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The Effect of Company Ownership Structure on the Stock Price Crash Risk in Iran: A Panel Co-Integration Approach with Cross-Sectional Dependence

Farzad Rahimzadeh*
Department of Economics and Accounting, Faculty of Humanities, University of Guilan, Rasht, Iran
Jalal Jamali
Department of Accounting, Payame Noor University, Tehran
Alimohammad Abed
Department of Management, Allameh Tabatabai University, Tehran, Iran

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Abstract

Investors are often unwilling to buy shares of companies that have experienced a sharp drop in their prices. Therefore, considering the importance of the phenomenon of falling stock prices, in this research, using the Cup-FM method, the effect of factors affecting the risk of falling stock prices in companies listed on the Tehran Stock Exchange has been studied, with an emphasis on the ownership structure of the companies. In this research, 74 companies were studied as a research sample. The data relating to these companies from 2014 to 2020 are extracted from the financial statements of the companies Rahavard Navin Software and the Codal Website and are used for analysis. The estimation results of the model show the influence of managerial ownership, rate of return on assets (ROA), the market value of the company's assets to its book value and the share of 10 major shareholders on the risk of falling stock prices are negative. These effects are statistically significant since the presence of company managers among the company's shareholders reduces the incentive to manipulate the stock price and thus reduces the risk of the stock price falling. Moreover, high financial leverage, institutional ownership and company size positively affect the risk of stock price fall. In this research, the factors affecting the fall in stock prices of active companies in the Tehran Stock Exchange have been studied with emphasis on the structure and diversity of ownership.

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Corresponding Author: Farzad Rahimzadeh
Email: f.rahimzadeh @guilan.ac.ir
Tel: 09141535890
ORCID:

1. Introduction

Stock price plays a vital role in the decision of investors whether to buy or not to buy stocks. Shareholders generally prefer to invest in companies with low price volatility. Although positive price swings are pleasing to shareholders, a drop in stock price and subsequent decline is intolerable for most shareholders and can lead to a sharp drop in stock price. According to studies, stock prices fall more when bad news and bad company financial conditions are hidden and accumulated. With the one-time disclosure of this information, the stock price reacts negatively, drastically lowering the stock price. Sudden changes in stock prices occur in the form of falls and jumps in stock prices. One of the reasons for the fall in stock prices is the specialization of companies and the separation of management from their ownership. According to agency theory, each party seeks to maximize its interests. Therefore, one of the parties can take action for their own interests that conflict with maximizing the interests of other groups. One of the most apparent conflicts in agency theory is the conflict between managers and shareholders. A wide range of incentives, such as bonus contracts and tenure issues, encourage managers to avoid disclosing negative information and accumulate it within the company. If managers keep and accumulate bad news inside the company for a long period, a big gap (stock price bubble) will be created between the inherent price of the company's stock and the value set by investors (stock market value). When the mass of accumulated negative news reaches the point of explosion, it suddenly enters the market and causes price bubbles to burst and stock prices to fall (Ahmadi and Darseh, 2016). Due to the importance of the risk of falling stock prices in issues such as portfolio management and the pricing of capital assets, several studies have investigated the contributing factors. The results of these studies indicate that the components of corporate governance are among the factors affecting the risk of falling stock prices. In other words, one of the best tools that can be used to reduce the risk of falling stock prices and not disclosing information on time is the corporate governance mechanism. Because the two main goals of the corporate governance system are to reduce the company's risk by improving and promoting transparency and accountability and improving the long-term efficiency of the organization (Dianti et al., 2012). Further, one of the essential elements of corporate governance is shareholders and their ownership. Since shareholders play a crucial role in corporate governance criteria, their different combinations can affect the company's performance and how the company's information is reflected in the market. For example, large shareholders have an information advantage over other shareholders due to their influence in the company, which causes information asymmetry in the market and reduces liquidity. Therefore, about the short-term horizon, large shareholders pressure managers to sacrifice long-term investment and performance to maintain short-term profit growth and accelerate the recognition of good news instead of delaying the recognition of good news. This provides the basis for opportunistic actions of managers and increases the risk of future falls in stock prices (Kordestani and Khatami, 2016).

Moreover, there is another type of shareholder composition of management ownership, which, based on the hypothesis of alignment of equity rights, with the increase in the percentage of managerial ownership, there is a greater alignment of the interests of managers with the interests of shareholders. Therefore, managerial ownership is an important mechanism considered to limit management's opportunistic behavior. Also, when managers seek to increase their wealth, their conflict with shareholders increases, and if the management has a share in the company's ownership, the interests of managers and shareholders converge. Therefore, the information asymmetry between shareholders and managers is reduced, resulting in a reduced risk of falling stock prices. According to the above, the question raised is what factors can affect the fall in the share prices of active companies on the Tehran Stock Exchange? Can the diversity and ownership structure of companies affect the fall in the stock prices of these companies? In order to answer these questions, the factors

affecting the fall in the stock prices of active companies on the Tehran Stock Exchange have been studied with emphasis on the structure and diversity of ownership.

2. Literature Review

2.1. Stock price crash risk

A stock price crash is a phenomenon in which a sudden and negative revision of investors' expectations about a company's stock occurs. Besides, sophisticated investors have lower risk and higher expectations, which are closer to objective criteria than other investors with a lower level of complexity (Stålnacke, 2019). The sudden changes in stock prices have recently attracted the attention of many academics and professionals. It can be said that the stock price crash is a phenomenon in which the stock price undergoes a sudden and severe negative adjustment (Chen, Hong and Stein, 2001). A stock price crash has three characteristics: First, a stock price crash is a very large and unusual change in stock prices that occurs without a significant economic event. Second, these changes are very large and negative. Third, the fall in stock prices is a contagious phenomenon at the market level; that is, the fall in stock prices is not limited to a specific stock but includes all types of stocks in the market (Chen, Hong and Stein, 2001). Several studies have investigated the external and internal factors affecting the risk of falling stock prices, including:

Chen, Hong and Stein (2001) test a model in which investor opinion heterogeneity, combined with short-term selling constraints for some investors, leads to stock price falls. The main reason for the stock price fall in their model is not the internal reasons of the company but the accumulation of bad news caused by an external characteristic of the financial market and short-term selling restrictions. In contrast, Jin and Myers (2006) developed a model in which a firm's internal characteristics, such as agency conflicts between inside and outside investors, along with the lack of transparency of the company for outside investors, lead to a fall in the stock price. They found that information opacity increases the probability of stock price crashes (Kim et al., 2021).

Jin and Myers (2006) measured opacity at the annual country level (i.e., the average opacity of all firms in a country in a year). Therefore, measuring the lack of transparency is not a firm-specific variable. Hutton et al. (2009) extended the study of Jin and Myers (2006) by examining the relationship between the risk of falling stock prices of companies and the lack of transparency of company-specific financial reporting (sum of absolute discretionary accruals in the previous three years) and it was found that the lack of transparency of the company's financial reporting increases the probability of the stock price falling (Kim et al., 2021). According to Hutton et al. (2009), several studies have investigated the determinants of stock price crash risk at the firm level. First, Kim and Zhang (2014) found that tax avoidance provides managers with the tools to hide bad news from shareholders, thereby increasing the risk of collapse. Second, Kim, Luo and Xei (2016) found that the comparability of financial statements reduces the accumulation of bad news and thus reduces the risk of collapse. Callen and Fang (2015) also argue that religion, as a set of social norms, helps prevent the accumulation of bad management news. They found that companies in cities with higher levels of religiosity are less prone to stock price declines. In summary, the above studies identify the determinants of stock price crashes associated with the accumulation of bad news (Kim et al., 2021).

2.2. Ownership structure

The relationship between the shareholders and managers of the company is full of conflict of interest that comes from the separation of ownership and control, the difference in goals of shareholders and managers, and the asymmetry of information between managers and shareholders (Dey, 2008), which is expressed by the conflict of the agency.

An agency relationship is a contract whereby one or more persons employ another person to perform services on their behalf and delegate decision-making authority to him (Jensen and Meckling, 1976). Information asymmetry has caused the cost of capital to rise, and information asymmetry models show that this relationship is driven by the gap between the costs of internal and external resources, which results from management having superior information relative to shareholders. Therefore, the agency cost theory predicts a positive relationship between investment and cash flows in such a way that managers tend to overinvest when companies generate additional internal cash flows. These theories indicate that companies facing information asymmetry problems or higher agency costs will face a higher gap between internal and external financing. And for this reason, capital expenditures will be more sensitive to the availability of internal resources (Attig et al., 2012). As a result, to promote corporate governance and increase managers' accountability to shareholders and other stakeholders, intervention is necessary. The ownership structure is one of the important issues of corporate governance that affects the motivation of managers and can significantly affect the efficiency of companies (Kumar, 2005).

2.3. Explaining the relationship between ownership structure and stock price fall

Forecasting the risk of falling stock prices in the future has attracted considerable attention in academic and empirical studies, especially after the recent financial crisis. Corporate managers often have incentives to exaggerate financial performance and maintain inflated stock prices by strategically hiding bad news and accelerating the release of good news. When the accumulation of bad news exceeds a certain threshold, the overpricing bubble bursts and a sudden stock price crash occurs (Hutton et al., 2009; Jin and Myers, 2006). Current literature mainly focuses on different accounting mechanisms to identify the determinants of crash risk. Considering that managerial opportunistic behavior is caused by the separation of ownership and control of the company, this study examines the structure of corporate ownership and tries to find out how the concentration of ownership affects the risk of falling stock prices in companies listed on the Tehran Stock Exchange. According to the existing literature, there are two opposing views on the relationship between corporate ownership concentration and stock price crash risk. The supervisory role played by large shareholders can align the interests of large and small shareholders. Therefore, centralized ownership can reduce the risk of a particular company's stock price falling. However, the influence effect of large shareholders shows that the presence of large shareholders can increase the risk of a company collapse.

Shleifer and Vishny (1986, 1997) state that major shareholders monitor corporate governance because they are motivated to gather information about the company and review investment decisions and operational activities. Hutton et al. (2009) found that major shareholders help company managers not to manipulate stock prices. In addition, Grossman and Hart (1988) and Mitton (2002) found that when the ownership structure is concentrated, controlling shareholder interests are highly correlated with firm performance and hence with the interests of small investors. This is considered the effect of convergence. Evidence obtained from Chinese listed companies shows that if there are several large shareholders in a company, they balance each other's effects well. This prevents the stock price from bubbling up and forces major shareholders to disclose more information (Liu, 2006). As a result, it improves the quality of information disclosure and reduces the risk of falling stock prices.

Therefore, it can be assumed that "there is a negative relationship between the ownership structure and the risk of falling stock prices." On the other hand, Croce, Stewart, and Yermo (2011) argue that blockholders (major shareholders) are sometimes myopic, which can lead to increased asset bubbles. Graves and Waddock (1990) and Porter (1992) suggest that if major shareholders are overly concerned with short-term stock prices, they tend to encourage corporate managers to pursue short-term profits rather than long-term corporate development.

Jebran, Chen and Zhang (2022) show how board social capital influences stock price crash risk. Considering that directors are embedded in two kinds of social capital, internal and external, the association of internal and external board social capital with the future stock crash is theoretically proposed and empirically presented. A sample of Chinese firms from 2004 to 2018 is used, and findings reveal that internal board social capital, and networking experience among directors within a board, increase future stock crashes. By contrast, external board social capital, the external social networks of directors, reduces future crash risk. Moreover, institutional investors' monitoring attenuates the effect of internal social capital but increases that of external social capital on future crash risk. Furthermore, information quality, accounting conservatism, and tax avoidance are three potential channels that explain the relationship between social capital and crash risk .

Ryu and Chae(2021) investigate the effect of managerial ownership level in distribution and service companies. The results indicate that the stock price crash risk was reduced as managerial ownership levels increased. The managerial ownership level has a significant negative coefficient on stock price crash risk, negative conditional return skewness of firm-specific weekly return distribution, and asymmetric volatility between positive and negative price-to-earnings ratios. Zachro and Utama(2021) show that multiple positions bring no effect on the stock price crash risk due to cross-over interaction which negated the substantial effect on the risk of stock price crashes. As a country with high family ownership concentration, the results illustrate that family firms in Indonesia will strengthen the influence of Commissioners who hold multiple positions in reducing stock price crashes risk. Waqas and Siddiqui (2021) show a significant negative effect of accounting conservatism on firms' stock price crash risk. This study also finds that managerial ownership enhances the stock price crash risk of the sample firms significantly as a moderator. At the same time, there is no significant moderating influence of institutional ownership. Taghizadeh Khaneghah and Badavarnehandi (2018) investigated the relationship between corporate philanthropy and the risk of falling stock prices, emphasizing information asymmetry in companies listed on the Tehran Stock Exchange. Cash and non-cash donations were used to measure the company's philanthropy, as well as to measure the risk of falling stock prices, the index of negative skewness of monthly stock returns and the fluctuation of high and low stock returns were used, and they showed that there is a significant negative relationship between corporate philanthropy and the risk of falling stock prices. The investigated companies were also divided into companies with high and low information asymmetry using growth opportunities. The results showed that the negative correlation between corporate philanthropy and the risk of falling stock prices is stronger for companies with high information asymmetry. The results show that corporate philanthropy has economic consequences such as reducing stock price volatility, and increasing responsibility reduces managers' willingness not to release bad news. Barzegar and Khatami (2018) showed a positive and direct relationship between the variable of managerial ownership and the risk of falling stock prices; that is, with the increase of managerial ownership, the risk of falling stock prices increases. In addition, agency costs affect the relationship between managerial ownership and stock price risk. This means that the effect of managerial ownership on increasing the risk of future stock price falls is greater in companies with higher agency costs. Zarei et al. (2018) found a significant and inverse relationship between the decision-making power of CEOs and the risk of falling stock prices. The results show that CEO tenure

has the greatest impact on decision-making power among the three factors that determine the decision-making power of CEOs. Yeung and Lento (2018) considered three dimensions of the governance mechanism: ownership structure, board structure, and audit quality, which include 15 individual characteristics. These governance features are intended to increase management control, enhance effective decision making, and limit opportunistic behavior. The results showed that a strong ownership structure and higher audit quality are associated with lower stock price crash risk. The authors also found that the board's structure has no significant relationship with the risk of falling stock prices. Given that, the authors concluded that the better the company's corporate governance, the lower the information asymmetry between shareholders and management, and as a result, the lower the probability of future stock price falls.

Habib and Hassan (2017) indicate that managerial ability reduces underinvestment, strengthens overinvestment and generally increases the deviation in the expected level of investment. Management ability also significantly increases the risk of falling stock futures prices. In addition, good financial reporting quality reduces the risk of falling stock futures prices.

Kim and Zhang (2016) found that companies with CEO overconfidence have a high stock price crash risk, and the effect of managerial overconfidence on stock crash risk is greater when the CEO has more control over the senior management team. Also, their results show that the effect of the CEO's overconfidence on the risk of stock price fall is less for companies with more conservative policies. Coffey and Fryxell (1991) and Manconi (2012) found that if monitoring the company's management requires a lot of capital and time, block holders tend to sell their shares directly instead of performing their duties. In addition to the short-term investment horizon of large shareholders, they are criticized for having influence. This phenomenon refers to a situation where large shareholders are incentivised to expropriate small investors' interests and increase their own interests. Under these conditions, the disclosure of manipulated information increases the risk of falling stock prices. Therefore, according to the theoretical foundations and background, the research hypothesis is proposed as follows:

Research hypothesis: There is a positive and significant relationship between the ownership structure and the risk of falling stock prices.

3. Research Methodology

The present study examines the factors affecting the fall in stock prices in companies listed on the Tehran Stock Exchange, emphasising ownership structure. For this purpose, company data has been collected from 2014-2020. Then the model is estimated using the panel data method.

$$CRASH_{it} = \alpha_i + \beta_1 MANAGE_{it} + \beta_2 INST_{it} + \beta_3 BOARD_{it} + \beta_4 OWNER_{it} +$$
$$\beta_5 SIZE_{it} + \beta_6 ROA_{it} + \beta_7 MB_{it} + \beta_8 LEV_{it} + \beta_9 SOE_{it} + U_{it}$$

In this model, the dependent variable is the risk of the stock price falling, and to measure, the low-to-high volatility ratio (DUVOL) is used as follows. According to the study by Kim, Luo and Xei (2016), this criterion has been used as an index to measure the risk of falling stock prices. Kim, Luo and Xei (2016) believe that the low-to-high volatility ratio (DUVOL) is a better indicator for measuring the risk of falling stock prices.

$$DUVOL_{iT} = Log\left[\frac{(n_u - 1) \sum_{Down} R_{it}^2}{(n_d - 1) \sum_{Up} R_{it}^2} \right]$$

Where n_u and n_d are the numbers of days when the share price is high and low in year t, respectively. For each company and during year t, the stock return of a company may be lower or higher than its annual average in year t. A high DUVOL ratio indicates a high risk of falling stock prices. R^2 it is the second power of the return of the i-th share at time t and is calculated from the following equation.

$$\mathbf{r_{it} = \alpha_i + \beta_{1,i}R_{M,t-1} + \beta_{2,i}R_{M,t} + \beta_{3,i}R_{M,t+1} + \varepsilon_{it}}$$

Where ri,t is the yield of the i-th share at time t and $R_{M,t-1}$, $R_{M,t}$, $R_{M,t+1}$ are the market earnings on day t, T-1 and T+1, respectively. The regression residual is the daily yield of the i-th share at time t. Also, in this study, the control variables of the model are financial leverage LEV, ROA rate of return on assets, MB ratio of the market value of company assets to book value, SIZE of company size or natural logarithm of company assets, OWNER share of 10 major shareholders, BOARD size of the board of directors, MANAGE is the percentage of managerial ownership and INST is the percentage of institutional ownership.

3.1. Statistical population

The statistical population of this research includes all companies listed on the Tehran Stock Exchange. In order to take a sample, a systematic elimination method was used and the companies included in the sample must have the following conditions.

- Be among the accepted companies of the Tehran Stock Exchange before 2013.

- The end of their financial year should be the end of March every year.
- They have not changed their financial year during the period under review.

- The studied companies should not be among investment companies, banks and holding companies

In this way, 74 companies were studied as a research sample. The data and information related to these companies from 2014 through 2020 are extracted from the companies' financial statements, Rahavard Navin software and the Codal Website and used for analysis.

The estimation method of the research model in this article is the panel data method. It is generally assumed that the data used have cross-sectional independence in panel data econometrics. This assumption, like other assumptions, may not be true. Therefore, the first step in panel data econometrics is to determine cross-sectional dependence or independence before performing any test since the dependence between sections can exist due to factors such as external consequences, regional and economic relations, and the interdependence of remaining uncalculated components and unusual unobserved factors between different sections. Several tests have been proposed for this purpose in econometrics; the tests of Friedman (1937), Breusch-Pagan (1980) and Pesaran's CD test (2004) are some of these tests. Pesaran (2004) presented a test to detect cross-sectional dependence or independence for balanced and unbalanced panels. This test is applicable for balanced and unbalanced panel data and has favorable characteristics in small samples. Also, unlike Breusch-Pagan's method, it has provided reliable results for large cross-sectional dimensions and small time dimensions. It is resistant to one or more structural failures in individual regression slope coefficients. The null and competing hypotheses of this test are defined as follows:

$$H_0 : \ \rho_{ij} = \rho_{ji} = E\left(u_{it}v_{it}\right) = 0 \text{ For all } i \neq j$$
$$H_1 : \ \rho_{ij} = \rho_{ji} = E\left(u_{it}v_{it}\right) \neq 0 \text{ For some } i \neq j$$

For balanced panels, the CD test statistic can be calculated as follows:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \right)$$

Where $\hat{\rho}_{ij}$ Pearson's pairwise correlation coefficients are among the residuals, suppose the calculated CD statistic is greater than the critical value of the standard normal distribution at a certain significance level. In that case, the null hypothesis will be rejected and cross-sectional dependence will be concluded.

Suppose cross-sectional dependence is confirmed in panel data. In that case, conventional panel unit root methods such as Levin and Lin (LL), Im, Sons and Shin (IPS) tests, etc., will increase the probability of false unit root results. Several panel unit root tests have been proposed despite cross-sectional dependence, including the cross-sectional generalized ADF unit root (CADF) test to solve this problem. In other words, Pesran (2004) proposed a test statistic to check the presence or absence of a unit root by converting the ADF and IPS tests by considering cross-sectional dependence, known as Pesran's CIPS test. The statistic of this test is as follows:

$$CIPS(N, T) = \frac{1}{N} \sum_{i=1}^{N} \tau_i(N, T)$$

Where ti is the CADF model statistic for each individual cross section in the panel, the value of the CIPS statistic is compared with the critical values calculated by the Pesaran. Suppose this statistic is greater than the critical values. In that case, the null hypothesis (non-stationary status of the variable) will be rejected and the stationary status of the variable will be accepted.

In addition, if cross-sectional dependence is confirmed, conventional panel cointegration methods such as Kao (2006), Pedroni (1996), etc., will increase the probability of false clustering results. In order to solve this problem, several panel tests have been proposed, among which is the method proposed by Westerlund and Edgerton (2008). Westerlund Edgerton's (2008) cointegration test is one of the tests that give valid results if there is cross-sectional dependence in an unspecified structural fracture across the intercept and the slope of the cointegration regression as error sentences with frequent correlation and the heterogeneity of variances. The null hypothesis of this test is the absence of collinearity and the hypotheses H_0 and H_1 are tested by LM statistics. The Z statistic is defined for testing the hypotheses H_0 and H_1.

$$Z_j(N) = N^{1/2}(LM_j(N) - E(B_j))$$
$$Z_j(N) \rightarrow N(0, Var(B_i))$$

The Z statistic has a normal distribution with zero mean and constant variance. The obtained Z statistic is compared with the critical values of this statistic calculated by Westerlond and Edgerton. If the calculated Z statistic is greater than its critical value, the null hypothesis is rejected and the variables will have a collinear relationship. Although several methods have been proposed to investigate the panel cointegration relationship between variables, most of these methods only discuss the presence or absence of the relationship and do not provide information about the cointegration vector. Several methods have been proposed to solve this shortcoming, one of which is the frequently updated and fully adjusted estimation method (Cup-FM).

Bai and Kao (2006) proposed an estimator called fully adjusted frequent updating (Cup-FM), which uses factor structure to identify the source of cross-sectional dependence and provides the

cointegration vector. This method recursively calculates the coefficients of the cointegration vector by estimating the parameters and the long-term covariance matrix and factor loadings.

Like the Fully Modified Ordinary Least Squares (FMOLS) estimator, this estimator is resistant to serial autocorrelation bias and endogeneity bias. In addition, it is indifferent to the normality and non-normality of the explanatory variables. Bai and Kao (2006) assumed that the error term of the regression equation follows the following factor model to consider cross-sectional dependence.

$$\upsilon_{it} = \lambda_i F_t + e_{it}$$

Where Ft is a vector of $r \times 1$ common factors and λ1 is a vector of $r \times 1$ factor loads. Therefore,

$$\sigma_{it} = x_{it}\beta + \lambda_i F_t + e_{it}$$

Bai and Kao proposed the following estimator for the coefficient vector: the Cup-FM estimator.

$$\hat{\beta}_{cup\_FM} = \left[\sum_{i=1}^{N}(\sum_{t=1}^{T}\hat{y}_{it}^{+}(\hat{\beta}_{cup})(x_{it} - \overline{x}_i)' - T(\hat{\lambda}'_{it}(\hat{\beta}_{cup}) + \hat{\Delta}_{uzi}(\hat{\beta}_{cup}))) \right]^{-1} \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it} - \overline{x}_i)(x_{it} - \overline{x}_i)' \right]$$

Where

$$\hat{y}_{it} = y_{it} - (\lambda_i\Omega_{Fei} - \Omega_{Mei})\Delta x_{it}$$

Ω is the estimate of the long-run covariance matrix and xi is the cross-sectional mean of variable x. Other variables are like before and $\hat{\Delta}_{uzi}$ are defined as $\hat{y}_{it}$. It is important to mention that the values of y, Ω, and β are estimated iteratively to achieve convergence. In this research, STATA and Eviews software have been used for econometric analysis.

4. Research findings

The first step is performing the cross-sectional correlation test to estimate the model using the panel data method. In this research, the cross-sectional dependence Pesaran test was conducted for the model under study; the statistical value of this test is shown in Table (1). According to the results of this table and the critical values of cross-sectional dependence Pesaran test has a normal distribution and is equal to the values of 1.64, 1.96 and 2.57 at the levels of one percent, five percent, and ten percent, respectively. The null hypothesis based on the absence of cross-sectional dependence in the model is rejected at the level of one percent and the existence of cross-sectional dependence between the model variables is accepted.

Table 1. The Results of cross-sectional dependence Pesaran Test

Model	Pesaran's CD calculated the statistic value	Result
Model 1 (dependent variable: low to high volatility ratio)	3.240	The presence of cross-sectional dependence confirmed

Source: research calculations

Due to the existence of cross-sectional dependence in the model based on the relevant test, the CIPS statistic of Pesaran has been used to check the presence or absence of a unit root. The results of this test are presented for all variables and assume the existence of intercept and trend (C+T). Based on these results and the critical values presented by the Pesaran, it can be concluded that all the variables are at the significance level of five per cent.

Table 2. The Results of the unit root test based on Pesaran's CIPS statistic

Variable	With intercept and trend	Result
CRASH	-2.270*	I(0)
MANAGE	-2.310*	I(0)
INST	-2.420*	I(0)
BOARD	-2.940*	I(0)
OWNER	-2.190*	I(0)
SIZE	-2.410*	I(0)
MB	-2.850*	I(0)
ROA	-2.540*	I(0)
LEV	-2.240*	I(0)
SOE	-2.480*	I(0)

Source: research calculations

*indicates the stationary status of variables at the first order difference level

It can be seen that all the variables at the level of the variables are normalized and accumulated from the order of zero. Now, without worrying about false regression, we can estimate the models. For this purpose, the Cup-FM estimator has been used. GAUSS software was used to estimate the model; its results are presented in Table (3). It should be noted that in the Cup-FM method and the GAUSS software, the intercept value is not provided automatically. If necessary, it can be calculated manually and inserted into the regression equation of the research.

Table 3. The Model estimation results with the Cup-FM estimator

Variable	Coefficient	T-Statistic
C	0.180	1.100
MANAGE	-0.250	-2.190*
INST	0.190	2.780*
BOARD	0.100	1.270
OWNER	-0.200	-2.380*
SIZE	0.160	2.620*
MB	-0.140	-2.950*
ROA	-0.130	-2.750*
LEV	0.110	3.260*
SOE	0.180	1.210

Source: research calculations

*indicates the significance of coefficients at 5% of significance level

Based on the estimation results of the model, at a significant level of 5%, the amount of institutional ownership has a positive and significant effect on the risk of falling stock prices. In other

words, the presence of institutional investors among the shareholders of a company, according to their short-term perspective, increases the possibility of the rapid growth of the stock price and thus increases the risk of the stock price falling. The level of managerial ownership also has a negative effect on the risk of falling stock prices. This effect is statistically significant at a significance level of 5% since the presence of the company's managers among the company's shareholders reduces the incentive to manipulate the stock price and, as a result, the risk of the stock price falling.

Financial leverage and company size also positively affect the risk of falling stock prices, which is statistically significant at a significance level of 5%. In other words, the larger the company's size, the more difficult it is to audit the financial statements and monitor its activities compared to smaller companies. As a result, the risk of falling stock prices increases. The company's high financial leverage also positively affects the risk of falling stock prices and increases it. Also, the effect of the size of the board on the risk of falling stock prices was positive, but these effects are not statistically significant at the 5% level. Based on the results of the estimated model, the effect of the share percentage of 10 major shareholders on the risk of falling stock prices is negative, and these effects are statistically significant at the 5% level. In other words, owning more shares than the top 10 shareholders of the company reduce the risk of the stock price falling. Because, in this case, the incentive to control the stock price by the major shareholders will be greater. The effect of return on assets (ROA) and the ratio of the market value of the company's assets to the book value is negative on the risk of falling stock prices. These effects are statistically significant at a significance level of 5%. In other words, the higher the rate of return on assets and the ratio of the market value of the company's assets to the book value, the lower the risk of falling stock prices in that company and vice versa.

5. Discussion and conclusion

Considering the importance of the phenomenon of falling stock prices, in this research, using the Cup-FM method, the effect of factors affecting the risk of falling stock prices in companies listed on the Tehran Stock Exchange has been studied, with an emphasis on the ownership structure of the companies. Based on the estimation results of the model, institutional ownership has a positive and significant effect on the risk of falling stock prices. In other words, the presence of institutional investors among the shareholders of a company increases the risk of falling stock prices. The level of managerial ownership also significantly negatively affected the risk of falling stock prices. Because the presence of company managers among the company's shareholders reduces the incentive to manipulate the stock price and thus reduces the risk of the stock price falling. Financial leverage and company size also positively affect the risk of falling stock prices. In other words, the larger the company's size, the more difficult it is to audit the financial statements and monitor its operations compared to smaller companies. As a result, the risk of falling stock prices increases. The company's high debt compared to its assets (high financial leverage) also positively affects the risk of falling stock prices and increases it. Also, the effect of the size of the board on the risk of falling stock prices was positive, but this effect was not statistically significant at the 5% level. Based on the results of the estimated model, the impact of the share percentage of ten major shareholders on the risk of falling stock prices has been negative. In other words, owning more shares than the company's top ten shareholders reduces the stock price risk. Because in this case, the incentive to control the stock price by the major shareholders will be greater. The effect of return on assets (ROA) and the ratio of the market value of the company's assets to the book value is negative on the risk of falling stock prices. In other words, the rate of return on assets and the market value of the company's assets to the book value reduces the risk of the stock price falling in that company and vice versa. The results of this

research are in line with Barzegar and Khatami (2018), who found a positive and direct relationship between managerial ownership and the risk of falling stock prices. It is contrary to the research of Yeung and Lento (2018), who found that the board's structure has no significant relationship with the risk of falling stock prices.

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