DIGITAL TRANSFORMATION AND ADMINISTRATION INNOVATION

Citation: Kamrani, H., Salari, H., & Iranmanesh, M. (2024). Examining the Impact of Revenue Diversification on Risk Management and Financial Returns in Electronic Banking. *Digital Transformation and Administration Innovation*, 2(4), 25-32.

Received: 2024-09-15 Revised: 2024-10-18 Accepted: 2024-11-09 Published: 2024-11-25

Examining the Impact of Revenue Diversification on Risk Management and Financial Returns in Electronic Banking

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Abstract

Given the emergence of revenue diversification and the level of investment in various economic sectors, the liquidity entering the market has increased, ultimately leading to a rise in inflation rates. The proportion of independent board members can be considered one of the influential factors in establishing a balance between revenue diversification and the expansion of banking activities. The objective of this study is to examine the impact of revenue diversification on risk management and financial returns in electronic banking. This research is a library-based and analytical-causal study, utilizing panel data analysis. The financial information of ten banks listed on the Tehran Stock Exchange was analyzed over the period from 2016 to 2021 (60 bank-years). The findings indicate that revenue diversification significantly affects banks' risk levels and financial returns. Therefore, based on the research findings, an increase in the level and extent of revenue diversification can have significant implications for investors' decision-making.

Keywords: Revenue diversification, risk, financial returns, electronic banking

1. Introduction

Today, revenue diversification in banks can have a significant impact on their responsibilities and risk levels. When banks engage in various investment activities across different economic sectors to generate diverse sources of income, they simultaneously increase the level and diversity of their profitability (Claessens & van Horen, 2019). However, as banks seek to enhance their revenues, they also assume various types of risks (Roshan & Khodarahmi, 2024; Temba et al., 2024). When a bank's risk level rises due to its activities, the scope of its banking operations expands accordingly (Barba Navaretti et al., 2021). The expansion of banking operations affects the stock returns of bank shareholders. With increasing volatility in bank stock returns over the long term, the cash flows of banks are influenced, potentially leading to an increase in the growth rate of banks' economic value-added (Köhler, 2020).

Revenue diversification can occur through banks' investments in different sectors. Some banks, in line with their long-term strategic policies, invest in multiple economic sectors, thereby generating diverse income streams. Ultimately, by implementing a diversified revenue portfolio, banks can improve their overall performance (Maudos, 2017). Revenue diversification can influence bank stock returns over the long term, while in the short term, it significantly impacts banking risk (Beck et al., 2020). With an increase in the expected return of banks, investors are more likely to engage in investments in these financial

institutions. One of the critical factors affecting shareholders' and other stakeholders' investment intentions in bank stocks is the volatility of banking risks (Barba Navaretti et al., 2021; Claessens & van Horen, 2019).

The fluctuations in banking risk can affect variables such as bank size and the ratio of capital expenditures. As the proportion of capital expenditures increases, bank size expands, ultimately leading to an increase in the capital ratio of banks (Maudos, 2017). Revenue diversification can influence banking inflation rates, contributing to an overall increase in inflation within an economy. The proportion of independent board members typically emphasizes the concentration of banking activities, guiding banks toward a focus on service-oriented operations (Köhler, 2020). In certain cases, the expansion of banking activities positively impacts banks' growth rates. As bank growth rates rise, revenue diversification and the scale of banking activities increase correspondingly, ultimately having a positive effect on banks' expected returns (Barba et al., 2021).

Banks, in alignment with their long-term strategies, increase their capital expenditures and strive to enhance shareholder dividend payouts over different time periods (Alvani et al., 2016; Beck et al., 2020). In pursuit of greater efficiency and productivity, banks raise their capital ratios and, by diversifying and expanding their operations, aim to mitigate the risks associated with their activities (Lehar, 2005; Maudos, 2017). In most cases, banking expansion leads to improved bank performance, which, over different time periods, can significantly influence stock returns, ultimately enhancing banks' expected performance. Inflation is one of the key factors affecting the growth rate of banking activities. As risk increases, inflation rates rise accordingly, eventually leading to a reduction in banks' capital expenditure ratios (Pasiouras & Kosmidou, 2007; Saeedi & Shabani Motlagh, 2021).

The literature on revenue diversification, banking activities, and financial performance presents various perspectives on their interconnections. Barba et al. (2021) investigated the role of financial flexibility and regulatory frameworks in bank returns, concluding that increased financial flexibility enhances stock returns and overall efficiency, while regulatory constraints create a structured banking environment that improves operational efficiency (Barba Navaretti et al., 2021). Madous (2020) analyzed the relationship between income structure, profitability, and risk in European banks, revealing that income volatility affects profitability, ultimately reducing banking risk (Maudos, 2017). Köhler (2020) explored banking risk and its influence on business model flexibility, showing that higher risk levels lead to greater flexibility and, consequently, improved bank performance (Köhler, 2020). Beck et al. (2020) focused on the impact of modern banking on banking activity expansion, concluding that the adoption of new banking technologies increases online banking activities, which, in turn, affects bank efficiency either positively or negatively (Beck et al., 2020). Claessens and Van Horne (2020) studied the effects of banking investment on liquidity ratios and bank risk, finding that increased banking activities improve liquidity and asset positions but that rising bank debt negatively affects overall performance. Domestic studies have also examined related factors in Iran's banking sector (Claessens & van Horen, 2019). Panahi et al. (2021) analyzed the social cost of market power in Iranian banking, highlighting its impact on GDP over time (Panahi et al., 2015). Ghalibaf Asl and Babalovian (2020) investigated bank stock valuation models, emphasizing the challenges posed by regulatory constraints, reinvestment policies, and capital structures (Ghalibaf Asl & Babalovian, 2015). Daei Karimzadeh et al. (2019) assessed the macroeconomic determinants of bank stock prices, finding that inflation and exchange rates negatively influence bank stock indices, while deposit rates and GDP have positive effects (Daei Karimzadeh et al., 2013). Sheikh et al. (2018) explored the impact of inflation on corporate financing, showing that inflation has a stronger effect on bank debt financing than on equity issuance (Sheikh et al., 2013). Abonouri et al. (2017) analyzed the relationship between inflation and deposit interest rates in Iran's banking system, confirming a long-term positive correlation between nominal interest rates and inflation (Abounoori et al., 2013). Alvani et al. (2016) studied the efficiency of bank branches and identified economic size, fixed asset ratios, employee education, and technology adoption as key efficiency determinants (Alvani et al., 2016). Khosh Sima and Shahiki Tash (2016) examined the effect of credit, operational, and liquidity risks on banking efficiency in Iran, finding that these risks significantly impact bank performance, with parametric methods outperforming non-parametric approaches in efficiency assessments (Khosh Sima & Shahiki Tash, 2016). These studies suggest that revenue diversification and banking activities play a crucial role in shaping risk, returns, and efficiency within banking systems.

Based on the discussed considerations, the primary research question of this study is to examine the impact of revenue diversification and banking activity expansion on the risk and returns of banks listed on the Tehran Stock Exchange. Additionally, this study investigates the influence of variables such as the capital ratio, bank size, and capital expenditure ratio on the relationships between revenue diversification, banking activity expansion, and risk-return dynamics.

2. Methods and Materials

The research method employed in this study falls under the category of correlational research, which is a subset of descriptive research. In correlational descriptive research, the researcher examines the relationships between two or more variables. The reasoning approach of this research is deductive-inductive. It is deductive because the theoretical framework and literature review are derived from books, articles, and internet sources. It is inductive because the data collection is based on primary data to accept or reject the hypotheses. Given the nature of the data and the available statistical analysis methods, this study utilizes the panel data method. This method is chosen because, to examine the impact of revenue diversification and the expansion of banking activities on banks' risk and returns, the predictor and estimated variables are analyzed from two different perspectives. On one hand, these variables are tested across different banks, and on the other hand, they are examined over the period from 2016 to 2021.

Data collection is of particular importance in any type of research. In this study, to review the theoretical foundations and literature, a library-based method is used, utilizing specialized books, articles in Persian and English, and dissertations. Since the variables in this study include numerous accounting items presented in the audited financial statements of banks, the required data are manually extracted from financial statements available on the following sources: the Research, Development, and Islamic Studies Management website of the Securities and Exchange Organization (www.rdis.ir), the Codal system, which is the comprehensive publisher information system (www.codal.ir), the Iranian Financial Information Processing Center (www.fipiran.com), and compact discs provided by the Securities and Exchange Organization.

Data analysis is a multi-stage process in which the data collected through various instruments in the statistical sample are summarized, coded, categorized, and ultimately processed to facilitate different types of analyses and establish relationships among the data for hypothesis testing. At the analysis stage, it is crucial for the researcher to examine the data in line with the research objectives, answer the research questions, and evaluate the research hypotheses (Hafeznia, 2006).

For data analysis and hypothesis testing, the necessary information will be collected from the audited financial statements of the banks under review over a six-year period (2016–2021). After gathering the required data for the selected banks, the research hypotheses will be examined using correlation analysis, regression analysis, and the panel data statistical method. Initially, preliminary calculations will be conducted in Microsoft Excel to prepare the data for analysis. Subsequently, final statistical analyses will be performed using SPSS 22, EViews 8.1, and Minitab 17.1 software.

3. Findings and Results

In this section, for each research hypothesis, the appropriate estimation model is determined first, followed by the estimation of the research model and the interpretation of the obtained results. Additionally, for each hypothesis, statistical assumptions are tested, including residual normality, homoscedasticity, independence of residuals, and linearity of the model, along with explanations and the corresponding results. All statistical tests have been conducted using EViews 8.1 software. Finally, the research hypotheses are formulated as follows:

First Hypothesis:

Revenue diversification affects banks' risk.

Second Hypothesis:

Revenue diversification affects banks' financial returns.

The objective of testing the first hypothesis is to examine the impact of revenue diversification on banks' risk. The statistical hypothesis is defined as follows:

H_0: Revenue diversification does not have a significant impact on banks' risk.

H_1: Revenue diversification has a significant impact on banks' risk.

This hypothesis is estimated using model (1) in the form of panel data. If the coefficient β_1 is significant at the 95% confidence level, the hypothesis will be confirmed.

Model (1):

$$Risk\_(i,t) = \alpha_0 + \beta_1 CBB\_(i,t) + \beta_2 Efficiency\_(i,t) + \beta_3 Equity\_(i,t) + \beta_4 Size\_(i,t) + \beta_5 Bankingfreedom\_(i,t)$$

- $+ \beta_6 Propertyright\_(i,t) + \beta_7 Capitalstringent\_(i,t) + \beta_8 GDPgrowth\_(i,t) + \beta_9 Inflation\_(i,t) + \varepsilon\_(i,t)$

To determine whether the panel data method is appropriate for estimating the given model, the Chow test (F-restricted test) is employed. Additionally, to determine the more suitable estimation method (fixed effects or random effects) and to assess whether the differences across cross-sectional units are fixed or random, the Hausman test is applied. The results of these tests are presented in Table 1.

Table 1. Results of the Chow and Hausman Tests for Model (1)

Test	Observations	Test Statistic	Statistic Value	Degrees of Freedom	P-Value
Chow	60	F	3.3113	(41,9)	0.0040
Hausman	60	χ^2	13.8897	9	0.0263

Considering the results of the Chow test and its P-Value (0.0040), the null hypothesis H_0 is rejected at the 95% confidence level, indicating that the panel data method is applicable. Additionally, based on the Hausman test result and its P-Value (0.0263), which is less than 0.05, the null hypothesis H_0 is rejected, and the alternative hypothesis H_1 is accepted. Consequently, the model should be estimated using the fixed effects method.

To validate the model and assess the classical regression assumptions, in addition to verifying the absence of multicollinearity among the independent variables, further tests related to residual normality, homoscedasticity, independence of residuals, and specification error (model linearity) are conducted.

For testing residual normality, various methods can be used. One of these methods is the Jarque-Bera test, which is also employed in this study. The results indicate that the residuals from the estimated model follow a normal distribution at the 95% confidence level, as the probability of this test (0.1758) is greater than 0.05.

Another classical regression assumption is the homoscedasticity of residuals. If variances are heteroskedastic, the estimator will not be the Best Linear Unbiased Estimator (BLUE) and will not have the minimum variance. In this study, the Breusch-Pagan test is used to examine homoscedasticity. Given the significance level of this test, which is less than 0.05 (0.0056), the null hypothesis of homoscedasticity is rejected, indicating that the model exhibits heteroskedasticity. To address this issue, the Generalized Least Squares (GLS) estimation method is applied.

Additionally, to test the independence of residuals, which is a fundamental assumption in regression analysis, the Durbin-Watson (D-W) test is used. Based on the initial model estimation results, the Durbin-Watson statistic is 1.93, which falls within the acceptable range of 1.5 to 2.5. This suggests that the residuals are independent.

Furthermore, to examine whether the model is correctly specified in terms of linearity, the Ramsey RESET test is applied. Given that the significance level of the Ramsey test (0.1553) is greater than 0.05, the null hypothesis of model linearity is confirmed, and the model does not suffer from specification error. The summary of these test results is presented in Table 2.

Table 2. Results of Statistical Tests for Model Assumptions (1)

Test	Statistic Value	P-Value
Jarque-Bera (χ^2)	3.4758	0.1758
Breusch-Pagan (F)	0.7229	0.0056
Durbin-Watson (D)	1.93	-
Ramsey (F)	1.9363	0.1553

These results confirm that the model meets the key assumptions for statistical validity and robustness in regression analysis.

Based on the results of the Chow and Hausman tests, as well as the findings from the classical regression assumption tests, Model (1) is estimated using the panel data method with fixed effects. The estimation results of the model are presented in Table 3. The estimated form of the model, using EViews 7 software, is as follows:

$$Risk\_(i,t) = 0.4233 + 0.0818\ CBB\_(i,t) + 0.1205\ Efficiency\_(i,t) + 0.1241\ Equity\_(i,t) + 0.0087\ Size\_(i,t)$$

- $0.0649\ Bankingfreedom\_(i,t) + 0.0628\ Propertyright\_(i,t) - 0.3258\ Capitalstringent\_(i,t)$
- $0.0958\ GDPgrowth\_(i,t) + 0.1718\ Inflation\_(i,t) + \varepsilon\_(i,t)$

Table 3. Results of Testing the First Research Hypothesis Using the Fixed Effects Method

Variable	Coefficient	t-Statistic	P-Value	Relationship
Constant	0.4233	2.5158	0.0159	Positive
Revenue Diversification	0.0818	2.9256	0.0101	Positive
Banking Activity Expansion	0.1205	3.3179	0.0048	Positive
Capital Ratio	0.1241	3.2554	0.0064	Positive
Bank Size	0.0087	4.3376	0.0003	Positive
Ratio of Independent Board Members	-0.0649	-3.8495	0.0005	Negative
Capital Expenditure Ratio	0.0628	1.0543	0.2979	Insignificant
Growth Rate	-0.3258	-2.8525	0.0068	Negative
Inflation Rate	0.0958	2.1011	0.0418	Positive
Ratio of Fixed Assets	0.1718	2.1476	0.0377	Positive

R^2 = 0.6063; F-Statistic (P-Value) = 3.5088 (0.0004)

In assessing the significance of the overall model, given that the P-Value of the F-Statistic is less than 0.05 (0.0004), the significance of the entire model is confirmed at the 95% confidence level. The coefficient of determination (R^2) indicates that 60.63% of the variation in bank risk is explained by the variables included in the model.

For evaluating the significance of individual coefficients, as presented in Table 3, since the P-Value for the coefficient of the revenue diversification variable is less than 0.05 (0.0101), the significant effect of revenue diversification on risk is confirmed at the 95% confidence level. Therefore, the first research hypothesis is accepted, and it can be stated with 95% confidence that revenue diversification has a significant impact on bank risk. The positive coefficient of this variable (0.0818) indicates a direct effect, meaning that an increase of one unit in revenue diversification leads to a 0.0818 unit increase in bank risk. Based on the conducted analysis supporting the first hypothesis, it can be concluded that revenue diversification influences bank risk.

The objective of testing the second hypothesis is to examine whether revenue diversification has a significant effect on bank returns. The statistical hypothesis is formulated as follows:

H_0: Revenue diversification does not have a significant effect on bank returns.

H_1: Revenue diversification has a significant effect on bank returns.

This hypothesis is estimated using Model (2) in the panel data framework. If the coefficient β_1 is significant at the 95% confidence level, the hypothesis will be confirmed.

$$return\_(i,t) = \alpha_0 + \beta_1\ CBB\_(i,t) + \beta_2\ Efficiency\_(i,t) + \beta_3\ Equity\_(i,t) + \beta_4\ Size\_(i,t) + \beta_5\ Bankingfreedom\_(i,t)$$

- $\beta_6\ Propertyright\_(i,t) + \beta_7\ Capitalstringent\_(i,t) + \beta_8\ GDPgrowth\_(i,t) + \beta_9\ Inflation\_(i,t) + \varepsilon\_(i,t)$

Table 4. Results of the Chow and Hausman Tests for Model (2)

Test	Test Statistic	Statistic Value	Degrees of Freedom	P-Value
Chow	F	0.2404	(41,9)	0.0061
Hausman	χ^2	2.9838	9	0.0049

Considering the results of the Chow test and its P-Value (0.0061), the null hypothesis H_0 is rejected at the 95% confidence level, indicating that the panel data method is appropriate. Additionally, based on the Hausman test result and its P-Value (0.0049), which is less than 0.05, the null hypothesis H_0 is rejected, and the alternative hypothesis H_1 is accepted. Consequently, the model should be estimated using the fixed effects method.

In assessing the classical regression assumptions, the results of the Jarque-Bera test indicate that the residuals from the estimated model follow a normal distribution at the 95% confidence level, as the probability of this test (0.1194) is greater than 0.05. Moreover, given that the significance level of the Breusch-Pagan test is less than 0.05 (0.0178), the null hypothesis of homoscedasticity is rejected, indicating the presence of heteroscedasticity in the model. To address this issue, the Generalized Least Squares (GLS) estimation method is applied.

For the autocorrelation test of residuals, the Durbin-Watson (D-W) statistic is used. The test result shows a Durbin-Watson value of 2.26, which falls within the acceptable range of 1.5 to 2.5. This confirms that the residuals are independent. Additionally, given that the significance level of the Ramsey test is greater than 0.05 (0.2480), the null hypothesis of model linearity is confirmed, indicating that the model does not suffer from specification error.

Table 5. Results of Statistical Tests for Model Assumptions (2)

Statistic	Jarque-Bera (χ^2)	Breusch-Pagan (F)	Durbin-Watson (D)	Ramsey (F)
Value	4.2496 (0.1194)	0.4209 (0.0178)	2.26	1.4354 (0.2480)

Based on the results of the Chow and Hausman tests, as well as the findings from the classical regression assumption tests, Model (2) is estimated using the panel data method with fixed effects. The estimation results of the model are presented in Table 6.

Table 6. Results of Testing the Second Research Hypothesis Using the Fixed Effects Method

Variable	Coefficient	t-Statistic	P-Value	Relationship
Constant	0.0476	3.2918	0.0036	Positive
Revenue Diversification	0.0093	3.6103	0.0050	Positive
Banking Activity Expansion	0.0042	4.2754	0.0004	Positive
Capital Ratio	0.0024	2.1538	0.0185	Positive
Bank Size	0.0068	3.2741	0.0098	Positive
Ratio of Independent Board Members	-0.0001	-4.0097	0.0003	Negative
Capital Expenditure Ratio	-0.0001	-0.1090	0.9137	Insignificant
Growth Rate	0.0670	2.4496	0.0187	Positive
Inflation Rate	0.0004	3.0540	0.0072	Positive
Ratio of Fixed Assets	-0.0043	-2.3057	0.0013	Negative

R^2 = 0.5435; F-Statistic (P-Value) = 11.7334 (0.0000)

The estimated form of the model, using EViews 7 software, is as follows:

return_(i,t) = 0.0476 + 0.0093 CBB_(i,t) + 0.0042 Efficiency_(i,t) + 0.0024 Equity_(i,t) + 0.0068 Size_(i,t)

- 0.0001 Bankingfreedom_(i,t) - 0.0001 Propertyright_(i,t) + 0.0670 Capitalstringent_(i,t)
- 0.0004 GDPgrowth_(i,t) - 0.0043 Inflation_(i,t) + ε_(i,t)

In assessing the significance of the overall model, given that the P-Value of the F-Statistic is less than 0.05 (0.0000), the significance of the entire model is confirmed at the 95% confidence level. The coefficient of determination (R^2) indicates that 54.35% of the variation in bank returns is explained by the variables included in the model.

For evaluating the significance of individual coefficients, as presented in Table 6, since the P-Value for the coefficient of the revenue diversification variable is less than 0.05 (0.0050), the significant effect of revenue diversification on bank returns is confirmed at the 95% confidence level. Therefore, the second research hypothesis is accepted, and it can be stated with 95% confidence that revenue diversification has a significant impact on bank returns. The positive coefficient of this variable (0.0093) indicates a direct effect, meaning that an increase of one unit in revenue diversification leads to a 0.0093 unit increase in bank returns. Based on the conducted analysis supporting the second hypothesis, it can be concluded that revenue diversification influences bank returns.

4. Discussion and Conclusion

Today, revenue diversification in banks can significantly affect their responsibilities and risk levels. When banks engage in various investment activities across different economic sectors to generate diverse sources of income, they simultaneously increase the level and diversity of their profitability.

In evaluating the significance of the coefficients, according to the results presented in Table 3, since the P-Value for the coefficient of the revenue diversification variable is less than 0.05 (0.0101), the significant effect of revenue diversification on bank risk is confirmed at the 95% confidence level. Therefore, the first research hypothesis is accepted, and it can be stated with 95% confidence that revenue diversification has a significant impact on bank risk. The positive coefficient of this variable (0.0818) indicates a direct effect, meaning that an increase of one unit in revenue diversification leads to a 0.0818 unit increase in bank risk. Based on the conducted analysis supporting the first hypothesis, it can be concluded that revenue diversification influences bank risk.

The results of the first hypothesis align with the findings of Köhler (2020) in confirming a significant relationship between the independent and dependent variables (Köhler, 2020). However, regarding the nature of the relationship (direct or inverse),

the findings are consistent with those of Claessens and Van Horne (2022) (Claessens & van Horen, 2019) but contradict the results of Barba et al. (2021) (Barba Navaretti et al., 2021).

In evaluating the significance of the coefficients, according to the results presented in Table 6, since the P-Value for the coefficient of the revenue diversification variable is less than 0.05 (0.0050), the significant effect of revenue diversification on bank returns is confirmed at the 95% confidence level. Therefore, the second research hypothesis is accepted, and it can be stated with 95% confidence that revenue diversification has a significant impact on bank returns. The positive coefficient of this variable (0.0093) indicates a direct effect, meaning that an increase of one unit in revenue diversification leads to a 0.0093 unit increase in bank returns. Based on the conducted analysis supporting the second hypothesis, it can be concluded that revenue diversification influences bank returns.

The results of the second hypothesis are consistent with the findings of Köhler (2020) (Köhler, 2020) but contradict the findings of Barba et al. (2021) (Barba Navaretti et al., 2021).

Ethical Considerations

All procedures performed in this study were under the ethical standards.

Acknowledgments

Authors thank all participants who participate in this study.

Conflict of Interest

The authors report no conflict of interest.

Funding/Financial Support

According to the authors, this article has no financial support.

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