Firm and CEO Characteristics as Determinants of Firm Risk: Evidence from the Industrial and Service Sectors of the Amman Stock Exchange

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Abstract

This research paper examines the diverse influences of firms' traits and CEOs' characteristics on corporate risk, particularly among industrial and service companies listed on the Amman Stock Exchange, from 2015 to 2023. Using an analytical panel-data approach with 513 firm-year observations, the paper integrates multiple measures to assess companies' risks, including stock-return volatility, market returns, capital losses, and accounting-based proxies. This statistical analysis considers the firm-specific features, such as size, leverage, profitability, and liquidity, alongside CEOs' attributes, which involve age, tenure, education, gender, and duality. Grounded in a robust theoretical framework combining Agency Theory, Upper Echelons Theory, and the Resource-Based View, the research findings indicate that internal resources and managerial qualities can strongly influence risk-taking behavior. Empirical results also suggest that the largest and most profitable companies tend to exhibit the lowest risk levels, consistent with resource-based arguments. In contrast, higher leverage is associated with increased risk, underscoring the impact of financial structure on corporate performance. CEOs' characteristics also matter, as they are closely associated with reduced risks, indicating that both theoretical knowledge and professional experience can steadily foster conservative strategic choices. These concluding interpretations proved reliable and consistent, maintaining robustness across various risk measures and sub-period analysis. This yielded valuable insights, offering practical implications for investors and corporate governance practitioners in the Jordanian business setting and beyond.

Keywords: Firm traits, CEO characteristics, Firm risks, Industrial sector, Business Service, Amman Stock.

I. Introduction

Jordan's market is widely regarded as an integral part of the bustling Levant region, which consistently faces economic setbacks, including fluctuations in oil prices and global events (Alrabadi, 2024). In this regard, firms' traits are the primary catalysts, as they shape companies' administrative means for navigating turbulent conditions to remain afloat (Samarah, 2024). In an exceptionally strategic location such as Jordan, where the entire economy is tied to trade and tourism, small shifts can significantly affect resources (Aityassine et al., 2024). This indicates that understanding firms' characteristics helps policymakers and specialists identify risks and build robust businesses. This paper discusses these features, covering the connotations of firms' traits and the types of risks associated with them, drawing on established findings from previous Amman Stock Exchange studies.

The paper also demonstrates that firm characteristics are fundamental to the corporate structure. These pillars support the company's health, including size (measured by total assets), debt levels (measured by loans and equity), liquidity ratios, and profit margins. The paper also explains the relationship between CEO characteristics, including age, tenure, education, and career horizon, and the company's traits, particularly the industrial and service companies listed in the Amman Stock Exchange, during the period from 2015 to 2023. In the currently growing industries, these traits indicate the challenging conditions ahead (Almarayeh et al., 2025).

For instance, the firm's size acts as its shield against economic shocks (Abdeljawad & Farhood, 2025). Similarly, high profits indicate sound choices, whereas poor liquidity signals cash constraints (Alsaad et al., 2025). When applying these facts to the Amman Stock Exchange, which lists 161 companies, it is evident that local rules, such as banking regulations, make firm traits stand out more clearly than in stable markets like the US (Qwader, 2024). As the World Bank reports consistently describe the Jordanian economy as volatile, with GDP growth of 8%, this underscores that firms' characteristics drive risks that threaten the company's stability (Al-Mohareb et al., 2024). For example, industrial risk arises from price declines and currency fluctuations (Mohammad et al., 2024). In parallel, credit risk arises when borrowers fail to make timely payments, whereas operational risk is embedded in day-to-day glitches, such as supply chain disruptions (Najeeb, 2024).

This indicates that the size of ASE firms is associated with lower risk, whereas debt increases financial pressure (Alhamdan & Almatarneh, 2024). As ASE sectors vary, it is apparent that banks exhibit stable betas, owing to existing regulations, whereas manufacturing companies generate profits driven by fluctuations in raw material prices (Al Dabbas, 2025). Such good results can be sustained if disclosure rules are strengthened and quarterly liquidity reports are issued regularly to detect potential risks early (Kayed, 2024). This can certainly reinforce trust and, at the same time, establish the corporate financial stability, especially after the recent stresses (Alhasanko, 2024). Accordingly, this study aims to answer the main question: What is the relationship between company and CEO characteristics and companies' total risk in the industrial and service sectors during the period 2015-2023?

2. Literature Review

In an emerging institution such as the Amman Stock Exchange (ASE), risk is paramount, as firms that can mitigate the inherent threats posed by business complexity and overhead costs can build trust and comply with regulatory rules.

Many previous studies have sought to elucidate this. They aim to specify the firms' traits and CEO characteristics that drive risk disclosure and steady cash flow. An empirical study examined the effects of the risk management committee's characteristics on companies' performance in Jordan (Alduneibat, 2023). Another study followed a similar approach, exploring the strategies banks use to manage their daily risks (Alshehadeh et al., 2023). Both papers examined business risk, aiming to identify whether better practices lead to stronger firms. Although the authors sought to provide accurate results, the methods and findings fall short in several key areas. Initially, the samples were primarily drawn from specific firms, which provided data for only five years. Second, both studies employed agency theory. This suggested that managers might act individually to attain personal objectives, thereby neglecting the interests of owners and stakeholders. Another gap is that the authors drew on ideas and input from earlier works that covered several oversight bodies. Notably, although both studies listed firms from the U.S. and Europe, they completely disregarded Jordanian law.

Another study examined daily risks in Jordanian banks (Malahim, 2023). It claimed that tools introduced by the Basel Committee on Banking Supervision can effectively

assist financial institutions, as these tools have established global standards that support corporate safety. The study also included validated surveys completed by 50 bank managers. The results indicate that effective plans reduce errors by 20%. Although the author offered numerous examples using value-at-risk metrics to measure risk, he focused solely on banks' perspectives, ignoring the broader context. The author could avoid such an extensive gap by following PRISMA guidelines, which sort sources by theme and identify biases from selecting only favorable findings. By contrast, empirical research selected 120 non-financial companies in Jordan, building its evidence on solid ground (Toumeh, 2023). The study drew on annual reports and databases. The time frame spanned nine years, from 2010. The results demonstrated that ASE companies experienced severe declines in local markets. The author used basic fixed-effects models. He ignored the fact that corporate performance can fluctuate year to year. The author also addressed the owner-manager clashes. He missed that dynamic effects require additional theories, such as the stakeholder framework, which can incorporate employees' and communities' perspectives. This narrow lens set aside the social risks. In addition, the non-financial metrics, such as employee turnover, were neglected.

3. Theoretical framework and development of hypotheses

The relationship between firm characteristics such as firm size and book-to-market value, as well as CEO attributes such as age, education, tenure, and career horizon, plays a determining role in total corporate risk (Hu et al., 2024; Luo et al., 2023; Zhang et al., 2022; Serfling, 2014). According to Zhang et al. (2022) and Serfling (2014), this relationship is theoretically and empirically complex. An integration of agency theory (Chari et al., 2019), upper echelon theory (AlZboon, 2025), and the resource-based view (Hertrampf et al., 2025) can explain this complexity.

Agency theory refers to the relationship between a company's owners or shareholders and its board of directors, which may be marred by conflicts of interest between these managers and shareholders (Chari et al., 2019). Canarella & Miller (2022) indicated that corporate managers seek to make decisions that affect risk levels and serve their personal interests, such as increasing compensation or maintaining their positions, without focusing solely on shareholders' interests. Accordingly, Zhang et al. (2022), Imes & Anderson (2021), and Serfling (2014) indicated that CEO

characteristics such as age, tenure, and career horizon influence corporate risk-taking behavior.

On the other hand, previous studies, according to Hambrick & Mason (1984), have shown that an organization's risk tolerance is reflected in its senior managers, according to the Upper Echelons theory, which assumes that the knowledge base, values, experiences, and personalities of senior managers influence their perception and interpretation of information, thereby impacting strategic decisions and organizational performance (Hertrampf et al., 2025; Hambrick & Mason, 1984; Hambrick, 2007). Furthermore, Hambrick & Mason (1984) and Dang et al. (2018) proposed a set of demographic indicators representing the knowledge base, values, experiences, and personalities of senior managers, namely age, tenure, education, and career horizon. Through this research, we contribute to the explanation of the relationship between CEO characteristics and total risk in industrial and service companies in Jordan.

The resource-based view of the firm holds that leveraging internal resources to generate economic value provides a superior competitive advantage (Chen & Zheng, 2014). A firm can gain this competitive advantage by adopting methods that current or potential competitors cannot imitate (Guizani & Larabi, 2025). Resources can be tangible, such as firm size (Barney, 1991), or intangible, such as book-to-market ratio (Hall, 2009). Accordingly, firm characteristics such as firm size and book-to-market ratio can reflect internal resources that can be leveraged to generate competitive advantage, thereby affecting the firm's ability to bear risk. This is based on findings by Al-Zboon (2025), Luo et al. (2023), and Griffin & Lemmon (2022), who indicate that larger firms with greater resources are better able to withstand market fluctuations and risks.

The integration of the three theories can explain the theoretical complexity of the relationship between firm and CEO characteristics on Total Risk by employing the Upper Echelons Theory to explain CEO characteristics (CEO Age, CEO Tenure, CEO Education, and CEO Career Horizon) (Bonsu et al., 2024), while the Resource-Based View theory expresses firm characteristics (Firm Size and Book-to-Market Ratio) (Wernerfelt, 1984). Furthermore, Total risks can also be high due to conflicts of interest between managers and shareholders, as managers exert greater pressure to maximize their own benefits, which conflicts with shareholders' preferences. Therefore, Agency Theory integrates the Upper Echelons Theory and the Resource-Based View by explaining the relationship between

management, represented by CEO characteristics, and shareholders, expressed through firm characteristics (Imes & Anderson, 2021; Antia et al., 2010).

Previous studies help explain the empirical complexity of this relationship, as noted by Zhang et al. (2022) and Al-Zboon (2025), who find that the CEO's educational background is negatively associated with corporate risk behavior. Furthermore, CEO age is negatively associated with stock return volatility (Serfling 2014) and with corporate risk tolerance and performance (Al-Zboon 2025). Based on this, the following hypotheses were proposed:

H1: There is a significant negative relationship between CEO age and total risk.

H2: There is a significant negative relationship between CEO education level and total risk.

AlZboon (2025) and Chen & Zheng (2014) reported a positive relationship between career horizon and risk-taking ability. In contrast, Kero & Bogale (2023) and Dang et al. (2018) reported a negative relationship between career horizon and risk tolerance. Based on this contradiction in the results of previous studies, the following hypothesis was hypothesized:

H3: There is a significant relationship between the CEO's career horizon and total risk.

Al-Zboon (2025) also indicated that the relationship between CEO tenure and risk-taking ability is positive. On the other hand, Kero & Bogale (2023) and Dang et al. (2018) reported a negative relationship. Based on this, the following hypothesis was proposed:

H4: There is a significant relationship between CEO tenure and total risk.

Dang et al. (2018) examined how firm size affects operational efficiency and CEO compensation, and concluded that larger firms can better manage risk. This is consistent with Luo et al. (2023). On the other hand, Ali et al. (2003) indicated that a high book-to-market ratio is associated with higher risk. Griffin & Lemmon (2022) confirmed this and showed that a high book-to-market value exposes a company to greater risks. Based on this, the following hypotheses were proposed:

H5: There is a significant negative relationship between firm size and total risk.

H6: There is a significant negative relationship between the book-to-market ratio and total risk.

4. Methodology

4.1 Sample

The study population consists of all companies in the industrial and service sectors listed on the Amman Stock Exchange. The number of companies in the industrial sector reached 26, and in the service sector, 31. The collected data covers the period from 2015 to 2023. This nine-year combined sample included approximately 513 observations.

4.2 Measurement of Variables

Data on CEO characteristics and company characteristics were collected from all companies in the industrial and service sectors listed on the Amman Stock Exchange. Data on CEO characteristics included CEO Age, CEO Tenure, CEO Education, and CEO Career Horizon, while data on company characteristics included Book-to-Market and Firm Size. The data collected over nine years comprised approximately 513 observations. Table 1 illustrates how each variable was measured:

4.3 Econometrics model

Using a regression model, we test our hypotheses on the Firm and CEO Characteristics as Determinants of Firm Risk:

Model: $SD_{i,t} = \beta_0 + \beta_1\,CEO\_AGE_{i,t} + \beta_2\,CEO\_TEN_{i,t} + \beta_3\,CEO\_EDU_{i,t} + \beta_4\,CEO\_CAR_{i,t} + \beta_5\,BTM_{i,t} + \beta_6\,LNSIZE_{i,t} + \varepsilon_{i,t}\ \dots (1)$

Model: $SD_{i,t} = \beta_0 + \beta_1\,CEO\_AGE_{i,t} + \beta_2\,CEO\_TEN_{i,t} + \beta_3\,CEO\_EDU_{i,t} + \beta_4\,CEO\_CAR_{i,t} + \beta_5\,BTM_{i,t} + \beta_6\,LNSIZE_{i,t} + \beta_7\,CEO\_DUA_{i,t} + \beta_8\,ROE_{i,t} + \varepsilon_{i,t}\ \dots (2)$

Where:

β_0: Constant coefficient in regression models.

$\beta_1 - \beta_8$: Regression Model Coefficients.

$\varepsilon_{i,t}$: Random Error for the university i in the year t.

A panel database (cross-section × time) of all companies in the industrial and service sectors listed on the Amman Stock Exchange was created and analyzed in EViews. The analysis began with traditional regressions (Fixed-Effects and Random-Effects) and pooled regression, followed by LM

and F tests to determine the most appropriate model. In addition, Diagnostic Tests: Stability and stationarity tests of variables, Autocorrelation of residuals, and Robustness test.

5. Results and discussion

5.1 Summary statistics and correlation matrix

5.1.1 Descriptive statistics

Table 2 displays the descriptive statistics for the study variables for all companies listed in the industrial and services sectors on the Amman Stock Exchange during the period (2015–2023).

The average return on equity (ROE) was approximately 0.0496, reflecting lower profitability among Jordanian companies relative to more stable markets, consistent with the market's emerging nature. CEO_Duality also averaged 0.6355, indicating that a substantial number of companies have a CEO who also serves as chairman of the board, reflecting a pronounced concentration of managerial power. Additionally, CEO_AGE had a mean of 57.7 years, indicating that CEOs in Jordanian companies are often older, which may limit their propensity to take risks. CEO_TEN, by contrast, had an average tenure of 7.9 years, indicating relative stability in executive positions. The BTM averaged 1.35, indicating that most companies have market valuations close to their book values, suggesting a certain degree of market risk. The SD (Total Risk) averaged 0.0658, indicating that stock return volatility in the Jordanian market is within relatively acceptable levels compared with other emerging markets.

Conclusion: the descriptive values **reflect the reality of the Jordanian market, where profitability levels are low, and risk is present. At the same time, the leadership structure (CEO duality) exerts** influence that may deepen the gap between shareholders and management.

5.2 Correlation Matrix

Table 3 presents the correlation matrix, which reveals preliminary correlations among variables prior to testing the regression models. It showed a negative correlation between Book-to-Market and CEO Career Horizon, suggesting that duality may be associated with lower indicators of good governance.

Meanwhile, ROE was positively correlated with Firm Size (LNSIZE) (0.3172), reflecting that larger firms generate higher returns. CEO Education showed very weak correlations with the remaining variables, which may indicate that the effect of education warrants causal testing in regression models.

CEO_TEN was positively correlated with CEO_DUAL (r = 0.2701), indicating that the longer a CEO has served, the greater the likelihood of dual tenure.

From the above, it is noted that there are no strong correlations, indicating severe multicollinearity, which supports the validity of the subsequent regression models.

5.3 Panel unit root test

To verify the properties of time series in the panel data, the ADF-Fisher Chi-square, PP-Fisher Chi-square, and Levin, Lin & Chu t-statistic were applied to all research variables, as shown in Table 4. The results showed that the probability values for all variables were less than 5%. As for the variables (SD, BTM), it was found that the possibility of testing (ADF) was greater than 5%, but the possibility of the two (PP, LLC) was less than 5%. indicating that the null hypothesis of the presence of a unit root was rejected, and the alternative hypothesis of stationarity at the level was accepted. These results support the use of static panel regression models. For the variable (CEO_DUA), stationarity testing was not conducted, as it is a binary variable, and it does not represent a continuous time series but rather qualitative indicators of the presence or absence of a particular characteristic. Therefore, they are not affected by the single-root problem (Unit Root) in the same way as continuous quantitative variables, and their variance is constant by virtue of the binary design. It thus does not reflect temporal changes in trend or distribution.

5.4 Determine the Appropriate Model

Table 5 presents the results of the restricted F- and LM-tests used to select the optimal model. In the first model, the LM and restricted F-test results were not statistically significant (p > 0.05), thereby favoring the pooled regression model (PRM). In the second model, the F-statistic was significant (p=0.044), supporting the appropriateness of the fixed-effects model (FEM). In models 3 through 6, pooled regression (PRM) was the most appropriate.

Table 1. Measurement of Variables

Variable Name	Symbol	Measurement	Source	References
Dependent variable				
Total Risk	SD	Annualized standard deviation of daily stock returns	ASE Database	Cid-Aranda & López-Iturriaga (2023)
Independent variables				
CEO Age	CEO_AGE	Number of years	Hand-collected from annual reports and corporate websites	Farag & Mallin (2018)
CEO Tenure	CEO_TEN	Years serving as CEO		
CEO Education	CEO_EDU	Ordinal scale (0-5)		Naseem et al., 2020
CEO Career Horizon	CEO_CAR	Industry-adjusted measure of tenure and age $((\text{CEO tenure}_{ind,t} - \text{CEO tenure}_{it}) + (\text{CEO age}_{ind,t} - \text{CEO age}_{i,t}))$		Antia et al. (2010)
Book-to-Market	BTM	Book value per share /closing price per share	Annual Reports and ASE Database	Cid-Aranda & López-Iturriaga (2023)
Firm Size	LNSIZE	Ln (Total Assets)		
Control variables				
CEO_Duality	CEO_DUA	1 if the CEO is also Chairman of the Board, 0 otherwise	Annual reports, corporate governance reports	Basalat et al., (2023)
Return on Equity	ROE	Net income/Shareholders' equity	Annual Reports and ASE Database	Alhasanko, (2024)

Table 2. Descriptive statistics

	SD	BTM	CEO_AGE	CEO_CAR	CEO_TEN	CEO_EDU	CEO_DUAL	ROE	LNSIZE
Mean	0.0658	1.3597	57.7359	-0.9044	7.9347	3.2632	0.6355	0.0496	17.4946
Median	0.0194	0.9626	57.0000	-0.4840	7.0000	3.0000	1.0000	0.0540	17.3996
Maximum	5.2630	29.5106	88.0000	56.5160	26.0000	5.0000	1.0000	0.5574	21.4292
Minimum	-2.2587	0.1748	29.0000	-31.3000	1.0000	0.0000	0.0000	-1.2995	13.6200
Std. Dev.	0.9809	1.6076	10.7239	11.2948	5.2131	0.6896	0.4818	0.1354	1.4344
Skewness	0.4581	11.1003	0.2293	0.2675	0.5552	0.1397	-0.5630	-3.0837	0.3277
Kurtosis	3.9794	186.1328	2.9081	4.9932	2.7181	5.1465	1.3169	30.8828	3.8088
Jarque-Bera	38.449	727401.385	4.675	91.033	28.058	100.157	87.647	17431.035	23.163
Probability	0.0000	0.0000	0.0966	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	33.7520	697.5356	29618.500	-463.9560	4070.5000	1674.0000	326.0000	25.4263	8974.709
Sum Sq. Dev.	492.608	1323.2068	58881.460	65316.645	13914.062	243.473	118.834	9.381	1053.473
Observations	513	513	513	513	513	513	513	513	513

Note: The table presents summary statistics on the contextual characteristics of a sample of Jordanian companies in the service and industrial sectors listed on the ASE, comprising 26 companies in the industrial sector and 31 in the service sector.

Table 3. Correlation analysis of main variables

	BTM	CEO_AGE	CEO_CAR	CEO_DUAL	CEO_EDU	CEO_TEN	LNSIZE	ROE
BTM	1.0000							

CEO_AGE	0.0235	1.0000						
	0.5956	-----						
CEO_CAR	-0.0182	-0.9473	1.0000					
	0.6817	0.0000	-----					
CEO_DUA	0.0461	0.3074	-0.3172	1.0000				
	0.2968	0.0000	0.0000	-----				
CEO_EDU	0.0205	0.0077	-0.1004	0.0894	1.0000			
	0.6440	0.8619	0.0229	0.0429	-----			
CEO_TEN	0.0322	0.3572	-0.3515	0.2701	-0.0395	1.0000		
	0.4673	0.0000	0.0000	0.0000	0.3721	-----		
LNSIZE	-0.0721	0.0941	-0.0953	-0.0076	0.0721	-0.1218	1.0000	
	0.1027	0.0331	0.0308	0.8637	0.1030	0.0058	-----	
ROE	-0.2244	0.0526	-0.0538	-0.0485	0.0768	0.0518	0.3172	1.0000
	0.0000	0.2345	0.2242	0.2730	0.0824	0.2418	0.0000	-----

Note: This table reports the Correlation matrix estimation

Table 4. Panel unit root test

Variables	PP - Fisher Chi-square		ADF - Fisher Chi-square		Levin, Lin & Chu t		Decision
	Statistic	Prob.**	Statistic	Prob.**	Statistic	Prob.**	
SD	340.045	0.000	209.508	0.074	-18.458	0.000	Level stationary I(0)
BTM	180.354	0.000	136.516	0.346	-13.147	0.000	Level stationary I(0)
LNSIZE	260.402	0.000	184.509	0.000	-15.257	0.000	Level stationary I(0)
ROE	292.371	0.000	185.824	0.000	-18.962	0.000	Level stationary I(0)
CEO_EDU	74.526	0.000	53.752	0.017	-11.016	0.000	Level stationary I(0)
CEO_CAR	120.756	0.000	102.310	0.000	-7.088	0.000	Level stationary I(0)
CEO_AGE	129.429	0.000	98.239	0.001	-24.386	0.000	Level stationary I(0)
CEO_TEN	96.316	0.000	76.848	0.022	-15.219	0.000	Level stationary I(0)

Table 5. Determine the Appropriate Model results

Model	Lagrange Multiplier		F Test		Decision
	Chi-Sq. Statistic	Prob.	F Statistic	Prob.	
Full Sample 1	1.126	0.289	1.221	0.142	PRM
Full Sample 2	0.677	0.411	1.118	0.269	PRM
Industrial Sectors 1	1.451	0.228	0.861	0.660	PRM
Industrial Sectors 2	1.284	0.257	0.928	0.566	PRM
Service Sectors 1	2.164	0.141	1.544	0.040	FEM
Service Sectors 2	0.449	0.503	1.218	0.209	PRM

Table 2. Regression testing results for the Full Sample

	1	2
Variable	PRM	PRM
BTM	0.1646***	0.1732***
LNSIZE	0.1567***	0.1399***
CEO_AGE	0.0033	0.0022
CEO_CAR	0.0140	0.0148
CEO_EDU	0.5318***	0.5132***
CEO_TEN	0.0389***	0.0342***
ROE		0.1875**
CEO_DUA		0.5987**
C	-5.1218***	-4.8230***
R-squared	0.2810	0.2931
F-statistic	32.9570	26.1180
Prob(F-statistic)	0.0000	0.0000
Jarque-Bera	5.1345	3.5073
Prob	0.0767	0.1731

Note: Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 3. Regression testing results for the industrial sector

	1	2
Variable	PRM	PRM
BTM	0.1712***	0.1717***
LNSIZE	0.2037***	0.1838***
CEO_AGE	-0.0028	-0.0044
CEO_CAR	0.0126	0.0122
CEO_EDU	0.4979***	0.4716***
CEO_TEN	0.0398***	0.0340**
CEO_DUA		0.1426
ROE		0.1041
C	-5.5227***	-5.0490***
R-squared	0.3133	0.3167
F-statistic	17.2581	13.0381
Prob(F-statistic)	0.0000	0.0000
Jarque-Bera	5.0268	4.6164
Prob	0.0810	0.0994

Note: Standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

5.5 Baseline regression estimation

To test the hypotheses, two models were used: one without control variables and one with control variables (CEO_Duality and ROE). This approach aims to verify the stability of the relationships between firm characteristics and executive characteristics, on the one hand, and total risk, on the other. To ensure the robustness of the results and to assess the absence of sector-specific effects, the sample was divided into two subgroups: industrial firms (Table 7) and service firms (Table 8). This step allows for comparison of trends across sectors and cross-correlations of the results with the full sample (Table 6).

The Jarque-Bera test was also applied to assess the normality of the model residuals (Tables 6–8), thereby strengthening the validity of the statistical inferences and supporting the reliability of the results.

The regression results for the entire sample, shown in Table 6, indicate that the first hypothesis (H1), which posits a negative relationship between CEO age and total risk, was not supported, as CEO age did not significantly explain risk levels (p> 0.1). The second hypothesis (H2), which predicted a negative relationship between education level and risk, was not supported: education level had a positive and significant effect on risk (p < 0.01), indicating that more educated managers tend to make riskier decisions. The third hypothesis (H3), related to career horizon, was also not supported, as this variable had no significant effect (p > 0.1). Regarding the fourth hypothesis (H4), the CEO's tenure had a positive and significant impact on risk (p < 0.01), supporting the hypothesis, despite the relationship not being predetermined. Regarding the fifth hypothesis (H5), which posited a negative relationship between company size and risk, the results showed a positive and significant association (p < 0.01), indicating that the hypothesis was not supported and that larger companies face higher risk. Similarly, the results for the sixth hypothesis (H6) were contrary to expectations: book-to-market value was positively and significantly associated with risk (p < 0.01), rather than the hypothesized negative relationship. Regarding the control variables, return on equity (ROE) and CEO duality were positively and significantly associated with risk (p < 0.01).

The coefficient of determination (R^2) for the first model, without control variables, was 0.2810, accounting for approximately 28.1% of the variance in total risk attributable to company and CEO characteristics. In the second model, after adding control variables, $R^2 = 0.2931$, with the explanatory power increasing slightly after adding control variables (CEO_Duality and ROE).

The regression results for the industrial sector, shown in Table 7, indicate that the first hypothesis (H1) was not supported. Despite the negative effect of the CEO's age, the association with risk was not statistically significant (p > 0.1). The second hypothesis (H2) was also not supported, as the results showed a positive and significant relationship between education level and risk, contrary to the expected negative relationship. The third hypothesis (H3), related to career horizon, was not supported due to the lack of statistical significance (p> 0.1). The fourth hypothesis (H4), associated with the length of the CEO's tenure, was supported, as it had a positive and significant effect in the industrial sector. As for the fifth hypothesis (H5), the results were contrary to expectations: company size had a positive and significant impact on risk, rather than the assumed negative relationship. The same was true for the sixth hypothesis (H6), as book-to-market value was positively and significantly associated with risk, contrary to the hypothesis's prediction. As for the control variables, dual position had no significant effect (p > 0.1), and the impact on return on equity was not consistently observed (p > 0.1). These results reflect that firm characteristics within the industry, such as size and book value, are the most influential determinants of risk, even if the trend differs from theoretical expectations.

The coefficient of determination (R^2) for the first model was 0.3133, accounting for approximately 31.3% of the variance in risk attributable to company and manager characteristics. In the second model, after adding control variables, $R^2 = 0.3167$, indicating an increase in explanatory power to 31.7%. This means that the effect of controls in the industrial sector is very weak, and the explanation of risk remains primarily dependent on company size and the book-to-market ratio.

The regression results for the services sector, presented in Table 8, indicate that the first hypothesis (H1) was not supported, as CEO age had no significant effect on risk (p> 0.1). Despite its negative impact, it was not substantial in the economic context. The second hypothesis (H2) was also not supported, as education was positively and significantly associated with risk, rather than the expected negative association. The third hypothesis (H3) was also not supported, as career horizon had no significant effect (p > 0.1). In contrast, the fourth hypothesis (H4) was supported

(in the second model after introducing the control variables), as it was found that the CEO's tenure was positively and significantly related to risk, confirming that the length of time in office increases the CEO's influence on risk-taking decisions. The fifth hypothesis (H5) was not supported, as the company's size had no significant effect on risk in the services sector. Regarding the sixth hypothesis (H6), the results showed a positive and significant relationship between book-to-market value and risk, contrary to expectations that a negative relationship was assumed. Regarding the control variables, duality had a positive, albeit weak, effect, whereas return on equity (ROE) had a positive and significant impact on risk. This is consistent with economic theory: the higher the level of profits, the higher the level of risk. These results indicate that risks in the services sector are more closely associated with CEO characteristics, such as education and tenure, than with the firm's own characteristics.

The coefficient of determination (R^2) for the first model was 0.3759, accounting for approximately 37.6% of the variance in risk. In the second model, after adding the control variables, $R^2 = 0.2842$, indicating a significant reduction in explanatory power.

Table 4. Regression testing results for the services sector

Variable	I	2
	FEM	PRM
BTM	0.3111**	0.2062***
LNSIZE	0.4237**	0.1097***
CEO_AGE	-0.1969	0.2281
CEO_CAR	-0.1889	0.2386
CEO_EDU	0.6317**	0.5158***
CEO_TEN	0.0191	0.0362***
ROE		1.3068***
CEO_DUA		0.2040*
C	1.1830	-17.2005
R-squared	0.3759	0.2842
F-statistic	4.0480	13.3983
Prob(F-statistic)	0.0000	0.0000
Jarque-Bera	0.9204	0.3323
Prob	0.6312	0.8469

Note: Standard errors in parentheses, ***p <0.0I, **p <0.05, *p <0.I.

5.6 Residuals check

In order to verify the assumption of normal distribution of the residuals of the models, the Jarque-Bera test was applied to the models shown in Tables (6-7-8) before and after introducing the control variables. The results showed that the probability value of the test was all greater than 5%, which means accepting the null hypothesis that states that the residuals follow the normal distribution and that there are no problems related to skewness or kurtosis in the distribution.

5.7 Residual stationarity

Table 10 reports that the stationarity tests of the model residuals indicate stationarity at the level (p-values of 0.000 in all tests), indicating that the estimated panel models do not exhibit non-stationarity in the errors. It means the validity of the probabilistic inference (Statistical values and their probabilities) and that inappropriate temporal characteristics do not confound it. This diagnostic step is essential before moving on to the robustness test.

5.8 Autocorrelation of residuals

The results in Table 9 show that none of the models exhibited autocorrelation in the residuals, with the test statistics being insignificant. This suggests that the errors are independent over time; therefore, the regression coefficient estimates are unbiased.

5.9 Robustness test

To ensure the robustness of the results, the traditional regression method used to test the hypotheses presented in Table 6 was replaced with the Robust Least Squares (RLS) test, as shown in Table 11. This process aims to address potential limitations, outliers, and heteroscedasticity, which could weaken the reliability of estimates in standard models.

The results in Table 11 indicate that the trends in the coefficients of the independent variables are consistent with those in Table 6. The key variables (such as education, firm size, book-to-market value, and CEO tenure) remained statistically significant and in the same direction. The coefficients of determination (R^2) also remained at acceptable levels, indicating that the models retain their explanatory power despite changes in the estimation methodology. This consistency between the results from the two tables enhances the robustness of the findings. It indicates that they are not merely a reflection of the estimation method, but rather the result of a genuine relationship among firms' characteristics, executives' characteristics, and risk levels.

Table 5. Autocorrelation tests for residuals

Model	Pesaran CD	
	Statistic	Prob.
Full Sample 1	1.166	0.244
Full Sample 2	1.007	0.314
Industrial Sectors 1	1.275	0.202
Industrial Sectors 2	1.294	0.196
Service Sectors 1	-0.947	0.343
Service Sectors 2	-0.709	0.479

Table 10. Residuals stationarity test

Model	PP - Fisher Chi-square		ADF - Fisher Chi-square		Levin, Lin & Chu t		Decision
	Statistic	Prob.**	Statistic	Prob.**	Statistic	Prob.**	
Full Sample 1	340.605	0.000	223.557	0.000	-24.435	0.000	stationary
Full Sample 2	351.569	0.000	229.126	0.000	-29.894	0.000	stationary
Industrial Sectors 1	139.740	0.000	87.080	0.002	-9.003	0.000	stationary
Industrial Sectors 2	143.999	0.000	85.812	0.002	-8.649	0.000	stationary
Service Sectors 1	201.428	0.000	140.905	0.000	-28.818	0.000	stationary
Service Sectors 2	214.490	0.000	137.753	0.000	-30.841	0.000	stationary

Table 6. Robustness test results

	1	2
Variable	RLS	RLS
BTM	0.1653***	0.1721***
LNSIZE	0.1672***	0.1521***
CEO_AGE	0.0032	0.0021
CEO_CAR	0.0148	0.0156
CEO_EDU	0.5347***	0.5163***
CEO_TEN	0.0419***	0.0368***
CEO_DUA		0.1981**
ROE		0.5485*
C	-5.3574***	-5.0830***
R-squared	0.2229	0.2346
Rn-squared statistic	193.3970	204.4966
Prob (R-squared stat.)	0.0000	0.0000
Jarque-Bera	5.2097	3.5020
Prob	0.0739	0.1736

Note: Standard errors in parentheses, ***p <0.01, **p <0.05, *p <0.1.

The robustness test results showed the same trend as in Table 6, with slight differences in values. This indicates that the relationships are stable and are not the result of the estimation method alone, but rather reflect a true relationship between the studied characteristics and the level of risk.

6. Discussion

Previous Studies that underpinned the present research identified the firm's traits and CEOs' characteristics as drivers of risk disclosure (Al-Mohareb et al., 2024).

Those studies also examined the effects of the risk management committee's characteristics on the performance of Jordanian companies (Kayed, 2024). Although they yielded relevant findings, the studies fell short because they relied primarily on samples drawn from specific firms and ignored the local rules applicable in Jordan (Alshehadeh et al., 2023). This introduced an actual gap arising from fewer experiments, which the studies only partially demonstrated, limited disclosure of CEOs' pays, and the rare use of tail metrics, such as Value at Risk and downside semi-variance (Toumeh, 2023). The studies could bridge this obvious gap by combining market and accounting risks to improve reliability. The studies also investigated the potential risks that the companies listed on the Amman Stock Exchange frequently encounter (AlZboon 2025). The studies used both market and accounting data to define the research focus, specifically the determinants of firms' risk and CEOs' characteristics related to financial leverage, profitability, volatility, downside risk, and distress in Jordanian companies (Malahim, 2023). The studies also discussed an integrated governance framework that integrated three theories: Agency Theory, Upper Echelons Theory, and the Resource-Based View (Alduneibat, 2023). The theories presented distinct concepts and evidence, thereby forming a coherent framework for interpreting firms' risks (Alhasanko, 2024). For instance, Agency Theory yielded accurate results that examined CEO duality, ownership, and board strength (Basalat et al., 2023). The theory clarified that CEO duality and weak boards are associated with higher risk, particularly when corporate oversight is absent (Abdeljawad & Farhood, 2025). CEO ownership and independent directors also tend to mitigate risk (Alsaad et al., 2025). In Jordan, concentrated ownership can serve as a substitute for board monitoring (Samarah, 2024). They can also provide several private benefits and manage risk (Qwader, 2024). Similarly, the Upper Echelons theory posits that top managers shape risk-taking choices (Hertrampf et al., 2025). The theory

links CEO age, gender, education, and tenure to risk probabilities (Almatarneh & Alhamdan, 2024). This indicates that younger leaders and finance-trained CEOs may pursue bolder projects, whereas longer-tenured leaders often reduce downside risk. In Jordan, culture and norms shape such consequences. Boards usually favor family ties, which means that corporate decisions are strongly influenced by internal relationships, thereby affecting the firm's reputation (Alrabadi, 2024). The Resource-Based View took a distinct direction, defining risk management as an ideal strategic resource (Guizani & Larabi, 2025). The theory treats the managerial skills and processes as resources (Kero & Bogale, 2023). This suggests that firms that build strong finance groups, data systems, and risk assessments can reduce volatility and avoid affecting business returns (Najeeb, 2024). As such, stable boards and experienced CEOs can become firm-specific assets. This view forecasts persistent differences in organizational risks across firms.

In fact, the three theories sporadically align and conflict, at times. To clarify, both Agency and Upper Echelons theories agree that powerful and younger CEOs may embrace risks. In the business context, agency theory consistently examines the widening gap between company owners and young CEOs. Owners naturally seek to maximize profits, whereas young CEOs seek job security and a stable income. Such an obvious conflict can lead to poor decisions. Upper Echelons Theory consistently argues that young CEOs' traits are the exceptional engines driving firms' trajectories. The Resource-Based View also emphasizes that innovative and energetic young leaders are better prepared to take risks. The theory also illustrates that consistent systems can reduce risks, regardless of the leadership methods and techniques employed. Agency Theory appears similar to the Resource-Based View, as it identifies leadership traits that affect risk, particularly in the context of conflicts of interest. Managers, representing agents, might also pursue risky strategies that maximize personal gains, such as higher compensation and career advancement. CEO duality is also strongly present, leading to the lowest risk levels. In parallel, CEOs with longer tenures may have entrenched interests, which can lead to risk aversion and risk-seeking behavior. Organizational outcomes that entail risks further support the Upper Echelons Theory, which posits that business risks reflect top executives' characteristics, such as age, education, and experience.

Empirical evidence indicates that CEOs with university degrees prefer conservative strategies to reduce risk. This

emphasizes an inverse correlation between CEOs' age and corporate risk, and that CEOs' demographics clearly influence strategic choice. In contrast, the Resource-Based View asserts that firms' assets, such as business reputation and organizational knowledge, serve as competitive advantages because they significantly affect the firm's capacity to manage risks. Combining prior studies and theoretical frameworks underscores that firms' traits and CEOs' characteristics are critical determinants of corporate risk. Although the study is relatively strong, it also exhibits some flaws, including contradictory findings. For instance, some research suggests that long-tenured CEOs can enhance firm performance. In contrast, others argue that CEO duality is a prominent factor that reduces risk by accelerating decision-making and coordinating communication between the board and stakeholders. In summary, addressing the study's limitations and paradoxes through diverse samples, refined methodologies, and expanded theoretical lenses would have enhanced the robustness and applicability of the research results. Such efforts could have informed Jordanian policymakers and managers, enabling them to navigate risks effectively and foster sustainable settings.

7. Conclusion

This paper investigates the primary factors influencing the risks of Jordanian firms. This is an important preluding analysis to understanding the companies' stability and performance under challenging economic conditions. By integrating established theories such as Agency Theory, Upper Echelons Theory, and the Resource-Based View, the study offers a comprehensive framework that recognizes the relationships among internal resources, managerial traits, and risk behavior. The insights derived from such an empirical review guide investor, regulators, and corporate managers seeking to mitigate risks and promote sustainable growth.

This paper precisely analyzes the impact of firms' characteristics—such as size, leverage, profitability, and liquidity—and of CEOs' attributes, including age, tenure, education, and governance structure, on business risks. By explicitly applying Agency Theory, Upper Echelons Theory, and the Resource-Based View within the contexts of Jordanian industrial and service companies, the findings enrich the existing literature and extend the theoretical debate, indicating that internal resources and managerial traits can jointly affect risk.

The study offers valuable insights that can benefit the investors, regulators, and corporate decision-makers. The results indicate that profitable and liquidity-rich firms are perceived as less risky, whereas high leverage and CEO chair duality are frequently associated with increased risk. This can guide investors toward stable investment solutions and corporate managers toward tailoring risk management strategies, strengthening internal resources, and thereby enhancing overall business practices.

8. Limitations and Future Research Directions

This research has several limitations that also provide clear guidelines for future research. To begin with, the study is limited to industrial and service companies listed on the Amman Stock Exchange during 20152023, which limits the external validity of the results and prevents the observation of long-term and industry-specific risk dynamics. It is thus recommended that future research increase the sample size to include other significant sectors, such as construction and healthcare, and conduct cross-country comparisons to enhance external validity. Second, the use of fixed-effects panel regression methods limits the analysis of dynamic risk behaviour and the potential endogeneity between firm and CEO attributes. Future studies should use more sophisticated econometric techniques, including dynamic panel models and System GMM, to enhance causal inference. Lastly, although the study's theoretical approach incorporates several perspectives, the relationship among governance mechanisms, the institutional environment, and leadership qualities remains under-researched. Future studies can fill this gap by including qualitative studies and further studies of the behavioral characteristics of CEOs, namely risk appetite, ethical orientation, and emotional intelligence, to offer a more detailed picture of corporate risk formation in emerging markets.

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