RISK AND INCOME DIVERSIFICATION IN THE VIETNAMESE BANKING SYSTEM

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Abstract:

The study sheds light on the impacts of income diversification on risks of the Vietnamese banking industry. By analyzing a broad set of 32 local commercial banks during the period from 2005 to 2012, we find the evidence that bank with high non-interest income present lower risk than those with mainly interest income. Considering size effects, the results are also mostly accurate for large banks. However, for small banks, the impacts of income diversification are not confirmed clearly. In addition, the paper investigates two samples: listed and unlisted banks. The results also indicate the positive effects of the diversification on banking risks of these categories.

1. Introduction

The development and success of banking systems depend totally on the demand for financial services of the society. Therefore, the expansion of this demand enables banks to diversify their functions. Deposit and lending are no longer the only activities that generate profits for banks. Along with traditional lending activities, new services especially consulting services and investment have opened an innovative business trend based on staff professionalism and an intensive network. Technological advancements help shorten the processing time, as a result, banks have more time in deploying new services and facilities. Furthermore, enhanced competition in credit activities among domestic banks and even international banks forces banks to switch to a new strategy of seeking non-interest income. This income has increased faster than the traditional ones in developed countries. The fall in marginal interest encourages banks to raise banking fees, such as those of cash withdrawal, account management, data management etc. Because of such drastic changes in business environment and an abundant capital advantage, banks are now actively engaging in investment and investment brokerage activities as well as mergers and acquisitions.

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The Vietnamese banking system does not stay outside of that trend. By 2013, there are 37 commercial banks operating in Vietnam with total assets approximately 1.5 times of Vietnam's GDP. In addition, the Vietnamese banking system includes two state-owned banks, one bank for social policies, 50 branches of foreign banks, four joint-venture banks, five 100% foreign owned banks, 50 representative offices of foreign banks, 18 finance companies, 12 finance leasing companies and 968 credit cooperatives. Banks become larger and larger in size, especially in credit activities. However, as a result of a chronic hot credit growth, Vietnamese banks also face with challenges in controlling of bad debts. In practice, banks' risks are increasing. Firstly, quality of properties tends to deteriorate, evidenced by an increase in non-performing loan (NPL)[4]. As calculated by Vietnam, the NPL of the Vietnamese banking system in 2013 is from above 6% to above 8% (this figure by international organizations is above 15%). Secondly, capital safety is relatively low, which is reflected by a decrease in capital adequacy ratio (CAR). Diversification of activities becomes an approach which banks resort to reduce this pressure. However the question motivating to conduct this study is whether such diversification reduces risks of bank activities.

2. Literature Review

This section discusses the results of the empirical literature on bank income structure. So far, a number of studies have been conducted. However, the impacts of income diversification on banking risks are not consistent (Saunders and Walter (1994)). Several studies indicate that the combination of lending activities and non-interest activities allows banks to obtain the diversification benefits, thereby reducing risks. Other papers conclude that the diversification in activities, conversely, contributes to the higher volatility of bank revenue.

Theoretically, diversification should enable banking system to increase its efficiency and risk management. The combination of various financial services may enhance the profitability thanks to economics of scale (Klein and Saidenberg (1997)). In their paper, Klein and Saidenberg (1997) find the benefits of diversification by analyzing multi-bank holding companies (MBHCs) during the period of 1990 and 1994. In terms of risk, since non-interest income and interest income have a negligible correlation, the combination of banking services would stabilize income, optimize the administrative costs of internal organization, and contribute to banks' profit. Similarly, applying option-pricing techniques, Santomero and Chung (1992) suggest that banks with nonbanking business decrease the volatility of returns. In addition, The European Central Bank (2000) comparing banking system in Europe and the U.S, it finds the evidence that interest income increases the

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[4] Under the Decision No. 493/2005/QĐ-NHNN dated Apr 22, 2005, NPL is defined as a loan in Category 3 (sub-standard), Category 4 (doubtful) and Category 5 (risk of capital loss).

volatility of returns in Europe greater than in the U.S, whilst non-interest income reduces risks in the European banking system. Being consistent with other studies, Smith, Staikouras, and Wood (2003) investigate banks in 15 European countries between 1994 and 1998 and conclude that income from non-lending activities contributes to the stabilization of these banks' profit. Chiorazzo, Milani, and Salvini (2008) examine a set of Italian banks to give the evidence that diversification improves the trade-off between risks and income. In particular, diversification benefits are greater at the large banks. Small banks get benefits from diversification only when the proportion of non-interest income to total income is relatively low. Tarazi, Crouzille, and Tacneng (2010) investigate how the diversification strategy affects risks and profitability of banking system in the Philippines. The study shows that non-lending activity leads to higher profitability, but finds no clear evidence showing the impacts of non-interest activities on the volatility of return. This result is not consistent with the case of the U.S banks. Furthermore, the paper delves deeper into trading and investment activities and point out the positive relationship between diversification and profitability. This study also indicates that small banks obtain more diversification benefits than large ones.

In contrast, studies such as DeYoung and Roland (2001), Stiroh and Rumble (2006) show that product diversification is the crucial determinant in an increase in bank risks. Stiroh (2004) analyzes diversification benefits of the banking system in the U.S. The result shows that non-interest income fluctuates more wildly than interest income. Moreover, trading income is the most volatile category of bank income. Stiroh (2004) concludes that non-lending-based income, e.g. trading, reduces risk-adjusted income and contribute to higher risks. A number of previous studies also emphasize that there is no presence of diversification benefits or bank expansion into non-lending activities even increases risks (see Boyd and Graham (1986), Kwast (1989),Demsetz and Strahan (1997),Kwan (1998)). DeYoung and Roland (2001) use a broad set of data including 472 U.S banks from 1988 to 1995 to find three components of earning volatility. Firstly, due to switching costs and information costs, the lender and/or the borrower are/is unlikely to terminate the lending relationship. However, for fee-based products, customers are able to shift to using other banks' services. Therefore, earnings from lending business may be more stable, and product mix rise bank's earnings volatility. The second reason could be explained by an increase in fixed costs of fee-based activities, which enlarges bank's operating leverage. Conversely, thanks to the traditional lending relationship, margin cost of new loans relatively reduces. Furthermore, departing from non-lending activities, the banks must set a capital requirement for the outstanding loan balances. The traditional business, therefore, employ a low level of financial leverage which dampen the bank' earning volatility. Stiroh (2004) also concludes that cross-selling product mix to the same customer does not involve in

diversification benefits. As mentioned in Mercieca, Schaeck, and Wolfe (2007), non-interest income activities negatively affect profitability and risk-adjusted returns, and are closely associated with insolvency risk at 755 small European banks during 1997 and 2003. Based on the sample data of European banks from 1996 to 2002, Lepetit, Nys, Rous, and Tarazi (2008) show that the shift toward non-interest income business is likely to lead to higher risk and higher insolvency risk than traditional lending activities. For small banks, risk is mainly linked with fee and commission activities, but not trading activities. Similarly, De Jonghe (2010) measures systemic banking risk with the tail-beta which is computed as the probability that a bank's stock price plummet in the presence of a crash in a banking stock index. The study indicates that non-lending activities contribute to a higher tail-beta. Köhler (2013) applying both linear and quantile regressions shows that income of retail-oriented banks is significantly more stable when they expand into non-interest income activities. In contrast, income of investment-oriented banks become significantly more volatile. While a substantial literature on banking system in developed countries are common, the empirical papers on emerging markets are scare. A study examining China's evidence could be mentioned in Berger, Hasan, and Zhou (2010), the results show that diversification benefits is reduced in four aspects: loans, deposits, assets and geography. In addition, domestic banks are more vulnerable than those with foreign ownership if banks raise their share of non-lending business.

3. Methodology

In this study, we apply Stiroh and Rumble's model (2006) to evaluate the relationship between diversification of activities and systematic risk of the Vietnamese commercial banking system. The novelty of our study is to categorize the banks by size of total assets and equities to examine if there is any difference between these categories. Listed and unlisted banks are also compared.

The full model to measure the relationship between income diversification and risk to banks is as follows:

$$ADZ_{it} = \alpha + \beta_1 DIV_{it} + \beta_2 SHnon_{it} + \beta_3 ASSET_{it} + \beta_4 LOAN_{it} + \beta_5 EQUITY_{it} + \beta_6 EXPENSE_{it} + \varepsilon$$

As we know, there are 4 conventional methods in handling panel datasets which are: (1) pooled OLS, (2) Fixed effects model (FEM), (3) Random effects model (REM), (4) Regression with Instrumental variables (IV estimator). How we conclude optimal methods is not straightforward:

- Even though using pooled OLS contains many errors that need correction, it is a regression approach that is widely used and simple for econometrics and there are various technical methods to remove errors.

- Meanwhile using REM means estimates may be inappropriate due to endogeneity problem.

- FEM and GMM (one of the methods of estimation that use instrumental variables) is an optimal choice when we wish to address endogeneity problem and render estimates to be appropriate.

This study employed OLS regression and tests to check the model errors for rectification. Fixed Effects Model (FEM) regression and Hausman Test were employed to estimate the model and its robustness respectively. In addition, Generalized Method of Moments (GMM) is applied to address the endogeneity problem. In consistent with other studies of income diversification, this paper uses lags and the difference in lag of explanatory variables as instrumental variables to eliminate endogenous variables. Furthermore, other instrumental variables are used to improve the model robustness. To determine the suitability of estimates and to test the validity of instrumental variables, Sargan Test and Arellano – Bond Test were employed. The above methods are similar to those vastly used in processing panel datasets.

Based on the model, we test the three following hypotheses:

Hypothesis 1: In general, the income diversification reduces risk of Vietnamese banks.

Hypothesis 2: There is a size difference when banks diversify income: large-sized banks have more benefits.

Hypothesis 3: Banks with sound, abundant capital are safer when diversifying.

4. Data

The number of banks in Vietnam is limited and most of them are non-public. Consequently, the number of observations is not large enough. Data of Vietnamese commercial banks are collected from official releases of banks and Deposit Insurance of Vietnam in the period of 2005 – 2012. By 2013, Vietnam has 37 commercial banks including four state-owned and 33 private banks, 5 foreign banks and 50 representatives of foreign banks and four joint-venture banks. In this study, we concentrate on domestic commercial banks only due to the unavailability of financial data to foreign banks.

On the other hand, because of the fact that some banks did not differentiate between interest income and non-interest income, to solve this problem and avoid the elimination of observations which can make our sample become even smaller, we use data of the previous year or the nearest preceding year (if any) or the nearest subsequent year to compare and make necessary adjustments. This is

based on our assumption that activities in a specific year are basically identical to the previous year in an economic climate with no considerable changes.

We finally set a sample of 32 domestic joint-stock commercial banks with 249 observations. (See Table 1 – Appendix).

In addition, the commercial banks are divided into two categories by average total assets in the eight observed years. The first category consists of 19 banks with large average total assets (above 30,000 billion VND) (Table 3 – Appendix). The second category consists of 13 banks with small average total assets (below 30,000 billion VND) (Table 3 – Appendix). Similarly, the commercial banks are also divided into two categories by equities in the eight observed years. The first category consists of 20 banks with large average equities (above 2,000 billion VND) and the second one consists of 12 banks with small average equities (below 2,000 billion VND) (Table 4, Table 5 – Appendix).

We use t-test to check whether there is difference between groups of banks when classified according to total assets and equity as above, and the test results show basically there are differences between large and small banks (Table 8, 9 – Appendix).

Furthermore, when examining hypothesis of whether there is difference of diversification impact on large and small banks, besides classifying banks into various groups, the author also use interaction variables such as DIV*ASSET and SH_{NON}*ASSET to compare the scale of total assets of banks; DIV*EQUITY and SH_{NON}*EQUITY to compare the scale of equity to utilize all collected samples.

We also take into consideration the difference between listed and unlisted banks through the division of the banks into two categories: 8 listed banks (Table 6 – Appendix) and 24 unlisted banks (Table 7 – Appendix).

Variables that need to be collected and adjusted include:

Non-interest income: Non-interest income derives from investment activities and fees of banks. In order to measure the importance of the non-interest income, we compute non-interest income to total operating income ratio.

During the data processing, we find that some observations of non-interest income are negative due to losses in non-interest activities. Therefore, if these observations are taken into account, the diversification ratio is likely to be incorrect. This study proposes an adjustment to the negative non-interest income: if the interest income ratio is greater than 1, we consider non-interest income 0% and interest income 100%, which means no diversification; similarly in the case of negative interest

income, we consider interest income 0% and non-interest income 100%. This adjustment has never been applied in any studies of similar topic.

Diversification measurement: In order to evaluate the diversification level, the approach of Stiroh and Rumble (2006) is employed: we divide income of the Vietnamese commercial banks into two categories: interest income (NET), and non-interest income (NON) including income from fee, commission, investment and other activities. Subsequently, the Herfindant-Hirschman Index (HHI) which measures the diversification level is applied. HHI is based on the total number of enterprises and size of each enterprise in the industry and measured by square of relative size of every enterprise in the industry. HHI is highly practical and is used widely to measure the competitiveness in a specific industry or market.

Let DIV be the index of diversification level. The smaller the DIV is, the lower the diversification level is and vice versa. DIV is based on HHI and calculated as follows:

$$DIV = 1 - (SH_{NET}^2 + SH_{NON}^2)$$

Where SH_{NET} and SH_{NON} is the ratio of interest income and non-interest income:

$$SH_{NET} = \frac{NET}{NET + NON}$$

$$SH_{NON} = \frac{NON}{NET + NON}$$

Using simultaneously DIV and SH_{NON} variables is to investigate the impacts of non-interest income on bank risk because applying only DIV cannot capture completely whether a bank is diversified. For instance, ratio SH_{NON} is 80% or 20%, DIV has the same result. Adding SH_{NON} will remedy this shortcoming.

Risk: Z-Score was employed in this study to measure banks' risk. This parameter measures risk of bankruptcy which is considered as an overall risk.

To reduce the difference of Z-Score indices of samples, this study employed another variable namely adjusted Z-Score (ADZ) which represents the bankruptcy risk. This approach is identical to those in studies of IMF researchers Laeven & Levine (2009), which aims to reduce the difference of Z-score of different observations.

$$ADZ = \log(Z - Score)$$

The higher the ADZ is, the lower the likelihood of bankruptcy is and vice versa.

Control Variables:

The model also employs a range of control variables, including ASSET (Logarithm of Total assets), LOAN (Outstanding debt to Total assets ratio), EQUITY (Equity to Total assets ratio), EXPENSE (Total expense to Total Asset ratio). Control variables are applied to reduce the multi-collinearity.

- ASSET variable is logarit of total assets, this variable measures the effect of bank asset scale on its risks. The large banks may invest more in technology and management, so they probably get more advantaged in risk management. Moreover, thanks to a financial capacity, they can expand business to non-traditional loan activity.

- LOAN variable measures ratio of outstanding debt to total assets. This variable records bank lending activities, from which we can examine partly how lending strategies affect bank risks. Consider whether the amount of bank capital used for disbursement for lending purposes is high or low and its impact on risk diversification upon changes in business environment. Banks that focus on lending purposes will pay little attention to other activities and vice versa.

- EQUITY is ratio of equity to total assets. The banks that have this high ratio are usually conservative ones and accept low risk. While the banks having low equity ratio tend to have high risk. A large change in expenses or income can affect equity considerably, and affect bank's capital adequacy ability.

- EXPENSE is ratio of operating expenses to total assets. It measures whether expanding business increases expenses such as marketing costs, salaries for new staffs. To some extent, an increase in these expenses can affect the risks of bank. For instance, opening a new branch can affect large loan risk in here because of lacking of experience about customers as well as customs in new place. And the expenses for salaries increases faster than income from new activities will affect interest or loss ability in the future and then affect the risk.

5. **Results**

Through the consideration of the relationship between income diversification and risk to banks using three regression methods on available data, we find that there is a significant correlation between income diversification and bankruptcy risk. Even though these coefficients are different by regression, the impacts of diversification is consistent, i.e. an increase in the income diversification or non-interest income reduces risk (See Table 10 – Appendix).

When categorizing banks by total asset size, we find the significant relationship between income diversification and risk of large banks. Income diversification reduces risk, indicated by DIV variable having positive influence on the ADZ but at the same time increases risk, indicated by SHNON variable being negative (-). We do not find any evidence of this relationship for banks with small total assets. At banks with large equities, there is also a two-way influence between income diversification and risk, in which the positive influence is more than the negative one. This result is pretty similar to the case of banks with large total assets as mentioned above: a positive correlation between DIV and ADZ variables (signifying the risk reduction effect when diversification level increases) and a negative correlation between SHNON and ADZ variables. However, the benefit of diversification is not found in the category of banks with small total assets. In order to consider the net effect of income diversification in the category of banks with large total assets and equities, we employed non-interest income ratios to examine the influence of these changes on ADZ as shown in Table 14 – Appendix. In most of non-interest income ratios, the positive influence in the risk reduction is more pronounced, i.e. the benefit of diversification is sustained.

By using data set of all commercial banks, we get the same results with examining impacts of income diversification on bank risks in terms of total assets and equity by using combination DIV, SH_{NON} variables and ASSET, EQUITY. The results show that for banks with higher total assets and equity, impact of diversification is more intense on bank risk reduction as suggested in table 11,12 – Appendix

When comparing public and non-public banks, there is no considerable difference in terms of the influence of income diversification on the risk to banks. We also found an influence in the risk reduction when there is an income diversification of these two bank categories; however the difference between these two groups are not considerable (See Table 13 – Appendix).

6. Conclusion

The study investigates the relationship between income diversification and risk of the Vietnamese Commercial Bank System in the period of 2005 – 2012. We find an evidence that risk is reduced when commercial banks diversifies income structures, in addition to traditional credit activities. The study also indicates a positive impact of income diversification on risk of banks of large size by total assets and equities. This effect is not found in small banks.

This conclusion recommends an approach to control risks to the Vietnamese banking system in an environment of diversified activities as present. It also emphasizes the importance of seeking new

income sources to reduce the overall risk of bank activities. The study also introduces several suggestions to restructure the banking system to make use of diversification benefits.

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APPENDIX

Table 1: Descriptive statistics of the commercial banks in Vietnam over the period 2005 -2012

	ADZ	DIV	SHNON	ASSET	LOAN	EQUITY	EXPENSE
Mean	1.507	0.277	0.215	4.331	0.521	0.142	0.015
Median	1.513	0.301	0.186	4.346	0.515	0.103	0.014
Maximum	2.130	0.500	1.000	5.702	0.936	0.712	0.060
Minimum	0.870	-	-	2.161	0.155	0.029	-
Std. Dev.	0.245	0.158	0.175	0.727	0.150	0.111	0.007
Skewness	(0.077)	(0.395)	1.236	(0.551)	0.155	2.227	2.218
Kurtosis	2.855	1.958	5.127	3.135	2.604	8.611	13.905
Jarque-Bera	0.462	17.735	110.332	12.805	2.618	532.395	1,437.956
Probability	0.794	0.000	-	0.002	0.270	-	-
Sum	375.246	68.914	53.599	1,078.372	129.773	35.427	3.670
Sum Sq. Dev.	14.877	6.217	7.604	130.973	5.576	3.039	0.011
Observations	249	249	249	249	249	249	249

Note: Results are for 32 commercial banks in Viet Nam over the period 2005 – 2012. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: natural logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 2: Descriptive statistics of the large asset commercial banks in Vietnam over the period 2005 -2012

	ADZ	DIV	SHNON	ASSET	LOAN	EQUITY	EXPENSE
Mean	1.473	0.301	0.238	4.712	0.495	0.091	0.014
Median	1.480	0.320	0.205	4.772	0.496	0.078	0.013
Maximum	2.043	0.500	1.000	5.702	0.829	0.462	0.032
Minimum	0.870	-	-	3.001	0.191	0.029	0.003
Std. Dev.	0.252	0.144	0.176	0.529	0.136	0.054	0.005
Skewness	(0.015)	(0.613)	1.382	(0.434)	0.092	3.794	0.861
Kurtosis	2.714	2.447	5.769	3.013	2.325	22.721	4.326
Jarque-Bera	0.505	11.088	93.772	4.613	2.994	2,734.789	28.943
Probability	0.777	0.004	-	0.100	0.224	-	0.000
Sum	216.604	44.248	34.985	692.667	72.726	13.438	1.986
Sum Sq. Dev.	9.264	3.033	4.535	40.823	2.697	0.429	0.004
Observations	147	147	147	147	147	147	147

Note: Results are for 19 commercial banks in Vietnam which have the average asset over the period 2005 – 2012 greater than 30,000 billion Vietnam Dong. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: natural logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 3: Descriptive statistics of the small asset commercial banks in Vietnam over the period 2005 -2012

	ADZ	DIV	SHNON	ASSET	LOAN	EQUITY	EXPENSE
Mean	1.555	0.242	0.182	3.781	0.559	0.216	0.017
Median	1.574	0.265	0.157	3.988	0.543	0.166	0.015
Maximum	2.130	0.499	0.783	4.722	0.936	0.712	0.060
Minimum	1.003	-	-	2.161	0.155	0.054	-
Std. Dev.	0.227	0.172	0.169	0.613	0.161	0.129	0.008
Skewness	(0.063)	(0.055)	1.067	(0.790)	0.014	1.549	2.299
Kurtosis	3.107	1.618	3.907	2.752	2.632	5.265	12.344
Jarque-Bera	0.116	8.163	22.838	10.869	0.580	62.597	460.892
Probability	0.944	0.017	0.000	0.004	0.748	-	-
Sum	158.642	24.666	18.614	385.705	57.047	21.989	1.684
Sum Sq. Dev.	5.210	2.973	2.884	38.002	2.629	1.682	0.007
Observations	102	102	102	102	102	102	102

Note: Results are for 13 commercial banks in Vietnam which have the average asset over the period 2005 – 2012 less than 30,000 billion Dong. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: natural logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 4: Descriptive statistics of the large capital commercial banks in Vietnam over the period 2005 -2012

	ADZ	DIV	SHNON	ASSET	LOAN	EQUITY	EXPENSE
Mean	1.498	0.299	0.234	4.661	0.501	0.102	0.013
Median	1.506	0.320	0.204	4.742	0.498	0.083	0.013
Maximum	2.043	0.500	1.000	5.702	0.845	0.462	0.029
Minimum	0.870	-	-	2.828	0.191	0.037	0.003
Std. Dev.	0.252	0.145	0.174	0.565	0.141	0.062	0.005
Skewness	(0.151)	(0.617)	1.392	(0.483)	0.146	3.030	0.657
Kurtosis	2.740	2.470	5.889	3.101	2.362	14.743	3.629
Jarque-Bera	1.023	11.664	103.929	6.080	3.183	1,127.735	13.711
Probability	0.600	0.003	-	0.048	0.204	-	0.001
Sum	232.241	46.297	36.337	722.438	77.685	15.763	2.092
Sum Sq. Dev.	9.741	3.227	4.670	49.103	3.044	0.593	0.004
Observations	155	155	155	155	155	155	155

Note: Results are for 20 commercial banks in Vietnam which have the average capital over the period 2005 – 2012 greater than 2,000 billion Dong. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: natural logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 5: Descriptive statistics of the small capital commercial banks in Vietnam over the period 2005 -2012

	ADZ	DIV	SHNON	ASSET	LOAN	EQUITY	EXPENSE
Mean	1.521	0.241	0.184	3.787	0.554	0.209	0.017
Median	1.542	0.263	0.156	3.988	0.532	0.166	0.015
Maximum	2.130	0.499	0.783	4.722	0.936	0.712	0.060
Minimum	1.003	-	-	2.161	0.155	0.029	-
Std. Dev.	0.234	0.173	0.173	0.632	0.160	0.138	0.008
Skewness	0.103	(0.015)	1.067	(0.747)	0.034	1.382	2.197
Kurtosis	2.994	1.577	3.799	2.669	2.755	4.756	11.253
Jarque-Bera	0.167	7.934	20.353	9.178	0.253	41.996	342.387
Probability	0.920	0.019	0.000	0.010	0.881	-	-
Sum	143.006	22.618	17.261	355.934	52.088	19.664	1.578
Sum Sq. Dev.	5.104	2.792	2.783	37.136	2.369	1.770	0.007
Observations	94	94	94	94	94	94	94

Note: Results are for 12 commercial banks in Vietnam which have the average capital over the period 2005 – 2012 less than 2,000 billion Dong. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 6: Descriptive statistics of the listed commercial banks in Vietnam over the period 2005 - 2012

	ADZ	DIV	SHNON	ASSET	LOAN	EQUITY	EXPENSE
Mean	1.485	0.344	0.257	4.983	0.518	0.091	0.014
Median	1.499	0.366	0.242	5.135	0.536	0.073	0.013
Maximum	2.043	0.498	0.663	5.702	0.710	0.387	0.027
Minimum	0.916	-	-	3.121	0.329	0.037	0.006
Std. Dev.	0.261	0.116	0.140	0.524	0.106	0.056	0.005
Skewness	0.164	(0.910)	0.887	(1.093)	(0.036)	3.168	0.930
Kurtosis	2.712	3.637	3.985	4.150	1.795	15.428	3.966
Jarque-Bera	0.500	9.758	10.809	16.008	3.822	510.817	11.541
Probability	0.779	0.008	0.004	0.000	0.148	-	0.003
Sum	93.580	21.651	16.199	313.917	32.657	5.703	0.876
Sum Sq. Dev.	4.229	0.840	1.208	17.025	0.698	0.192	0.001
Observations	63	63	63	63	63	63	63

Note**:** Results are for 8 commercial banks in Vietnam which listed on the stock exchange over the period 2005 – 2012. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 7: Descriptive statistics of the unlisted commercial banks in Vietnam over the period 2005 -2012

	ADZ	DIV	SHNON	ASSET	LOAN	EQUITY	EXPENSE
Mean	1.514	0.254	0.201	4.110	0.522	0.160	0.015
Median	1.537	0.276	0.171	4.236	0.514	0.122	0.014
Maximum	2.130	0.500	1.000	5.257	0.936	0.712	0.060
Minimum	0.870	-	-	2.161	0.155	0.029	-
Std. Dev.	0.239	0.164	0.184	0.650	0.162	0.119	0.007
Skewness	(0.165)	(0.177)	1.400	(0.785)	0.156	1.972	2.202
Kurtosis	2.943	1.745	5.450	3.321	2.430	7.199	13.102
Jarque-Bera	0.867	13.189	107.328	19.900	3.280	257.224	941.147
Probability	0.648	0.001	-	0.000	0.194	-	-
Sum	281.666	47.263	37.400	764.455	97.116	29.724	2.794
Sum Sq. Dev.	10.609	4.999	6.248	78.096	4.877	2.621	0.009
Observations	186	186	186	186	186	186	186

Note: Results are for 24 commercial banks in Vietnam which are unlisted on the stock exchange over the period 2005 – 2012. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 8: T-Test for Equality of means of variables according to bank by asset size over the period 2005 - 2012

Variable	Classification	Observations	Mean	Standard error	Variance assumption	T-Stat	P-value
ADZ	Small	102	1.56	0.23	Equal	2.623	0.009
	Big	147	1.47	0.25	Different	2.673	0.008
DIV	Small	102	0.24	0.17	Equal	-2.945	0.004
	Big	147	0.30	0.14	Different	-2.855	0.005
SHNON	Small	102	0.18	0.17	Equal	-2.485	0.014
	Big	147	0.24	0.18	Different	-2.504	0.013
ASSET	Small	102	3.78	0.61	Equal	-12.783	0.000
	Big	147	4.71	0.53	Different	-12.446	0.000
LOAN	Small	102	0.56	0.16	Equal	3.411	0.001
	Big	147	0.49	0.14	Different	3.308	0.001
EQUITY	Small	102	0.22	0.13	Equal	10.422	0.000
	Big	147	0.09	0.05	Different	9.172	0.000
EXPENSE	Small	102	0.02	0.01	Equal	3.611	0.000
	Big	147	0.01	0.01	Different	3.336	0.001

Table 9: T-Test for Equality of means of variables according to bank by equity size over the period 2005 - 2012

Variable	Classification	Observations	Mean	Standard error	Variance assumption	T-Stat	P-value
ADZ	Small	94	1.52	0.23	Equal	0.718	0.473
	Big	155	1.50	0.25	Different	0.731	0.466
DIV	Small	94	0.24	0.17	Equal	-2.846	0.005
	Big	155	0.30	0.14	Different	-2.724	0.007
SHNON	Small	94	0.18	0.17	Equal	-2.237	0.026
	Big	155	0.23	0.17	Different	-2.241	0.026
ASSET	Small	94	3.79	0.63	Equal	-11.319	0.000
	Big	155	4.66	0.56	Different	-11.011	0.000
LOAN	Small	94	0.55	0.16	Equal	2.735	0.007
	Big	155	0.50	0.14	Different	2.652	0.009
EQUITY	Small	94	0.21	0.14	Equal	8.407	0.000
	Big	155	0.10	0.06	Different	7.130	0.000
EXPENSE	Small	94	0.02	0.01	Equal	3.924	0.000
	Big	155	0.01	0.00	Different	3.473	0.001

Table 10: The relationship between diversification and risk of the commercial banks in the Vietnam over the period 2005-2012

Variable	Pooled OLS	Fixed effect regression	GMM
	ADZ	ADZ	ADZ
ADZ(-1)	0.570***		0.128***
	(0.061)		(0.014)
DIV	0.466***	0.167***	-0.021
	(0.088)	(0.053)	(0.029)
SHNON	-0.232***	-0.074	0.064**
	(0.062)	(0.047)	(0.029)
ASSET	0.061***	-0.006	-0.009
	(0.020)	(0.011)	(0.014)
LOAN	0.251***	0.027	0.014
	(0.0804)	(0.039)	(0.021)
EQUITY	1.117***	1.744***	1.865***
	(0.119)	(0.077)	(0.054)
EXPENSE	-1.102	1.483*	1.708***
	(1.750)	(0.077)	(0.448)
C	0.030	1.219***	
	(0.133)	(0.061)	
R²	0.60	0.96	
Obs	249	249	249
J-Statistic			19.99
Prob(J-Statistic)			0.45
AB test of No AR(1)			0.09
AB test of No AR(2)			0.35

***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. T-statistics are corrected for heteroskedasticity following White's methodology for the fixed effects panel regression. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Arellano-Bond order 1 (2) are tests for first (second)-order serial correlation. These test the first-differenced residuals in the GMM estimators.

The Sargan test (J-Statistic) is a test of over identification restrictions in the GMM estimators.

Table 11: The relationship between diversification and risk of the commercial banks taking into the effect of total asset size in the Vietnam over the period 2005-2012

Variable	Pooled OLS	Fixed effect regression	GMM
	ADZ	ADZ	ADZ
ADZ(-1)	0.686***		0.133***
	0.054		0.020
DIV*ASSET	0.044***	0.040***	(0.015)***
	0.013	0.011	0.006
SHNON*ASSET	(0.026)***	(0.019)**	0.023***
	0.008	0.009	0.006
ASSET	0.033*	(0.011)	0.018
	0.018	0.011	0.011
LOAN	0.248***	0.025	0.166***
	0.062	0.038	0.037
EQUITY	0.706***	1.751***	1.990***
	0.154	0.074	0.043
EXPENSE	1.262	1.483*	
	1.084	0.811	
C	0.045	1.241***	
	0.108	0.061	
R^2	0.74	0.97	
Obs	249	249	249
J-Statistic			19.99
Prob(J-Statistic)			0.363
AB test of No AR(1)			0.106
AB test of No AR(2)			0.460

***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. T-statistics are corrected for heteroskedasticity following White's methodology for the fixed effects panel regression. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Arellano-Bond order 1 (2) are tests for first (second)-order serial correlation. These test the first-differenced residuals in the GMM estimators.

The Sargan test (J-Statistic) is a test of over identification restrictions in the GMM estimators.

Table 12: The relationship between diversification and risk of the commercial banks taking into the effect of equity size in the Vietnam over the period 2005-2012

Variable	Pooled OLS	Fixed effect regression	GMM
	ADZ	ADZ	ADZ
ADZ(-1)	0.686*** 0.051		0.129*** 0.022
DIV*EQUITY	2.285*** 0.534	0.901** 0.448	(0.254) 0.280
SHNON*EQUITY	(1.525)*** 0.474	(0.256) 0.442	0.669*** 0.168
ASSET	0.049*** 0.018	(0.006) 0.012	0.004 0.012
LOAN	0.251*** 0.056	0.018 0.043	0.130** 0.052
EQUITY	0.589*** 0.124	1.574*** 0.090	1.961*** 0.119
EXPENSE	1.579 1.066	1.542* 0.834	1.898** 0.928
C	(0.021) 0.102	1.253 0.068	
R^2	0.76	0.96	
Obs			
J-Statistic			17.79
Prob(J-Statistic)			0.47
AB test of No AR(1)			0.10
AB test of No AR(2)			0.89

***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. T-statistics are corrected for heteroskedasticity following White's methodology for the fixed effects panel regression. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Arellano-Bond_order 1 (2) are tests for first (second)-order serial correlation. These test the first-differenced residuals in the GMM estimators.

The Sargan test (J-Statistic) is a test of overidentification restrictions in the GMM estimators.

Table 13: The relationship between diversification and risk of the commercial banks in Vietnam according to size classifications over the period 2005-2012

Variable	Large asset Bank ADZ	Small asset Bank ADZ	Large capital Bank ADZ	Small capital Bank ADZ	Listed Bank ADZ	Unlisted Bank ADZ
DIV	0.141***	0.017	0.151***	-0.048	-0.118*	0.202***
	-0.043	-0.077	-0.048	-0.087	-0.065	-0.054
SHNON	-0.069**	0.026	-0.073*	0.057	0.286***	-0.112**
	-0.034	-0.046	-0.042	-0.038	-0.067	-0.049
ASSET	0.013	0.005	0.007	0.011	0.041*	-0.010
	-0.011	-0.010	-0.012	-0.008	-0.023	-0.012
LOAN	0.146**	0.023	0.116	0.052	0.058	0.017
	-0.056	-0.033	-0.074	-0.040	-0.082	-0.037
EQUITY	3.105***	1.635***	2.665***	1.631***	2.682***	1.657***
	-0.312	-0.060	-0.294	-0.057	-0.170	-0.074
EXPENSE	0.854	0.153	1.976	0.536	2.466	1.547*
	-1.215	-0.441	-1.267	-0.569	-2.656	-0.826
C	1.017***	1.159***	1.079***	1.102***	0.943***	1.233***
	-0.070	-0.056	-0.083	-0.051	-0.120	-0.061
R^2	0.97	0.97	0.97	0.97	0.97	0.96
Obs	147	102	155	94	63	185

***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. T-statistics are corrected for heteroskedasticity following White's methodology for the fixed effects panel regression. ADZ: measure of bankruptcy risk, DIV: measure of income diversification, SHNON: the ratio of non-interest income, ASSET: logarithm of total assets, LOAN: the ratio of net loans to total assets, EQUITY: ratio of total equity to total capital, EXPENSE: ratio of operating expenses to total assets.

Table 14: Estimated impact of an increase in the share of noninterest income on risk of the commercial banks by size in Vietnam over the period 2005 – 2012

SHNON percentiles	Large asset Bank			Large capital Bank		
	Impact of DIV	Impact of SHNON	Net impact to ADZ	Impact of DIV	Impact of SHNON	Net impact to ADZ
5%	0.013	(0.003)	0.010	0.014	-0.004	0.011
10%	0.025	(0.007)	0.018	0.027	-0.007	0.020
25%	0.053	(0.017)	0.036	0.056	-0.018	0.038
50%	0.070	(0.034)	0.036	0.075	-0.037	0.039
60%	0.068	(0.041)	0.026	0.072	-0.044	0.028
75%	0.053	(0.052)	0.001	0.056	-0.055	0.002
90%	0.025	(0.062)	(0.036)	0.027	-0.066	(0.039)