher than all categories of US banks. The obvious reason for this is the low capital ratio for Canadian banks on average as compared to US banks, which allows Canadian banks to get higher return on equity while their return on assets were lower than that of US banks.

As far as the diversification ratio is concerned, we observe that Canadian banks have a mean of 0.2738 with the standard deviation of 0.1182. In the case of US banks, diversification ratio is higher for large banks with a mean of 0.305, as compared to small

and medium sized US banks. At the same time, mean diversification of large US banks is higher than that of Canadian banks, but standard deviation of US large banks is also higher, which is 0.283, suggesting higher deviation from mean for all banks in that group in general meaning higher ratio of banks which are away from the mean diversification. Mean diversification for both medium sized (0.189) and small US banks (0.152) are less than that of Canadian banks, which means Canadian banks are more diversified than medium sized and small US banks on average.

We also look into the correlation between each independent variable and the result of that correlation is shown in the form of matrices presented in Table 3 and 4.

Panel Regression Results

Regression results for each model is presented separately here.

Determinants of Profitability Model (Model 1)

Table 5 shows the results of first regression analysis, we have shown both independent variables, namely ROA and ROE, and how the result of regression looks like for whole period between 2000Q1 and 2016Q2. For size, the coefficient for ROA is smaller (0.000656) as compared to that for ROE (0.0126), but both are statistically highly significant ($p < 0.01$). This can be inferred intuitively as well since size is expected to have significant impact on overall profitability of banks because with the bigger size banks get

the advantage of economies of scale. This result is also consistent with the results of other similar researches done by Alhassan (2015) and Saona (2016).

For capital ratio, we find that there is a positive correlation with both ROA and ROE, however, the statistical significance is very high for its impact on ROA, while that for ROE, it is not significant. This result is in line with the general understanding that the higher the capital ratio, the less the interest cost. Because the bank will be relying more on internal funds i.e. equity. For ROE, the impact becomes less significant as ROE itself has capital in its denominator and hence the impact of capital ratio, defined as equity over assets, gets canceled out.

The p-values for both total deposit to liabilities ratio and total deposits growth are greater than 0.1, which are statistically insignificant independent variables. This means that both total deposits to liability ratio and total deposit growth rates, they do not have significant impact on profitability of banks in Canada. This result is in contrast to what we expected before the analysis where the view was that these factors might have some significant relationship with profitability.

Total loans to total assets ratio has a positive significant relationship with ROA in our analysis, however, for ROE, this relationship is not significant. In other researches we find mixed relationships, for example, Liu and Wilson (2010) find an insignificant relationship between loan to total assets and profitability at both ROA and ROE level. While Trujillo-Ponce (2013) finds that there is a highly significant positive relationship

between above mentioned independent variable and profitability at both the levels, Rumler and Waschiczek (2016) find a significantly negative effect of loan to total assets on ROE.

GDP growth has a highly significant relationship with both ROA and ROE according to results of our analysis. This confirms our expectation of banks performing well and earning higher returns during stronger economy cycles. Inflation, however, has no significant relationship with profitability contrary to what we expected earlier.

For the analysis purpose, we consider 2000Q1 to 2007Q2 as before crisis period and 2007Q3 to 2016Q2 as after crisis period. As shown in Table 6, if we compare results between two periods, we find the following important comparisons. For size and capital ratio, the relationship with ROA do not change during these two periods as it stays highly significant and positive. Similarly, for deposits to liability ratio and inflation rate, the significance level remains unchanged as it is not significant in both the periods for ROA. However, for deposits growth rate the relationship with ROA is highly significant pre-crisis but it has turned insignificant after crisis. One of the explanations for this change is that before crisis, banks have ample opportunities to invest and higher deposits allow them to earn more at the assets side. During the post-crisis period, not only the opportunities are limited but also banks were more cautious, therefore there are less options to invest increased deposit. This means an increase in deposit which has additional cost attached to it, might not be able to earn proportionately, thereby putting

downward pressure on overall profitability of the banks at worse and cause the profitability to be neutral at best. This result is in line with our expectation as we are of the view that deposit growth can be significant in terms of profitability if there are opportunities available to deploy those deposits to earn better profit.

Independent variable such as loans to total assets ratio and GDP growth rate have no significant impact on ROA before crisis, whereas GDP growth has highly significant impact, loan to assets has a significant relationship post crisis. The result shows that GDP growth has consistent impact on ROA post crisis as compared to what it has before crisis, reason being in post-crisis period banks profitability is dependent on GDP growth as compared to before, when banks were enjoying high profitability regardless of the GDP growth rate.

As we can see from Table 7, ROE has similar relationship as ROA with size in both post and pre-crisis periods. However, capital ratio has highly significant and a positive impact with a coefficient of 1.58 before crisis on ROE which changes to not significant after crisis. This means that the pre-crisis capital ratio plays an important role as one of the determinants of ROE, which is not the case for post-crisis period. One of the reasons might be that the post-crisis period reduced interest rate on liabilities and rendered this relationship insignificant.

During both pre and post-crisis periods, three independent variables namely deposit to liabilities ratio, loans to total assets ratio and inflation do not have any significant impact

on ROE, as the case with total period under our analysis. GDP growth has insignificant impact on ROE before crisis, but it has highly significant and positive relationship with ROE post crisis. The results are same as we saw in case of ROA. Most of the research paper we consulted find a positive relationship between profitability and GDP growth in general.

Diversification Model (Model 2)

Regression results for this model is presented in Table 8. Meslier, Tacneng, and Tarazi (2014) find results indicating that income diversification and a shift toward non-interest income has a positive influence on the profitability and risk-adjusted profitability of Philippine banks. In our research, we calculate the diversification ratio by dividing the non-interest income by total interest income plus non-interest income and then we use diversification squared, which is simply a square of diversification ratio, to see if the nonlinear relationship between diversification and profitability prevails.

As per our empirical analysis, after including time fixed effects and banks fixed effects in the model, we find a nonlinear relationship between diversification and profitability which can be seen in Figure 5. In this graph, diversification ratio beyond 0.51 is essentially extrapolated by the equation as in our data the maximum diversification ratio found is 0.51. We expect similar relationship between ROE and diversification ratio with somewhat more curvilinear relationship as we can see that coefficient for diversification

and diversification squared both are bigger number in case of ROE, with similar significance and signs.

Similar results are drawn by Gambacorta, Scatigna and Yang (2014), according to them, diversification and profitability go hand in hand up to point (30%) after which ROA starts declining. They find that for US banks, the diversification is closer to the level where ROA can be maximized while for other countries the level of diversification is lower. Regardless of point of decline, our results and that of above mentioned paper are same in essence as both papers show the result in which we have a hump shaped curve, which proves the nonlinear relationship between diversification and profitability.

Another similar research done by Wu and Kachari (2015) on 2,897 US bank holding companies between 2002 and 2014, use annual financial results. Following coefficients for ROA and ROE regression analysis are reported by them using similar model:

VARIABLES	ROA	ROE
Diversification Ratio	0.0652***	0.925***
Diversification Ratio Squared	-0.0455***	-0.740***

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

We can see that their results also follow a similar kind of projection and if plotted, the result is almost similar relationship, which is nonlinear, between diversification ratio and profitability and even significance level is very similar to our results.

Other three independent variables, namely total deposits to assets ratio, retail ratio and total loans to total deposits ratio, have no significant relationship with the profitability measured by ROA and ROE. However, cost to income ratio, calculated as operating cost divided by net income, enters as highly significant and negative factor for both ROA and ROE. Similar results are found by Liu and Wilson (2010), Trujillo-Ponce (2013) and others (as reported in literature review). This result is very intuitive since it suggests that higher the cost as compared to net income the lower the profitability.

We bifurcate periods into pre and post financial crisis and find the results presented in Table 9 using ROA as the dependent variable for our diversification model. It is evident that in pre-crisis period, diversification ratio has no significant relationship with ROA while it is highly significant post crisis era. Diversification squared, which has significant relationship with ROA when the whole data is considered, changes its relationship to insignificant when the data is bifurcated into both pre and post crisis. Our results are matching with results of research by Wu and Kachari (2015) if we consider medium sized and small banks in their paper. This means that for post-crisis period the relationship between diversification ratio and ROA is somewhat linear, suggesting that during post crisis time, as banks do not enjoy similar level of earning opportunity in terms of

traditional income activities, they have to rely more and more on nontraditional activities to increase profitability in terms of ROA.

Total deposits to assets ratio, retail ratio and loans to deposits ratio have no significant relationship with ROA before crisis, but they all show significant relationship with ROA in the post-crisis period. While retail ratio has positive relationship, other two are negatively related to ROA. Cost to income ratio is negatively related to ROA in both the period but its significance improves from significant to highly significant from pre to post-crisis periods, which means higher the cost to income lower the overall profitability, which aligns with our intuitive reasoning.

Similar to what we do for ROA, we bifurcated data into post and pre financial crisis period for ROE as well and results of regression are shown in Table 10. Diversification enters the ROE equation in similar fashion as it does with ROA, i.e. pre-crisis period, it is not significant and post crisis it is highly significant, while diversification square is not significant in both the periods. This means that for post-crisis period, the relationship between diversification ratio and ROE is somewhat linear, as is the case with ROA, suggesting that in post crisis era banks having higher diversity tend to earn better ROE, other things being equal. Other independent variables have shown similar patterns with ROE as they show with ROA.

Conclusion

We conduct a research on 8 Canadian Schedule Ⅰ banks, which are involved in deposit taking activities. We only include those banks for which we have data available between 2000Q1 and 2016Q2 and altogether there are 66 quarterly data for 8 banks. We use ROA and ROE as measures of profitability and they enter into the regression as dependent variables on both the models we analyze.

For the first model, that is determinants of profitability model, we find size and GDP growth are the most significant factors contributing to banks profitability in terms of both ROA and ROE. Meslier, Tacneng and Tarazi (2014) find similar relationship between size and ROA while considering 39 commercial banks in Philippines between 1999 and 2005. Capital ratio, on the other hand, has high significance only with ROA and not with ROE, as capital enters as denominator in ROE calculation and thus nullifies its impact. The reason for this relationship is intuitively aligned as when a bank has higher capital ratio it would incur less interest expenses and thus the higher ROA.

When it comes to the period before crisis, size and capital ratio are two most significant determinants of profitability measure both in terms of ROA and ROE. While size and GDP growth remain most significant determinants of profitability in post-crisis period.

In our second model, that is the diversification model, when we look at whole period the relationship between diversification ratio and profitability, in terms of ROA and ROE, is

nonlinear after including time fixed effects and bank fixed effects. The results also suggest that as banks starts to diversify their income generation venues initially the benefits are very high but the benefits tend to have diminishing effect after certain level of diversification. Graph of ROA and diversification ratio, presented in Figure 5, also depicts this result and we can observe that ROA is maximized at certain diversification level after which it starts declining. Gambacorta, Scatigna and Yang (2014) and Wu and Kachari (2015) find similar relationship between diversification and profitability.

In sub periods, we see that there is no significant relationship between diversification and profitability in pre-crisis, while in post-crisis period a linear relationship is found between them. One of the reasons could be that diversification does not come out to be the significant factor for profitability pre-crisis owing to the robust economic conditions where even those banks which were not well diversified were faring well.

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Appendix

Table 1:   Summary Table Only for ROA and ROE for Data Under Analysis

Variables	Return on Assets	Return on Equity
Observations	528	528
Mean	0.0073	0.1337
Standard Deviation	0.0036	0.0681
Min	-0.026	-0.617
Max	0.0288	0.4154

Table 2:   Summary Statistics of All Variables for Data Under Analysis

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
ROA	528	0.0073	0.0036	-0.0260	0.0288
ROE	528	0.1337	0.0681	-0.6169	0.4154
Size	528	11.9657	1.5512	7.8882	13.9981
Capital Ratio	528	0.0546	0.0118	0.0375	0.1000
Total Deposits to Total Liability Ratio	528	0.7350	0.0975	0.5356	0.9669
Growth rate of Total Deposits	520	0.0206	0.0411	-0.1592	0.2235
Total Loan to Total Assets Ratio	528	0.5576	0.1426	0.3657	0.8819
Total Deposits to Total Assets Ratio	528	0.6948	0.0860	0.5109	0.8966
Retail Ratio	528	1.2523	0.2206	0.9253	1.7492
Total Loans to Total Deposits Ratio	528	0.7941	0.1264	0.5674	1.1335
Diversification Ratio	528	0.2738	0.1182	-0.7824	0.5133
Diversification Ratio Squared	528	0.0889	0.0628	0.0030	0.6121
Cost to Income Ratio	528	0.4093	0.0900	0.1945	0.7837

Table 3:   Correlation Matrix for Determinants of Profitability Model (Mode 1)

	Size	Capital	Deposits to liabilities	Deposits to labilities	Loans to assets	GDP growth	Inflation
Size	1						
Capital	-0.4352	1					
Deposits to liabilities	-0.736	0.6071	1				
Deposits growth	-0.0369	0.0627	0.1269	1			
Loans to assets	-0.8397	0.4907	0.8554	0.0619	1		
GDP growth	-0.0487	0.0315	0.038	0.0141	0.0195	1	
Inflation	-0.1077	-0.0941	0.043	-0.0029	0.0129	0.1817	1

Table 4: Correlation Matrix for Diversification Model (Model 2)

	Size	Capital	Deposits to assets	Retail ratio	Loans to deposits	Diversification	Diversification squared	Cost to income
Size	1							
Capital	-0.4321	1						
Deposits to assets	-0.7329	0.5397	1					
Retail ratio	-0.8288	0.5263	0.942	1				
Loans to deposits	-0.7175	0.2984	0.5343	0.7856	1			
Diversification	0.6079	-0.2927	-0.6456	-0.663	-0.4799	1		
Diversification squared	0.5877	-0.2595	-0.6142	-0.6396	-0.4837	0.6081	1	
Cost to income	0.5687	-0.355	-0.5853	-0.6153	-0.4596	0.5547	0.7497	1

Table 5:   Regression Result using ROA and ROE as dependent variable
(from 2000Q1 to 2016Q2)

VARIABLES	ROA	ROE
Size	0.000656***	0.0126***
	(0.000169)	(0.00359)
Capital Ratio	0.146***	0.348
	(0.0151)	(0.321)
Total Deposits to Total Liability Ratio	-0.00117	-0.0137
	(0.00308)	(0.0654)
Growth rate of Total Deposits	0.00560	0.120
	(0.00344)	(0.0730)
Total Loan to Total Assets Ratio	0.00416*	0.0655
	(0.00240)	(0.0508)
Growth Rate of Quarterly GDP	0.0564**	1.045**
	(0.0231)	(0.490)
Inflation	0.0110	0.185
	(0.0164)	(0.348)
Constant	-0.0106***	-0.0736
	(0.00326)	(0.0693)
Observations	520	520
R-squared	0.222	0.046

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6:   Regression Results using ROA as dependent variable
A comparison before and after Financial Crisis

VARIABLES	ROA Before Crisis	ROA After Crisis
Size	0.00103***	0.000692***
	(0.000393)	(0.000220)
Capital Ratio	0.212***	0.136***
	(0.0357)	(0.0169)
Total Deposits to Total Liability Ratio	-0.00675	-0.000662
	(0.00803)	(0.00359)
Growth rate of Total Deposits	0.0125**	0.00259
	(0.00621)	(0.00398)
Total Loan to Total Assets Ratio	0.00729	0.00557*
	(0.00574)	(0.00308)
Growth Rate of Quarterly GDP	-0.0624	0.0706***
	(0.0584)	(0.0249)
Inflation	-0.0261	0.0123
	(0.0306)	(0.0204)
Constant	-0.0142*	-0.0118***
	(0.00814)	(0.00373)
Observations	232	288
R-squared	0.165	0.320

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Regression Results using ROE as dependent variable
A comparison before and after Financial Crisis

VARIABLES	ROE Before Crisis	ROE After Crisis
Size	0.0192**	0.0144***
	(0.00850)	(0.00457)
Capital Ratio	1.580**	0.205
	(0.773)	(0.352)
Total Deposits to Total Liability Ratio	-0.124	-0.0159
	(0.174)	(0.0748)
Growth rate of Total Deposits	0.254*	0.0630
	(0.134)	(0.0828)
Total Loan to Total Assets Ratio	0.125	0.106
	(0.124)	(0.0641)
Growth Rate of Quarterly GDP	-1.475	1.313**
	(1.263)	(0.519)
Inflation	-0.628	0.222
	(0.662)	(0.424)
Constant	-0.127	-0.113
	(0.176)	(0.0776)
Observations	232	288
R-squared	0.073	0.072

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Regression Result using ROA and ROE as dependent variable (from 2000Q1 to 2016Q2)

VARIABLES	ROA	ROE
Diversification Ratio	0.0129***	0.303***
	(0.00175)	(0.0364)
Diversification Ratio Squared	-0.00706*	-0.214***
	(0.00397)	(0.0825)
Size	0.000804	0.00791
	(0.000834)	(0.0173)
Capital Ratio	0.0892***	-0.481
	(0.0219)	(0.454)
Total Deposits to Total Assets Ratio	-0.0440	-0.699
	(0.0539)	(1.120)
Retail Ratio	0.0305	0.518
	(0.0299)	(0.622)
Total Loans to Total Deposits Ratio	-0.0130	-0.203
	(0.0194)	(0.403)
Cost to Income Ratio	-0.0147***	-0.327***
	(0.00349)	(0.0725)
Constant	-0.00194	0.129
	(0.0211)	(0.438)
Time fixed effects	Yes	Yes
Bank fixed effects	Yes	Yes
Observations	528	528
R-squared	0.571	0.496

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Regression Results using ROA as dependent variable
A comparison before and after Financial Crisis

VARIABLES	ROA Before Crisis	ROA After Crisis
Diversification Ratio	0.00712	0.0133***
	(0.0333)	(0.00181)
Diversification Ratio Squared	0.0177	-0.000245
	(0.0534)	(0.00414)
Size	0.00165	-0.00387*
	(0.00255)	(0.00224)
Capital Ratio	0.164***	0.0490**
	(0.0579)	(0.0246)
Total Deposits to Total Assets Ratio	-0.185	-0.104*
	(0.149)	(0.0531)
Retail Ratio	0.112	0.0600**
	(0.0836)	(0.0290)
Total Loans to Total Deposits Ratio	-0.0787	-0.0393**
	(0.0563)	(0.0195)
Cost to Income Ratio	-0.0131*	-0.0193***
	(0.00680)	(0.00447)
Constant	0.0322	0.0868**
	(0.0543)	(0.0392)
Time fixed effects	Yes	Yes
Bank fixed effects	Yes	Yes
Observations	240	288
R-squared	0.432	0.751

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Regression Results using ROE as dependent variable
A comparison before and after Financial Crisis

VARIABLES	ROE Before Crisis	ROE After Crisis
Diversification Ratio	0.297 (0.729)	0.321*** (0.0332)
Diversification Ratio Squared	0.0952 (1.170)	-0.0473 (0.0757)
Size	0.00627 (0.0557)	-0.0471 (0.0410)
Capital Ratio	0.749 (1.267)	-1.048** (0.450)
Total Deposits to Total Assets Ratio	-3.504 (3.253)	-1.624* (0.971)
Retail Ratio	2.138 (1.830)	0.992* (0.531)
Total Loans to Total Deposits Ratio	-1.559 (1.234)	-0.614* (0.356)
Cost to Income Ratio	-0.263* (0.149)	-0.443*** (0.0818)
Constant	1.072 (1.189)	1.284* (0.718)
Time fixed effects	Yes	Yes
Bank fixed effects	Yes	Yes
Observations	240	288
R-squared	0.355	0.737

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Figure 1

Return on Assets (ROA) For 8 Banks Under Alanalysis Period

Figure 2

Return on Equity (ROE) For 8 Banks Under Analysis Period

Figure 3

Canadian GDP Growth and Inflation Under Analysis Period

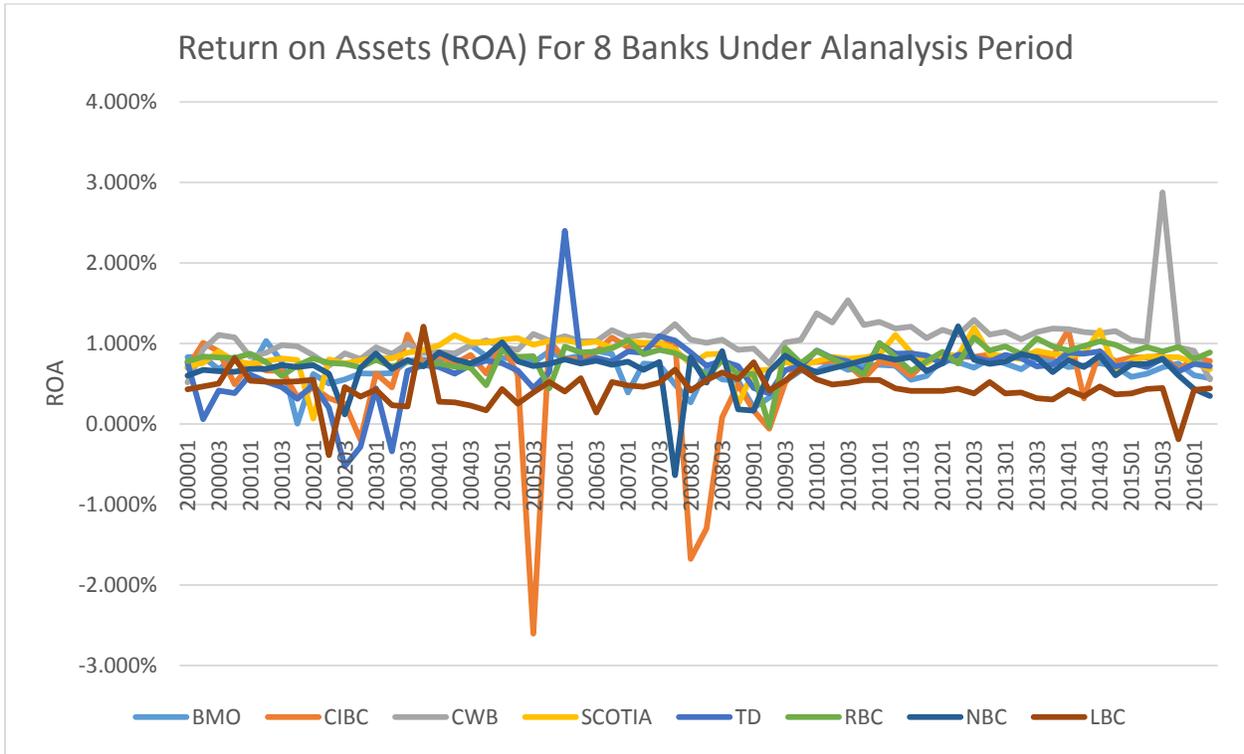**Figure 4**
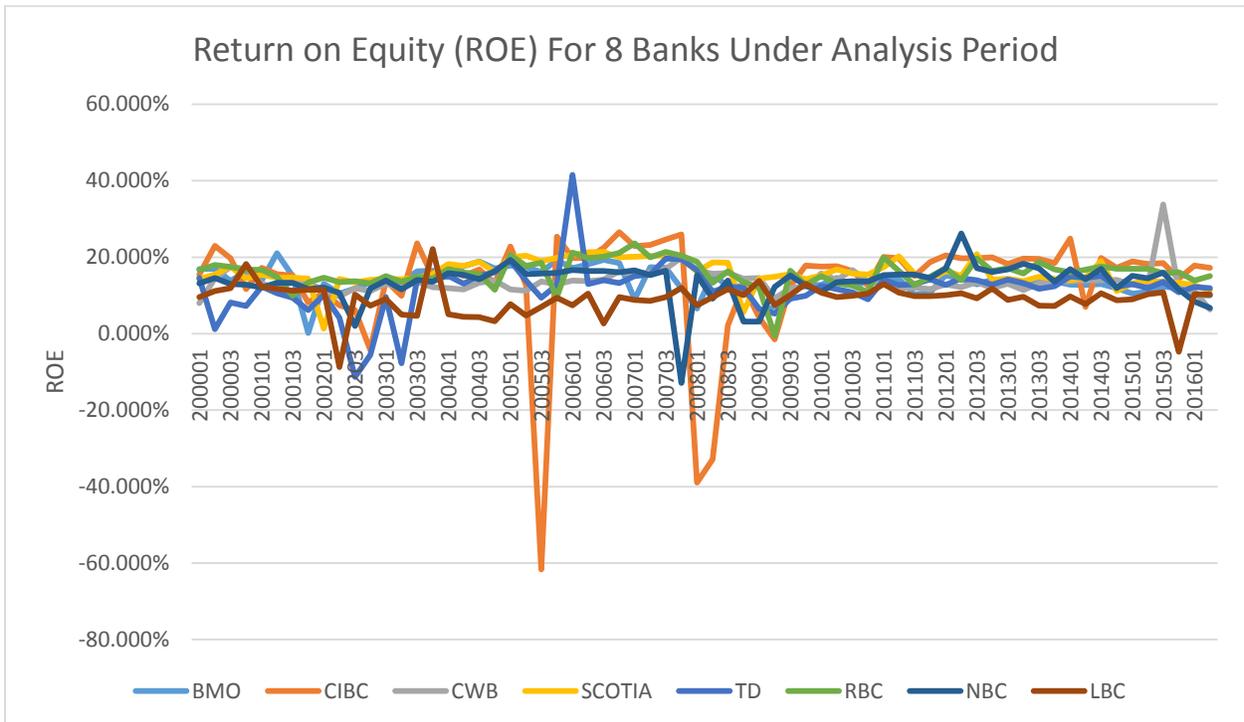

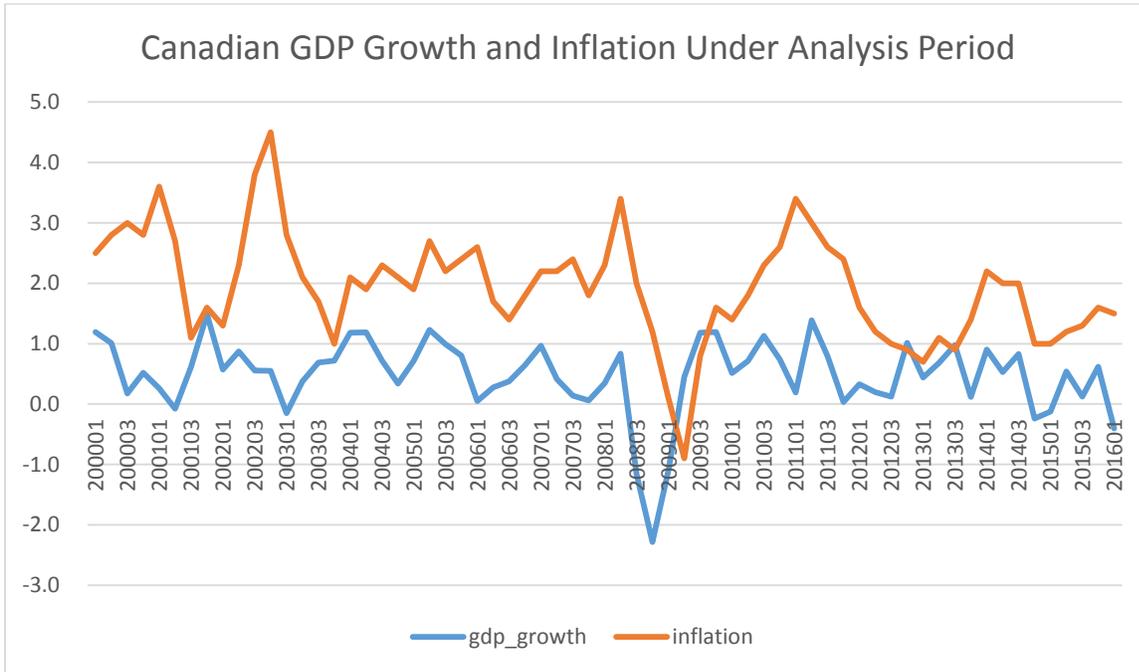--- US High-Yield Market Index --- US High-Yield Market Index Capped*

*The US High-Yield Market Capped Index uses the US High- Yield Market Index as its foundation but caps the total debt of any single issuer at USD 15 billion of par amount outstanding and also delays the entry of fallen angels for a minimum of one month after their downgrade to high-yield status.

Source: Citigroup High-Yield Index (Yield Book)

Figure 5

Non Linear Relationship Between ROA and Diversification Ratio