The Effect of Credit Risk on Profitability and Liquidity in Tehran Stock Exchange Banking Industry

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Abstract
Considering that profitability is one of the important functions of the bank as a financial intermediary, and since a profitable bank has more potential to deal with the negative markets, attention to credit risk and liquidity as indicators affecting the profitability of banks and the importance of their role in decisions on how to equip resources, finance, and how to allocate resources as well is essential. The main objective of this research is to investigate the relationship between credit risk and liquidity and profitability in banks listed in Tehran Stock Exchange. The statistical sample includes 17 banks and the research period was from 2010 to 2014. The dependent variables include the profitability criteria (return on assets, return on owners' equity, net interest margin) and liquidity criteria (stock turnover rate and relative price gap). Independent variable is the credit risk of banks and the control variable is the bank size. The method of data collection in the theoretical basis section was derived from the library method and the data gathering method in the hypothesis testing section have been extracted from the financial statements and Tehran Stock Exchange website. The data analysis method is also a multiple correlation and regression test.
The results of the research show that increasing credit risk reduces the profitability and liquidity of banks' shares.
Keywords: Credit Risk, Profitability, Liquidity, Return on Assets Rate, Relative Price Gap

1. Introduction
Banks, as the intermediary of monetary resources, along with investment institutions such as stock exchange and insurance companies, are considered as the main pillars of financial markets. They are one of the most important factors in monetary policies and executives for central bank economic decisions. Beyond helping to stabilize the macroeconomics, banks have an important role in regulating the economic sectors by contacting and expanding the bank credits and managing funds from one sector to another. Due to the lack of necessary development of capital market in the Iranian economy, banking is more important and in practice these banks are responsible for long-term financing (Shadkam, 2001, p. 37). Since banks, like other businesses, are looking for profitability, identifying effective variables is essential to achieve this crucial goal. (Akhter, 2017)

The determinants factors in the banks' performance are divided into two groups of internal factors controlled by the management of the bank branches and external factors out of the control of the management and under the macroeconomic environment conditions. Banks have an intermediary role between the lender and the borrower. (DeZoort, 2017) Obviously, the main purpose of a bank or any other economic entity, in addition to social responsibility, is to increase its value. In order to achieve the main goals of the bank, increased efficiency and productivity, increased market share, and increased profitability, growth and development are considered. (Chen, 2017) Banks are businesses that are rooted in private-sector economic construction, and similar to other manufacturing firms in the economy, they can provide their services in an optimal way under the plan and the goal of maximizing profits. From the perspective of the founders and shareholders, the bank is a business enterprise created to earn profit by making monetary and credit transactions. According to this group, the efforts of the bank managers must realize the maximum possible benefits. Therefore, due to the extent of the bank branches and the increasing growth of private banks and financial and credit institutions throughout the country, followed by the participation in the competitive market, the study of the relationship between credit risk and profitability and liquidity in Tehran Stock Exchange banking industry is regarded as a requirement (Aouni, 2008).

In Iran, the role of monetary markets (banks) in financing various economic sectors is far more powerful than capital markets. Profitability is one of the basic objectives of every business and every economic bank. (Hesse, 2016) Banks make every effort to achieve the goals and meet the economic needs of the community members and they are considered as one of the most important tools for implementing monetary policy in the economic system of each country. (Sehgal, 2017) Because, on the one hand, they collect small savings and wandering funds of the people, and on the other hand, in line with the implementation of settled economic and credit policies, they will direct the financial resources needed to boost the industrial and manufacturing cycles of the country.

2. Previous Research
Ben Nekaura (2014) conducted a study to investigate the factors that determine the profitability of the Tunisian

banking industry, which examines the profitability of the top 10 depository banks in Tunisia during 2000-2013. The results show that among the internal factors, high capital, overhead costs, and bank lending rates granted to customers have no direct effect on increasing the profitability. Among the indicators related to the financial structure, the focus on free competition has a less positive effect on profitability and net profit margin of the banks and the index of stock market development has a positive impact on the profitability of the banks, which indicates the dependence of the development of the stock market and banks, and the lack of government intervention in the banking industry is consistent with the profitability of this sector.

Athanasoglou et al. (2013) conducted a study titled "the bank-specific, industry-specific and macroeconomic determinants of bank profitability" during the years 2000-2011. The results showed that capital, productivity growth, and cost management variables have a positive relationship with profitability, and the bank size and ownership variables have little impact on the profitability of banks. Industry-specific variables have a significant impact on bank profitability, and the density variable has a small negative effect on the profitability. The impact of economic fluctuations is asymmetric, and only when the growth is more than the trend, they have a positive effect on the bank profitability.

Paula et al. (2012) evaluated the credit risk and the impact of the new capital treaty on small and medium-sized enterprises. Empirical analysis showed that the probability of a non-default risk in the next year will be the function of profitability increase, liquidity, coverage, activity and reducing the leverage function. Smaller companies and those associated with one bank link will have a higher probability of the default risk. The findings show that a major bank is very motivated to enter into implementation of policies to reduce risk by increasing the margins, which have previously been very high.

Marcus (2011) noted that the value of bank assets and capital disappears when the bank goes bankrupt. Therefore, the bank attempts to inject assets to reduce its bankruptcy probability in order to strengthen its capital structure.

Kayley (2010) has investigated that bank failures during the 2000s could be attributed to the risk created by fixed-rate deposit insurance.

Abuvassani (2014), in a study entitled "investigation of the bank profitability improvement strategies in the banking system of Iran", in which the performance of the Mellat Bank over a 12-year period has been studied, showed that lending and short-term facilities had a reverse effect on profitability and there is a significant and positive relationship between short-term deposits and profitability. Lending facility has also been identified as a factor of reducing the profit and it is suggested that the lending facility should not be paid. In case of payment, its method of payment should be changed, and the inflation is applied as a base interest rate and regarding the duration, a few percentage is received from the recipients of the facility and paid to the depositors as a profit.

Bagheri (2013) has conducted a study on the factors affecting the profitability of commercial banks during the period between 2001 and 2011. The findings show that efficient management of costs, assets, liquidity, and capital among internal factors and economic growth among the external factors have a positive and significant relationship with profitability, and the inflation rate has a reverse effect on profitability with a low significance.

Ahmadian (2012) in a study entitled "Credit Risk Management, The Leading Challenge for Financing in the Banking System of Iran" aimed at formulating a model to reduce the gaps between the banking system and the private sector in the field of financing and investigated the challenge from the perspective of the banking system, on the one hand, and the economic enterprises on the other hand. Finally, he presented operational solutions to reduce the existing gaps between the banking system and the private sector in the field of financing and the improvement of the financing process.

In his master's thesis, Armashi (2011) studied the relationship between customer credit risk and some financial and demographic variables. After estimating the model, the following results were confirmed: the variables such as gender, income, type of residence, marital status, age, and occupational status of the clients affect the likelihood of non-failure of facilities, but the income variable has a negative effect, and the variables of the size and the repayment period of the loan were ineffective in the studied sample.

3. Methodology

3.1. Descriptive Findings of Research Variables

The descriptive statistics of the research variables included credit risk (CR), return on assets (ROA), return on equities (ROE), net interest margin (NIM), stock turnover rate (TURNOVER), relative price gap (SPREAD), and the size of the bank (SIZE) is shown in Table (1).

Table 1: Descriptive analysis of research variables

variable	number	minimum	maximum	mean	Standard deviation	variance	skewness	elongation
CR	85	0.1203	0.5321	0.3768	0.135	0.120	0.312	-0.121
ROA	85	0.0132	0.935	0.4371	0.178	0.123	0.249	0.241
ROE	85	0.0173	0.8392	0.3876	0.117	0.063	0.163	0.521
NIM	85	0.1198	0.7034	0.2769	0.159	0.015	0.943	0.389
TURNOVER	85	0.132	0.3869	0.1947	0.142	0.025	- 0.299	0.213
SPREAD	85	0.187	0.4925	0.2794	0.259	0.198	- 0.329	0.119
SIZE	85	0.130	4.9354	2.021	0.156	0.327	0.306	0.209

According to the descriptive statistic, the dispersion index of these variables is low in different banks. The highest mean is related to the rate of return on assets variable and the lowest mean is for the return on equities variable.

The highest standard deviation is associated with the rate of return on assets and the lowest standard deviation relates to the rate of stock turnover.

In examining the degree of skewness and elongation of each variable and comparing it with normal distribution, it seems that all the variables of the research are distributed normally, because when the absolute values of the numbers related to the skewness and elongation are large, it can be concluded that the there is a big difference with normal distribution.

3.2. Normality Test of Variables
To examine the claim of the normality of a particular variable, the following applies:

H_0: The distribution of the selected variable is normal
H_1: The distribution of the selected variable is not normal

Table 2: Normality test of variables

Variables	The Kolmogorov-Smirnov Z	Significance Level
CR	2.031	0.238
ROA	1.712	0.691
ROE	1.450	0.299
NIM	1.741	0.642
TURNOVER	1.777	0.582
SPREAD	1.893	0.760
SIZE	1.247	0.447

As it is seen, since the significance level in all variables is more than 0.05, so the research variables have a normal distribution.

3.3. Correlation Test
The results of this study are shown in Table (3).
Table 3: Pearson correlation test of research variables

Variable	CR	ROA	ROE	NIM	TURNOVER	SPREAD	SIZE
CR	1	-.853*	.294**-	-.432**	-.520**	-.452*	.064*
ROA	-.853*	1	.385**	.407**	.196**	.308*	.093*
ROE	-.294**	.385**	1	.180**	.083*	.157**	.096*
NIM	-.432**	.407**	.180**	1	.068*	.371**	.081*
TURNOVER	-.520**	.196**	.083*	.083*	1	.311	.027
SPREAD	-.452*	.308*	.157**	.157**	.311	1	.087
SIZE	.064*	.093*	.096**	.096**	.027	.087	1

* significance at the 1%error level
** significance at 5% the error level

Regarding the correlation test table, credit risk has a reverse and significant correlation with the return on assets, return on equity, net profit margin, stock turnover rate, and relative price gap variables. The credit risk correlation with the size of the company is direct and significant.

3.4. Testing the Significance of the Regression
According to the F statistic in all tables related to the first to fifth hypothesis, as discussed below, since their significance level is less than 0.05, the regression model is significant in all tests of hypotheses.

3.5. Collinearity (multicollinearity) Test

The collinearity test of the research variables is described in the table below

Table (4): collinearity test

variables	eigenvalue	Status indicator
1	0.121	3.832
2	0.109.	4.217

As can be seen, the near-zero eigenvalues of the internal correlations of predictions are high, and small alterations in data values lead to large changes in the estimation of regression equation coefficients. Eigenvalues represent the probability of internal correlation between variables.

As it can be observed, all status indicators are less than 15, indicating the absence of collinearity between independent variables.

3.6 Lack of Autocorrelation Test

The Durbin–Watson statistic in each of the hypothesis tests represent the autocorrelation test between the research variables. Since this statistic in each tables of the first to fifth hypotheses, shown in the following, is between 1.5 and 2.5, there is no autocorrelation between the research variables.

3.7 Testing the Hypotheses and the Results

F-Limer test

Table 5: F Limer Test (the isotropy of sections' y-intercepts)

Zero hypothesis	Research models	F statistic	Degree of freedom	p-value	Test result
All sections have the same intercept	Model 1	2.6453	2	0.000	H_0 is rejected
	Model 2	1.1325	2	0.000	H_0 is rejected
	Model 3	1.0231	2	0.000	H_0 is rejected
	Model 4	1.5243	2	0.000	H_0 is rejected
	Model 5	33.2134	2	0.000	H_0 is rejected

Considering the significance levels in the above table, the result of this test indicates that the studied sections are heterogeneous and the use of panel method data is more appropriate. After choosing the panel data method, the Hausman test is performed using the F limer test. In this test, if the zero hypothesis is accepted, then the random effects model is used and if the H0 is rejected, a fixed effects model is applied.

Table 6: Hausman test results (choosing between the fixed and random effects model)

Zero Hypothesis	Research models	Chi-square statistic	Degree of freedom	p-value	Test result
There is no difference between systematic coefficients	Model 1	5.4503	2	0.000	H_0 is rejected
	Model 2	4.4528	2	0.000	H_0 is rejected
	Model 3	4.3452	2	0.000	H_0 is rejected
	Model 4	5.5464	2	0.000	H_0 is rejected
	Model 5	4.7564	2	0.000	H_0 is rejected

The results show that the value of this statistic is significant for each of the models and the significance level reported in the above table (p-value < 0.05) reflects the rejection of the H0 hypothesis at 95% confidence level for each of the models. It implies the fixed effects method.

3.7.1 Testing the First Hypothesis

In this research, the first hypothesis examines the effect of credit risk on the rate of return on assets of the bank.

H0 = Credit risk does not have a significant effect on the rate of return on bank assets.   H0: $\beta = 0$

H1 = Credit risk has a significant effect on the rate of return on bank assets.   H1:$\beta \neq 0$

The result of its regression is presented in Table 7:

Table 7: Results of Multivariate Regression of Credit Risk and the rate of Return on Bank Assets

Type of variable	Symbol	Variable name	Coefficient	T statistic	Significance level
Dependent variable	Y	Return on bank assets rate	_	_	_
Constant value	α	Alpha	-1.744	-1.648	0.025
Independent value	X_1	Credit risk	- 0.240*	1.995-	0.001
Control variable		Bank size	0.627*	1.80	0.020
		Durbin–Watson	1.856*	_	_
		F statistic	3.742	_	0.003
R		Correlation coefficient	0.443	_	_
R Square		Coefficient of determination	0.197	_	_
Adjusted R Square		Adjusted coefficient of determination	0.196	_	_

*: The significance level is 0.05.

As shown in this table, credit risk and bank size (p-value < 5%) have a significant effect on the rate of return on bank assets. The variable coefficients show that the effect of bank size on the rate of return on assets is higher than that of the credit risk.

The credit risk variable has a reverse and significant effect on the return on assets of the bank, and the bank size variable has a direct and significant impact on the return on bank assets.

Regarding to the value of F statistic, the fitted regression model is significant and according to the coefficient of determination, these variables account for 19.7% of the changes in the rate of return on assets of the bank.

The Durbin-Watson statistic is also between 1.5 and 2.5, therefore, it can be concluded that there is no autocorrelation problem among the variables.

3.7.2 Testing the Second Hypothesis

In this research, the second hypothesis examines the effect of credit risk on rate of return on bank equities.

H0 = Credit risk does not have a significant effect on the rate of return on equity of the bank. H0: β = 0

H1 = Credit risk has a significant effect on the rate of return on equity of the bank.   H1:β≠ 0

The result of its regression is presented in Table 8:

Table 8: Results of Multivariate Regression of Credit Risk and the rate of Return on Equity

Type of variable	Symbol	Variable name	Coefficient	T statistic	Significance level
Dependent variable	Y	Return on equity rate	_	_	_
Constant value	α	Alpha	1.765	1.544	0.002
Independent value	X_1	Credit risk	-0.357*	-1.531	0.040
Control variable		Bank size	0.645*	1.985	0.001
		Durbin–Watson	1.775	_	_
		F statistic	14.002	_	0.003
R		Correlation coefficient	0.668	_	_
R Square		Coefficient of determination	0.446	_	_
Adjusted R Square		Adjusted coefficient of determination	0.445	_	_

*: The significance level is 0.05.

As shown in this table, credit risk and bank size (p-value < 5%) have a significant effect on the return on equity. The variable coefficients show that the effect of bank size on the return on equity is higher than that of the credit risk.

The credit risk variable has a reverse and significant effect on the return on equity of the bank, and the bank size variable has a direct and significant impact on it.

Regarding to the value of F statistic, the fitted regression model is significant and according to the coefficient of determination, these variables account for 44.6% of the changes in the rate of return on equity.

The Durbin-Watson statistic is also between 1.5 and 2.5, so it can be concluded that there is no autocorrelation problem among the variables.

3.7.3 Testing the Third Hypothesis

In this study, the third hypothesis evaluates the effect of credit risk on the net interest margin of the bank.

H0 = Credit risk does not have a significant effect on the net interest margin of the bank.   H0: β = 0

H1 = Credit risk has a significant effect on the net interest margin of the bank.   H1:$\beta \neq 0$
The result of its regression is shown in Table 9:

Table 9: Results of Multivariate Regression of Credit Risk and the net interest margin

Type of variable	Symbol	Variable name	Coefficient	T statistic	Significance level
Dependent variable	Y	net interest margin	–	–	–
Constant value	α	Alpha	1.445	1.365	0.000
Independent value	X1	Credit risk	-0.229*	1.118-	0.000
Control variable		Bank size	0.387*	1.254	0.000
		Durbin–Watson	1.894	–	–
		F statistic	6.987	–	0.001
R		Correlation coefficient	0.702	–	–
R Square		Coefficient of determination	0.492	–	–
Adjusted R Square		Adjusted coefficient of determination	0.491	–	–

*: The significance level is 0.05.

As shown in the table, credit risk and bank size (p-value < 5%) have a significant effect on the net interest margin. The variable coefficients indicate that the effect of bank size on the net interest margin is higher than that of the credit risk.

The credit risk variable has a reverse and significant effect on the net interest margin of the bank, and the bank size variable has a direct and significant impact on it.

According to the value of F statistic, the fitted regression model is significant and based on the coefficient of determination, these variables explain 49.2% of the changes in the net interest margin.

Also, the Durbin-Watson statistic is between 1.5 and 2.5, thus it can be concluded that there is no autocorrelation problem among the variables.

3.7.4 Testing the Fourth Hypothesis
In this study, the fourth hypothesis examines the effect of credit risk on the stock turnover rate of the bank.
H0 = Credit risk does not have a significant effect on the stock turnover rate of the bank.   H0: $\beta = 0$
H1 = Credit risk has a significant effect on the stock turnover rate of the bank.   H1:$\beta \neq 0$
The result of its regression is shown in Table 10:

Table 10: Results of Multivariate Regression of Credit Risk and the stock turnover rate

Type of variable	Symbol	Variable name	Coefficient	T statistic	Significance level
Dependent variable	Y	the stock turnover rate	–	–	–
Constant value	α	Alpha	1.545	1.405	0.050
Independent value	X1	Credit risk	-0.447*	-1.950	0.003
trol variable		Bank size	0.745*	1.840	0.003
		Durbin–Watson	1.921	–	–
		F statistic	6.950	–	0.001
R		Correlation coefficient	0.645	–	–
R Square		Coefficient of determination	0.416	–	–
Adjusted R Square		Adjusted coefficient of determination	0.415	–	–

*: The significance level is 0.05.

As can be seen from the table, credit risk and bank size (p-value < 5%) have a significant effect on the stock turnover rate. The variable coefficients show that compared to the credit risk, the effect of bank size on the stock turnover rate is higher.

The credit risk variable has a reverse and significant effect on the stock turnover rate of the bank, while the bank size variable has a direct and significant impact on it.

According to the value of F statistic, the fitted regression model is significant and regarding the coefficient of determination, these variables can explain 41.6% of the changes in the stock turnover rate.

In addition, the Durbin-Watson statistic is between 1.5 and 2.5, thus it can be concluded that the variables do not have autocorrelation problem.

3.7.5 Testing the Fifth Hypothesis

In this study, the fifth hypothesis examines the effect of credit risk on the relative price gap of the bank shares.

H0 = Credit risk does not have a significant effect on the relative price gap in the bank shares.   H0: $\beta = 0$

H1 = Credit risk has a significant effect on the relative price gap of the bank shares.   H1:$\beta \neq 0$

The result of its regression is represented in Table 11:

Table 11: Results of Multivariate Regression of Credit Risk and the relative price gap of shares

Type of variable	Symbol	Variable name	Coefficient	T statistic	Significance level
Dependent variable	Y	the relative price gap of shares	_	_	_
Constant value	α	Alpha	2.100	1.050	0.001
Independent value	X_1	Credit risk	-0.441*	-1.702	0.000
Control variable		Bank size	0.547*	1.535	0.001
		Durbin–Watson	1.668	_	_
		F statistic	8.840	_	0.000
R		Correlation coefficient	0.600	_	_
R Square		Coefficient of determination	0.36	_	_
Adjusted R Square		Adjusted coefficient of determination	0.35	_	_

*: The significance level is 0.05.

As can be seen from the above table, credit risk and bank size (p-value < 5%) have a significant effect on the relative price gap of shares. The variable coefficients show that compared to the credit risk, the impact of bank size on relative price gap of shares is higher.

The credit risk variable has a reverse and significant effect on the relative price gap of bank shares, while the bank size variable has a direct and significant impact on it.

According to the value of F statistic, the fitted regression model is significant and regarding the coefficient of determination, these variables account for 36% of the changes in the relative price gap of shares.

In addition, the Durbin-Watson statistic is between 1.5 and 2.5, then, it can be concluded that there is no autocorrelation problem among the variables.

4. Conclusion

Credit risk has a reverse and significant effect on the rate of return on bank assets during the years 2010-2014. Therefore, it can be claimed that if the ratio of doubtful debts to the facilities in the beginning of the course is high; the return on assets decreases.

Credit risk has a reverse and significant effect on the rate of return on equity of the bank in the period from 2010 to 2014. Therefore, it can be claimed that when the ratio of doubtful debts to the initial facilities is high; the return on equity is reduced.

Credit risk has a reverse and significant impact on the net interest margin of the bank from 2010 to 2014. Therefore, it can be argued that the ratio of doubtful debts to initial facilities is high; the net interest margin of the bank is reduced.

Credit risk has a reverse and significant effect on the rate of stock turnover in the years 2010 to 2014. Thus, it can be claimed that the ratio of doubtful debts to the initial facilities is high; the rate of stock turnover of the bank decreases.

Credit risk has a reverse and significant effect on the relative price gap of the bank between 2010 and 2014. Hence, it can be asserted that the ratio of doubtful debts to initial facilities is high; the relative price gap of the bank shares decreases.

The size of the company has a direct and significant effect on the bank profitability during 2010 and 2014. Therefore, it can be said that the larger the size of the company, the higher the profitability of the bank.

The size of the company has a direct and significant effect on the liquidity of the bank shares from 2010 up to 2014. Thus, it can be claimed that the larger the size of the company, the higher the liquidity of the bank shares.

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