Presenting a model for the effective factors on the stock price crash risk

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Abstract

In order to explain the stock price crash risk as a proxy to measure asymmetry in risk, despite its importance in portfolio analysis and capital assets pricing, no model has been designed. At the same time, it is very vital and necessary to identify the effective factors on the stock price crash risk in the Tehran Stock Exchange, which is a nascent, inefficient and developing market; because this risk is an inhibiting factor in attracting financial resources in the capital market. Therefore, in the present research, a model has been presented for the effective factors on the stock price crash risk. In this research, in order to identify the effective factors on the stock price crash risk, the data of 127 listed companies during the period of 2010 to 2020 was used and for their analysis, the partial least squares structural equation modelling method was used in PLS 3 software. It is necessary to explain in relation to the structural equation model, data and research variables (except for dummy variables) have been entered into the model in decimal form. The effective factors include specific characteristics of the company such as growth opportunity, agency cost, size, performance and risk of the company, corporate governance including the subcategories of governance quality and audit quality, quality of accounting information, capital market situation, economic situation and political relations, and the two criteria contain the negative skewness of the stock return and the fluctuation of the company's weekly return has been used to measure the stock price crash risk. The findings of the research indicate that the effect of growth opportunity, size, company performance, audit quality, capital market situation and economic situation on various criteria of the stock price crash risk is negative and significant and the effect of agency cost on various criteria of the stock price crash risk has been positive and significant. Meanwhile, the stock price crash risk was independent of the company's risk, governance quality, and accounting information quality. However, the results related to the effect of political relations on various indicators of the stock price crash risk have been contradictory.

Keywords: specific corporate characteristics, governance quality, audit quality, accounting information quality, capital market situation, economic situation, political relations, the stock price crash risk and listed companies
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1 Introduction

One of the main concerns of investors in the stock market is the stock price crash risk in the capital market. This issue, while creating pessimism among investors in the field of investing in the stock exchange, can lead to the

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withdrawal of huge sources of capital from the capital market. In fact, the stock price crash risk is an indicator for measuring the degree of asymmetry in investment risk in the stock market and is very important in portfolio analysis and capital asset pricing [55].

Despite the many researches about the stock price crash risk, the existing research gap in this field is the lack of designing a comprehensive model in the field of explaining and categorizing micro and macro factors affecting the stock price crash risk. Therefore, in the current research, in order to enrich the empirical foundations in the field of stock price fall risk, a model has been presented to explain the stock price crash risk. Also, in terms of methodological issues, in order to provide a model to explain micro and macro factors affecting the risk of stock price drop, structural equation modeling (SEM) has been used due to its advantages; Because of the high variety of factors affecting the stock price crash risk, this problem can be answered well with this analysis method. On the other hand, structural equation modeling allows researchers to evaluate the validity and reliability of the variables used in the model; however, in the current research, due to the use of mainly quantitative (and sometimes dummy) variables, it will not be necessary to measure the validity and reliability of the variables.

According to this introduction, in the present research, a model has been presented to explain and categorize micro and macro factors affecting the risk of stock price drop using quantitative data and through structural equation modeling.

In other words, this research sought to answer the following basic question: What are the micro and macro factors affecting the stock price crash risk in listed companies?

2 Theoretical foundations and background of empirical research

A stock price drop is a sudden and severe negative adjustment in the company's stock price due to a sudden and negative revision of investors' expectations regarding the said shares. In general, in the researches conducted in this field, two main reasons for the fall in stock prices have been pointed out, i.e., management's motivations (either selfish or benevolent motivations) and the weakness of the accounting system. Usually, by delaying the release of bad news or accelerating the release of good news in order to maximize the company's performance, managers have been effective in creating a bubble in the company's stock price, and the weakness in the accounting system has facilitated the implementation of this by the company's management [24]. In this regard, Pástor and Veronesi [66], believe that the fall in stock prices has been accompanied by an increase in political risk. Also, Chang et al. [16], believes that the fall in stock prices is caused by the greater ability of managers to suppress bad news.

In this section, the theoretical and empirical foundations are examined in the context of different classes of factors affecting the stock price crash risk, such as specific corporate characteristics (such as growth opportunity, agency cost, size, performance and risk of the company), corporate governance (including subcategories of governance quality and audit quality), quality of accounting information, capital market situation, economic situation and political relations are discussed:

2.1 Company specific features

Every company has a set of features and characteristics related to the type and nature of the company's activity, and on the other hand, the reporting environment of the company has been significantly affected by the type of business activity and its governing characteristics [5]. In this context, Bemmelich et al. [10], believe that managers with equity-based bonus contracts have a high motivation to continue projects with negative net present value and, in this regard, try to hide bad news that this Finally, it leads to the fall of the company's stock price. Of course, Hamers et al. [34], believe that the risk (danger) of falling stock prices occurs not only because of the opportunistic behavior of managers, but also because of the uncertainty associated with different stages of the life cycle. They concluded that in the stages of introduction and growth, the risk of stock price decline reaches its peak, and this relationship is stronger for companies with more future growth opportunities and higher performance, as well as in companies with no short-term interest.

Large companies incur a small cost to access the debt market due to their better reputation, having sufficient guarantees and enjoying diverse activities and due to less information asymmetry. Also, large companies are very flexible to increase their after-tax profits and as a result, they have a high level of debt capacity. Based on the theory of the hierarchy of financing options, large companies do not need access to additional financing; Because these companies have a lot of opportunity to maintain profits. Tangibility (high volume of tangible assets) also indicates the high capacity of debt repayment in large companies; Because the value of tangible assets does not disappear at the time of settlement. According to An et al. [7], believe that there is a negative and significant relationship between

the size of the company and the stock price crash risk. In this research, to measure the size of the company, 4 criteria of natural logarithm of assets, natural logarithm of employees, ratio of operating assets and ratio of fixed assets have been used.

On the other hand, according to the theory of stable equilibrium (static equilibrium), profitability indicates the high ability of companies to maintain assets and predicts that profitable companies should have relatively less debt. In this regard, Kayhan and Titman [45], based on the dynamic model of the substitution relationship, believe that the negative relationship between profitability and financial leverage of companies is due to concentrated profits in such companies. On the contrary, Jensen [41], and Harris and Ravio [70], believe that debt, despite the role of preventing managers from abusing free cash flows and making insufficient investment decisions in line with individual goals, ultimately increases the cost of corporate bankruptcy. increases Therefore, in profitable companies, the costs due to free cash flows can be lighter by issuing additional debt securities. As a result, based on the free cash flow theory, there is an expectation of a positive relationship between the company's profitability and financial leverage. However, An et al. [7], believe that there is a negative and significant relationship between various performance and profitability evaluation criteria (regardless of the positive or negative relationship between profitability and financial leverage) and the stock price crash risk. In this research, to measure the performance of the company, 4 criteria of annual stock return, asset return, equity margin and sales growth have been used.

In general, companies with high growth opportunities also have a high level and risk of financial crisis costs. Therefore, based on the theory of substitution relationship, there is an expectation of a negative relationship between growth opportunities and financial leverage. In other words, in such companies (high-growth companies), managers reduce the amount of debt in order to protect the company from the threat of bankruptcy. Also, the high growth opportunity leads to greater cooperation and participation of shareholders to make valuable investment in the company, and this reduces the amount of financial leverage in the company. On the other hand, according to the theory of stable equilibrium (static parallelism), it is expected that companies with high growth should have more financing through debt. However, An et al. [7], believe that there is a negative and significant relationship between different measures of growth opportunity (regardless of the positive or negative relationship between growth opportunity and financial leverage) and the stock price crash risk. In this research, to measure the growth opportunities of the company, two criteria of market value ratio to book value and accumulated profit to book value ratio (company life cycle index) have been used.

Based on the model based on failure risk (going concern), companies with higher default risks are more likely to publish very bad or very good news; Because they either go bankrupt or continue to operate. The theory of the hierarchy of financing options predicts that companies with high stock price risk have more debt. It is claimed that these companies suffer from adverse selection. In addition, companies with high stock price risk regularly have limited access to foreign capital markets. Christie [20], states that the stock price risk is subject to the increase of financial leverage. Dennis and Strickland [23], also discovered a positive relationship between price volatility and financial leverage. On the other hand, the stable equilibrium theory predicts that the high risk of the stock price leads to a reduction in debt. In particular, companies with high stock price risk are expected to have higher financing costs. In this context, An et al. [7], believe that the relationship between different measures of company risk and the stock price crash risk should be positive and significant. In this research, to measure the risk of the company, 6 criteria of standard deviation of cash flow, standard deviation of profit before tax, probability of bankruptcy, loss index, inverse of company life and beta coefficient have been used.

Also, in relation to the level of agency costs measured by 3 criteria of free cash flow, financial leverage and the ratio of administrative and general expenses, the results of their research showed that more short-term debt bonds cause the stock price to fall less in the short term; Because more short-term debt bonds have a more effective regulatory role in limiting managers' behavior in the context of bad news. Hutton et al. [39], and Kim et al. [49], believe that in the previous literature, the criteria of company size and financial leverage have been used in order to measure the risk of failure; Although the experimental results in support of this proposition have not been very strong. However, by accepting the positive relationship between financial leverage and the risk of corporate bankruptcy, Campbell et al. [14], found a negative relationship between financial leverage and the stock price crash risk. Andreo et al. [9], believes that with the increase in the fall in the share price of certain companies from 5.5% to 27% between 1950 and 2018, most of the existing literature in this field attributes the fall in the stock price to the reasons and agency problems, such as hiding Bad news (reported lack of financial transparency) by managers and over-attributed investment. Meanwhile, the reasons and problems of agency have not been able to explain the increasing frequency of falling stock prices. Pourheidari et al. [65], also believe that in companies, especially in companies with high levels of agency costs and in the absence of transparency in financial reporting, managers may hide bad news in the company and refrain from publishing it. Storing and hiding too much bad news and suddenly announcing and publishing it to the market will

lead to a fall in stock prices.

In relation to specific corporate characteristics, Ahmadpour et al. [4], found a negative and significant relationship between the variables of asset return, company size, market value to book value ratio and Qotubin ratio with the stock price crash risk. However, the stock price crash risk has been independent of the variables of financial leverage and return on equity. Heydarpour et al. [37], also found a positive and significant relationship between the stages of growth and decline with the stock price crash risk and a negative and significant relationship between the maturity stage and the stock price crash risk. Fakhari and Nasiry [28], also believe that there is a negative and significant relationship between the company's performance (including the ratio of market value to book value, rate of return on assets, Tobin's Q index and earnings per share) and the risk of a future fall in stock prices. Shafiei and Dastgir [72], also concluded that the effect of asset growth on the stock price crash risk is positive and significant, and free cash flow (an indicator of agency problems) strengthens the positive effect of asset growth on the stock price crash risk. This is despite the fact that the relationship between asset growth and the stock price crash risk has been independent of accounting conservatism.

2.2 Corporate governance

One of the important mechanisms in order to prevent the problems related to the phenomenon of falling stock prices is the issue and concept of corporate governance, which emphasizes the necessity of monitoring the company's management, separating the business unit from the company's ownership, and also Protecting the rights of shareholders, investors and other stakeholders. In general, the design and establishment of suitable corporate governance mechanisms is a fundamental and necessary step in order to optimize the use of resources, improve the level of accountability, increase the level of transparency and respect the rights of all the stakeholders of the company, the final result of which is the correct establishment of management systems [81]. In the research literature, the existence of institutional owners is considered as informed investors who play a decisive role in the transmission of information in the stock price and the amount of delay in the adjustment of the stock price. Also, the non-executive members of the board of directors are not willing to collude with the other managers of the company due to less dependence on the company and in line with a better career future for themselves and gaining reputation in the field of management, and therefore, the motivations of these managers are not the same as those of other managers, leading to favorable supervision. They will participate and this issue will lead to the reduction of agency costs [59]. In this regard, Hou and Moskowitz [38], believe that there is an inverse relationship between the amount of institutional ownership and the amount of delay in stock price adjustment. Also, Callen and Fang [21], Ahmadi and Dorseh [3], and Sadeghi et al. [71], in line with the monitoring perspective, found an inverse relationship between institutional owners and the future drop in stock prices. In other words, by monitoring the management, institutional investors prevent the accumulation of bad news in the company (as one of the most important reasons for the stock price drop). Also, Ahmadi and Derse [3], found out the negative effect of other corporate governance mechanisms such as managerial ownership, independence of the board of directors and the dual role of the CEO on the stock price crash risk. Meanwhile, according to Yeung and Lento [82], the stock price crash risk was independent of the structure of the board of directors.

In the field of audit quality, Ying and Lento [82], and Kazemi [46], found out the reverse effect of audit quality on the stock price crash risk. Also, Talebnia and Rajabdari [75], and Mahmoudi Minaei and Seyedi [60], found a negative relationship between the effectiveness of the audit committee and the stock price crash risk. On the other hand, Carey and Simnett [15], believe that the long tenure of auditors has been associated with low audit quality, including low probability of bad news publication and increased risk of falling stock prices.

2.3 Quality of accounting information

Jackson [40], believes that low-quality accounting information is an obstacle in the direction of price discovery and leads to more delays in stock price adjustments. In relation to the quality of accounting information, the effect of profit management and profit instability [33], profit smoothing [50], the tendency of managers to asymmetric disclosure of news [51], and the comparability of financial statements. Chogan and Imamqolipour [19], has been positive and significant on the stock price crash risk. However, Chen et al. [50], believe that high levels of earnings smoothing are associated with stock price downside risk for firms with fewer analysts, for firms with smaller institutional shareholders, and also for firms with positive discretionary accruals has been more intense (a measure of earnings management). Also, Sadr al-Sadat et al. [6], also believe that there is a positive and significant relationship between profit smoothing and the stock price crash risk in companies with strong corporate ownership and a negative and significant relationship in companies with weak corporate ownership. On the other hand, the relationship between profit smoothing and risk of stock price fall in companies with high level of accruals has been negative.

On the other hand, the impact of accounting conservatism [62], readability in financial reports [44], and profit smoothing [68], on the stock price crash risk was negative and significant. Is. However, Ghaznavi Qasuni et al. [67], believe that the stock price crash risk was independent of profit management and tax avoidance.

2.4 Capital market situation

Financial reporting and information disclosure in the capital market is one of the most important tools for companies to communicate with shareholders and creditors. The main and primary goal of information disclosure is to reduce the ambiguity of capital market actors and workers regarding the amount of cash flows and the timing of said cash flows in order to increase the accuracy of forecasting in the field of future profitability of companies [42]. With the increase in the transparency of the capital market environment, the amount of reflection and influence of specific information of companies on their stock prices increases and as a result, the simultaneity of stock returns, which is an inverse measure of the effect of specific information of companies on their stock prices, decreases [2]. Anyway, regarding the state of the capital market, Foroughi et al. [29], believe that in the conditions of lack of transparency in the capital market, managers in order to strengthen and maintain their job position, in order to disclose bad news (including losses) and Its reflection on the market had some motivation. In any case, with the departure of the current managers and the one-time disclosure of accumulated and undisclosed bad information and news, the fall in stock prices will not be far from expected. Chang et al. [17], also believes that the extent of the impact of stock liquidity on downside risk directly and indirectly (through the flow of temporary investors) is not clear.

2.5 The economic situation

The claim that economic variables such as inflation, liquidity, exchange rate, etc. are the drivers of stock price changes, has been accepted as a theory. In terms of the economic situation, the results of Khani and Mohammadipour [47], indicated a positive and significant effect of inflation rate and interest rate on the stock price crash risk. Meanwhile, the stock price crash risk was independent of the exchange rate. Amin Eshairi [27], also showed that only the money supply index caused by the central bank's policy did not affect the stock price crash risk and it also occurred due to the collinearity between the independent variables. Meanwhile, the facilities granted by the banking network, the supply of money from oil exports, the supply of bonds and the supply of shares of state-owned companies in the stock exchange have had a significant impact on the stock price crash risk. Also, Rahmati and Ahadi Sarkani [69], came to the conclusion that with the increase of uncertainty in economic policy, the stock price crash risk increases.

2.6 Political Relations

In the context of political relations, there have been conflicting results as described by Boubaker et al. [13]. They believe that managers with political connections, on the one hand, and for two reasons, are less likely to take actions that lead to low-quality financial reporting. The first reason is that negative and opportunistic financial reporting by these managers will have a very negative effect on their human capital compared to their non-political counterparts. The second reason, considering that the high quality of information reduces the stock of negative information, the low quality of financial reporting by political managers will be accompanied by a very severe punishment in terms of higher capital costs by the market. Therefore, the market expects high quality financial reporting from such managers. On the other hand, based on the theory of rent seeking, emphasis on job promotion and credit status of political managers increases their motivation to manage profit in order to meet expectations of their performance. In this situation, political managers are expected to have a high incentive to hide bad news. Hence, the risk of stock price collapse increases for companies with political managers, and such an effect will be intensified in companies with high information asymmetry.

Anyway, Wang [77], Shen and Lin [73], Mahmoudzadeh Tilmi and Nesl Mousavi [76], and Khalifa Soltani et al. [74], politically, they reached the stock price crash risk.

Therefore, due to the importance of the stock price crash risk for both shareholders and companies, as well as the lack of comprehensive research in the field of providing a model for micro and macro factors affecting the stock price crash risk, this research has investigated this issue. has been Also, based on the theoretical foundations and previous researches, the following hypotheses have been formulated and examined:

The first main hypothesis: specific corporate characteristics have an effect on the stock price crash risk index.

First hypothesis: the size of the company has an effect on the stock price crash risk index.

The second hypothesis: the performance of the company has an effect on the index of stock price crash risk.

The third hypothesis: the growth opportunity of the company has an effect on the index of the stock price crash risk.

Fourth hypothesis: Company risk has an effect on the stock price crash risk index.

The fifth hypothesis: the level of the company's agency cost has an effect on the stock price crash risk index.

The second main hypothesis: corporate governance mechanisms have an effect on the stock price crash risk index.

Sixth hypothesis: governance quality has a significant effect on the stock price crash risk.

The seventh hypothesis: audit quality has a significant effect on the stock price crash risk.

The third main hypothesis (eighth hypothesis): The quality of accounting information has an effect on the stock price crash risk index.

The fourth main hypothesis (ninth hypothesis): The state of the capital market has an effect on the stock price crash risk index.

Fifth main hypothesis (tenth hypothesis): The economic situation has an effect on the stock price crash risk index.

Sixth main hypothesis (11th hypothesis): Political relations have an effect on the stock price crash risk index.

3 Conceptual Model

In terms of logic (theoretical foundations) and the background of the research, the following factors are expected to be effective on the stock price crash risk. Based on this, the conceptual model is presented in Figure 1 below.
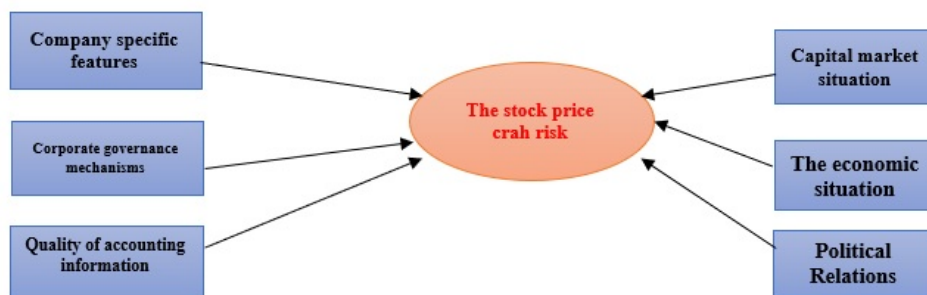

Figure 1: **Conceptual model of research**

4 Research methodology

4.1 Research Method

The current research is applied research in terms of its purpose. Also, based on the method of data collection, this research is a descriptive, quantitative and correlational research that seeks to identify the impact of micro and macro factors on the stock price crash risk. Also, in terms of reasoning, the current research is placed in the deductive-inductive class.

4.2 Population and statistical sample

The statistical population of the research included all the companies accepted in the Tehran Stock Exchange during the years 2010 to 2020. In the current research, the statistical population was adjusted based on systematic characteristics (statistical sample); Therefore, the following features were taken into account in the selection of companies:

The date of their acceptance in the stock exchange organization is before 2010 and they should be in the list of listed companies until the end of 2020. Also, according to the conducted research and in order to provide more reliable results than the conducted research, this research period was selected.

In order to increase comparability and unify the conditions of the selected companies, the financial year of the company should end at the end of March of each year and this date has not changed during the information access period.

In order to match the type of items and classify them in the financial statements, the chosen company should not belong to the stock market industries of "banks, credit institutions and other monetary institutions", "other financial intermediation", "financial investments" and "multidisciplinary industrial companies".

In order to have a reliable market price, during the period of research, there should be no more than three months of trading stop and they should have transactions throughout the research period. The number of extracted companies is 127 companies as described in Table 1, and the required data was collected during a period of 11 years.

Table 1: How to choose the studied companies

Company	Company	Description
417		The date of their acceptance in the stock exchange organization before 2019
	72	The number of companies whose fiscal year ends does not end on 12/29.
	75	Investment companies, banks and financial intermediation, holdings, leasing and insurance
	64	The number of companies that were removed from the stock market during the research period
	79	The number of companies whose financial information was not available during the period
(290)		The number of companies excluded from the research sample
127		The number of companies investigated in the research

4.3 Operational definitions of research variables

4.3.1 Dependent variable (the stock price crah risk)

The dependent variable of the research is the stock price crash risk, which is measured by two indices ($DuVoli_{i,t}$) and ($NcSkew_{i,t}$) as follows: First, according to the definition of Hutton et al. [61], and Kim et al. [57], if If the share price of a company has fallen sharply during the period under review, the share price of that company has fallen during that period. Since the sharp reductions in the share price may be the result of a general decrease in prices in the market, one should pay attention to the general market situation and mean a sharp decrease in the share yield compared to the market yield. For this purpose, the time series regression model has been used as follows to calculate the specific return of the company.

$$R_{j,\tau} = \alpha_0 + \Upsilon 1_j R_{m,\tau-2} + \Upsilon 2_j R_{m,\tau-1} + \Upsilon 3_j R_{m,\tau} + \Upsilon 4_j R_{m,\tau+1} + \Upsilon 5_j R_{m,\tau+2} + \epsilon_{j,\tau 0}$$

In this regard, R_j; The monthly return of the company, R_m: the monthly return of the market and τ represents the months of the year. The residuals of the above model show the company's specific return to the market, which the following relationship has been used to bring their distribution closer to the normal distribution.

$$W_{j,\tau} = LN\left(1 + \epsilon_{j,\tau 0}\right)$$

In the above relationship, $W_{j,\tau}$ is the specific return of the company. According to this definition, assuming the distribution of specific returns is normal, the period of decline is the period during which the company's specific return is 3.09 standard deviations lower than its average specific return.

The first criterion to measure the risk of spillage, presented by Chen et al. [80], is the negative skewness coefficient (NcSKEW). This measurement preserves the asymmetry coefficient of the yield distribution and is often used in the research literature. Negative (positive) skewness values indicate data that is skewed to the left (right). The skewness variable is calculated using the company's weekly returns and is normalized to the power of 3 by the standard deviation of the company's weekly returns.

$$NcSKEW = -[n\left(n-1\right)^{3/2} \sum_{j,\tau} w^3]/[(n-1)(n-2)(\sum_{j,\tau} w^2)^{3/2}]$$

This measurement is multiplied by (-1); So that if a higher value is obtained, it indicates a greater risk of falling.

The second criterion for measuring the risk of collapse is the volatility measure (DUVOL) of probability of collapse. For company j during a fiscal year period τ, the weekly returns of companies are divided into two groups: down weeks; when the return is lower than the annual average and up weeks; When the return is higher than the annual average. The standard deviation of the company's weekly return is calculated separately for each of these two groups. DUVOL is the natural logarithm of the ratio of the standard deviation in (down) weeks to the standard deviation in (up) weeks:

$$DUVOL_{j,\tau} = \log\{(n_u - 1) \sum_{Down} w_{j,\tau}{}^2 \, /(n_d - 1) \sum_{Up} w_{j,\tau}{}^2$$

The higher the DUVOL value, the higher the risk of the stock price falling.

Independent variables (factors affecting the stock price crash risk)

In the present study, the specific characteristics of the company as the first independent variable included the components of company size, company performance, growth opportunity, company risk and agency cost. Each of these components has the following indicators:

Company size: This component has the following indicators:

1. Firm size (SIZE): natural logarithm of total assets [61].

2. Net operating assets (OPASSET): the ratio of total accounts and commercial receivables, cash balance and orders and prepayments to total assets [31].

3. Fixed asset ratio (PPE): the ratio of property, equipment and machinery to total assets [26].

4. Number of employees (EMPLOY): the natural logarithm of the number of employees in the company [8].

Company performance: This component has the following indicators:

1. Return on assets (ROA): the ratio of profit before tax to total assets [49].

2. Return on equity (ROE): the ratio of equity to total assets [61].

3. The company's annual return (RET): the difference between the stock price in the current year compared to the previous year and the stock price in the previous year [49].

4. Sales growth (SGrowth): the ratio of the change in sales of the current year compared to the previous year to the sales of the previous year [36].

Growth opportunity: This component has the following indicators:

1. Market to Book Value (MB): The ratio of the company's market value to the book value of equity [61].

2. Company life cycle (RETAIN): the ratio of accumulated profit to the book value of assets [22]. The higher the ratio of retained earnings to book value of assets, the more mature the company is. Companies with a high ratio of retained earnings (more mature companies) have a higher growth opportunity.

Company risk: This component also has the following indicators:

1. Operating cash flow standard deviation (CFOSTD): the standard deviation of operating cash flow over a 5-year period [48].

2. Earnings before tax standard deviation (INSTD): The standard deviation of earnings before tax over a 5-year period [48].

3. Probability of bankruptcy (BANKRU): To measure the probability of bankruptcy of the company, the Altman model has been used as follows:

$$Z - Score = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E$$

A = (working capital/total assets of the company)

B = (accumulated profit/total assets of the company)

C= (Profit before interest and taxes/total assets of the company)

D = (market value of equity/total liabilities of the company)

E= (sales/total assets of the company)

4. Loss index (LOSS): it is a dummy variable (bivariate); So that if the company has reported a loss in the previous year, the value is one and otherwise, the value is zero [36].

5. Beta Coefficient (BETA): Covariance ratio between market return and company return divided by market return variance [1].

6. Age of the company (AGE): the natural logarithm of the number of years of the company's activity since its establishment. In the current research, the inverse of the company's life has been used as a measure of the company's risk.

Agency fee: This component also has the following indicators:

1. Financial leverage (LEV): debt-to-asset ratio [61].

2. Free cash flow (FCF): There are different methods for calculating this variable, including the use of profit before interest and taxes, net profit or using the form of cash flow. In this research, EBIT (earnings before interest and tax) was used to calculate the company's free cash flow [64]:

$$FCF = (EBIT * (1 - T) + A + D) + \Delta WC + NIF + \Delta OA$$

EBIT: Earnings before interest and taxes

T: statutory tax rate

A: Depreciation cost of tangible assets

D: Depreciation cost of intangible assets

ΔWC: change in working capital

NIF: Net investment in fixed assets

ΔOA: Change in other assets

3. General and administrative expenses (ADM): the ratio of administrative, general and organizational expenses to the total sales of the company [8].

In this research, corporate governance as the second independent variable includes the components of governance quality and audit quality. Each of these components has the following indicators:

Governance quality: This component has the following indicators:

1. Institutional Ownership (INS): According to the definition of Clause 27, Article 1 of the Securities Law of the Islamic Republic of Iran, any natural or legal person who buys more than 5% or more than 5 billion Rials of the nominal value of the securities being issued. , is considered among this group of investors.

2. The independence of the board of directors (OUT): the ratio of non-executive members to the total members of the company's board of directors [36].

Audit quality: This component also has the following indicators:

1. Auditor size (ASIZE): It is a dummy variable (two-faceted), if the company is audited by the audit organization and other A-level audit institutions (as large audit institutions), the value is one and otherwise, the value is zero.

2. Change of auditor (CHANGE): If the auditor of the company has changed in the given year, the value is one and otherwise, the value is zero [36].

3. Tenure of the auditor (TENURE): It is equal to the number of years of auditing by an auditing firm [83].

4. Lag in the auditor's report (LAG): It is the number of days that the audit report is published after the end of the financial period. The longer the gap between the auditor's report and the end of the financial period, the longer the delay. In the current research, the inverse of the delay in the auditor's report (in terms of days) has been used as a measure of audit quality.

In this study, the quality of accounting information as the third dimension or category (in other words, in the role of the third independent variable) factors affecting the stock price crash risk included the following indicators:

1. Discretionary accruals (ACCRU): Discretionary accruals were used to measure profit management based on accruals using model of Kothari et al. [53]. To estimate discretionary accruals, the following regression model is used, where the residual of the regression equation (ε) represents discretionary accruals:

$$TA/A = \alpha 1 \, (1/A) + \alpha 2 \, (\Delta REV/A) + \alpha 3 \, (PPE/A) + ROA + \varepsilon$$

which in this model:

TA: Total accruals (the difference between operating profit and operating cash flow) in the current year

ΔREV: Change in accounts receivable this year

A: The assets of the company in the previous year

PPE: property, machinery and equipment in the current year

ROA: The rate of return on the company's assets in the previous year

Kothari et al. [53], designed their model by adding the rate of return on assets to the modified model of Jones [43]. They believe that this model has stronger results than the adjusted model of Jones [43].

2. Smoothing of profit (SMOOTH): In this research, in accordance with the researches of Lee Oz et al. [63], and Frances et al. [30], the ratio of the standard deviation of net profit to the standard deviation of operating cash flow is used to measure profit smoothing.

$$SMOOTH = \frac{SD\ net\ income}{SD\ CFO}$$

in which we have:

SMOOTH = smoothing profit

SD = net income standard deviation of net income

SD CFO = Standard deviation of operating cash flow

The higher the level of the SMOOTH variable, the higher the volatility of the company's net profit [35].

3. Profit stability (PRESIS): Profit stability is the concept of profit repeatability. A profit that is not the result of unexpected and unusual activities is more stable [51]. Sustainable profit is desirable from the investors' point of view due to its continuity in future periods [54]. In this research, to measure profit stability,model of Kormandi and Laip [52], model is used as follows:

$$\frac{Earn_{jt}}{TotalAssets_{jt}} = \alpha 0 + a_1 \frac{Earn_{jt}}{TotalAssets_{jt-1}} + e$$

in which we have:

Earn jt = operating profit of company j in year t

Earn jt−1 = operating profit of company j in year t-1

Total Asset jt-1 = total assets of company j in year t-1

Any size of the explanatory variable coefficient of profit stability model (a1), close to one or greater than one, indicates a high level of profit stability, and if it is close to zero or smaller than zero, it indicates the instability of profit [12].

4. Probability of fraud in reporting (BENISH): Beneish [11], used a combination of financial ratios and accruals to predict profit manipulation methods. Due to the lack of proper economic theory in the field of handling financial information, he used three sources to select explanatory variables. The first source is the examination of the future signs of the company based on the available scientific and specialized literature. He assumed that when the company's future situation is weak, the probability of profit manipulation is also higher. The second source is the selection of variables based on cash flows and accruals based on the Jones [43], model. Finally, the source of profit is the use of the contractual hypothesis based on the proof theory of [78]. The result of Beneish's [11], search based on financial statement data led to the creation of an eight-variable model. According to Beneish [11], it was preferable to use the probit and logit method to identify companies handling financial information. Beneish [11], stated in modeling studies during 1997 and 1999 that companies handling financial information do not always use commitment items. Therefore, to determine the manipulation of financial information, different variables should be used. Variables based on financial statements may be suitable for identifying profit management companies or companies that have made transactions against the accepted principles of accounting (profit fraud).

Beneish's model [11], was as follows:

$$EM = a_0 + a_1 DSRI + a_2 GMI + a_3 AQI + a_4 SGI + a_5 DEPI + a_6 SGAI + a_7 ATA + a_8 LVGI$$

The constituent variables of Beneish's [11] model are as follows.

$$DSRI= \frac{REC_t/SALES_t}{REC_{t-1}/SALES_{t-1}}$$

An increase in the index of receivables (REC) to sales (SALES) can be due to a change in credit policies to increase the amount of sales; In any case, the disproportionate increase in demands leads to overestimation of income and sales [11].

Gross profit margin index (GMI) is obtained from the following relationship. If the GMI is greater than 1, the gross profit margin is greatly degraded. The weakening of the gross profit margin indicates the negative situation of the company's outlook and increases the possibility of profit manipulation [11].

$$GMI= \frac{SALES_{t-1}- COG_{t-1}/ SALES_{t-1}}{SALES_t- COG_t/SALES_t}$$

In this regard, SALES is annual sales, COG, cost of goods sold.

Asset Quality Index (AQI) is measured from the following relationship. If this index is greater than 1, the company has potentially increased deferred costs and intangible assets. Therefore, the possibility of profit manipulation also increases [11]. In this regard, CA is the sum of current assets and PPE is property, machinery and equipment and ASSETS is the sum of assets.

$$AQI= \frac{1 - (CA_t+PPE_t)/ASSETS_t}{1 - (CA_{t-1}+PPE_{t-1})/ASSETS_{t-1}}$$

The sales growth index (SGI) is obtained from the following relationship. Sales growth alone does not indicate profit manipulation, but there is a possibility of profit manipulation by increasing sales compared to the previous period [11].

$$SGI= \frac{SALES_t}{SALES_{t-1}}$$

Consumption cost index (DEPI) is calculated from the following equation. If this index is greater than 1, it indicates high estimates of property, machinery and equipment by the company. Therefore, the possibility of profit manipulation also increases [11]. In this regard, DEP is the cost of depreciation of tangible fixed assets and gross PPE of property, machinery and equipment.

$$DEP= \frac{DEP_{t-1}/PPE_{t-1}}{SEP_t/PPE_t}$$

The general, administrative and selling expenses index (SGAI) is obtained from the following relationship. The largeness of this index is a sign of the negative situation of the company's future prospects. Therefore, there is a possibility of profit manipulation [11]. In this regard, EXP, SGA are general, administrative and sales expenses and SALES is annual sales.

$$SGAI= \frac{SGA\ EXP_t/SALES_t}{SGA\ EXP_{t-1}/SALES_{t-1}}$$

The index of total accrual items to total assets (TATA) is calculated from the following relationship. The possibility of profit manipulation is associated with the increase of accruals [11]. In this regard, ACC shows accrual items (the difference between operating profit and operating cash flow) and ASSETS shows the total assets of the current year.

$$TATA= \frac{ACC_t}{ASSETS_t}$$

The financial leverage index (LVGI) is measured from the following relationship. A value greater than 1 of the leverage indices indicates an increase in the probability of profit manipulation [11]. In this regard, LTD represents the sum of long-term liabilities, CL represents the sum of current liabilities, and ASSETS represents the sum of assets.

$$LVGI = \frac{LTD+_t + CL_t / ASSETS_t}{LTD_{t-1} + CL_{t-1} / ASSETS_{t-1}}$$

This variable, finally in dummy form (1 and 0), indicates the possibility of fraud or non-fraud in financial reporting.

In the current research, the market situation as the fourth dimension or category (in other words, in the role of the fourth independent variable) factors affecting the stock price crash risk included the following indicators:

1. Stock market index (INDEX): The current value of each company is obtained by multiplying the number of shares of each company by its stock price, and the current market value is obtained from the total current value of all accepted companies. Obviously, in the case of industry price index, the current value of each industry will be considered. Therefore, with the increase and decrease in the current value of the stock market, the index also increases or decreases [62].

$$\text{Total value index} = \frac{\text{(calculation of time in current market share value)}}{\text{(The origin of the date in the current stock market value)}} \times 100$$

2. P/E ratio: It shows the price to profit per share.

Also, in this research, the economic situation as the fifth dimension or category (in other words, in the role of the fifth independent variable) of the factors affecting the stock price crash risk included the following indicators:

1. Economic growth (ECOGRO): It is equal to the natural logarithm of the country's GDP [54].

2. Inflation rate (INFL): The inflation rate percentage announced by the central bank at the end of each year.

3. Interest rate (INTER): long-term interest rate

4. Exchange rate (CURREN): Exchange rate, as a factor affecting the economy, can affect stock prices.

5. The price of oil (OIL): The price of oil, as a factor affecting the economy, can affect the price of stocks.

Finally, in the present study, political relations as the sixth dimension or category (in other words, in the role of the sixth independent variable) of the factors affecting the stock price crash risk included a single index as follows:

1. Political connection (GOV): signs of the company's management and political connection include the presence of board members affiliated with the government, parliament, political institutions, or the presence of major governmental and quasi-governmental shareholders in the company's ownership structure. This variable is represented by a value of one and zero. If there is political management, its value is one and otherwise it is zero [25].

5 Statistical test methods

In this research, structural equation modeling and partial least squares method have been used to test the hypotheses and model fit. It should be noted that in relation to the structural equation model, the research data and variables (except dummy variables) have been entered into the model in decimal form.

In structural equation modeling, there are two types of reflective and formative measurement models. Chin [18], and Leo [56], believe that in formative models (due to the use of real and not subjective data), the evaluation of reliability and validity with the same criteria as reflective models is not correct; So that in formative models, to evaluate the measurement model, the variance inflation factor (VIF) is used to check co-linearity, and external weights and, if necessary, factor loadings are used to check the significance and relevance of the indicators. In this research, according to the type and nature of the variables, the measurement model is formative and therefore, based on the mentioned criteria, the measurement model has been examined.

Also, for the goodness of fit of the model (structural model evaluation), coefficient of determination (R2), effect size (f^2) and predictive power of the model or redundancy sharing (Q2) have been used. The mentioned cases are rational reasons for using this method. The analyzes of this research have been done using Smart PLS software.

6 Research findings

6.1 Descriptive Statistics

1. Descriptive statistics of the factors affecting the stock price crash risk, along with the descriptive statistics of risk indicators of falling stock prices, are presented in Tables 2 to 7, respectively. Descriptive statistics of specific

company characteristics, including subcategories of growth opportunity, agency cost, size, performance, and company risk, are presented in Table 2. The results of descriptive statistics indicate that among the components of company size, the average ratio of net operating assets and ratio of fixed assets in the investigated companies were 0.65 and 0.25, respectively. Also, among the components of the company's performance, the average return on assets, return on equity, sales growth, and annual return on stock were 11%, 26%, 19%, and 1.32%, respectively. Among the company's risk components, the average standard deviation of cash flow, standard deviation of profit before tax and beta coefficient were 6%, 5% and 61%, respectively. Finally, among the agency cost components, the average financial leverage and the ratio of general and administrative costs were 59% and 8%, respectively. The results of descriptive statistics related to qualitative variables, including the loss index, show that about 15% of the surveyed companies (209 companies) were unprofitable.

Descriptive statistics of corporate governance features, including subcategories of governance quality and audit quality, are presented in Table 3. The results of descriptive statistics indicate that among the components of governance quality, the average institutional ownership and the independence of the board of directors in the investigated companies were 0.69 and 0.74, respectively. Also, among the audit quality components, the average delay in the auditor's report was 29% (about 106 days). The results of descriptive statistics related to qualitative variables, including the size and change of the auditor, show that during the research period, about 22% of the investigated companies (302 companies) were investigated by the auditing organization. Also, during the research period, about 72% of the surveyed companies (1006 companies) changed their auditors.

Descriptive statistics of the quality of accounting information are presented in Table 4. The results of descriptive statistics indicate that among the various quality criteria of accounting information, the average of discretionary accruals, profit smoothing, the possibility of fraud in reporting and profit stability in the studied companies are 0.002, 1.22, 0.28 and respectively. It was 0.28.

Descriptive statistics of the capital market situation are presented in Table 5. The results of descriptive statistics indicate that among the various measures of the capital market situation, the average stock market index and P/E ratio in the studied companies were 0.64 and 30.97, respectively.

Descriptive statistics of the economic situation are presented in Table 6. The results of descriptive statistics indicate that among the various measures of the economic situation, the average economic growth, inflation, interest rate, exchange rate and oil price during the study period were 1%, 11%, 17%, 10.63 and 24% respectively. It has been 4/

Descriptive statistics of only the measure of political relations and stock price fall risk indicators are presented in Table 7. The results of the descriptive statistics related to the qualitative variable of political relations show that during the research period, about 49% of the investigated companies (689 companies), from political management (the presence of board members affiliated with the government, parliament, political institutions or the existence Government and semi-government major shareholder in the ownership structure of the company) have enjoyed.

Also, among the stock price fall risk indicators, the second stock price fall risk index (variation of specific weekly returns) compared to the first stock price fall risk index (negative coefficient of skewness), is more than the amount of change and dispersion coefficient and as a result of stability and it has had less stability.

7 Measurement model

7.1 Collinearity

VIF index was used to check the intensity of multiple collinearity. This index shows how much a variable changes its behavior under the influence of other variables. In other words, how much of the variation in the estimated coefficients has increased due to collinearity. Values less than 5 are acceptable for the VIF index. Table 8 shows the values related to this index.

Based on the results of Table 8, it can be seen that the VIF index is less than 5 for all variables except the exchange rate and inflation. This indicates that the variables, except for inflation and exchange rate, are collinear without problems. Due to the fact that the exchange rate and inflation are highly dependent on each other, the existence of co-linearity is expected and it is ignored.

7.2 Significance and relevance of indicators

Another important criterion for evaluating the contribution of a formative index and its relevance is its external weight. Any variable (index) whose external weight is significant ($p \leq 0.05$) remains in the analysis. If the external

Table 2: Descriptive statistics of specific company characteristics affecting the stock price crash risk

Group	Variable (description)	Code	Average	Mean	standard deviation	Maximum	Minimum	Coefficient of variation
The size of the company	size of the company	SIZE	14.38	14.28	1.48	20.30	10.23	0.10
The size of the company	Net operating assets	OPASSET	0.65	0.68	0.21	0.97	0.07	0.32
The size of the company	Fixed asset ratio	FPE	0.25	0.20	0.19	0.87	0.01	0.76
The size of the company	Number of Employees	EMPLOYEE	6.10	6.01	1.22	11.55	0.69	0.20
Company's performance	Return on equity	ROE	0.26	0.26	0.29	0.89	-0.67	1.12
Company's performance	Return on assets	ROA	0.11	0.09	0.15	0.65	-0.63	1.33
Company's performance	Sales growth	SGROWTH	0.19	0.15	0.44	1.46	-0.54	2.33
Company's performance	Annual return	HET	1.32	0.34	2.34	10.61	-0.59	1.77
Company growth opportunity	Market value to book value	MB	5.30	3.23	5.73	25.44	0.25	1.08
Company growth opportunity	Life cycle (accumulation of cash flow)	RETAIN	0.14	0.14	0.21	0.78	-0.045	1.45
Company risk	standard deviation of cash flow	CFO	0.06	0.05	0.05	0.36	0.01	0.77
Company risk	Standard deviation of profit before tax	STD	0.05	0.04	0.05	0.50	0.001	0.94
Company risk	The possibility of bankruptcy	BANKR	4.70	3.18	4.62	19.17	-0.26	0.98
Company risk	Loss index	LOSS	0.15	0	0.36	1	0	2.38
Company risk	Life of the company	AGE	3.65	3.78	0.39	4.52	2.30	0.11
Company risk	Beta coefficient	BETA	0.61	0.47	0.94	9.19	-1.20	1.56
Agency fee	Free cash flow	FCF	0.04	0.02	0.16	0.56	-0.34	3.23
Agency fee	Financial Leverage	LEV	0.59	0.60	0.22	0.93	0.03	0.37
Agency fee	General and administrative expenses	ADM	0.08	0.06	0.09	0.76	0.01	1.04

Table 3: Descriptive statistics of corporate governance affecting the stock price crash risk

Corporate governance						Statics
Governance quality		audit quality				
Institutional ownership	Independence of the board of directors	Delay in the auditor's report	Auditor tenure	The size of the auditor	Change of auditor	
INS	OUT	LAG	TENURE	ASIZE	CHANGE	
0.69	0.74	0.29	96.3	0.22	0.72	Average
0.73	0.80	0.30	3	0	1	Middle
0.20	0.18	0.08	3.05	0.41	0.45	standard deviation
0.92	1	0.68	14	1	1	Maximum
0.07	0	0.11	1	0	0	Minimum
0.29	0.24	0.29	0.77	1.90	62.0	Coefficient of variation

Table 4: Descriptive statistics of the quality of accounting information affecting the stock price crash risk

Quality of accounting information				Statics
Optional accrual items	Profit smoothing	The possibility of fraud in reporting	Sustainability of profits	
ACCRU	SMOOTH	bless	PRECISION	
0.002	22/1	0.28	0.28	Average
0/0001	0.82	0	01/0-	Middle
0.01	1/15	0.45	1/01	standard deviation
0.69	85/3	1	61/2	Maximum
-0.47	0.03	0	-0.76	Minimum
36/5	0.94	61/1	60/3	Coefficient of variation

Table 5: Descriptive statistics of the state of the capital market affecting the stock price crash risk

Capital market situation		Statics
Stock index	P to A ratio	
INDEX	PE	
0.64	97/30	Average
0.47	86/34	Middle
0.63	07/13	standard deviation
87/1	09/48	Maximum
0.21-	37/1	Minimum
0.98	0.42	Coefficient of variation

weight of a variable is not significant ($p \geq 0.05$), the corresponding factor load is checked. If its factor loading is equal to or greater than 0.5 (even if it is not significant), it remains in the analysis. If the factor loading of a variable is less than 0.5 and it is not significant, it is removed, and if it is less than 0.5 and it is significant, theoretically, it should be checked whether that variable (index) remains in the analysis or is removed [32]. Table 9 shows the external weights and significance of the variables (indices).

As can be seen in Table 9, the external weight of indicators of probability of bankruptcy (BANKRU), standard deviation of cash flow (CFOSTD), standard deviation of profit before tax (INSTD), stability of profit (PRESIS), smoothing of profit (SMOOTH), probability of fraud In reporting (BENISH), lag in auditor report (LAG), institutional ownership (INS), annual return (RET), return on assets (ROA), return on equity (ROE) and sales growth (SGROWTH) are not significant. Therefore, in order to decide to keep or remove these indicators, their factor loads are checked. The external weight of other indicators is significant, so they are maintained. Table 10 shows the factor loadings of

Table 6: Descriptive statistics of the economic situation affecting the stock price crash risk

Economic condition					Statics
Economic Growth	swelling	Interest rate	exchange rate	exchange rate	
ECOGRO	INF	INTER	CURREN	CURREN	
0.01	0.11	0.17	63/10	63/10	Average
0.03	0.10	0.18	45/10	45/10	Middle
0.06	0.01	0.03	0.89	0.89	standard deviation
0.13	0.12	0.22	34/12	34/12	Maximum
08/0-	0.09	0.13	27/9	27/9	Minimum
22/4	0.08	0.15	0.08	0.08	Coefficient of variation

Table 7: Descriptive statistics of political relations affecting the stock price crash risk and fall risk indicators

Political Relations	Stock price crash risk indicators		Statics
Political communication	The first indicator of the stock price crash risk - the negative coefficient of skewness	The second indicator of the stock price crash risk - the fluctuation of specific weekly returns	
Gov	NCSKEW	DUVOL	
0.49	0/20	0.26-	Average
0	-0.25	-0.32	Middle
0.50	0.37	0.54	standard deviation
1	0.93	0.79	Maximum
0	-0.70	-0.95	Minimum
1/01	1/88	2/06-	Coefficient of variation

indicators whose external weights were not significant. If its factor loading index is 0.5 or more, it will be maintained; But if its factor load is less than 0.5, it will be removed.

Based on the results of Table 10, it can be seen that the factor load of the indicators of probability of bankruptcy (BANKRU) and annual return (RET) is more than 0.5 and they remain in the analysis, but other indicators are removed.

7.3 Testing research hypotheses (structural model)

Investigating the relationship of variables in PLS is done through path coefficients (β) and the t statistic is used to check the significance of the coefficients. If t is outside the range of ± 1.96, the path coefficient is significant at the level of 0.05, and if t is outside the range of ± 2.58, the coefficient is significant at the level of 0.01. Path coefficients and t value for hypothesis testing are shown in Table 11.

The results indicate the negative (inverse) effect of company size, company performance, company growth opportunity, audit quality, capital market situation and economic situation, and the positive (direct) effect of the company's agency fee level on various indicators of stock price fall risk. This is despite the fact that different indicators of the stock price crash risk have been independent of the company's risk, governance quality, and accounting information quality. In relation to political relations, conflicting results were obtained; So that the first indicator of the risk of falling price (negative coefficient of skewness) was independent of political relations. Meanwhile, the influence of political relations on the second indicator of the stock price crash risk (variation of specific weekly returns) has been negative (inverse). Among the important results of this study, it indicates that the quality of governance in listed companies did not have the necessary quality and ability to prevent the stock price crash risk. Meanwhile, the improvement of the capital market situation and economic situation have led to a significant reduction in the stock price crash risk of listed companies.

Table 8: Index (Variance Inflation Factor) VIF

Variables	VIF	Variables	VIF
Age of the company (AGE)	142/3	loss index (LOSS)	045/1
Optional accruals (ACCRU)	02/1	Market value to book value (MB)	041/1
General and Administrative Expenses (ADM)	046/1	The first risk index of stock price fall (NCSKEW)	1
auditor size (ASIZE)	1/17	The second risk index of stock price fall (DUVOL)	1
Probability of bankruptcy (BANKRU)	207/3	oil price	096/3
beta coefficient (BETA)	931/3	net operating assets (OPASSET)	18/2
Cash Flow Standard Deviation (CFOSTD)	681/1	Independence of the Board of Directors (OUT)	1
change auditor (CHANGE)	556/1	PE ratio	044/1
Exchange rate (CURREN)	548/18	Fixed asset ratio (PPE)	18/2
economic growth (ECOGRO)	569/1	Profit Stability (PRESIS)	1/003
number of employees (EMPLOY)	627/1	annual return (RET)	134/1
Free Cash Flow (FCF)	752/1	Life cycle (retained earnings to book value) (RETAIN)	041/1
political communication (GOV)	1	return on assets (ROA)	732/2
Stock market index (INDEX)	044/1	return on equity (ROE)	65/2
Inflation (INF)	711/20	Company size (SIZE)	759/1
Institutional Ownership (INS)	1	Profit smoothing (SMOOTH)	859/1
Earnings before tax standard deviation (INSTD)	132/3	Sales growth (SGROWTH)	034/1
interest rate (INTER)	132/2	Tenure of the auditor	688/1
Delay in Auditor's Report (LAG)	022/1	The possibility of fraud in reporting (BENISH)	845/1
financial leverage (LEV)	705/1		

7.4 Structural model evaluation

As mentioned, coefficient of determination (R^2), effect size (f^2) and predictive power of the model or redundancy sharing (Q^2) were used to evaluate the structural model. The coefficient of determination (R^2) shows how many percent of the variance of the dependent variable is explained and covered by the independent variable. The coefficient of determination considers the number of independent variables and the sample size less, therefore, some researchers prefer to use another index called the adjusted coefficient of determination. The corresponding R2 values are reported in Table 12.

The values of the coefficient of determination (R2) show that 81% of the changes in the first index of stock price fall risk and 84% of the changes in the second index of stock price fall risk are explained by research models.

The effect size (f^2) determines the effect of exogenous variables on the amount of variance of endogenous variables. In other words, if a specific exogenous variable is removed from the model, what effect does it have on the variance of the endogenous variables? The effect size values are given in Table 13. In general, values higher than 0.02 are effective and values of 0.02, 0.15 and 0.35 have been evaluated as weak, medium and strong values, respectively.

The results of the effect size analysis show that political relations, company risk, quality of accounting information and quality of governance on the variance of the first and second indicators of the stock price crash risk; The performance of the company does not affect the variance of the second indicator of the stock price crash risk. The effect sizes of other variables are higher than 0.02.

The predictive power of the model or redundancy sharing (Q2) shows the ability of the structural model to predict the relationship of the variables. The value of Q2 is reported in Table 14.

The Q2 statistic is 0.809 for the first index of stock price fall risk and 0.838 for the second index of stock price fall risk, because the values of Q^2 are greater than zero, it shows the ability of the whole model to predict the relationship of variables. In general, according to the presented indicators, the research models have a good fit.

Table 9: External weights of indicators

Variables	Indicators	External weight	The value of t	P value
Company risk	Age of the company (AGE)	0.47	75/2	0.006
	Probability of bankruptcy (BANKRU)	0.06	0.337	0.736
	beta coefficient (BETA)	0.54	926/2	0.003
	Cash Flow Standard Deviation (CFOSTD)	-0.003	0.025	0.98
	Earnings before tax standard deviation (INSTD)	-0.074	0.424	0.671
	loss index (LOSS)	-0.653	371/8	0.000
Quality of accounting information	Optional accruals (ACCRU)	0.897	531/4	0.000
	Profit Stability (PRESIS)	-0.344	671/1	0.095
	Profit smoothing (SMOOTH)	-0.173	0.646	0.518
	The possibility of fraud in reporting (BENISH)	0.313	207/1	0.227
The level of company agency fees	General and Administrative Expenses (ADM)	0.253	4/009	0.000
	Free Cash Flow (FCF)	0.825	11/99	0.000
	financial leverage (LEV)	296/1	887/49	0.000
audit quality	auditor size (ASIZE)	-0.322	776/2	0.006
	change auditor (CHANGE)	-0.425	416/3	0.001
	Delay in Auditor's Report (LAG)	0.092	0.825	0.41
	Tenure of the auditor	241/1	145/25	0.000
The economic situation	economic growth (ECOGRO)	0.164	3/6	0.000
	Inflation (INF)	-344/2	86/23	0.000
	interest rate (INTER)	-0.275	288/9	0.000
	Exchange rate (CURREN)	-266/3	122/40	0.000
	oil price	-0.114	3	0.003
Capital market situation	Stock market index (INDEX)	0.258	766/13	0.000
	PE ratio	0.915	288/86	0.000
Governance quality	Institutional Ownership (INS)	0.03	0.216	0.829
	Independence of the Board of Directors (OUT)	0.999	247/60	0.000
The size of the company	number of employees (EMPLOY)	-0.398	755/3	0.000
	Fixed asset ratio (PPE)	0.707	837/5	0.000
	net operating assets (OPASSET)	0.86	634/7	0.000
	Company size (SIZE)	191/1	539/21	0.000
Company growth opportunity	Market value to book value (MB)	0.874	49/37	0.000
	life cycle (RETAIN)	-0.69	193/22	0.000
company's performance	annual return (RET)	-0.93	035/1	0.301
	return on assets (ROA)	0.873	041/1	0.298
	return on equity (ROE)	-0.121	0.834	0.404
	Sales growth (SGROWTH)	-0.033	0.561	0.575
Political Relations	-	1	-	-
The first indicator of the stock price crash risk	-	1	-	-
The second indicator of the stock price crash risk	-	1	-	-

8 Discussion and Conclusion

It is very vital and necessary to identify the factors affecting the stock price crash risk in Tehran Stock Exchange, which is a nascent, inefficient and developing market. In this regard, Yang et al. [79], believe that this risk is an inhibiting factor in attracting financial resources in the capital market, especially in inefficient and developing markets. Therefore, in the current research, the impact of micro and macro factors on the stock price crash risk was investigated.

The interpretation of the results of the hypotheses and its comparison with the results of previous researches have been as follows:

The negative and significant effect of the characteristics of size, performance and growth opportunity on various indicators of the company's stock price fall risk indicates that large, profitable companies with high growth opportunities have had less risk of stock price fall. In other words, the size, profitability and growth opportunities of companies have been effective in preventing the fall of their stock prices. The result is somewhat in line with the results of

Table 10: Factor load of indicators

Variables	Indicators	factor load	The value of t	P value
Company risk	Probability of bankruptcy (BANKRU)	0.558	477/6	0.000
	Cash Flow Standard Deviation (CFOSTD)	0.312	110/3	0.002
	Earnings before tax standard deviation (INSTD)	0.386	081/4	0.000
Quality of accounting information	Profit Stability (PRESIS)	0.343	680/1	0.093
	Profit smoothing (SMOOTH)	0.180	0.961	0.336
	The possibility of fraud in reporting (BENISH)	0.311	710/1	0.087
audit quality	Delay in Auditor's Report (LAG)	0.178	578/1	0.115
Governance quality	Institutional Ownership (INS)	0.048	0.339	0.734
company's performance	annual return (RET)	0.678	030/1	0.303
	return on assets (ROA)	0.462	062/1	0.288
	return on equity (ROE)	0.288	070/1	0.284
	Sales growth (SGROWTH)	0.019	0.353	0.724

previous studies such as An et al. [7], Ahmadpour et al. [4], and Fakhari and Nasiry [28].

The positive and significant effect of the level of agency fees on various indicators of the company's stock price fall risk shows that the high level of agency fees of companies has been an effective factor in increasing the risk of their stock prices falling. The result is somewhat in line with the results of previous researches such as An et al. [7], and Pourheidari et al. [65].

The lack of influence of the company's risk on various indicators of the company's stock price fall risk indicates that, in general, the company's stock price fall risk is independent of other risks faced by the company, including the risk related to the amount of operating cash flows, the company's profitability risk, the risk of bankruptcy, loss The existence of the company has been systematic risk (beta coefficient) and risk related to the life of the company. The result was somewhat contrary to the results of previous studies such as Hamers et al. [34], and somewhat agreed with the results of previous studies such as Ahmadpour et al. [4].

The lack of effect of corporate governance components on the stock price crash risk indicates that the components of corporate governance such as the high percentage of ownership by institutional shareholders along with the high percentage of non-executive members of the board of directors have not been effective in preventing the fall in the stock price of companies. In other words, the corporate governance in the investigated companies did not have high quality, usefulness and efficiency in order to prevent the stock price from falling. This shows that corporate governance has not been effective in preventing managerial incentives to hide bad news. The resulting result (in relation to the role of institutional owners in preventing the fall of stock prices) is somewhat contrary to the perspective and hypothesis of effective (active) monitoring by institutional shareholders. Based on this hypothesis, due to having large ownership interests in companies, institutional shareholders have sufficient motivation to continuously control and monitor the activities of managers and other members of the board of directors. Based on this, institutional shareholders are expected to pass on the confidential information they receive from company managers to other shareholders. Also, in relation to the role of non-executive members of the board of directors in preventing the fall of stock prices, one of the reasons for this is that in most of the sampled companies, the ratio of non-executive members of the board of directors has been relatively stable during the research period. . The results regarding the lack of influence of corporate governance components on the stock price crash risk are in agreement with the research results of Ying and Lento [82], and contrary to the results of previous research such as Hu and Moskowitz [38], Cullen and Fang [21], Ahmadi and Dorseh [3], and Sadeghi et al. [71].

The negative and significant effect of the audit quality component on various indicators of stock price fall risk indicates that the audit quality has been effective and efficient in preventing the stock price crash risk. The results

Table 11: Test of the factors affecting the stock price fall risk indicators

Variables	path coefficient (β)	value t	Value P	Result
The size of the company	-0.105	-0.105	298/7	0.000	confirmation
	0/087	0/087	522/6	0.000	confirmation
company's performance	0.073-	0.073-	6/089	0.000	confirmation
	0.031-	0.031-	832/2	0.005	confirmation
Company growth opportunity	0.14-	0.14-	383/8	0.000	confirmation
	0.141	0.141	197/9	0.000	confirmation
Company risk	0.01	0.01	0.727	0.467	rejection
	0.006-	0.006-	0.402	0.687	rejection
The level of company agency fees	0.116	0.116	744/8	0.000	confirmation
	0.113	0.113	683/8	0.000	confirmation
Governance quality	0.008	0.008	0.602	0.547	rejection
	0.008	0.008	0.656	0.512	rejection
audit quality	0.142	0.142	602/8	0.000	confirmation
	0.137	0.137	236/8	0.000	confirmation
Quality of accounting information	02/0-	02/0-	638/1	0.101	rejection
	0.002-	0.002-	0.199	0.842	rejection
Capital market situation	-0.582	-0.582	4/27	0.000	confirmation
	0.591-	0.591-	6/29	0.000	confirmation
The economic situation	0.139	0.139	561/6	0.000	confirmation
	0.174	0.174	825/8	0.000	confirmation
Political Relations	0.005-	0.005-	0.428	0.669	rejection
	0/024-	0/024-	2/018	0.044	confirmation

Table 12: R^2 values

Statics Variables	The coefficient of determination	Adjusted coefficient of determination
The first indicator of the stock price crash risk	0.818	0.817
The second indicator of the stock price crash risk	0.846	0.845

regarding the inverse effect of audit quality components on the stock price crash risk, agree with the results of previous researches such as Ying and Lento [82], Khajavi [46], Talebnia and Rajabdorri [75], Mahmoudi Minaei and Seyedi [60]. and Sadeghi et al. [71], and it is contrary to the results of previous research such as Carey and Simentt [15].

The lack of impact of the quality of accounting information on various indicators of the stock price crash risk indicates that the shareholders in the capital market did not understand the quality of accounting information correctly from various aspects and it was not effective in their behavior and reaction to the purchase and sale of company shares. Based on this, the fall of stock prices based on various indicators has been independent of the quality of accounting information. This shows that shareholders in the Iranian capital market do not base their investment on fundamental analysis. The results related to the lack of impact of the quality of accounting information on the stock price crash risk, contrary to the results of previous research such as Hutton et al. [61], Kim et al. [49], Hajiha and Shaker [33], Chen et al. [16], Moradi et al. [62], Kurdestani and Khatami [51], Sadr al-Sadat et al. [6], Chogan and Imamqolipour [19], Azadi et al. [44].

Table 13: Effect size values (f²)

Variables	The first indicator of the stock price crash risk	The second indicator of the stock price crash risk
The size of the company	0.05	0.041
The economic situation	0.032	0.059
Capital market situation	0.548	0.655
Political Relations	0	0.003
Company risk	0.001	0
The level of company agency fees	0.058	0.064
company's performance	0.028	0.006
Company growth opportunity	0.058	0.07
Quality of accounting information	0.002	0
Governance quality	0	0
audit quality	0.101	0.112

Table 14: Q^2 values

statistics Variables	Q^2
The first indicator of the stock price crash risk	**0.809**
The second indicator of the stock price crash risk	**0.838**

The negative and significant effect of the capital market situation on various stock price fall risk indicators indicates that the improvement of the capital market situation in terms of transparency and efficiency will lead to a decrease in the stock price fall. The result is somewhat in line with the results of previous researches such as Foroughi et al. [29], Hutton et al. [61], and Chang et al. [17].

The negative and significant effect of the economic situation on various indicators of the stock price crash risk also indicates that the increase in economic recovery and prosperity will also lead to a decrease in stock price fall. The result is somewhat in line with the results of previous researches such as Khani and Mohammadipour [47], Amin Eshairi [27], and Rahmati and Ahadi Sarkani [69].

Considering the contradictory results regarding the influence of political relations on various indicators of the stock price crash risk, in this context, it is not possible to interpret and compare the results of the present study with the results of previous studies. Anyway, in relation to the negative and significant effect of political relations on the second index of the stock price crash risk, the result is somewhat in line with the results of previous researches such as Luo et al. [58], and somewhat contrary to the results of previous researches such as Boubaker et al. [13], Shen and Lin [73], Wang [77], Mahmoudzadeh Tilmi and Nesl Mousavi [76], and Khalifa Soltani et al. [74].

9 Practical suggestions

1. Considering the negative and significant effect of the characteristics of size, performance and growth opportunity on various indicators of the company's stock price fall risk, it seems that large, profitable companies with high growth opportunities have had a lower share price fall risk. Therefore, potential shareholders of listed companies are suggested to consider the size, profitability and growth opportunity of the company as positive and desirable factors in their decisions to buy, sell and hold shares in order to achieve appropriate returns and with the lowest risk of falling stock prices (factors that reduce the stock price crash risk) should be taken into consideration.

2. Also, according to the positive and significant effect of the level of agency fees on various indicators of the company's stock price fall risk, it seems that companies with high agency fees have a higher share price fall risk. Therefore, potential shareholders of listed companies are advised to refrain from investing in companies with high agency costs in order to manage their financial resources. It is suggested to the actual and institutional owners and shareholders of the mentioned companies, in order to reduce the stock price crash risk, to provide the necessary platform to reduce the high level of agency costs and to take appropriate practical measures in this direction.

3. Finally, due to the negative and significant effect of the characteristics of size, performance and growth opportunity, and the positive and significant effect of the level of agency fees on various risk indicators of the company's stock price, it is suggested to professional workers in the capital market, including financial analysts, in the analyzes themselves, pay special attention to the role of size characteristics, performance and growth opportunity as well as agency cost level in the risk of falling stock price of companies.

4. Due to the lack of influence of the governance quality component on various stock price fall risk indicators, it seems that the governance quality in listed companies has not been effective in preventing the fall of the stock prices of the companies. Therefore, it is suggested to the managers of listed companies as well as to the trustees of the stock exchange, in order to improve the mechanisms of corporate governance, to provide the necessary platform and take appropriate practical measures in this field.

5. Considering the negative and significant impact of the audit quality component on various stock price fall risk indicators, it seems that stock exchange companies audited by audit quality institutions have had a low stock price fall risk. Therefore, it is suggested to the potential shareholders of listed companies to consider the company's audit quality as a positive and favorable factor (risk-reducing factor) in their decisions to buy, sell and hold shares and in order to achieve appropriate returns and with the lowest risk of falling stock prices. fall in stock prices) should be taken into consideration. The actual and institutional owners and shareholders of the mentioned companies are also suggested to provide the necessary platform for employing quality auditors. Also, financial analysts are also suggested to pay special attention to the role of audit quality in reducing the stock price crash risk in their analyses.

6. Due to the lack of impact of the quality of accounting information on various indicators of the stock price crash risk, it seems that the quality of accounting information in listed companies has not been effective in preventing the fall in the stock price of companies. Therefore, it is suggested to the managers of listed companies to provide the necessary platform and take appropriate practical measures in this field in order to improve the quality of accounting information.

7. Considering the negative and significant impact of the capital market situation on various stock price fall risk indicators, it seems that the risk of the stock price fall has been significantly low during periods of improvement in the capital market situation. Hence, financial analysts are suggested to pay special attention to the role of capital market improvement periods in reducing the stock price crash risk in their analyses.

8. Considering the negative and significant effect of the economic situation on various indicators of the stock price crash risk, it seems that the stock price crash risk was significantly low even during periods of improvement in the economic situation. Therefore, financial analysts are suggested to pay special attention to the role of periods of improvement in the economic situation in reducing the stock price crash risk of companies.

9. In relation to the effect of political relations on various indicators of the stock price crash risk, only the effect of political relations on the second index of risk of falling stock prices was negative and significant. This is despite the fact that the first index of the stock price crash risk has been independent of political relations. In other words, regarding the effect of political relations on various indicators of the stock price crash risk, it is not possible to make a definite statement and offer a suggestion.

10 Suggestionsfor future research

1. Using other criteria for measuring the stock price crash risk and comparing its results with the results of the present study.
2. Using the meta-analysis method in examining the factors affecting the stock price crash risk in order to summarize the final factors affecting the stock price crash risk of companies in previous researches.
3. Determining the modulating criteria of the final factors affecting the stock price crash risk of companies in previous researches, including the type of study (domestic and foreign), the type of model for measuring the stock price crash risk, the type of definition of effective factors, etc., using the meta-analysis approach.
4. Examining the factors affecting the stock price crash risk of companies by different stock exchange industries.

11 Research Limitations

Some of the limitations of the present research are as follows:

1. This research is limited to listed companies in a period of time, and caution should be observed in generalizing its results to other companies, including non-listed companies.

2. As stated, the external weight of indicators of standard deviation of cash flow and standard deviation of pre-tax profit from the company's risk component, indicators of profit stability, profit smoothing and the possibility of fraud in reporting related to the quality factor of accounting information, the indicator of delay in the auditor's report from the quality component Audit, institutional ownership index from the governance quality component, asset return indices, equity return and sales growth from the company's performance component are not statistically significant. Also, the factor load of the mentioned indicators is less than 0.5. Therefore, the mentioned indicators have been removed from the analysis. This may have affected the research results.

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