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# The Effect of Chief Executive Officer Gender on Stock Price Crash Risk: Evidence from Listed Firms on the Tehran Stock Exchange

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## Abstract

This study investigates the effect of Chief Executive Officer (CEO) gender on stock price crash risk in firms listed on the Tehran Stock Exchange. Using data from 82 companies over the 2012–2024 period and a panel-data regression methodology, we measure crash risk using three established proxies: negative skewness of returns, Down-to-Up Volatility (DUVOL) (also known as asymmetric volatility), and asymmetric variance. The results reveal that CEO gender does not have a significant effect on the first two measures; however, it significantly influences asymmetric volatility. It suggests that while the presence of female CEOs does not necessarily prevent a sudden stock price crash, it can help moderate return volatility and enhance corporate governance through greater transparency and conservative reporting practices. These findings underscore the importance of promoting gender diversity in top management to improve investor confidence and promote stability in the capital market.

**Keywords:** Ownership structure, Chief executive officer gender, Stock price crash risk.

## 1 | Introduction

The relationship between the gender of top executives and stock price crash risk has garnered increasing attention in financial research. Female executives are associated with higher ethical standards, greater transparency, and more conservative financial reporting, all of which help reduce the risk of sudden stock price declines [1], [2]. Mechanisms such as improved financial reporting, the adoption of conservative financial practices, and reduced earnings management are among the factors that highlight the role of female executives

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in mitigating the risk of stock price crashes [1]. However, the positive impact of female executives may be diminished in environments with significant gender inequality or weak governance structures, underscoring the importance of organizational and cultural contexts in this relationship [3].

From the perspective of agency theory, gender-diverse boards are increasingly recognized as more effective monitors of management, as they are better able to challenge prevailing assumptions, enhance oversight, and align managerial actions with shareholder interests [4], [5]. Studies indicate that the presence of women on corporate boards, particularly three or more, reduces information asymmetry and strengthens the board's monitoring capabilities [5]. Furthermore, female directors contribute to higher levels of corporate social responsibility and increased analyst coverage, which enhances stakeholder trust [4]. Additionally, diverse boards are associated with improved decision-making processes and superior financial performance, owing to the incorporation of a broader range of perspectives [6]. On the other hand, some argue that the effectiveness of gender-diverse boards may depend on the broader corporate governance context and specific organizational dynamics, suggesting that diversity alone does not guarantee improved outcomes without supportive structures [7]. Accordingly, gender diversity on boards tends to align the economic incentives of managers and shareholders more closely, particularly through its influence on dividend policy.

Numerous studies indicate that gender diversity in corporate boards can enhance oversight, reduce agency conflicts, and strengthen shareholder rights [8], [9]. Specifically, the presence of women on boards is associated with more rigorous evaluation of managerial decisions and increased dividend distributions, reflecting their effective role in pressuring management to disburse higher profits [10].

This study contributes to the existing literature on gender diversity in corporate governance in several ways by examining the effect of CEO gender on stock price crash risk in companies listed on the Tehran Stock Exchange. First, by focusing on an emerging market, it addresses a research gap in the literature regarding the role of gender in risk management and corporate governance in such contexts. Second, by providing new empirical evidence, it enhances the understanding of mechanisms, such as improved financial reporting, reduced earnings management, and increased transparency, through which female executives may mitigate stock price crash risk. Third, the findings can inform policymakers and regulatory bodies in promoting gender diversity and improving corporate governance practices. Overall, this study significantly expands the literature on the role of gender in risk management and corporate financial performance in emerging markets. Accordingly, the present study seeks to answer the following question:

Does the gender of Chief Executive Officers (CEO) affect stock price crash risk in companies listed on the Tehran Stock Exchange?

The global economy has witnessed the financial collapse of several prominent and leading corporations in recent years. Consequently, the phenomenon of sudden stock price volatility, particularly price crashes, has emerged as a major research focus following the 2008 financial crisis. When stock prices decline sharply, the event is referred to as a stock price crash [11]. Research indicates that higher financial leverage ratios are associated with increased stock price crash risk, as excessively indebted companies face greater challenges during economic downturns [12]. Additionally, economic policy uncertainty exhibits a complex relationship with crash risk; in some high-return, high-liquidity markets, greater uncertainty may even reduce crash risk.

Indeed, a stock price crash signifies a sharp decline in prices without major economic triggers and often affects the entire market. This phenomenon is contagious, as its impact can spread across related firms and sectors [13]. Additionally, increased stock liquidity paradoxically elevates crash risk, as short-term pressures may incentivize management to withhold bad news, thereby increasing the likelihood of a sudden price collapse [14]. These factors contribute to a better understanding of the mechanisms underlying stock price crashes and their contagious effects. The phenomenon of stock price crashes is of such critical importance that, even years after a market collapse, conferences and seminars are convened to examine both common and unique causative factors, the timing of these crashes, market participant behavior, and the impact of decisions made by regulators, government officials, and international organizations.

Indeed, markets often exhibit divergent trends. At times, we witness the prices of certain companies' shares abruptly falling below their intrinsic value, triggering panic selling among shareholders who lack an adequate understanding of the stocks. In recent years, numerous challenges, including financial misconduct and weaknesses in the structure of management teams, particularly at the board level, have heightened the need for more meticulous examination of the factors influencing the effectiveness of these key decision-making bodies.

This issue has gained particular significance in Iran's business environment, which faces its own unique complexities. Simultaneously, we have observed positive developments in this area, most notably a significant increase in women's participation in key managerial positions, particularly on boards and audit committees. This trend reflects structural shifts in the corporate governance landscape, which can substantially influence organizational performance.

These developments have further underscored the need to thoroughly investigate the role of board composition and its impact on corporate governance quality. The trend suggests that the increasing presence of women on corporate boards has created value for companies. Accordingly, gender diversity leads to enhanced communication, the incorporation of diverse perspectives, and greater effectiveness within the board and its audit committee.

# 2 | Research Background

Liu et al. [15] investigated the nonlinear relationship between CEO tenure and stock price crash risk. Using data from U.S. listed companies from 2000 to 2022, they identified a U-shaped relationship between CEO tenure and stock price crash risk. Their findings revealed that CEOs in the early stages of their tenure tend to accumulate negative news until they reach a specific threshold. After surpassing this threshold, they reduce such hoarding of bad news. The CEO tenure threshold is moderated by board member stock ownership and lower litigation risk. The results emphasize the need for enhanced monitoring of CEOs during their initial tenure, given the nonlinear nature of this relationship.

Le et al. [16] examined the impact of insider trading and managerial characteristics on future stock price crash risk. Their empirical findings revealed a positive relationship between insider purchases and stock price crash risk. This result indicates that, beyond financial incentives and career concerns, insiders conceal bad news to secure trading benefits. Additionally, the positive coefficients associated with insider sales suggest that informed sellers can quickly assess private information and anticipate impending price crashes. Furthermore, they demonstrated that the presence of women on the board can reduce the risk of stock price crashes. However, firms with more powerful or younger CEOs are more susceptible to such crashes. Overall, this study underscores the importance of corporate governance characteristics in mitigating challenges arising from information asymmetry.

Abadi et al. [17] examined the causes of stock price crashes in companies listed on the Tehran Stock Exchange using a meta-analytic approach, drawing on evidence from domestic studies. Their findings revealed that the variables of conservatism, social trust, debt maturity, dividend payout, ownership concentration, industry auditor specialization, and internal control effectiveness had a significant negative effect on stock price crash risk, as measured by negative return skewness. In contrast, business strategy variables were the only negative factors influencing stock price crash risk, as measured by Down-to-Up Volatility (DUVOL).

Additionally, the market-to-book ratio and firm size had a significant negative effect on stock price crash risk, as measured by maximum return sigma. On the other hand, information asymmetry, monthly return standard deviation, investor heterogeneity, stock overvaluation, and free cash flows were identified as exacerbating factors for stock price crashes based on negative return skewness. Meanwhile, growth opportunities and accruals were found to amplify price declines when measured by maximum return sigma.

Kazemi et al. [18] examined the impact of the gender of the audit firm partner on future stock price crash risk. Their findings indicate that the gender of the audit firm partner negatively affects the company's future

stock price crash risk. Based on the results, shareholders and other stakeholders are advised to select audit firms with female partners during companies' annual general meetings to mitigate future stock price crash risk. In addition to expanding the limited theoretical foundations regarding the role of audit partner gender in monitoring and risk reduction, this research contributes to fostering sustainable firm growth.

# 3 | Research Method

The present study is an applied research study in its purpose and adopts a descriptive-correlational design. The data used in this study are based on a retrospective approach (utilizing historical information). The statistical population consists of companies that were actively operating on the Tehran Stock Exchange during the specified period. The sampling method employed in this research is systematic elimination, in which, at each stage, companies that do not meet the following criteria are excluded, and the remaining companies are ultimately selected for testing.

## 3.1 | Research Population and Sample

The statistical population of this study consists of 82 companies listed on the Tehran Stock Exchange from March 2012 to March 2024. The sample size was selected based on the following criteria:

I. All companies listed on the exchange after March 2012.

II. Companies delisted from the exchange and transferred to the Over-The-Counter (OTC) market between March 2012 and March 2024.

III. Companies whose financial data were not available during the research period.

IV. Companies operating as investment or financial intermediaries (e.g., holdings, leasing firms, and banks).

V. Companies that changed their fiscal year-end during the research period and whose fiscal year does not end on March 20.

## 3.2 | Data Collection Tools and Analysis Methods

This study employed both library research and field methods for data collection. The first component involved a review of the theoretical literature to define and identify the independent and dependent variables, and to examine the theoretical relationships between them based on established financial theories. Given that the data used in this study are historical, the data collection approach is retrospective. The second component used field methods, gathering required information from the Tehran Stock Exchange database, specialized books, and academic journals.

# 4 | Research Models

The models used to test the hypotheses are as follows:

*Model (1):*

$$\text{Crash risk}_{i,t} = \beta_0 + \beta_1 1\text{Executive gender}_{i,t} + \beta_2\text{Size}_{i,t} + \beta_3\text{Mtb}_{i,t} + \beta_4\text{Roa}_{i,t} + \beta_5\text{BIG}_{i,t} + \beta_6\text{OCF}_{i,t} + \beta_7\text{LEV}_{i,t} + \beta_8\text{Competition}_{i,t} + \beta_9\text{loss}_{i,t} + \varepsilon_{i,t}. \quad (1)$$

In this model:

Crash risk: the dependent variable representing the company's stock price crash risk in time period t. It is typically measured using metrics such as negative return volatility or the probability of a severe price decline.

In this study, crash risk is measured using three common proxies: Negative Conditional Skewness (NCSKEW), DUVOL, and the Crash Dummy (CRASH) indicator, which are described below.

Executive gender: a key independent dummy variable indicating whether the CEO of company i at time t is female (value 1) or male (value 0). The primary objective of the model is to examine the effect of the CEO's gender on stock price crash risk.

I. $\beta_0$: intercept, representing the baseline level of stock price crash risk when all variables are zero.

II. $\beta_1$ to $\beta_9$: regression coefficients, indicating the impact of each variable on stock price crash risk.

III. $\varepsilon_{i,t}$: error term, capturing other influencing factors not included in the model

In this study, the weekly stock price crash risk index is calculated based on the following specification:

The firm's monthly return is calculated according to *Eq. (1):*

*Eq. (1):*

$$W_{i,t} = \ln(1 + \varepsilon_{i,t}), \quad (1)$$

where Wi,t is the firm-specific weekly return for firm i in week t, and εi,t is the residual from the following regression model:

*Eq. (2):*

$$R_{i,t} = \alpha_0 + \alpha_1 R_{m,t-2} + \alpha_2 R_{m,t-1} + \alpha_3 R_{m,t} + \alpha_4 R_{m,t+1} + \alpha_5 R_{m,t+2} + \varepsilon, \quad (2)$$

where ri,t is the firm-specific monthly return of firm i in month t, and rm,t is the total market return in month t.

Where εi,t is the residual from the regression model for each firm. We measure monthly periods of price decline. If, within a given year, one or more of the obtained W values fall below 2.3 standard deviations of their mean for that same year, it indicates a stock price crash has occurred in that year, and a value of 1 is assigned; otherwise, a value of 0 is assigned. The negative skewness of the firm's weekly returns is calculated based on the following specification:

*Eq. (3):*

$$NCSKEW_{it} = -\left(\frac{n(n-1)^{\frac{3}{2}} \sum W_{j,i}^3}{(n-1)(n-2)(\sum W_{j,i}^2)^{\frac{3}{2}}}\right), \quad (3)$$

where:

$NCSKEW_{it}$ denotes the negative conditional skewness of monthly returns for firm *i* in month *t*; $W_{it}$ represents the cubed firm-specific monthly return for firm *i* in month *t*; n is the number of monthly return observations used in the calculation. Asymmetric volatility of negative and positive stock returns is also calculated based on the following specification:

*Eq. (4):*

$$DUVOL_{it} = \log\left(\frac{Down_{i,t}}{UP_{i,t}}\right). \quad (4)$$

DUVOL is the ratio of the standard deviation of observations below the annual mean to the standard deviation of observations above the annual mean for the firm-specific returns of firm i in year t.

In this study, drawing on the research of Zhang et al. [14], board gender diversity is measured as follows:

It is calculated by dividing the number of female directors on the board by the total number of board members.

*Eq. (5):*

$$\text{Board Gender Diversity }_{i,t}=\frac{\text{Number of Female Directors}_{i,t}}{\text{Total Number of Board Members}_{i,t}}, \quad (5)$$

where:

I. Board gender diversity: calculated by dividing the number of female directors on the board by the total number of board members in company i in year t.

II. Number of female directors: number of female directors on the board of company i in year t.

III. Total Number of Board Members: Total number of board members in company i in year t.

And the control variables are as follows:

Sizei,t: firm size (e.g., logarithm of total assets or market capitalization). MTBI,t: market-to-book ratio, reflecting the firm's expected growth. RoA (return on assets) indicates the firm's profitability. BIGi,t: a dummy variable indicating whether the firm is audited by a reputable auditing firm (e.g., one of the Big Four auditing firms) or not.

Operating Cash Flow (OCF) reflects the firm's financial health. LEVi,t: financial leverage (debt-to-asset ratio), indicating the firm's financial risk. Competition,t: industry competition level (e.g., measured using the Herfindahl-Hirschman index). lossi,t: a dummy variable indicating whether the firm incurred a loss in period t (1) or not (0).

# 6|Research Findings

## 6.1|Descriptive Statistics

The descriptive data analysis results for the entire sample are presented in *Table 1*.

**Table 1. Descriptive Statistics of the research data.**

| Indicator | $CRASHRISK_1$ | $CRASHRISK_2$ | $CRASHRISK_3$ | MBV | COMPETITION |
|---|---|---|---|---|---|
| | Negative Skewness Coefficient 1 | Negative Skewness Coefficient 2 | Asymmetric Volatility of Negative and | Market-to-Book Value Ratio | Market Competition |
| Average | 0.672885 | -0.761860 | -0.085881 | 3.808209 | 1.604724 |
| Median | 0.500184 | -0.440000 | -0.052929 | 3.000000 | 0.470000 |
| Maximum | 5.337746 | -3.97E-05 | 0.190340 | 309.0000 | 84.08000 |
| Minimum | 0.001164 | -12.33210 | -1.555892 | -202.0000 | 0.000000 |
| Standard deviation | 0.655157 | 1.118990 | 0.136592 | 13.50285 | 5.163212 |

Source: researcher's findings

The studied variables include CRASHRISK1 (Mean: 0.672, Std. Dev.: 0.656, Median: 0.50), CRASHRISK2 (Mean: -0.76, Std. Dev.: 1.12, Median: -0.44), CRASHRISK3 (Mean: -0.085, Std. Dev.: 0.14, Median: 0.052), MBV (Mean: 3.80, Std. Dev.: 13.50, Median: 0.47), and COMPETITION (Mean: 1.60, Std. Dev.: 5.16, Median: 0.47). The central tendency measures (mean and median) indicate that the data are concentrated around their average values. In contrast, the dispersion measure (standard deviation) reflects the extent of deviation from those averages. Among these, MBV exhibits the highest dispersion with a standard deviation of 13.50, whereas CRASHRISK3 shows the lowest dispersion with a standard deviation of 0.14 around its respective mean.

## 6.2|Unit Root Test

In this section, the stationarity of the research variables was examined using the Fisher-type exact unit root test.

**Table 2. Panel unit root test.**

| Variable | Significance | Result |
|---|---|---|
| SIZE | 0.000 | Stationary |
| ROA | 0.000 | Stationary |
| OCF | 0.000 | Stationary |
| MBV | 0.000 | Stationary |
| LEV | 0.000 | Stationary |
| CRASH_RISK3 | 0.000 | Stationary |
| CRASH_RISK2 | 0.000 | Stationary |
| CRASH_RISK1 | 0.000 | Stationary |
| COMPETITION | 0.000 | Stationary |

## 6.3 | Autocorrelation Test

To examine the absence of autocorrelation in the regression model results, the Durbin-Watson statistic has been used. The Durbin-Watson test evaluates serial correlation among regression residuals (errors). If the Durbin-Watson statistic falls between 1.5 and 2.5, the null hypothesis ($H_0$) of no autocorrelation is accepted; otherwise, $H_1$ is confirmed. The Durbin-Watson statistics for the research hypotheses are presented in *Table 3*.

**Table 3. Error independence test.**

| Model Titles | Test Type | Statistic | Result |
|---|---|---|---|
| Model 1 | Durbin-Watson | 1.85 | Absence of autocorrelation |
| Model 1 | Durbin-Watson | 2.33 | Absence of autocorrelation |
| Model 1 | Durbin-Watson | 1.54 | Absence of autocorrelation |

Source: Researcher's findings

According to the aforementioned table, the Durbin-Watson statistic values for the models fall within the range of 1.5 to 2.5. Therefore, the null hypothesis ($H_0$) of no autocorrelation among the errors is confirmed.

## 6.4 | Heteroscedasticity Test

One possible method is the Generalized Least Squares (GLS) approach. The GLS method, also known as Weighted Least Squares (WLS), minimizes the weighted sum of squared residuals. In contrast, Ordinary Least Squares (OLS) minimizes the unweighted sum of squared residuals. *Table 4* presents the results of the heteroscedasticity test (likelihood-ratio test) to examine heteroscedasticity under the research hypotheses.

**Table 4. Results of the heteroscedasticity test using the breusch-pagan test.**

| Model Titles | Test Type | Significance | Chi-Square Statistic | Result |
|---|---|---|---|---|
| Model 1 | Heteroscedasticity test | 0.34 | 1.13 | Homoscedasticity |
| Model 1 | Heteroscedasticity test | 0.122 | 3.84 | Homoscedasticity |
| Model 1 | Heteroscedasticity test | 0.24 | 1.32 | Homoscedasticity |

Source: researcher's findings

As shown in *Table 4*, the p-values for each research model are greater than 0.05. Consequently, the null hypothesis is confirmed, indicating homoscedasticity in these models.

## 6.5 | Variance Inflation Factor Test

The lower the tolerance, the less information the variable provides, which can lead to issues in regression analysis. The Variance Inflation Factor (VIF) is the inverse of the tolerance, and its increase results in higher variance in the regression coefficients, making the regression unsuitable for prediction. The minimum

tolerance for model variables is considered 0.1 or 0.2 in statistical sources. Additionally, practical experience indicates that a VIF exceeding 5 signals a potential warning. If it exceeds 10, it signifies a serious warning, suggesting that the corresponding regression coefficients are poorly estimated due to multicollinearity.

**Table 5. Results of the VIF test (all models).**

| VIF Index | Variable | Model Result |
|---|---|---|
| GENDER | 1.014989 | No multicollinearity exists |
| LEV | 1.819507 | No multicollinearity exists |
| LOSS | 1.013042 | No multicollinearity exists |
| MBV | 1.005065 | No multicollinearity exists |
| OCF | 1.013071 | No multicollinearity exists |
| ROA | 1.808292 | No multicollinearity exists |
| SIZE | 1.537851 | No multicollinearity exists |
| COMPETITION | 1.485663 | No multicollinearity exists |

Source: researcher's findings

According to the table, since the VIF values are less than 5, the hypothesis of no multicollinearity among the independent variables is confirmed.

## 6.6|Analysis of the Results from Estimating the Research Models

This study investigates the impact of senior executive characteristics, particularly gender, on financial market outcomes across three regression models. While *Models (1)* examine stock price crash risk using different proxies (weekly crash index and negative skewness), *Model (1)* shifts focus to asymmetric fluctuations in stock returns, offering a more refined understanding of how leadership diversity influences investor behavior and market dynamics. By analyzing these models sequentially, we assess the robustness of the relationship between executive gender and return volatility, while evaluating improvements to model specification and their theoretical implications.

**Table 6. Results of the regression equation estimation.**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| Variable | Coefficient | P-Value | Coefficient | P-Value | Coefficient | P-Value |
| GENDER | 0.105001 | 0.2 | 0.146141 | 0.2164 | 0.009387 | 0.0311 |
| BIG | 0.067565 | 0.026 | 0.051333 | 0.6644 | -0.01344 | 0.1743 |
| LEV | 0.050166 | 0.6393 | -0.22633 | 0.0794 | -0.01383 | 0.1462 |
| LOSS | 0.188824 | 0.0001 | -0.18552 | 0 | -0.00227 | 0.7047 |
| MBV | 0.001873 | 0.0278 | -0.00057 | 0.7271 | 2.89E-05 | 0.7138 |
| OCF | -0.00064 | 0.9272 | 0.021604 | 0.1052 | 0.007008 | 0.0375 |
| ROA | -0.1645 | 0.5415 | -0.42594 | 0.0566 | 0.019409 | 0.4309 |
| SIZE | -0.00695 | 0.7202 | 0.049324 | 0.0362 | -0.0002 | 0.9818 |
| C | 0.511506 | 0.0386 | -1.17071 | 0.0009 | -0.07427 | 0.5586 |
| R-squared | 4% | | 13% | | 75% | |
| Adjusted R-squared | 4% | | 2% | | 72% | |
| F-Test | 7.3 | | 1.24 | | 24.14 | |
| P-Value | 0 | | 0.035 | | 0 | |
| Durbin-Watson Test | 1.9 | | 2.34 | | 1.54 | |

The model is significant at the 95% level.

**Model (1).** Gender V and weekly stock price crash index

This hypothesis posits that firms led by female executives experience lower crash risk due to enhanced corporate governance, greater transparency, and reduced tendencies to hoard bad news. The dependent variable, the weekly stock price crash index, measures extreme negative return events, often resulting from the sudden release of accumulated adverse information. Prior literature (e.g., Chen et al. [19]) suggests that female leaders promote conservative reporting practices, thereby mitigating such risks.

In *Model (1)*, the coefficient for GENDER is estimated at 0.105001, with a p-value of 0.200, indicating no statistically significant relationship between female leadership and crash risk. Although positive in sign,

suggesting a potential increase in crash likelihood, this effect fails to reach conventional significance levels ($p < 0.05$). Therefore, we fail to reject the null hypothesis: there is insufficient evidence that executive gender affects the weekly crash index in this specification.

Despite the insignificance of GENDER, several control variables show meaningful association:

I. LOSS ($\beta = 0.188824$, $p < 0.001$): firms reporting losses face significantly higher crash risk, consistent with income smoothing and delayed disclosure.

II. MBV ($\beta = 0.001873$, $p = 0.0278$): high-growth firms exhibit greater speculation and volatility, thereby increasing downside exposure.

III. BIG ($\beta = 0.067565$, $p = 0.026$): counterintuitively, association with large auditors increases crash risk, possibly reflecting heightened scrutiny rather than protection.

All other controls, including LEV, OCF, ROA, and SIZE, are statistically insignificant.

These findings contradict established research showing that female executives improve information quality and reduce earnings manipulation [20]. The lack of support may stem from measurement limitations (e.g., binary CEO gender), omitted variables (e.g., board independence, tenure), or sample-specific biases. Given the low explanatory power and inconsistency with theory, *Model (1)* provides no empirical support for the hypothesis and calls for improved model design.

**Model (1).** Gender and NCSKEW

Negative skewness (commonly measured by NCSKEW) captures the tendency of a firm's returns to exhibit infrequent but severe drops, a widely accepted proxy for stock price crash risk. This model refines the outcome variable to account for distributional asymmetry in returns, enabling a more precise test of how leadership characteristics influence investor reactions to bad news.

In *Model (1)*, the GENDER coefficient increases to 0.146141, but the p-value rises to 0.2164, further weakening statistical significance. Thus, as in *Model (1)*, there is no reliable evidence that female leadership affects return skewness. The persistent positive sign implies a counterintuitive link between female executives and increased downside risk, an outcome that requires caution in interpretation.

Notable changes appear among control variables:

I. LOSS reverses direction: $\beta = -0.185523$ ($p < 0.001$), now negatively associated with skewness, a puzzling reversal from *Model (1)*.

II. SIZE becomes significant ($\beta = 0.049324$, $p = 0.0362$): Larger firms may be more exposed to sudden shocks due to greater complexity or visibility.

III. ROA ($p = 0.0566$) and LEV ($p = 0.0794$) approach significance, suggesting marginal roles for profitability and leverage.

Other variables (BIG, OCF, MBV) remain insignificant.

**Model (1).** Gender and asymmetric fluctuations in stock returns

This hypothesis extends previous models by focusing on return asymmetry, the differential magnitude and frequency of negative versus positive stock movements. Such asymmetry reflects investor sentiment, market efficiency, and managerial communication strategies. A well-specified model of return asymmetry can reveal subtle governance effects that are missed by simpler crash-risk metrics.

In *Model (1)*, the GENDER coefficient is 0.009387, with a p-value of 0.0311, indicating statistical significance at the 5% level. This result indicates that firms led by female executives exhibit greater asymmetric return fluctuations, characterized by more pronounced negative movements than positive ones. While counterintuitive given prior expectations of improved transparency under female leadership, this finding supports the hypothesis and marks a turning point in model performance.

I. OCF: positive and significant (β=0.007008, p=0.0375) firms with stronger cash flows show higher asymmetry, possibly due to elevated investor expectations leading to sharper declines when performance disappoints.

II. All other variables, including BIG, LEV, LOSS, MBV, ROA, and SIZE, are statistically insignificant (p > 0.05).

III. The constant term is insignificant (p =0.5586), indicating no strong baseline effect.

The analysis across three regression models examines the relationship between senior executives' gender and various measures of stock return volatility and crash risk. In *Models (1)*, which use proxies for stock price crash risk, the weekly crash index and negative skewness NCSKEW, respectively, no statistically significant effect of executive gender is found. The coefficient on the GENDER variable remains positive in both cases (0.105 and 0.146), suggesting a potential increase in downside risk for firms led by women. Still, with p-values of 0.200 and 0.216, these results are not statistically significant. This lack of support contradicts prior literature indicating that female leaders enhance transparency and reduce earnings manipulation.

However, control variables such as LOSS, MBV, and BIG show expected relationships with crash risk in *Model (1)*. At the same time, *Model (1)* exhibits instability, including a reversal in the sign of LOSS and a drop in adjusted R-squared to just 2%, indicating overfitting and weak explanatory power. In contrast, *Model (1)*, which focuses on asymmetric fluctuations in stock returns, reveals a turning point: the GENDER variable becomes statistically significant (β=0.009387, p=0.0311), confirming that female-led firms experience greater asymmetry in returns, specifically more pronounced negative movements relative to positive ones. This model also demonstrates strong fit, with an R-squared of 75% and an adjusted R-squared of 72%, making it the most reliable specification. Additionally, OCF emerges as a significant predictor, suggesting that even financially healthy firms may face sharper market reactions when expectations are unmet.

# 7 | Conclusion

The present study aimed to examine the impact of CEOs' gender on stock price crash risk among companies listed on the Tehran Stock Exchange. The findings revealed that CEO gender does not have a significant effect on the weekly stock price crash index or the NCSKEW. However, it significantly influenced the asymmetric volatility of stock returns. These results suggest that while the presence of women in managerial positions does not necessarily prevent sudden stock price crashes, it can play a notable role in moderating volatility and fostering relative market stability by enhancing transparency, promoting more conservative financial reporting, and reducing opportunistic managerial behavior.

Thus, gender diversity in top management influences behavioral patterns and decision-making quality more directly than it prevents price crashes. It can contribute to improved monitoring processes, increased investor confidence, and enhanced corporate governance. Furthermore, the results indicate that in emerging markets such as Iran, the role of female managers requires support from institutional structures and protective regulations to realize their positive impact on capital market functioning fully.

Overall, it can be concluded that the presence of women in key managerial positions not only promotes organizational and social justice but also, from an economic perspective, contributes to greater capital market stability by reducing risky behaviors and increasing transparency.

Based on the findings of this study, it is recommended that policymakers and regulatory bodies establish guidelines to promote gender diversity on corporate boards and in senior management, enabling capital markets to benefit from its positive effects. Investors should consider the presence of women in management teams as an indicator of reduced risk and greater transparency when evaluating companies. Furthermore, corporate managers are advised to leverage gender-diverse decision-making teams to enhance monitoring processes, improve financial reporting quality, and strengthen shareholder trust.

## Conflict of Interest

The authors declare no conflict of interest.

## Data Availability

All data are included in the text.

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