



Does Income Diversification Increase or Decrease Financial Risk? Evidence from Kenyan Commercial Banks

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Abstract

This paper aims at examining whether the income diversification reduce or increase the financial risks of the commercial banks in Kenya. Over decades the commercial banks in Kenya have been faced with a number of risks such as weaker asset quality, increase in non-performing loans and variability of returns hence engaging on income diversification as a strategy of mitigating such risks. This study uses a sample of 31 Kenyan banks and data for the period 2008-2019. Data is analyzed through random effect regression analysis. The study finds that income diversification decreases the financial risks. The reduction in financial risk resulted when the banks manage the agency costs and increase of income from non-interest activities. In addition, the key determinants of bank financial risk are; bank size, loan portfolio quality, lending strategy and market share which recorded a significant effect.

The findings of this study help managers to improve the financial outlook of their banks by pursuing income diversification in order to reduce financial risk.

Keywords: Income Diversification, Financial Risks and Commercial Banks

1. Introduction

Conventional wisdom in theory and practice believes that income diversification for banks tend to reduce finance risk and increase the profitability. However, addressing the financial risks of the commercial banks in Kenya, Africa and the rest world over has remained a salient issue and continues to elicit significant academic debate and in policy circles (Pyle, 1999). This is informed by financial crisis such as global financial crisis (2008-2009), Covid-19 pandemic 2019 among others which have elicited serious concern among regulators, practitioners, and scholars as to whether commercial banks have expanded their optimal scope to respond to these risks and whether aggressive income diversification strategies may have led some banks reducing their risk levels or have led to more risks. This research problem still exists due to the impacts of the changes of both economic and regulatory environment that encourages banks to diversify into non-interest income to compensate on declining income from traditional sources.

Definitely, the role of banking sector in economic growth has been widely appreciated due to the role it played in financial intermediation (Bongomin, Munene, Ntayi & Malinga, 2019) and financial deepening (Nzotta & Okereke, 2009 and Wang Zhao, Zhu & Pang, 2020). Moreover, the globally financial crisis that took place in 2007-2008 (Moudud-Ul-Huq et al, 2020 and Kim, et al., 2020) and political instability in 2008 (Mueller, 2008) emphasized the importance of a country having a stable and resilient financial sector toward economic growth. Over this period the financial sector has experienced an increase in the bank risks which has led to a decline of both interest and non-interest income informed by an increase in non-performing loans, deteriorating assets quality and reductions of income thus affecting the sustainability of the banking industry (Gutierrez Lopez & Abad-Gonzalez, 2020).

Evidence shows that during such difficult economic times banks pursue different financial strategies to mitigate the adverse effects of financial risks. Income diversification is considered as one of the financial strategies adopted to mitigate the effects of banks' financial risks unlike depending on the sole source of income through interest (Brei, Borio & Gambacorta, 2020). Markowitz's (1952) introduced the Modern Portfolio Theory to explain the relationship between the income diversification and financial risk.

Haubrich and Young (2019) and Qu (2020) elaborated on the concept of income diversification by categorizing it into four forms namely; service charges income (income from the sales of checks, service charges, wire transfer fees, ATM fees, card charges, safe deposit box fees). Secondly, is the trade income (net loans and leases sales, trading revenue, net real estate sales, net securitization income, net other sales). Third, is the investment banking income (income from fiduciary activities, insurance, venture capital

income, annuity fees, securitization fees). Finally, is the unclassifiable bank income (rent on a property and other real estates, food stamps, bank guarantee on asset importation, foreign exchange gains). Through income diversification it is expected that the revenue base will increase hence reducing the variability of the returns thus cushioning on unexpected banks risks which affects the variability of the financial performances.

While, the relationship between income diversification and financial has been subjected to extensive empirical studies, the findings show mixed results. Some studies show that the income diversification increases bank risks (Chiorazzo, Milani & Salvini, 2008; Mesler, Tecneg & Terazi, 2014; Köhler, 2015; Ekanayake, 2017).

While others believe that income diversification reduces bank risk (Lee, Yang, & Chang, 2014; Jouida & Hellara, 2018; Duho, Onumah, & Asare, 2020). Other studies documented no significant relationship between income diversification and financial risk (Adzobu, Agbloyor & Aboagye, 2017). Based on the conflict findings as shown in the extant literature, there are needed to further investigate the nexus between income diversification and bank financial performance. The rest of the paper is structured as follows: the next section presents an overview of the Kenyan banking sector. The third section reviews the existing literature. The fourth section presents the finding.

2. Overview of the Banking Industry in Kenya

Currently in sub-Saharan Africa (SSA) Kenyan banking industry is ranked the most the broadest and most developed having 49 financial institutions, comprising 43 commercial banks, 1 mortgage finance company and five deposit taking microfinance institutions (CBK 2019). The most pronounced role this institution has play is promoting the financial inclusion meaning most Kenyan can access the services of these financial institutions with statistics shows that financial deepening increased for instance the number of deposit accounts increased from 8.5 million in 2009 to 62.01 million in 2019 while the deposit increased from 0.8 trillion to 62.01 trillion in the same period. The growth is associated with efficiency, convenience and effectiveness of these institution in offering their services (Ndungu, 2018).

The financial outlook for banking industry shows that global financial risk (Banking z-score) stood at 14.5% (2017),12.28%(2008) Africa 13.07%(2017),11.84%(2008) and Kenya 21.56%(2016), 18.36%(2008) (CBK;2018 & 2019). Equally, evidence shows that the global NPLs 6.45% (2020), 3.68 % (2008) Kenya 14.5% (2020) and 9.0% (2008). Kenya faces a weaker asset quality rating with evidence showing index changed from strong

index rating of 1 (0-5.1-10%) in 2008 to a satisfactory index of 2(5.1-10%) in 2019 (Beck, Fuchs, Singer and Witte,2014; Hubrich& Young,2019; CBK 2008, CBK 2019). The profitability results show variability on return on assets at for instance in 2018 it reduced from 2.8% to 2.63% in the same period the pre-tax profit increased to Ksh. 152.7 billion down Ksh.133.2 billion in 2017 (CBK;2018 & 2019). The variability is visible in both interest and non-interest sources of income which have experience stiff completion and also including all the other participants in the industry including non-bank financial intermediaries, market based financial institutions and most recently from fin-tech companies (Faith, Raphael, and Stephanie, 2019). Mulindi (2021) shared an overview of the key bank performance of both listed and unlisted commercial banks, the gross loan portfolio quality experienced an exponential growth a period of 15 years for both the listed and unlisted banks realizing an average value of 40billion in 2003 to higher figure of 135 billion in 2013 and 4 billion in 2003 to higher figure of 35 billion in 2013 respectively.

3. Review of the Empirical Literature

The motive of income diversification is to minimize risk and improve firm performance. Income diversification has been considered good financial strategy for banks to manage idiosyncratic risks which are the shocks that net profit margins from the interest income (Salma &Hussain,2018). Köhler (2014) noted that income diversification amongst the banks provides financial sustainability and stability through minimization of loan portfolio risk. Duho et al., (2020), found that income diversification through leads to increase the proportion of the bank revenues hence reducing the financial risk by managing the volatility reduction of returns. A study on this relationship was done on emerging countries shows that both non-interest income and revenue concentration was found to have significant effect on bank risk in Pakistan and India but the case was different in Sri Lanka and Bangladesh due to economic situation. The study further recommends that bank should diversify the way of generating more income to minimize the levels of risk as a process of enhancing efficiency (Hunjra et al.,2020).

Ekanayake, (2017), linked the relationship between income diversification and risks of eleven commercial banks from an emerging economy. The study used panel data covering a period of 2002 to 2015.Results confirms that income diversification is riskier as compare with interest income but the long term relationship was more beneficial to the bank value. The risk adjusted on equity was positively affected by income diversification. Elsewhere; Pan-African banks were found to have champion for cross border banking as means of diversifying the portfolio risk. When Pan-African banks cross border they lower possibility of insolvency risk hence reducing the possibility of failure (Enoch et al.,2015). Diversifying firms

have few risks this is because they reduce the cost of capital which alleviate the cost of production. This statement support coinsurance effect theory that suggest that diversifying firms go for more debts because of reduced risk (Hann, Ogneva, and Ozbas, 2013).

Nepali, S. R. (2018), studied the effects of income diversification on risk of Nepalese commercial banks by employing secondary panel data from 2009 to 2015. The study reported that income diversification was positively correlated with risk thus implying the non-interest activities were riskier than interest activities. Income diversification is also viewed to add value during external financial constraints because the diversified firms are able to absorb economic risk in comparison with specialized firms (Liebenberg and Lin, 2019). The benefits of income diversification in relation to risk shows that during financial crisis conglomerates firms enjoy for leverage benefits and hence able to sustain financial risk which makes them stable and steady in comparison with specialized firms but during normal financial situations they all compete equally with no added advantage (Yan, Yang, & Jiao, 2010). According to DeYoung & Rice (2004), income diversification had positive effects on the bank performance measured by risk adjusted return on equity. However, the risk is higher for small banks, domestic and public banks in comparison with larger, foreign and private banks commercial banks.

Wang & Lin, (2021), investigated the effect of income diversification on bank risk of commercial banks from 14 Asia Pacific using panel data over a period 2011-2016. The findings reveals that bank that pursue more income diversification banks face less financial risks. This means income diversification is less especially during worsening the economy situations (Delis et al., 2014). Income diversification causes risk by exposing the banks operations to economic downturn from other industries which they may not handle resulting to bankruptcy. In addition, income diversification was found to have negative relationship with firm value due to risk associated, product diversification to be specific was found to be a factor informing why the firms expands the leverage ratios which will increase more liquidity risk thus reducing firm value (Kuppuswamy & Villalonga, 2016).

Some studies pursued effects of income diversification on credit risks. Zhou, K. (2014), used the panel data of Chinese banks between 1997-2012 from 62 commercial banks. The empirical bank results showed that income diversification reduces the bank credit risk. The risk reduction was informed by the significant reduction of depending on interest income activities This means that banks should be very keen on the type of risk they are exposed before diversifying. Jeuda and Hellara (2018), observed that diversification destroy firm value because the risk resulting from altering the ratio of the capital structure. The study

informed them their study on effect of diversification on capital structure and they found that asset based diversification can inform leverages choices. But the finding further reveals that diversification had negative impact on firm value due to risk (Jouida & Hellara,2018). According to Tu, (2016), focused on income and bank risk of Vietnamese commercial banks between 2006-2014, the findings reveals that the bank risk tend to be higher for banks which were diversifying. This contradicted the hypothesis of risk reduction due to income diversification

In summary, the empirical literature reviews fail to provide clear relationship between income diversification and financial risk amongst the commercial banks, this shades providesthe existence of conflicting hypothesis. A number Several suggest that income diversification reduces bank risks (Wang & Lin,2021 and Zhou,2014). However, all commercial banks engaging in income diversification also may increase the probability of multiple bank failure or risk (Nepali, 2018 and Ekanayake,2017). Acharya, Hasan & Saunders, (2006) found no effects on the relationship between income diversification and bank risk.

4. Method

4.1. Research Model

The research consists of three sets of variables; the dependent variable (financial risk), independent variable (income diversification) and control variables (bank size, lending strategy, loan portfolio quality and market share). The hypothesis will be tested using panel data analysis estimation model and the choice between fixed and random effect will be determined by the results of the Hausman test. The study econometric model is shown below;

$$FR_{it} = \beta_{0it} + \beta_1 ID_{it} + \beta_2 BS_{it} + \beta_3 LS_{it} + \beta_4 LPQ_{it} + \beta_5 MS_{it} + \varepsilon_{it}$$

Where;

FR is financial performance

ID is income diversification

BS is bank size

LS is lending strategy

LPQ is loan portfolio quality

Ms is market share

B₁... B_n denotes the beta coefficients and ε is the error term

4.2. Data and Methodology

The main objective of this study is to examine the impact of income diversification on the financial risk of Kenyan commercial banks. This study employs panel data drawn from all Kenyan commercial banks for the years 2008 – 2019. However, after excluding firm with missing data the final sample consisted of 31 banks; which yielded 372 bank-year observations. The measurements of the research variables are illustrated in table 1 below.

Table 1. Measurement of variables

Type	Variable	Measurement	Reference(s)
Dependent variable	Financial Risk	z-score	Lepetit&Strobel,(2015)
Independent variable	Income diversification	1-HHI	Seo&Chung,(2017)
Control variables	Bank Size	Natural logarithm of total assets	Gürbüz, Yanik and Aytürk, (2013)
	Bank Lending strategy	Ratio of loans to total assets	Githaiga and Yegon (2019)
	Loan portfolio quality	Ratio of non-performing loans to total loans and advances	Dimitrios, Helen and Mike (2016)
	Market share	Ratio of bank total assets to industry's total assets	Genchev, E. (2012)

5. Results and Discussions

This section presents the findings of the study. The descriptive statistics, the correlation coefficients and the regression results are shown in table 2, 3 and 4 respectively.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FR	372	2.993455	.8970069	.1152986	5.659184
Bank Size	372	17.37676	1.225367	14.97238	20.0195
Bank Age	372	35.8871	29.21328	1	123
FLS	372	.540505	.1731026	.00895	.8956
LPQ	372	.1248543	.1056437	.0089204	.9010086
MS	372	3.204624	4.841534	.002	20.62
DIV	372	.4062503	.078702	.1039373	.49998

Source: (Researcher, 2021)

Table 1 (above) present a general synopsis of the panel data for the 31 commercial banks in Kenya covering the period of 12 years (2008-2019). Based on the table financial risk (z-score) had mean of 2.993455 (minimum= 0.1153 and maximum = 5.659184; standard deviation = 0. 897). This imply that for the 372 observations the riskier banks have an index of 5.6 while those who face lower risk highest performance stood at 0.11 with a variation of 0.9. The variability of financial risk from this descriptive statistic implies that the banks face risks in their operations.

Table 3. Pairwise correlation analysis

	FR	Bank Age	Bank Size	LPQ	FLS	MS	ID
FR	1.000						
Bank Age	0.1061*	1.0000					
Bank Size	0.1286*	0.6856*	1.0000				
LPQ	-0.2317*	-0.1459*	-0.2897*	1.0000			
FLS	0.1727*	-0.1083*	-0.1830*	-0.1436*	1.0000		
MS	0.2505*	0.5009*	0.6647*	-0.3242*	-0.1905*	1.0000	
ID	-0.1905*	-0.0101	0.1357*	-0.0308	-0.0136	0.1847*	1.0000

The results presented above shows that correlation between Bank age and FR is positively and significant with pairwise Pearson correlation (r) ($r=0.1061$; $q < 0.05$). Secondly the association between bank size and lending strategy with financial risk were positively associated with ($r=0.1286$; $q < 0.05$) and ($r=0.1727$; $q < 0.05$) respectively. The analysis further reveals that Loan portfolio quality (LPQ) and financial performance were negatively correlated ($r = -0.2317$; $q < 0.05$). Additionally, market share records a positive correlation with financial risk ($r = 0.2505$; $q < 0.05$) while the correlation results between income diversification (ID) and financial risk (FR) was significantly negative ($r = 0.1905$; $q < 0.05$). As the income diversification increase the financial risk reduces.

Table 4. Regression Analysis

Variables	Fixed effects	Random effects
_constant	4.138(1.337)**	4.022(1.085)**
Income diversification	-0.770(0.150)**	-0.755(0.141)**
Bank age	-0.074 (0.179)	0.083(0.059)
Bank Size	-0.100(0.091)	0.195(0.041)**
Lending strategy	0.252(0.087)**	-0.171(0.050)**
Loan portfolio quality	-0.264(0.057)**	0.199(0.031)**
Market share	0.208 (0.058)**	0.098(0.023)**
R-sq	0.2362	0.4690
No. of observations	372	372
Hausman test	Prob< Chi2= 0.7218	

***significance levels 5%. Standard errors are in parentheses*

The results for both fixed effects and random effects on the relationship between income diversification and financial risks of commercial banks in Kenya are presented in table 3. The hypothesis is tested using the random effect regression as suggested by the results of the Hausman test (Prob>chi2=0.000). Based on the findings income diversification has a significant negative effect on the financial risk of commercial banks in Kenya ($\beta = -0.755$ $\rho < 0.05$). The results indicate that for one unit change of income diversification it reduces the bank risk by 0.755. The overall model explains 46.9% change in bank financial risk. Therefore, the hypothesis that income diversification has no significant effect on financial risk of the commercial banks in Kenya is rejected. The study concludes that income diversification has a significant effect of banks financial risks. The findings are consistent with previous studies that established significant relationship between income diversification and financial risk (Chiorazzo, Milani, & Salvini, 2008; Köhler, 2015 and Duho, Onumah, & Asare, 2020) but contrary to who believe that income diversification have no significant effect (Zhou, 2014 and Adzobu, Agbloyor & Aboagye, 2017). The results supports the theoretically assertions on risk return trade off that assert that income diversification is one of the strategy banks can use to increase returns as they reduce the risk (Pyle, 1999; Berger, Hasan, Korhonen, & Zhou, 2010; Ekanayake, 2017; Nepali, 2018). The control variables in the study present significant relationships with financial risk as follows; bank size ($\beta = 0.195$, $\rho < 0.05$), bank lending strategy ($\beta = -0.171$, $\rho < 0.05$), loan portfolio quality ($\beta = 0.199$, $\rho < 0.05$) and market share ($\beta = 0.098$, $\rho < 0.05$) but the bank age was not significant in explaining the financial risk ($\beta = 0.083$, $\rho > 0.05$).

6. Conclusion

Although the dominance of income diversification strategy in Kenyan commercial banks is undisputedly recognized as one main alternative to compensate the deteriorating interest income and increase loss associated to non-performing loans which have increased over time. Extant literature has also been documented giving three strands relationships between income diversification and financial risks. Some believe that income diversification increases risk (Ekanayake, 2017), others believe that it decreases the risk levels (Duho, Onumah & Asare 2020) while others don't support the two strands (Zhou, 2014 & Tu, 2016). With the increase of the financial risks the role played by the income diversification is still an open question. In this article, we contributed to the conflicting literature through empirical analysis from Kenyan Commercial banks for the period 2008-2019.

On the basis of our random regression results, we conclude that income diversification had a negative and significant effect on financial risks. The argument here is very simple: that non-interest activities are assumed to be uncorrelated or imperfectly correlated with interest income activities then income diversification brings forth the stabilization of operating income profits thus giving rise to stabilization of stream of sources of the incomes (Meslier, Tacneng & Tarazi, 2014). This means that diversifying banks tend to reduce financial risks thus supporting other studies such as Duho, Onumah & Asare (2020) who document that income diversification can be adopted as a strategy to reduce banks' financial risks and also improve profitability. Others argued that income diversification is beneficial to banks since it reduces the risk levels (Lee, Yang & Chang, 2014 and Jouda & Hellara, 2018). Chiorazzo, Milani & Salvini (2008) also posit that for banks in the United States of America the income diversification reduces risks as it improves the bank returns.

Equally, banks in emerging economies with high levels of income diversification had less financial risks. Contrary to Zhou (2014) who established that the non-interest income activities tend to increase the volatility levels to the organizations hence contributing to overall risks. In the same vein, Ekanayake, E. M. N. (2017) confirmed that non-interest income activities are associated with more risks in comparison to interest income. Evidently, the extant literature has confirmed that indeed income diversification decreases the financial risks which our findings lend support.

References

- Acharya, V. V., Hasan, I., & Saunders, A. (2006). Should banks be diversified? Evidence from individual bank loan portfolios. *The Journal of Business*, 79(3), 1355-1412.
- Adzobu, L. D., Agbloyor, E. K., & Aboagye, A. (2017). The effect of loan portfolio diversification on banks' risks and return: Evidence from an emerging market. *Managerial Finance*.
- Ashraf, B. N., Arshad, S., & Hu, Y. (2016). Capital regulation and bank risk-taking behavior: evidence from Pakistan. *International Journal of Financial Studies*, 4(3), 16.
- Berger, A. N., & Udell, G. F. (1990). Collateral, loan quality and bank risk. *Journal of Monetary Economics*, 25(1), 21-42.
- Berger, A. N., Hasan, I., Korhonen, I., & Zhou, M. (2010). Does diversification increase or decrease bank risk and performance? Evidence on diversification and the risk-return tradeoff in banking.
- Bongomin, G. O. C., Munene, J. C., Ntayi, J. M., & Malinga, C. A. (2019). Collective action among rural poor: Does it enhance financial intermediation by banks for financial inclusion in developing economies?. *International Journal of Bank Marketing*.
- Boyd, J. H., & De Nicolo, G. (2005). The theory of bank risk taking and competition revisited. *The Journal of finance*, 60(3), 1329-1343.
- Brei, M., Borio, C., & Gambacorta, L. (2020). Bank intermediation activity in a low-interest-rate environment. *Economic Notes*, 49(2), e12164
- CBK (2019). Central Bank of Kenya Bank Supervision Annual Report 2019. *Central Bank of Kenya*
- CBK (2018). Central Bank of Kenya Bank Supervision Annual Report 2018. *Central Bank of Kenya*
- Chiorazzo, V., Milani, C., & Salvini, F. (2008). Income diversification and bank performance: Evidence from Italian banks. *Journal of financial services research*, 33(3), 181-203.
- Delis, M. D., Hasan, I., & Kazakis, P. (2014). Bank regulations and income inequality: Empirical evidence. *Review of Finance*, 18(5), 1811-1846.
- DeYoung, R., & Rice, T. (2004). Noninterest income and financial performance at US commercial banks. *Financial review*, 39(1), 101-127.
- Duho, K.C.T., Onumah, J.M. and Asare, E.T. (2020).Determinants and convergence of income diversification in Ghanaian banks. *Journal of Research in Emerging Markets, Vol. 2 No. 2, pp. 34-47*
- Ekanayake, E. M. N. (2017). Income diversification and bank risk-return trade-off: evidence from an emerging economy. *Asian Economic and Financial Review*, 7(7), 644-655.
- Gutiérrez-López, C., & Abad-González, J. (2020). Sustainability in the banking sector: A predictive model for the European banking union in the aftermath of the financial crisis. *Sustainability*, 12(6), 2566.
- Hann, R. N., Ogneva, M., & Ozbas, O. (2013). Corporate diversification and the cost of capital. *The journal of finance*, 68(5), 1961-1999.
- Haubrich, J. G., & Young, T. (2019). Trends in the noninterest income of banks. *Economic Commentary*, (2019-14).
- Jouida, S., & Hellara, S. (2018). Diversification, capital structure, and performance: A simultaneous equation approach. *Managerial and Decision Economics*, 39(2), 117-130.
- Kuppuswamy, V., & Villalonga, B. (2016). Does diversification create value in the presence of external financing constraints? Evidence from the 2007–2009 financial crisis. *Management Science*, 62(4), 905-923.
- Kim, H., Batten, J. A., & Ryu, D. (2020). Financial crisis, bank diversification, and financial stability: OECD countries. *International Review of Economics & Finance*, 65, 94-104.
- Köhler, M. (2015). Which banks are more risky? The impact of business models on bank stability. *Journal of Financial Stability*, 16, 195-212.

- Konishi, M., & Yasuda, Y. (2004). Factors affecting bank risk taking: Evidence from Japan. *Journal of Banking & Finance*, 28(1), 215-232.
- Lee, C. C., Yang, S. J., & Chang, C. H. (2014). Non-interest income, profitability, and risk in banking industry: A cross-country analysis. *The North American Journal of Economics and Finance*, 27, 48-67.
- Moudud-Ul-Huq, S., Zheng, C., Gupta, A. D., Hossain, S. A., & Biswas, T. (2020). Risk and performance in emerging economies: do bank diversification and financial crisis matter?. *Global Business Review*, 0972150920915301.
- Meslier, C., Tacneng, R., & Tarazi, A. (2014). Is bank income diversification beneficial? Evidence from an emerging economy. *Journal of International Financial Markets, Institutions and Money*, 31, 97-126.
- Mueller, S. D. (2008). The political economy of Kenya's crisis. *Journal of Eastern African Studies*, 2(2), 185-210.
- Mulindi, H. (2021). Cost-Benefit Analysis of Bank Regulation: Does Size Matter?.
- Nepali, S. R. (2018). Income diversification and bank risk-return trade-off on the Nepalese commercial banks. *Asian Economic and Financial Review*, 8(2),
- Nzotta, S. M., & Okereke, E. J. (2009). Financial deepening and economic development of Nigeria: An empirical investigation. *African Journal of Accounting, Economics, Finance and Banking Research*, 5(5).
- Pyle, D. H. (1999). Bank risk management: theory. In *Risk Management and regulation in banking* (pp. 7-14). Springer, Boston, MA.
- Qu, Z. (2020). The Impact of Income Diversification on Chinese Banks: Bank Performance. In *Income Diversification in the Chinese Banking Industry: Challenges and Opportunities* (pp. 53-88). Springer, Singapore.
- Tu, L. (2016). The effect of income diversification on bank risk: Evidence from Vietnam.
- Wang, Z., Zhao, Q., Zhu, M., & Pang, T. (2020). Jump Aggregation, Volatility Prediction, and Nonlinear Estimation of Banks' Sustainability Risk. *Sustainability*, 12(21), 8849.
- Zhou, K. (2014). The effect of income diversification on bank risk: evidence from China. *Emerging Markets Finance and Trade*, 50(sup3), 201-213.