



THE EFFECT OF ASSET DIVERSIFICATION ON BANK RISK – EVIDENCE FROM TURKEY

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ABSTRACT

The main purpose of the paper is to investigate the effect of asset diversification on bank risk. The relationship between diversification strategies and bank risk has been evaluated for a long time. However, there is no consensus about the relationship between asset diversification and bank risk so far. It remains inconclusive whether asset diversification has a positive or negative effect on bank risk. The opposing arguments about diversification are based on Markowitz (1952) modern portfolio theory and Jensen (1986) agency theory. In line with the modern portfolio theory, traditional banking theory suggests that if there is negative correlation between assets diversification is beneficial for banks in terms of risk. In contrast, agency theory argue that diversification strategy is not beneficial because of agency costs. As a measure for bank diversification Laeven and Levine (2007) asset diversification formula is used. Bank risk is discussed in the context of credit risk. Using quarterly data of top 10 Turkish deposit banks from 2010 to 2020, pooled OLS regression results suggest that relationship between asset diversification and risk is positive which supports agency theory and contradicts with traditional banking theory. It can be concluded that diversification is not advantageous in terms of bank risk. This analysis may provide guiding for regulators and bank managers in Turkey as well as in other developing economies.

Key Words: Bank risk, Asset diversification, Deposit banks, Turkish banking sector

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ÖZ

Çalışmanın amacı aktif çeşitlendirmesinin banka riski üzerine etkisinin incelenmesidir. Çeşitlendirme stratejileri ile banka performansı arasındaki ilişki uzun süredir değerlendirilmektedir. Ancak, aktif çeşitlendirmesi ile banka riski arasındaki ilişki ile ilgili fikir birliğine varılamamıştır. Aktif çeşitlendirmesinin banka riski üzerinde olumlu veya olumsuz bir etkisi olduğu konusu belirsizliğini korumaktadır. Çeşitlendirme ile ilgili karşıt görüşler, Markowitz (1952) modern portföy teorisi ve Jensen (1986) vekâlet teorisine dayanmaktadır. Modern portföy teorisine paralel olarak, geleneksel bankacılık teorisi varlıklar arasında negatif korelasyon olması durumunda çeşitlendirmenin risk açısından bankalara faydalı olduğunu ifade etmektedir. Buna karşın, vekalet teorisi vekalet maliyetleri nedeniyle çeşitlendirme stratejilerinin yararlı olmadığını savunmaktadır. Banka çeşitlendirmesi ölçümü olarak Laeven and Levine (2007) aktif çeşitlendirmesi formülü kullanılmıştır. Banka riski ise kredi riski bağlamında ele alınmıştır. Türk Bankacılık Sektörü'nde faaliyet gösteren ilk 10 bankanın 2010-2020 arası çeyreklik verileri kullanılarak yapılan havuzlanmış EKK sonuçlarına göre aktif çeşitlendirmesi ile risk arasında vekâlet teorisini destekleyen ve geleneksel bankacılık teorisi ile çelişen pozitif yönlü bir ilişki tespit edilmiştir. Çeşitlendirmenin banka riski açısından avantajlı olmadığı sonucuna ulaşılabilir. Analiz sonucu Türkiye'deki ve diğer gelişmekte olan ülkelerdeki düzenleyici kurumlara ve banka yöneticilerine yol gösterici olabilir.

Anahtar Kelimeler: Banka riski, Aktif çeşitlendirmesi, Mevduat bankaları, Türk Bankacılık Sektörü

1. INTRODUCTION

In corporate finance focus and diversification strategies is discussed both theoretically and empirically, but there is no consensus that which strategy contributes positively to performance. Also, findings in the corporate finance literature are not the same with banking sector due to the different characteristics of banks from firms (Berger et al., 2010, p.1417).

As competition increases in the banking sector, there is a need to reveal new products and services which leads to banks taking more risks and reducing their stability.

Two opposing arguments exist about the relationship between banks' diversification strategies and risk. The contrasting views are based on Markowitz's (1952) modern portfolio theory and Jensen's (1986) agency theory. Modern portfolio theory states that if there is a perfect negative correlation between assets unsystematic risk can be eliminated and the firm value can increase. Within the scope of traditional banking theory, the view that diversification is beneficial for banks by Diamond (1984), and Boyd and Prescott (1986) is based on modern portfolio theory. They state that banks can diminish their risks by following diversification strategies on their balance sheets. According to traditional approach, banks can reduce their bankruptcy risk by diversifying at the highest level due to their high leverage (Berger, et al., 2010, p.1418).

In contrast to the traditional view, supporters of agency theory argue that firms should follow a focus strategy as much as possible in order to minimize agency problems and to get the most benefit from administrative activities (Hayden, 2007, p.136). According to agency theory, diversification can lead firms to be exposed to more risk due to the desire of managers to put their own interests first rather than shareholders'. Since diversified companies have more complex structures, monitoring and management become ineffective and agency costs increase.

As a result, there is no consensus among the empirical studies in the literature about optimal level of diversification and whether diversification is beneficial for the banking sector or not.

In that respect, the hypothesis of the study is as follows:

H₁: There is a relationship between asset diversification level and credit risk (negative or positive).

The object of the study is to set forth the effect of asset diversification on bank risk. The case of Turkey is taken into account to determine the effect of asset diversification on bank risk in emerging economies. In bank diversification literature developed countries such as United States of America and Europe are covered more. Considering that the number of studies about asset diversification for emerging countries are few, by discussing asset diversification and bank risk jointly in Turkish banking sector our study contributes the limited literature of emerging economies. Therefore, the paper aims to fill the gap in bank diversification literature by taking into account asset diversification rather than income diversification.

Rest of the paper is structured as follows respectively. First, the related literature about the effect of diversification on bank performance. Then the data and methodology section, the empirical results are given and finally the last section is the conclusion.

2. LITERATURE REVIEW

Diversification reduces the non-systematic risk so that total risk of a portfolio of financial assets equals to systematic risk (Leković, 2018, p.171). When portfolio theory is adapted to the banking industry, diversification can reduce the likelihood of banks going bankruptcy. On the

other hand, agency theory suggests that banks should not diversify in order to decrease risk or increase performance. There are numerous studies in the literature examining the impact of diversification on bank performance such as risk and profitability. This section includes studies on diversification and bank risk in the banking sector.

Body and Graham's (1986) study is the first study to investigate the effect of diversification on bank risk with "Bank Holding Companies" (BHC) operating in the United States between 1971 and 1983. The study finds no evidence that turning to non-banking activities systematically increases or reduces the risk of bankruptcy.

Demsetz and Strahan (1997) analyze 150 publicly traded "Bank Holding companies" (BHCs) operating in the United States between 1988 and 1993. The analysis basically establishes a relationship between the size of The Bank Holding Companies and their bank specific risks. Large "Bank Holding Companies" diversify better than small ones; however, further diversification does not reduce the risk. Therefore, diversification can encourage mergers of small banks.

Stiroh (2004) examines the relationship between the increase in non-interest income and volatility of bank return and profitability using two different types of data set. The first data set covers quarterly data of the American banking sector from 1984 to 2001, while the second data set includes annual bank level from 1978 to 2000. Results from both data sets indicate that increase in non-interest income generate higher bank risk.

Acharya et al. (2006) investigate impact of credit portfolio diversification on risk and return of 105 Italian banks between 1993 and 1999. Main finding is that the effect of diversification varies according to the level of risk carried by banks. In high-risk banks group, diversification decreases bank returns by creating riskier loans and in low-risk banks group, diversification has very limited improvements by creating inefficient risk-return balance.

Using market-based measurements Baele et al. (2007) investigate whether banks (commercial banking, investment banking, insurance, etc.) that adopted a functional diversification strategy have comparative advantage over other banks in long-term performance/risk indicators. Panel data set analysis result shows that revenue diversification increases systematic risk of banks. On the other hand, it's effect on bank-specific risk is negatively sloping and non-linear.

Hayden et al. (2007) determining a value at risk criteria based on unexpected credit losses, study impact of diversification on performance of 983 German banks operating from 1996 to 2002. They conclude that especially in low and medium risk bank groups, as diversification increases lower returns occur. More rarely, high-risk banks diversification and bank return is positively correlated.

Lepetit et al. (2008) measure the effect of income diversification on bank risk for the period 1996-2002. They find that banks that are more focused on non-interest income generating activities are riskier and more likely to face bankruptcy. Considering bank sizes and looking at the details of non-interest income items, in small-scale banks risk increases due to commission and fee income.

Bush and Kick (2009) study the impact of the non-interest income on financial performance and risk profiles of German banking sector between 1995 and 2007. They find positive relationship between fee based non-interest income and the risk-adjusted return on equity and return on asset in universal bank group. In commercial bank group, fee income tends to create

higher bank risk. Both in commercial and savings bank group fee income lowers interest margin.

Berger et al. (2010) employ credit, deposit, asset and geographical diversification indices for diversification to a wide sample of the Russian banking sector between 1999 and 2006. As banks diversify less, they make higher profits and are exposed to lower risk up to a certain threshold.

Tabak et al. (2011) argue that as concentration in the credit portfolio increases returns increase and the risk of default decreases in Brazilian banking sector. According to the ownership structure of the banks; the lack of diversification in the loan portfolio increases the return in privately owned banks and reduces the risk in foreign and publicly owned banks.

Swada (2013) finds that bank value is positively correlated with revenue diversification but there is no evidence that reduces bank risk for the period 1999-2011 in Japanese banking sector. On the other hand, activities that generate fee income reduces systematic and non-systematic risk.

Zhou (2014) conclude that because of the strong relationship between non-interest income and interest income, relationship between revenue diversification and total bank risk is insignificant.

Williams (2016) tests the relationship between revenue diversification and bank risk in Australian banking sector between 2002 and 2014, concluding that banks with lower non-interest income, that is, higher income concentration are less risky.

Lee et al. (2020) analyze the data of 1,008 banks from 53 countries covering the period 2006-2013, and examines impact of bank-level the weighted average of income diversification on the total risk of the banking sector. They use Z-score to measure systemic risk of the banking sector and results show that higher income diversification caused higher systemic risk. When banks with high correlations with each other are excluded from the sample, it is determined that the effect of bank-level diversification on systemic risk is not significant.

Pham et al. (2021) evaluate the impact of asset, funding and revenue diversification strategies and combinations of them on Vietnam banking sector risk during the period 2005-2019. According to the findings, during the banking crises between 2011 and 2014 diversification improved risk- return profile of the banks.

Li et al. (2021) discussed the impact of Covid-19 economic crises in the relationship between non-interest income sources and bank profitability and risk in the U.S. banking sector. As a result, non-interest income is positively correlated with performance but negatively correlated to risk.

In domestic literature most of the studies are concentrated on diversification and bank performance relationship.

Yılmaz Türkmen and Yiğit (2012) analyze annual data of 40 banks operating in Turkey for the period 2007 – 2011 and conclude that as the level of diversification increases in loan portfolio, the risk level of banks increases.

Gürbüz et al. (2013) examine the impact of revenue diversification on risk-adjusted bank performance for deposit banks operating in Turkey. Analyzing sample of 26 banks from 2005 to 2011 they find that revenue diversification improves bank performance.

Tunay (2015) investigates loans' sectoral concentration on credit risk for the period 2003-2014. Results of the panel data analysis show that lack of diversification of loans on a sectoral basis increased the risk of credit in all bank groups.

Çınar et al. (2018) use entropy methodology to measure Turkish deposit banks diversification variable as income and credit. They conclude that that diversification of credit types and revenue diversification increase profitability (ROA) and reduce risk (NPL). On the contrary, diversification of loans on a sectoral basis has an inverse effect on profitability and risk.

Atik (2019) analyzing 16 deposit banks data in Turkish banking sector from 2002-2017, discovers that diversification of banks' revenue sources do not improve performance and increase the risk level of banks.

Yalçın and Tunay (2020) examine the impact of loan diversification according to sectors of 23 commercial banks operating in Turkey covering the period 2002-2018 with dynamic panel data analysis method. They find that effective loan portfolio diversification reduces credit risk.

Buyuran and Eksi (2020); Kayran and Kıyılar (2021) reach a similar conclusion after analyzing income diversification and performance relationship. In both studies income diversification is positively related to performance, thus performance increases as diversification increases.

3. DATA AND METODOLOGY

3.1. Data

This paper attempts to investigate the effect of asset diversification on bank risk. A panel data sample of top 10 Turkish deposit banks from 2010:1 to 2020:4 is used. As of December, 2020 total of 32 deposit banks with 3 state-owned, 8 privately-owned and 21 foreign banks are operating in the Turkish banking sector. Considering the scale of banks top 10 commercial banks in terms of asset size are taken as the sample. Table 1 presents total assets of 10 deposit banks which constitute 86.1% of the total assets of the sector. Top 10 banks have significant share in the banking industry.

Table 1. Banks Included in the Analysis

Bank Name	Total Assets (million TL)	Sector Share (%)
“T.C. Ziraat Bankası A.Ş.”	942.601	16,6
“T.Vakıflar Bankası T.A.O.”	698.897	12,3
“T. Halk Bankası A.Ş.”	680.026	12,0
“T. İş Bankası A.Ş.”	593.902	10,5
“T. Garanti Bankası A.Ş.”	492.798	8,7
“Yapı ve Kredi Bankası A.Ş.”	459.694	8,1
“Akbank T.A.Ş.”	446.101	7,9
“QNB Finansbank A.Ş.”	227.253	4,0
“Denizbank A.Ş.”	199.256	3,5
“Türk Ekonomi Bankası A.Ş.”	140.048	2,5
Total	4.880.577	86,1

Source: “The Banks Association of Turkey”

Quarterly data of all banks included in the analysis is collected from “The Banks Association of Turkey” in bank-level. Macroeconomic data is gathered from “Turkish Statistical Institute (TURKSTAT)” and “the Central Bank of the Republic of Turkey (CBRT) Electronic Data Delivery System (EDDS)”.

3.2. Variables

Three types of variables are used in the paper. The dependent variable is the measurement of bank risk, independent variable is the measurement of bank asset diversification, and last the control variables. The definitions and calculation methods of the variables are shown in Table 2.

Table 2. Variables Used in Model

Variable	Variable Type	Calculation
Credit Risk	Dependent Variable	“Non-performing loans / Total Loans”
Asset Diversification	Independent Variable	$1 - \left \frac{\text{Net Loans} - \text{Other Earning Assets}}{\text{Total Earning Assets}} \right $
Size	Control Variable	“Bank Total Asset Share in Sector”
Equity	Control Variable	“Shareholders' Equity / Total Assets”
Liquidity	Control Variable	“Liquid Assets / Total Assets”
Inflation	Control Variable	“Consumer Price Index”
GDP	Control Variable	“Growth Rate of the Gross Domestic Product”

Source: Author

Leaven and Levine (2007) construct asset and income diversification formula to measure diversification level of bank business. In this paper Leaven and Levine (2007) method is adopted for asset diversification.

$$\text{Asset diversification} = 1 - \left| \frac{\text{Net Loans} - \text{Other Earning Assets}}{\text{Total Earning Assets}} \right| \quad (1)$$

where

Net Loans = Total Loans – Specific Provisions (TFRS 9 not applied, before 2018)

Net Loans = Total Loans – Expected Credit Losses (TFRS 9 applied, 2018 and after)

Other Earning Assets = Cash Balances at Central Bank + Banks + Receivables from Money Markets + Financial Assets

Total Earning Assets = Net Loans + Other Earning Assets

Asset diversification formula takes values between 0 and 1. When values of the diversification measure increases, it indicates greater diversification.

3.3. Metodology

The following panel data regression model for the empirical study is used.

$$Y_{i,t} = \alpha_i + \beta_1 AD_{i,t} + \beta_2 \text{control}_{i,t} + \varepsilon_{i,t} \quad (2)$$

where Y indicates bank risk, AD measures asset diversification with Leaven and Levine (2007) formula; and control is indicating a number of control variables. Dependent, independent and control variables are added depending on the previous literature. Size is the most widely used control variable in studies such as Acharya and Saunders (2006); Berger et al. (2010); Lepetit et al. (2008) and Zhou (2014). Equity ratio is included in studies such as Stiroh (2004); Busch

and Kick (2009); Berger et al. (2010); Tabak et al. (2011) and Sanya and Wolfe (2011). Liquidity, which is the ratio of liquid assets to total assets, used in Demirgüç-Kunt et. al. (2003) and Hou (2018). GDP growth rate and inflation are included most studies like Fiordelisi (2011); Sanya and Wolfe (2011); Amidu and Wolfe (2013).

All of the variables are fully included in the bank risk-diversification model, which is stated in equation 2.

Table 3. Descriptive Statistics

Variable	Mean	Std. Deviation	Minimum	Maximum
Credit Risk (NPL)	3.85	1.76	1.2	10.45
Size	8.57	3.79	1.8	16.64
Equity	10.83	1.70	6.3	15.60
Liquidity	23.76	8.32	4.93	45.17
Asset Diversification	68.01	10.95	45.08	99.02
Inflation	10.14	3.95	3.99	24.52
GDP	1.43	3.29	-10.97	15.94

Source: Author

In panel data analysis, it is necessary to investigate whether all units are equally affected as a result of the shock to cross sections. This research, also known as cross section dependency, determines whether the same period error terms are related (Ün, 2018, p.88). The presence of cross section dependency is related to the selection of panel unit root test. In order to test cross section dependency Breusch-Pagan Lagrange Multiplier Test (1980) is used.

$H_0: \rho = 0$

$H_1: \rho < 1$

Table 4. Breusch-Pagan LM Test Results

Test	Statistical Value (chi ²)	Probability Value
Breusch-Pagan LM	546.598	0,0000

Source: Author

Table 4 displays the results of Breusch-Pagan LM test indicating that H_0 hypothesis, is rejected and there is cross sectional dependence. Second generation panel unit root tests should be used to determine the stationary of variables, because of the correlation between cross section. Second generation panel unit root tests eliminate correlation between units with models established by factor model or generalized least squares method (Şak, 2018, p.305).

Table 5 displays the panel unit root results which includes CADF test developed by Pesaran (2007) and Levin-Lin-Chu (2002) test.

$H_0: \delta_i = 0$ (cross-sections contains unit root, not stationary)

$H_1: \delta_i < 0$ (cross-sections do not contain unit root, stationary)

Table 5. Unit Root Test Results

Variable	Test	I(0)		I(1)	
		Constant and Trend	p-value	Constant without Trend	p-value
Credit Risk (NPL)	Pesaran CADF	-2,390	0,429	-4,124	0,000***
Size	Pesaran CADF	-1,612	0,996	-4,576	0,000***
Equity	Pesaran CADF	-2,456	0,338	-4,537	0,000***
Liquidity	Pesaran CADF	-2,883	0,026**	-	-
Asset Diversification	Pesaran CADF	-2,478	0,310	-4,240	0,000***
Inflation	Levin-Lin- Chu	-4,883	0,000***	-	-
GDP	Levin-Lin- Chu	-5,356	0,000***	-	-

“Note: ***, ** and * represent %1, %5 and %10 significance level, respectively”

Source: Author

After the series become stationary, F-test and the Breush Pagan LM test for random effects are used to determine whether panel units are different from each other. Because both of the tests probability value is greater than 0.05, it is determined that pooled OLS model is appropriate.

Thus, according to the results of the F and Breush Pagan LM test, there is a single regression constant ($\beta_{kit}=\beta_t$) that defines all cross section units, and the model is estimated by pooled OLS method (classic model).

4. EMPIRICAL RESULTS

Table 6 presents the empirical results related to asset diversification. The coefficient of the asset diversification is significant and positive at 1 percent level when NPL rate is used to measure bank risk. Asset diversification level is positively correlated with credit risk, that is among earning assets, diversification of deposit banks fails to reduce the bank risk in Turkey. As banks diversify between their earning assets, non-performing loan rates increase. Higher levels of diversification indicates higher levels of bank risk. In other words, banks are exposed to more risk as they implement diversification strategies. This result supports with agency theory which argue that banks should pursue focus strategy. According to agency theory, diversification create agency costs due to conflicts of interest between managers and owners so that exposing banks to greater risk. Thus, the results indicate that high asset diversification cause high bank risk.

As for the other determinants of credit risk, the relationship between size and credit risk is significant and negatively correlated. That is, larger banks are exposed to less credit risk. With the advantage of economies of scale, large-scale banks can use more effective tools and techniques when managing their loan portfolios. Also, larger banks tend to take less risk due to their risk management policies so that their NPL rate decrease.

According to model results capital ratio is positively correlated with credit risk which indicates that banks with higher capital adequacy spread loans to riskier individuals and institutions. High capital level increases banks' appetite for risk-taking, increasing the risky loan rate in their portfolios, thereby increasing the risk of the loans they are exposed to.

Finally, the inflation rate has a positive and significant effect on the bank's credit risk. The fact that the income of borrowers does not increase at the same level as inflation increases, higher inflation come up with higher cost. Since the increase in inflation reduce the real income of households and institutions, there can be failure in loan repayments and the bank's non-performing loans increase.

Table 6: Pooled OLS Model Regression Results

Dependent Variable: Credit Risk (NPL)				
Variables	Coefficient	Std. Error	t-Statistic	Probability
Size	-0,2478	0,0817	-3,03	0,003***
Equity	0,2092	0,0324	6,44	0,000***
Liquidity	0,0006	0,0028	0,24	0,812
Asset Diversification	0,0189	0,0058	3,22	0,001***
Inflation	0,0317	0,0060	5,30	0,000***
GDP Growth Rate	-0,0005	0,0060	-0,08	0,933
Constant	-0,3183	0,1161	-2,74	0,006***

“Note: ***, ** and * represent %1, %5 and %10 significance level, respectively”

Source: Author

5. CONCLUSION

Developments in the finance industry led to more competition in the banking sectors both in developed and emerging countries. With the increase in competition, banks added new businesses as well as their traditional banking activities so that banks move towards asset and revenue diversification (Meslier et al., 2014, p.97-98). At the same time, as competition increases in the banking sector, new products and services leads to banks taking more risks and reducing their stability (Kusi et al., 2019, p.67). Therefore, in recent years the effect of diversification on bank performance has been a frequently studied for developed countries (Meslier et al., 2014, p.97-98).

In literature, there is no concurrence about diversification-performance relationship. The main reason for the lack of concurrence is due to the balance between the benefits and costs of diversification. Modern portfolio theory (Markowitz, 1952) suggests that if correlations of the assets are perfectly negative non-systematic risk of the portfolio can be eliminated. Traditional banking theory (Diamond 1984; Boyd and Prescott 1986) based on modern portfolio argument recommends that banks should diversify as possible as they can. However, Jensen (1986) states that firms should focus on their traditional activities in order to minimize agency problems. This point of view indicates that diversification leads to a decrease in the value of the company by increasing the resources controlled by managers and encouraging companies to increase above the optimal size.

Observations that more emphasis has been placed on diversification strategies in the Turkish banking sector in the past decade encouraged for the study to contribute to the literature in the point of emerging countries. In order to establish a relevance between bank diversification and risk, diversification strategies among earning assets on credit risk is investigated. For this purpose, 10 deposit banks data over the period from 2010 to 2020 is examined.

In summary, for asset diversification, the results show that more diversified assets lead to higher credit risk. It seems that asset diversification brings additional risk, focusing generally leads to lower risk. Therefore, the diversification of the assets of Turkish deposit banks is not useful in reducing their risks. This result is in line with the studies considering the impact of diversification on risk such as Berger et al. (2010), Yılmaz Türkmen and Yiğit (2012), Atik (2019), Stiroh (2004), Busch and Kick (2009), Lepetit et al. (2008) and Williams (2016). All of these studies show that there is a positive relationship between bank diversification and bank risk. Our result is contradicting with Tabak et al. (2011) and Pham et al. (2021).

In terms of policy implication, level of bank asset diversification should be carefully evaluated. It should be noted that asset diversification increases risk of the banks but also the asset correlation of banks needs to be examined in detail. Although the study presents some considerable results it has some limitations. First, the research is conducted only in Turkey which is difficult to generalize the conclusions. Second, the sample size is a limitation. The sample size should be expanded to increase the reliability of the study. Further studies should be done to provide contribution to literature.

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