
The Effect of Customers Concentration on Company Risks

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Document Type: Original Article

2020, Vol. 4, No. 2. 19-39

Received: 2020/04/16

Accepted: 2020/08/28

Published: 2020/10/13

Abstract

The companies with major customers can supply a considerable source of cash flows by selling a large portion of their products to them. Since the lack of purchase, loss, or bankruptcy of major customers can result in a significant reduction in cash flows in the company, thus the risk is the companies with major customers is higher than other companies. Thus, the present study aimed to investigate the effect of customer concentration on company risks. For this purpose, the effect of customer concentration on three criteria of stock price crash risk, bankruptcy risk, and employment risk was studied. The research sample included 127 companies listed in the Tehran Stock Exchange during 2011-2018. Multivariate regression models with panel data were used by the random-effects method to test the research hypotheses. The research findings indicated that customer concentration has a significant positive effect on stock price crash risk, bankruptcy risk, and employment risk. In other words, stock price crash risk, bankruptcy risk, and employment risk are higher in the companies where the concentration of major customers is higher.

Keywords: Customer concentration, stock price crash risk, bankruptcy risk, employment risk.

Introduction

Customers are one of the most significant assets of companies and making them satisfied plays a critical role in the success of companies. Review of the literature indicates that the more customer concentration, the more effective they can be at the activities and corporate performance (Dhaliwal et al, 2019). Customer concentration can enhance coordination in production, decrease advertising costs, and increase company revenues (Fakhari& Gafaricherati, 2018). However, selling a large part of products to the major customer can put the company at risk because increasing customer concentration increases their bargaining power (Steve et al, 2017). For instance, major customers can force sellers (companies) to grant some privileges such as discounts, long-term credit sales, and storage of inventory surplus. This situation makes companies suffer a higher risk because the ability of companies reduces in price adjustment (Piercy & Lane, 2006; Liu et al, 2019). In order to produce products based on the orders of major customers, companies are forced to make large investments for a specific production line. If the customers of such specific products decide to change the supplier, losing major customers can put the company at high risk and in this case, the continuity of the activities in the company will be disrupted (Mihov & Naranjo, 2017). On the other hand, if bankruptcy or loss occurs to major customers, they may not be able to fulfil their commitments. Such a case can result in the increased operational risk and liquidity of the company (Bei & Xu, 2017). Thus, customer concentration is expected to affect company risk. The review of financial and accounting studies in and out of Iran indicated that customer concentration affects different aspects of company activities. In some cases, the results of these studies in different countries are not consistent because of differences in economic conditions and industries in different countries. For instance, Chang et al (2017) in China reported that customer concentration hurts corporate performance. Hui et al (2018) indicated that customer concentration in America has a negative effect on corporate performance. Nevertheless, Abashi & Kordestani (2014) in Iran indicated that customer concentration has a positive effect on corporate performance.

Due to the significance of the role of customer concentration in the success or failure of companies, the effect of customer concentration on stock price crash risk, bankruptcy risk and employment risk in the companies listed on the Tehran Stock Exchange was not investigated as a research topic. Therefore, the present study aimed at investigating the effect of customer concentration on company risks. Investigating this issue can help investors with making better decisions on investment depending on the type of the effect of customer concentration on company risks. Besides, research findings can

help company managers with reducing the company risks depending on the type of the effect of customer concentration. First, the theoretical foundations of the study are presented and then the research background which includes a review of foreign and domestic studies on the subject of research is briefly presented. Then, the research hypotheses, hypothesis testing model, operational definition of variables, research method, and statistical analysis are presented. In the end, the results and suggestions of the study are presented.

Theoretical foundations

1- Customer concentration and stock price crash risk

Sudden changes in stock price, occurring both in the form of a stock price crash and jump, have attracted a lot of attention in recent years (Mamun et al, 2019). Given the importance considered by investors place for their stock returns, the phenomenon of the stock price crash, which leads to a sharp and sudden sharp reduction in stock prices, has been attracted by researchers (Tang et al, 2019). Stock price crash risk is influenced by multiple factors and less attention has been paid so far to the role of customer concentration in the research literature. The effect of customer concentration on stock price crash risk is examined from two perspectives. On the one hand, customer concentration can decrease the risk of a stock price crash. The continuous collaboration of the company with customer results in mutual trust and creates a coherent and lasting relationship between company and customer and then the improvement of the financial performance of the company (Patatoukas, 2012). As a result, it reduces the business risks and cash flow of companies helping the reduction of stock price crash risk in the future (Irvine et al., 2016). Customers can encourage companies to present a higher quality and more conservative financial reporting when they have higher bargaining power (Kordestani & Gholami roocheh, 2013). Customer bargaining power depends on customer concentration and in companies with high customer concentration, the company must apply more high-quality and conservative financial reporting practices and must be also more responsive due to their extra monitoring (Hui et al, 2012). Financial reporting and conservatism can decrease the stock price crash risk since they prevent the accumulation of bad news (Kim et al, 2016). On the other hand, customer concentration can increase the stock price crash risk. The companies with concentrated customers who rely on a limited number of major customers have higher business risk and liquidity risk because if major customers reduce the purchase or buy from other companies, it can lead to a significant decrease in sales. (Huang et al, 2016; Dhaliwal et al, 2016). Also, as there is data asymmetry between the company

and investors, the same (data asymmetry) can be assumed between companies and customers. Companies with complete knowledge of the company's financial status, are more aware of their customers and often attempt to present a desirable image of the company status through the methods such as earnings management (Liang & Li-Yu, 2016). For this reason, companies are more involved with hoarding bad news to manage the expectations of major customers which will result in the increased stock price crash risk in the future (Lee et al, 2020; Chen et al, 2019).

2- Customer concentration and bankruptcy risk

The issue of bankruptcy and failure of companies has been always a significant problem (Lu, 2016). The significance of bankruptcy is that its negative effects do not only affect the merchant or the bankrupt company, but also causes loss to the company's activities, investors, creditors, and traders (Salehi & Bazrgar, 2015). Bankruptcy occurs when the company has a permanent and serious loss or cannot repay the debts which exceed its assets. Determining the exact reason of financial bankruptcy is not easy because multiple factors are involved in the bankruptcy of companies (Khajavi & Amiri, 2013).

One of the factors which can affect the bankruptcy risk of companies is customer concentration; this effect can be evaluated from two perspectives. Based on the first perspective, customer concentration can decrease the bankruptcy risk of companies. In this perspective, customer concentration is considered as a factor in increasing production coordination, supply chain management, inventory management, and reduction of sales costs (marketing and advertising costs), and companies can reduce the business risk and increase profitability by selling a large portion of their products to them. For this reason, customer concentration is a factor which can reduce the bankruptcy risk of companies (Ak & Patatoukas, 2016).

Based on the second perspective, customer concentration can increase the bankruptcy risk of companies. The companies which have major and concentrated customers can supply a large portion of their revenues by these customers. With the bankruptcy of major customers, a considerable amount of the company's claims may not be collected and result in the significant reduction of cash flows, so that the company may face difficulty continuing its activities and it can lead to an increase in bankruptcy risk (Raman & Shahrur, 2008; Campello & Gao, 2017). Besides, companies with major customers are more likely to make special investments such as designing or purchasing equipment for a specialized product line and producing products based on the

order of major customers. If these customers disassociate, the investments will lose their value and will not be usable (Banker et al, 2014; Krishnan et al, 2018). For this reason, the bankruptcy of such companies is higher (Irvine et al, 2016).

3- Customer concentration and employment risk

The companies which have major customer concentration suffer from considerable operational restrictions caused by supply chain risk (Sheybani Tezerji & Khodamipour, 2018). Such companies are highly at risk of employment risk because if there are operational restrictions, employment in companies can deviate from the optimal level. There are a few perspectives about the effect of customer concentration on employee risk among the employees of companies. The first perspective is that in manufacturing companies, certain investments are made by focusing on customers and having major customers while maintaining unique capacities for this type of customers. In particular, these customers often supply their needs from a specific company having specific operations and make the company customize its operations. Such customization acts as an operational restriction on manufacturing companies and increases operational risk. Thus, companies refuse the actions which fail at customer retention because if the unpredicted (sudden) cooperation of major customers is stopped, the company will be forced to dismiss a large number of employees (Holzhacker et al, 2015). Based on the second perspective, companies should increase the level of wages to increase the welfare of their employees, and on the other hand, companies are forced to dismiss employees due to the increase in costs. In addition, dismissing employees will stop work. Also, companies fear the major customers' strike because stopping work creates significant uncertainty in their operations. Thus, the companies which focus more on customers pay more attention to the company's production cycle; for this reason, such companies have a higher employment risk (Cen et al, 2017). On the other hand, major customers may put pressure on companies to reduce costs and ask for a discount by retaining the level of product demand. Also, companies are required to reduce the selling price of products to meet the needs of such customers and not lose them. On the other hand, companies are required to decrease extra costs to compensate for the costs. Since human resources cost to form a major part of the final cost of products, companies may dismiss a part of human resources by retaining the production level. For this reason, customer concentration can increase employment risk (Zhang et al, 2018).

Review of literature

Lee et al. (2020) evaluated the relationship between customer concentration and stock price crash risk of companies. This study used the data from 13612 years - companies listed on the Chinese Stock Exchange during 1997 - 2016. The results obtained from testing the research hypotheses showed that customer concentration has a significant positive relationship with stock price crash risk of Chinese companies.

Cohen & Li (2020) studied the effect of customer concentration on corporate profitability with an emphasis on the role of government and corporate customers. This study used data from 59,305 year - companies listed on the US Stock Exchange during 1978 - 2015. The results obtained from testing the research hypotheses indicated that government customer concentration has a significant positive effect on corporate performance, but corporate customer concentration has a significant negative effect on corporate performance.

Song and Wang (2019) studied the relationship between customer concentration and corporate earnings management forecast. This study used data from 6940 years- companies listed on the Chinese Stock Exchange during 2007 – 2015. The results obtained from testing the research hypotheses showed that customer concentration has a significant positive relationship with Chinese companies' earnings management forecast.

Zhang et al (2018) investigated the relationship between customer concentration and employment risk in companies. This study used data from 13690 years - companies listed on the Chinese Stock Exchange during 1992 - 2015. The results obtained from testing the research hypotheses revealed that customer concentration has a significant positive relationship with the employment risk of Chinese companies.

Hui et al (2018) investigated the effect of customer concentration on corporate profitability. This study used data from 32085 years – companies listed on the US Stock Exchange during 1997 - 2013. The results obtained from the research hypothesis test indicated that customer concentration has a significant negative effect on the performance of American companies.

Huan et al (2017) studied the effect of customer concentration on corporate performance. This study used data from 9827 years - companies listed on the Chinese Stock Exchange during 2007 - 2012. The results of testing the research hypothesis showed that customer concentration has a significant negative effect on the performance of Chinese companies.

Dhaliwal et al (2016) studied the effect of customer concentration on the cost of corporate equity in companies. This study used data from 44218 years - companies listed on the US Stock Exchange. The results of testing the research hypotheses indicated that customer concentration has a significant positive effect on the cost of corporate equity.

Moradi et al (2019) studied the effect of customer concentration on the dividend payout policy of companies. In this study, the data of 140 companies listed on the Tehran Stock Exchange was used during 2009 - 2016. The results obtained from testing the research hypotheses showed that customer concentration has a significant negative effect on the dividend payout policy of companies.

Nikbakht et al (2019) evaluated the effect of customer concentration on capital structure and debt maturity of companies. In this study, the data of 140 companies listed on the Tehran Stock Exchange was used during 2011 - 2016. The results obtained from testing the research hypotheses indicated a significant positive relationship between customer concentration and capital structure. In addition, the debt maturity structure of companies with major customers is longer.

Sheybani Tezerji et al (2018) investigated the effect of customer concentration on tax avoidance by considering the market share of companies. In this study, the data of 79 companies listed on the Tehran Stock Exchange was used during 2005 - 2014. The results obtained from testing the research hypotheses showed that customer concentration has a significant positive effect on tax avoidance activities. Plus, the positive relationship between customer concentration and tax avoidance is more prominent when the company has a smaller market share in the industry it works.

Khodadadi et al (2017) studied the relationship between customer concentration and auditing fees of companies. In this study, the data of 60 companies listed on the Tehran Stock Exchange was used during 2010 - 2015. The results obtained from testing the research hypotheses showed that customer concentration has a significant negative effect on the auditing fees of companies.

Rahmani &Gholami Jamkarani (2016) examined the effect of customer concentration on corporate performance. In this study, the data of 104 companies listed on the Tehran Stock Exchange was used during 2007 - 2014. The results obtained from testing the research hypotheses showed that customer concentration has a significant negative effect on the return on assets of companies.

Abashi & Kordestani (2014) studied the effect of customer concentration on the financial performance of companies. In this study, the data of 79 companies listed on the Tehran Stock Exchange was used during 2002 - 2011. The results obtained from testing the research hypotheses showed that customer concentration has a significant positive effect on the financial performance of companies.

Research hypotheses

Hypothesis 1: Customer concentration effects on stock price crash risk of companies.

Hypothesis 2: Customer concentration effects on the bankruptcy risk of companies.

Hypothesis 3: Customer concentration effects on employment risk of companies.

Methodology of research

Based on the above-mentioned objectives of the study, the present study was descriptive in terms of purpose and descriptive in terms of method. Since this study aimed at finding a relationship between research variables in a population, thus the study was considered as a correlational study. On the other hand, the present study was of ex post facto type, i.e. it was based on the analysis of previous data (financial statements of companies). Furthermore, Also, in this study, the library method was used for collecting data. Then, the data were collected by referring to the financial statements and explanatory notes of the selected companies and using the databases of Tehran Stock Exchange, Tadbir Pardaz software, and the official website of the companies.

All companies listed on the Tehran Stock Exchange during 2011 - 2018 formed the statistical population of the present study. Because of the expansion and statistical volume of the population and the presence of some inconsistencies among the members of the population, the following conditions were considered for selecting the statistical sample.

1. Companies should not have any considerable operational interruption during the studied period.
2. Companies should not change the fiscal year during these years and the required information should be available for eliciting data.
3. Companies should not be part of banks and financial institutions, or investment, holding, and leasing companies since the reporting structure is different in them.
4. Their fiscal year is 1/1 to 12/29 (beginning of the year).

Based on the above-mentioned issues, finally, 127 companies were selected as a sample from the statistical population through a systematic elimination method.

Hypotheses testing models

In this study, the following multivariate regression models of one to three are used for testing the hypotheses of one to three.

$$C_R_{i,t} = \beta_0 + \beta_1 CC_{i,t} + \beta_2 CH_{i,t} + \beta_3 MTB_{i,t} + \beta_4 SIZE_{i,t} + \beta_4 LEV_{i,t} + \varepsilon \quad (1)$$

$$B_R_{i,t} = \beta_0 + \beta_1 CC_{i,t} + \beta_2 CH_{i,t} + \beta_3 MTB_{i,t} + \beta_4 SIZE_{i,t} + \beta_4 LEV_{i,t} + \varepsilon \quad (2)$$

$$E_R_{i,t} = \beta_0 + \beta_1 CC_{i,t} + \beta_2 CH_{i,t} + \beta_3 MTB_{i,t} + \beta_4 SIZE_{i,t} + \beta_4 LEV_{i,t} + \varepsilon \quad (3)$$

In which:

$C_R_{i,t}$: stock price crash risk of company i in year t

$B_R_{i,t}$: bankruptcy risk of company i in year t

$E_R_{i,t}$: employment risk of company i in year t

$CC_{i,t}$: customer concentration of company i in year t

$CH_{i,t}$: cash holding of company i in year t

$MTB_{i,t}$: market value to stock book value i in year t

$SIZE_{i,t}$: company size i in year t

$LEV_{i,t}$: leverage of company i in year t

Measurement of research variables

1- Dependent variables

Stock price crash risk (C_R): To measure stock price crash risk, as the studies by Tang et al. (2019) and Gao et al. (2017), the measure of bottom-up fluctuation proposed by Chen et al. was used based on model (4).

$$DUV_{i,t} = \text{Log}\left\{\frac{(n_u - 1) \sum \text{DOW } W_{i,t}^2}{(n_d - 1) \sum \text{UP } W_{i,t}^2}\right\} \quad (4)$$

In which:

n_u : The number of weeks when the weekly net return of company i in year t is more than the annual average of that company in the same year.

n_d : The number of weeks when the weekly net return of company i in year t is less than the annual average of that company in the same year.

$\sum \text{DOW } W_{i,t}^2$: Total square of the weekly net return of company i in year t that the weekly net return of that company in the same year is less than the average.

$\sum \text{DOW } W_{i,t}^2$: Total square of the weekly net return of company i in year t that

the weekly net return of that company in the same year is more than the average.

$W_{i,t}$: the weekly net return of company i in year t which is calculated using the model (5).

$$W_{i,t} = \text{Ln}(1 + \varepsilon_{i,t}) \quad (5)$$

In the above model, $\varepsilon_{i,t}$ represents the return of weekly stock remaining of the company I in month t and refers to the remaining of the model which is calculated using the model (6).

$$R_{i,t} = \alpha_i + \beta_{1,i}R_{m,t-2} + \beta_{2,i}R_{i,t-1} + \beta_{3,i}R_{m,t} + \beta_{4,i}R_{m,t+1} + \beta_{5,i}R_{m,t+2} + \varepsilon_{i,t} \quad (6)$$

In which, $R_{i,t}$ refers to the stock return of company I in week t during the fiscal year and $R_{m,t}$ refers to the market return in week t .

To calculate the market weekly return, the index of the beginning of the week is deducted from the weekend index and the result is divided by the index of the beginning of the week.

Bankruptcy risk (B_R): In this study, the Altman model (1986) was used for measuring the bankruptcy risk of the company. Ahmadpour et al (2016) and Salehi & Bazrgar (2015) in Iran used the Altman model to evaluate bankruptcy risk. Based on the above-mentioned studies, model (7) is used for investigating bankruptcy risk without changing the coefficients.

$$Z = 0.71X_1 + 0.84X_2 + 3.107X_3 + 0.420X_4 + 0.998X_5 \quad (7)$$

In which:

Z: Altman criterion

X_1 : Working capital to total assets

X_2 : Retained earnings to total assets

X_3 : Revenue before interest and tax to total assets

X_4 : The book value of equity to the book value of debts

And X_5 : *sale to total assets*

Based on the model (7), as the Z value is more, the company will have a better status and its bankruptcy risk will be less (Ahmadpour et al, 2016).

Employment risk (E_R): In this study, employment risk refers to the degree of deviation in the employment level of a company from its desired level. In particular, employment risk is regarded as the unnatural net employment of companies which is defined as the absolute difference between the actual net employment and the expected level of net employment. The actual net employment of companies is specified by changing the number of employees.

Regression model (8) is used for estimating the expected net employment, similar to the studies by Zhang et al. (2018) and Jung et al (2014).

$$\begin{aligned}
 NET_HIRE_{i,t} = & \beta_0 + \beta_1 S_G_{i,t-1} + \beta_2 S_G_{i,t} + \beta_3 ROA_{i,t} + \beta_4 \Delta ROA_{i,t-1} + \\
 & \beta_5 \Delta ROA_{i,t} + \beta_6 RET_{i,t} + \beta_7 SIZE_{i,t-1} + \beta_8 Quick_{i,t} + \beta_9 \Delta Quick_{i,t-1} + \\
 & \beta_{10} \Delta Quick_{i,t} + \beta_{11} LEV_{i,t-1} + \beta_{12} Lossbin1_{i,t-1} + \beta_{13} Lossbin2_{i,t-1} + \\
 & \beta_{14} Lossbin3_{i,t-1} + \beta_{15} Lossbin4_{i,t-1} + \beta_{16} Lossbin5_{i,t-1} + \varepsilon
 \end{aligned} \tag{8}$$

In which:

NET_HIRE: the per cent of changes in the number of employees

S_G: The per cent of changes in sales growth in company t

ROA: return on assets (net earnings to assets ratio)s

Δ ROA: changes of return on assets

RET: Stock return

SIZE: the logarithm of market value to equity

Δ Quick: Instant ratio (ratio of cash and short-term investments and accounts receivable to current liabilities),

Quick: Changes if the instant ratio

LEV: debts to assets ratio

Lossbin: five loss variables for each year is 0.005 from ROA. For example, Lossbin 1 will equal 1 if the return on assets is between 0.000 and -0.005, otherwise it will be zero. Or Lossbin2 will equal 1 if the return on assets is between -0.005 and -0.010, otherwise, it will equal Zero.

2- Independent variable

Customer concentration (CC): In Iran, there is no specific standard or requirement for disclosing major customers, but based on Statement 131 of the Financial Accounting Standards Board, if the revenue from sales to one customer is 10% or more than 10% of the total per cent of the company's revenue, it will be necessary to disclose such customers in financial statements. In this study, this standard was used to determine major customers and like the studies by Cohen and Lee (2020) and Song and Wang (2019), the Herfindahl – Hirschman index was used to determine the measurement of customer concentration. The Herfindahl – Hirschman index considers two factors; one is the number of major customers interacting with the company and another one is the relative significance of each customer in the company's annual revenue.

$$HHI = \sum_{i=1}^{Nj} \left(\frac{X_i}{X}\right)^2 \quad (9)$$

In model (9), X_i represents the sales of the company i to a major customer, X represents the total sales of the company, and n represents the number of major customers in the sales of a company, and HHI represents the Herfindahl – Hirschman index which is used for measuring the concentration of major customers. Its range is between zero and one and higher values show more customer concentration.

3- Control variables

Table 1. Definitions of control variables

Variable	Median
Cash holding (CH)	Obtained from the total cash to company's assets ratio at the end of the year.
MTB	Obtained from the ratio of the market value of the company equity to its book value at the end of the fiscal year.
SIZE	Obtained from the logarithm of the company's assets at the end of the fiscal year.
Leverage	Obtained from the total debt to total assets ratio at the end of the fiscal year.

Data analysis and hypotheses testing

Descriptive statistics

The data related to the descriptive statistics of the research variables are reflected in Table 2. The main central tendency is the mean indicating the equilibrium point and center of gravity of the distribution and is a perfect tendency for displaying the centrality of data. As indicated in Table 2, the average customer concentration of the studied companies during the years under test was 0.23 indicating that most of the data related to this variable are centered around this point. Median is another central tendency which reflects the state of the population. As can be observed, the mean of the above-mentioned variable is 0.19 indicating that half of the data is less than this value and the other half is more than this value. Also, standard deviation indicates the number of changes in the square of dependent variable data around the mean and as it is lower it indicates the normal distribution of the data related to that variable. As it is observed, the employment risk and company size have respectively the minimum (0.108) and maximum (1.220) standard deviations among the research variables.

Table 2. The descriptive statistics of the research variables

Variable	Mean	Median	Std. D	Min	Max
Stock Price Crash Risk	-0.13	-0.11	0.573	-3.61	2.84
Bankruptcy Risk	2.93	2.99	0.983	-1.84	7.80
Employment Risk	0.12	0.11	0.108	0.00	0.44
Customer Concentration	0.23	0.19	0.213	0.00	0.87
Cash Holding	0.05	0.04	0.031	0.00	0.29
MTB	2.09	1.94	0.265	0.31	4.22
SIZE	14.12	14.08	1.220	10.02	19.07
Leverage	0.61	0.59	0.119	0.13	0.89

Inferential statistics

1- Homogeneity of variance

One of the criterial topics we face in econometrics is the heterogeneity of variance. The heterogeneity of variance heterogeneity means that the values of error sentences have unequal variances in estimating the regression model. The heterogeneity of variance for the remaining of the research model was performed using the Breusch–Pagan test. Table 3 indicates that the error level of the above-mentioned test is less than 5% for three research models, thus the test statistics indicate the heterogeneity of variance and their significance level did not confirm the null hypothesis of this test as the homogeneity of variance. In other words, the remaining from the estimation of the research models had no fixed variance. For this reason, the generalized least squares method is used for estimating the regression.

Table 3. Homogeneity of Variance test for the remaining

Breusch–Pagan test	Statistic/ prob	Model 1	Model 2	Model 3
	Statistic	3.13	4.05	3.29
prob	0.00	0.00	0.00	

2- The reliability of research variables

Another pre-assumption of regression is the reliability of the research variables. Thus, the reliability of the research variables should be tested before analyzing the hypotheses. The reliability of the research variables used in the model means that the mean and variance of the research variables between was fixed during different years. Thus, using these variables in the model will not cause false regression. The reliability test of the research variables was conducted using Levin, Lin & Chu test. The findings of the reliability test of the research variables in Table 4 indicate that the significance level of all variables is less than 5% and the research variables are reliable.

Table 4. The reliability of the research variables

Variable	Statistic	prob
Stock Price Crash Risk	-21.33	0.00
Bankruptcy Risk	-24.15	0.00
Employment Risk	-25.53	0.00
Customer Concentration	-14.61	0.00
Cash Holding	-27.05	0.00
MTB	-22.95	0.00
SIZE	-41.24	0.00
Leverage	-14.64	0.00

3- Model selection test

To select an appropriate method for estimating the research models at different sections and periods of panel data, the Chow test was used. If the error level of the Chow test is less than 5%, the panel data model will be accepted, otherwise, the panel data method will be used. Based on Table 5, "panel data" are used for estimating the research model because the error level of the Chow test for research models is less than 5%. Thus, the Hausman test is used for determining the method of fixed or random effects. Since the error rate of the Hausman test in research models is more than 5%, the selected model type will be "random effects model".

Table 5. Research model estimation test

Model	Test	Statistic	prob	
1	F Leamer Test	6.09	0.00	panel data
	Hausman's Test	9.52	0.08	random effects
2	F Leamer Test	3.83	0.00	panel data
	Hausman's Test	5.02	0.41	random effects
3	F Leamer Test	3.56	0.00	panel data
	Hausman's Test	4.28	0.51	random effects

4- Testing hypotheses

Based on the results obtained from testing the research hypotheses in Table 6, a significant level was calculated for each variable and the whole model at 5% confidence level. Due to the adjusted coefficient of explanation of the adjusted models of testing the research hypotheses, it can be claimed that about 66, 54 and 61% of the dependent variable changes (stock price crash risk, bankruptcy risk and employment risk) in models 1 to 3 can be explained by the independent and control variables of each model. Auto-correlation is the violation of one of the standard assumptions of the regression model and the Durbin-Watson statistic can be used for determining the presence or absence of

auto-correlation in the regression model. The calculated Durbin -Watson statistic for models 1 to 3 is between 1.5 and 2.5, thus the assumption of the presence of a correlation between the errors is rejected and it can be accepted that the errors in the research models are independent. Thus, regression models can be used. Furthermore, the significance level of F-Leamer statistics for all models of one to three is less than 5%, so it can be accepted that at least one of the independent or control variables has a linear relationship with the dependent variable in each of the research models. The findings of the study models can be relied on for the relationship between independent and control variables with the dependent variable. Based on to Table 6, T-statistics and significance levels for customer concentration in the model (1) are 2.63 and 0.00. Since the significance level is less than the 5% error level, customer concentration has a significant effect on n stock price crash risk the first hypothesis is accepted. Since the variable coefficient is positive, it can be accepted that customer concentration has a significant positive effect on stock price crash risk.

In model (2), the t-statistic and significance level for customer concentration are respectively -2.66 and 0.00. Since the significance level is less than the 5% error level, it can be accepted that the customer concentration has a significant effect on the bankruptcy risk of companies and the second hypothesis is accepted. The coefficient of the variable is negative. Since the Z criterion of Altman was considered as an inverse criterion for the bankruptcy of companies, it can be accepted that customer concentration has a significant positive effect on the bankruptcy risk of companies. Besides, the t-statistic and significance level for customer concentration in Model 3 are 3.24 and 0.00. Since the significance level is less than 5%error level, it can be accepted that customer concentration has a significant effect on employment risk of companies and hypothesis three is accepted. Because the coefficient of the variable is positive, it can be accepted that customer concentration has a significant positive effect on the employment risk of companies.

Table 6. Findings obtained from testing the research hypotheses

Variable	Description	Model 1	Model 2	Model 3
C	Coefficient	0.50	0.35	0.38
	t- statistic	4.21	3.63	3.82
	Prob	0.00	0.00	0.00
Customer Concentration	Coefficient	0.08	-0.12	0.13
	t- statistic	2.63	-2.66	3.24
	Prob	0.00	0.00	0.00
Cash Holding	Coefficient	-0.05	0.09	-0.03
	t- statistic	-2.08	2.13	-1.81

	Prob	0.03	0.03	0.07
MTB	Coefficient	-0.09	0.10	-0.09
	t- statistic	-2.85	2.91	-2.93
	Prob	0.00	0.00	0.00
SIZE	Coefficient	0.10	0.05	0.11
	t- statistic	3.05	2.04	2.12
	Prob	0.00	0.04	0.03
Leverage	Coefficient	0.11	-0.07	-0.10
	t- statistic	3.08	-2.13	-2.88
	Prob	0.00	0.03	0.00
Adjusted R2		0.66	0.54	0.61
F- statistic		43.01	29.61	37.15
Prob F- a statistic		0.00	0.00	0.00
D-W		1.74	1.81	2.05

Discussion and conclusion

This study aimed to evaluate the effect of customer focus on the risks of companies listed on the Tehran Stock Exchange. For this purpose, the effect of customer focus on stock price crash risk, bankruptcy risk, and employment risk was investigated. The results of testing the first hypothesis indicated that customer focus has a significant positive effect on the stock price crash risk of companies. In other words, the stock price crash of companies increases with an increasing customer focus. The results obtained from testing this hypothesis are consistent with the results of the study by Lee et al. (2020). Lee et al. (2020) used data from the companies listed on the China Stock Exchange indicated that customer focus had a significant positive relationship with the stock price crash risk of Chinese companies. According to the above-mentioned researchers, when the products are sold to a large number of customers, losing a small number of these customers has no high effect on the company's sales performance and the company can replace new customers in the short term. However, increasing customer focus increases the dependence of the sales performance to one or more major customers. Besides, it is difficult to replace focused and major customers in the short term. In case of reduced purchase or the loss of these focused and major customers, a shock can be imposed on the company's performance and lead to increased stock price crash risk of companies.

The results of testing the hypothesis of two studies indicated that customer focus has a significant positive effect on the bankruptcy risk of companies. In other words, the bankruptcy risk of companies increases with an increasing customer focus. The results obtained from testing this hypothesis are consistent with the results of the study by Irvini et al. (2016). Irvini et al.

believed that increasing major customers focus can make the company focus on producing customized products according to the requests of these customers. Therefore, the sales performance of the company's products will be highly dependent on the purchase of major customers. Thus, the investments made by the company to produce customized products will have no result in case of bankruptcy or loss of such major customers. For this reason, the bankruptcy risk is higher in companies with major and focused customers.

The results obtained from testing the third hypothesis indicated that customer focus has a significant positive effect on the employment risk of companies. In other words, the companies' employment risk increases with an increasing customer focus. The results of this hypothesis are consistent with the results of the study by Zhang et al. (2018). Zhang et al. (2018) used the data of the companies listed on the China Stock Exchange and indicated that customer focus has a significant positive relationship with the employment risk of Chinese companies. Zhang et al. believed that customer focus can increase their bargaining power for reducing the sales price (discount) or long-term credit sales. On the other hand, companies should reduce production costs according to the reduced sales price. An approach for reducing production costs by companies is to reduce the number of workforce in such a way that the production process is not disrupted. For this reason, customer focus increases the company's employment risk.

Based on the research results, it can be said that customer focus can impose inefficiency to companies by increasing the stock price crash risk, bankruptcy risk, and employment risk. Based on the results of testing the hypotheses, some practical suggestions for using the results are provided as follows:

1. Due to the positive effect of customer concentration on stock price crash risk of companies, the investors of companies are suggested to pay special attention to the role of customer concentration as a non-financial criterion at the time of investment and regard considering financial and accounting criteria in order to avoid stock price crash risk of companies.
2. Due to the positive effect of customer concentration on bankruptcy risk, companies are suggested to take steps for diversifying of customers and reduction of dependence on major customers by advertising and marketing. The competitiveness of the company increases but bankruptcy risk decreases by reducing major customer concentration.
3. Due to the positive effect of customer concentration on employment risk, the managers of companies are suggested to take steps to long-term contracts with major customers or joint ventures with customers to retain them. In this regard, the employment risk will be reduced.

4. Since there is no specific standard or requirement for disclosure of major customers in Iran, it seems necessary to disclose such customers. Thus, it is suggested to provide the requirements related to the disclosure of information related to customers, so that investors can make better decisions.

Funding: This research received no external funding.

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Bibliographic information of this paper for citing:

Abbasi, Ebrahim & Tamoradi, Ali (2020). The Effect of Customers Concentration on Company Risks. *Iranian Journal of Finance*, 4(2), 19-39.