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## CEO Overconfidence and Corporate Risk and Performance

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### ABSTRACT

*This study examines how CEO overconfidence is related to corporate risk and performance. A sample of 74 Jordanian-listed companies, listed on Amman Stock Exchange, from both the industrial and service sectors in the period from 2009–2022, is employed. CEO overconfidence was measured by developing an index consisting of five variables related to CEO characteristics. The confidence level which is employed in this study, considers CEO gender, age, qualifications, experience and compensation. Our panel regression, which performed using the Feasible Generalized Least Square method, reveals that more confident CEOs take higher risks measured by financial risk and the volatility in the accounting profit. Corporate performance found by return on assets and return on equity is also positively and significantly affected by CEO overconfidence, indicating that more confident CEOs are value enhancing for their companies. These results imply that CEO overconfidence should be considered when analyzing determinants of corporate risk and performance. Further, the findings of this study are all in line with the hubris hypothesis and upper echelons theory arguments. Our findings are robust using alternative measures for CEO overconfidence, risk, and performance. Testing an important psychological bias, such as overconfidence, has significant implications for academics, investors, and policymakers.*

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## INTRODUCTION

Overconfidence is probably one of the most significant psychological biases studied in the finance, psychology, and strategic management literature. Overconfidence, according to psychologists, leads people to exaggerate their control over events, underrate risks, and overestimate their knowledge (Deshmukh et al., 2018). Another common term is hubris, which is frequently used interchangeably with overconfidence. Hubris, according to Hiller and Hambrick (2005, p. 6), is the same idea as overconfidence and has been defined as "exaggerated self-confidence". Prior studies provide evidence that executives, particularly in positions of power, are more likely to be overconfident, probably because their powerful positions. Thus, overconfidence is common for CEOs and executives in senior positions. CEOs who are overconfident commonly overestimate the success of their business decisions, under-estimate risk in investment

decisions and other financial signals, and place an excessive emphasis on one's own abilities rather than those of external causes in explaining the success of their companies (Deshmukh et al., 2018).

Overconfidence can indeed explain business decisions and CEO strategy (Gurdgiev and Ni, 2023). In this regard, empirical evidence has provided conflicting findings. Several papers indicate that overconfident CEOs positively affect firms' outcomes', see for example I. Vitanova (2019) and T. Reyes et al. (2022), among others. These studies focus on how overconfident CEOs are more efficient in making decisions and sending important positive signals inside and outside their companies. However, this overconfidence may have a negative effect due to overestimating corporate expected revenues or underestimating risk leading to corporate failure (Ho et al., 2016). This debate in the literature calls for more investigation into how CEO overconfidence may affect corporate outcomes.

Chief Executive Officers are thought to be highly prone to personality overconfidence, according to research in the fields of strategic management, finance, and psychology. One probable reason is that these personality traits, which include high degrees of external self-confidence, enthusiasm, and a strong ambition to achieve prestige, enable such people to advance to influential positions inside organizations and subsequently become important decision-makers (Lubit, 2002). In light of this, it is crucial to examine the role that CEO overconfidence plays in determining corporate investment decisions in order to fully comprehend the causes of ineffective corporate strategic investment decisions that lead to numerous corporate investment defaults and bankruptcies. Further, the debate in the literature on whether CEO overconfidence positively or negatively affects corporate outcomes serves as an important motivation to conduct the current study. Further, risk and performance are two important indicators not only for corporate managers but also for all stakeholders. Prior literature indicates that CEO overconfidence is a key factor in understanding corporate outcomes. Thus, the current study addresses the following research question "Does CEO overconfidence impact the firm risk and performance?".

The primary goal of this work is to investigate how CEO overconfidence is associated to corporate risk and performance. The current study adds to the literature in several ways, First, to the best of our knowledge, this is one of a few papers investigating the effect of CEO overconfidence on firm outcomes in Jordan. Amman Stock Exchange (ASE) is considered one of the most important markets in the region with a market capitalization of 18 billion JOD as in 2022, with foreign investors owning 48.1% of the listed shares (CEIC, 2023). Thus, studies considering the Jordanian market can be extremely valuable to market participants not only in Jordan but also in other developing countries, particularly, those in the Middle East and the Arab regions where all have the same institutional and cultural characteristics.

Second, most of the available evidence in the literature has focused on overconfidence with respect to corporate performance (Vitanova, 2019; Reyes et al., 2022) while how CEO overconfidence affect corporate risk is rarely examined (Li and Tang, 2010). Given that risk-taking is essential to decision-making and has the most important effects on the success and survival of businesses. Thus, this study offers important empirical evidence that enhances our understanding of these relationships. Finally, this study includes two of the largest sectors in the Amman stock exchange, i.e., industrial and service sectors with a final sample of 1,036 yearly observations covering the period from 2009–2022.

This paper is organized as follows. Following this introduction, the related literature and the hypotheses developed are presented in Section 2. Data and samples, re-search methods and models are available in Section 3. In addition, Section 4 summarizes the findings and subsequent discussions, while the final part concludes the study.

## 1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Prior publications have discussed CEO overconfidence from different theoretical perspectives, particularly, theories in psychology, finance and management. For instance, in psychology, the "better-than-average" hypothesis offers an explanation of how the decision-making processes of firms are significantly impacted by the psychological biases of companies' executives, wherein people display irrational optimism (Larwood and Whittaker, 1977). In the finance literature, R. Roll (1985) has developed the hubris

hypothesis. This hypothesis suggests that hubris influences how CEOs assess contextual cues, and as a result, it ought to affect the strategic decisions they make for their companies (Camerer and Lovallo, 1999).

Another important theory known as the upper echelons' theory that was proposed by D. Hambrick and P. Mason (1984). Simply, this theory is founded on the idea of bounded rationality, which alludes to restrictions on how humans can access, process, and use information (Holmes et al., 2011). Thus, the cognitive underpinnings and personality characteristics of CEOs influence the scope of their vision (i.e., the focus of their attention), perception (i.e., what they observe), and interpretation (i.e., how they perceive things). CEO overconfidence, therefore, can influence the firm's outcomes and strategies (Ho et al., 2016). The empirical evidence offers mixed and inconsistent results, in this regard.

CEO overconfidence can positively influence the firm's outcome for several reasons. First of all, Overconfident executives tend to adopt most decisions independently because they think that others in the organization are not able to make quality decisions as well as they do (Owen and Davidson, 2009). Second, over-confident CEOs frequently draw other executives with similar values and ideas, resulting in centralized decisions. Because of this, less coordination and communication efforts are required, resulting in a more efficient decision-making process (Alonso et al., 2008). Third, according to I. Vitanova (2019), overconfident CEOs have valuable signals, both for inside and outside the company. Internally, employee commitment is increased by the CEO's overconfidence since it boosts their belief in the company's perseverance in achieving its strategic direction. The external signal is also important, as overconfident CEOs usually acquire funds easily and at a lower cost (Dai et al., 2017). CEOs could encourage their company's competitive advantage by strongly convincing competitors that their company's quality is higher than it truly is, gaining more support from resource providers in the process (Owen and Davidson, 2009).

Empirically, T. Reyes et al., (2022) report evidence on the positive influence of over-confidence on firm performance using a sample from the US between 1992 and 2015. In their 2019 analysis of companies listed on the Bombay Stock Exchange between 2000 and 2015, H. Mundi and P. Kaur also noted that executive overconfidence has a sizable positive impact on firm value. Z. Li and Y. Zhang (2022) provide evidence from the Chinese market that CEO overconfidence can enhance corporate innovation. Another recent study by M. Salehi et al. (2022), examines the impact of corporate managers' and auditors' narcissism on company performance and management team stability. The findings reveal that the relative business performance and the narcissism of managers and auditors have a positive and significant correlation.

From another perspective, overconfidence may negatively affect a firm's outcome. Overconfident CEOs frequently overestimate future revenues and positive states; thus, their estimations are more likely to be inaccurate and have such an optimistic bias (Ho et al., 2016). M. Salehi et al., (2022) employ a sample consisting of 150 companies and examine how different managerial attributes such as managerial entrenchment, managerial myopia, and managerial overconfidence are related to corporate risk. The reported results indicate that overconfidence is negatively related to corporate risk-taking. According to the aforementioned discussion, we expect that CEO over-confidence is positively associated with firm performance, leading us to the following hypothesis:

*H1: CEO overconfidence has a significant and positive relationship with firm performance.*

Building on the above-mentioned theories, overconfidence also affects corporate risk-taking decisions. Scholars offer several reasons explaining this effect, for instance, CEOs who are overconfident often overestimate their own capacity for problem-solving. Thus, this could cause the CEO to overstate the advantages of a particular strategic choice (Camerer and Lovallo, 1999). Moreover, an overconfident CEO has a tendency to overestimate the firm's resource endowment while underestimating the resources needed to carry out strategic projects, resulting in higher optimism regarding the success of risky strategic initiatives (Shane and Stuart, 2002). Additionally, overconfidence may also cause CEOs to underestimate risks in their working environment. In this regard, overconfident CEOs think they know more than is actually the case and believe that their own information is more valuable than any other source. Thus, overconfident CEOs tend to be greater risk-takers in their strategic decisions and even affect the decisions of top executives as well (Li and Tang, 2010).

Managerial overconfidence has a positive and considerable impact on leverage, according to C. Park and H. Kim's (2009) observations of companies listed on the Korean market during 1985 and 2007.

According to D. Hirshleifer et al., (2012), companies in the US with overconfident executives who invest in more innovative initiatives, have a higher number of patents, and have greater R&D expenditures.

Aabo et al. (2020) employed a sample from large US non-financial companies for the period 2007–2016 and reported a positive association between company risk and CEO overconfidence. Another recent study by W. Zhong and W. Yan (2022), applied using Chinese-Listed Firms in the period from 2009–2019, shows that CFOs positively and significantly increase financial risk. However, A. Batool et al. (2021) used an electronic Questionnaire directed to the top managers in Pakistani companies and report an inverse relationship between risk perception and overconfidence. In this study we propose the following hypothesis:

*H2: CEO overconfidence has a significant and positive relationship with firm risk.*

This study aims to test how CEO overconfidence is associated with corporate risk and performance using a sample from industrial and service sectors in the ASE over the period 2009–2022.

## 2. DATA AND METHODOLOGY

### 2.1 Data

The selected sample of this study included all of the listed companies in ASE. However, the financial sector was not included due to its special financial characteristics. The final sample comprised of 74 companies: 33 from the industrial sector and 41 from the service sector. The study collected data on an annual basis from 2009–2022. The main source of financial data was the website of ASE while the CEO characteristics that were used to calculate the overconfidence variable were manually gathered from the sampled companies' annual reports. Table 1 shows the descriptive statistics for all of the study variables employed in the study.

**Table 1.** Descriptive Statistics

<i>Variable</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Skewness</i>	<i>Kurtosis</i>
OC	1,036	2.518	0.917	1.000	4.000	-0.026	2.181
LEV	1,036	0.320	0.188	0.090	0.689	0.654	2.385
$\sigma$ ROA	1,036	0.041	0.032	0.009	0.106	0.963	2.631
ROE	1,036	0.045	0.084	-0.109	0.173	-0.253	2.300
ROA	1,036	0.029	0.051	-0.058	0.116	-0.020	2.220
BZE	1,036	8.222	2.358	5.000	12.000	0.186	1.856
CEO DUAL	1,036	0.471	0.499	0.000	1.000	0.118	1.014
FZE	1,036	7.492	0.434	6.834	8.273	0.214	2.156
BM	1,036	0.808	0.287	0.411	1.376	0.511	2.452
Age	1,036	34.658	15.435	16.000	62.000	0.562	2.040
Cash	1,036	0.063	0.072	-0.042	0.182	0.166	1.898

OC is CEO overconfidence, LEV is financial leverage,  $\sigma$  ROA is standard deviation of return on assets, ROE is return on equity, ROA is return on assets, BZE is board size, CEO DUAL is CEO duality, FZE is firm size, BM is book to market ratio, Age is firm age, Cash is cash holding.

From Table 1, the mean value of CEO overconfidence is around 2.5, where the minimum value is 1 and the maximum is 4. The risk measures used in this work are leverage and the standard deviation of return on assets. The mean value is 32% (0.04) for firm leverage and the standard deviation of ROA,

respectively. Regarding the performance measures, the ROE seems higher in terms of mean and maximum values which are 4.5% and 17.3%, respectively, while the mean value of ROA is 2.9% with a maximum value of 11.6%. The board size of the sampled firms, on average, has 8 directors, with the number of directors ranging from 5 to a maximum of 12. According to Table 1, around 47% of the sampled firms have duality, i.e., the CEO is the chairman. With respect to the firms' characteristics, the mean values are 7.49, 0.80, 34, and 0.06 for firm size, book-to-market ratio, firm age, and cash flows, respectively. Our statistics are quite close to several Jordanian prior studies (see Kharabsheh et al., 2019, for example).

## 2.2 Study Variables

### 2.2.1 Dependent variables

We employ two main dependent variables in this study; the first is corporate risk, measured by two variables: the first one is leverage which is a direct indicator of financial risk and calculated as total liabilities divided by total assets (Kharabsheh et al., 2019; Aabo et al., 2020). The second measure of risk is the standard deviation of return on assets using five years moving average to calculate the volatility in ROA ( $\sigma$  ROA), this variable is used as a direct indicator of a company's volatility in its accounting profit (Hoang and Phung, 2019). To examine how CEO overconfidence may affect firm performance, we use two measures of performance: ROA, which is the re-turn on assets calculated as the net income divided by total assets, while the second is ROE, which is the return on equity calculated as the net income divided by total equity. Both ROA and ROE are metrics used to assess a company's capacity to generate profits from the assets or equity that have been invested in it or the efficiency with which its resources have been employed (Lan et al., 2017).

### 2.2.2 CEO Overconfidence

Following prior literature, the common used measure for overconfidence is related to the exercise of stock options held by managers. However, in Jordan this data is not available, thus due to this limitation, we follow Zhong and Yan (2022) and adopt personal characteristics as a substitute to measure CEO overconfidence. The following equation is used to measure the confidence level of the CEO.

$$\text{Confidence Level} = \text{Gender} + \text{Age} + \text{Degree} + \text{Financial Background} + \text{Wage} \dots (1)$$

The personal characteristics used in the above equation are expected to affect the level of CEO confidence; for instance, males are more likely than females to display overconfidence. Thus, gender in equation (1) takes the value 1 if the CEO is male and zero otherwise. Compared to younger CEOs, older CEOs are more likely to exude higher confidence. Therefore, the variable age in the above equation equals one if the CEO's age is above the mean value in the sampled companies and zero otherwise. With respect to degree, this variable is assigned as one when the CEO holds a master's degree or above and zero otherwise. Experience is also an important variable that influences confidence: financial background is set to one when the CEO has financial experience, i.e. previously worked in a financial institution, and zero otherwise, regarding the CEO compensation (we use annual salary as a proxy for CEO compensation), higher compensation will mean that you are in a better position than others so it is expected that higher compensation will lead to greater confidence; thus, this variable takes one when it is above the average of CEO compensation calculated in the sampled companies and zero otherwise. Therefore, the confidence level calculated from the above equation will range from one (the least confident CEO) to five (the most confident CEO). Table 2 displays the descriptive statistics employed in the calculation of CEO overconfidence level.

Table 2 demonstrates that whereas a male representation in the sampled organizations is 98%, female representation only amounts to 2% of the observations. The CEOs' age was derived from the annual report and deducted from the year in which the current study was carried out. The average value for age was then calculated and found to be 62 years. The figures for educational background reveal that 68% of the selected companies are undergraduates while only 32% hold graduate certificates. Moreover, only 40% of sampled CEOs have financial experience and 35% receive compensation above average.

**Table 2.** Descriptive Statistics of Overconfidence Equation

<i>Variables</i>	<i>Dummies</i>	<i>Proportion</i>	<i>Frequency</i>
Gender	Female	2%	16
	Male	98%	798
Age	<62	51%	418
	≥62	49%	396
Educational degree	Undergraduate	68%	551
	Postgraduate	32%	263
Financial background	Non-Financial Institutions	60%	487
	Financial Institutions	40%	327
Wages	<107343	65%	531
	≥107343	35%	283

Source: own

Table 3 provides a summary of all the variables' definitions and measurements that were included in the analysis.

**Table 3.** Summary of Variables Definitions and Measurement

<i>Description</i>	<i>Variable name</i>	<i>Measurement</i>
<u><i>Dependent Variable:</i></u>		
Risk	LEV	Total liabilities divided by total assets
Risk	$\sigma$ ROA	The standard deviation of return on assets using five years moving average to calculate the volatility in ROA
Performance	ROE	The net income divided by total equity
Performance	ROA	The net income divided by total assets
<u><i>Independent Variables:</i></u>		
CEO Overconfidence	OC	Confidence Level = Gender + Age + Degree + Financial Background + Wage
<u><i>Control Variables</i></u>		
Firm size	FZE	Natural logarithm of total assets
CEO Duality	CEO DUAL	Dummy variable equal to 1 when the CEO is also the chairman and zero otherwise
BM Ratio	BM	book to market ratio
Firm Age	Age	Number of years since the date of incorporation
Cash holding	Cash	Cash flow from operating activities by total assets at the end of the period
Board Size	BZE	The number of directors on the board

Source: own

## 2.3 Models

Following W. Zhong and W. Yan (2022) and Reyes et al., (2022), two models were employed to study the relationship between CEO overconfidence and corporate risk and return. Model (2) is for corporate risk using leverage and the standard deviation of return on assets, while model (3) is for corporate performance using ROA and ROE, as follows:

$$\text{Risk}_{it} = \alpha_0 + \beta_1 OC_{it} + \beta_i \text{Controls}_{it} + \varepsilon_{it} \dots \quad (2)$$

Where: risk is either leverage or the standard deviation of ROA, OC is CEO overconfidence, and Controls which involve several variables such as Firm size, Board size, CEO duality, Book to Market ratio, and Firm age. All of these controls are consistent with the previous literature (Lan et al., 2017; Zhong and Yan, 2022).

$$\text{Performance}_{it} = \alpha_0 + \beta_1 OC_{it} + \beta_i \text{Controls}_{it} + \varepsilon_{it} \dots \quad (3)$$

Where: Performance is either ROA or ROE, OC is CEO overconfidence, and Controls involve a set of control variables such as Firm size, Board size, CEO duality, Book to Market ratio, and Firm age. All of these controls are in line with most of the previous literature (Lan et al., 2017; Zhong and Yan, 2022; Reyes et al., 2022).

### 3. RESULTS AND DISCUSSION

Before moving to the main results of this paper, several tests were performed before moving to the main analysis; these tests include Pearson Correlation, Autocorrelation and Heteroscedasticity in addition to the unit root test.

#### 3.1 Pearson Correlation Test

**Table 4.** Pearson Correlation Test

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	VIF
(1) OC	1.000							1.090
(2) FZE	0.196	1.000						1.370
(3) BZE	0.194	0.423	1.000					1.320
(4) CEO DUAL	0.130	0.079	0.184	1.000				1.060
(5) BM	-0.233	-0.414	-0.330	-0.163	1.000			1.760
(6) Age	0.124	0.200	0.276	0.115	<b>-0.508</b>	1.000		1.090
(7) Cash	0.132	0.159	0.133	0.048	-0.360	0.176	1.000	1.150

OC is CEO overconfidence, BZE is board size, CEO DUAL is CEO duality, FZE is firm size, BM is book to market ratio, Age is firm age, Cash is cash holding.

Source: own

All of the figures in Table 4 indicate the Pearson correlation between independent variables in this study. Preparing a correlation matrix is essential to detect multicollinearity problems. The highest value in Table 4 is 50% between firm age and BM. According to Gujarati (2021), when the detected correlation between independent variables is less than 80%, the dataset is considered free from multicollinearity issues. The variance inflation factor (VIF) also confirms that multicollinearity is not an issue in our dataset; the values of VIF are small and far from 10.

#### 3.2 Autocorrelation and Heteroscedasticity Tests

Panel A in Table 5 presents the autocorrelation test, whereas panel B presents the heteroscedasticity test. The presence of autocorrelation and heteroscedasticity might lead to confusing results. The findings of the Wooldridge test, in panel A, confirm the presence of an autocorrelation problem in all the regression models except for ROE. Moreover, in panel B, the results of the Wald Test suggest the presence of heteroscedasticity in all of the study models, which could frequently lead to understating the coefficient estimate and occasionally causes insignificant variables to appear significant (Hair et al., 2010).

**Table 5.** Autocorrelation and Heteroscedasticity Tests

<i>Panel A: Test of Autocorrelation</i>		
<i>Model</i>	<i>F</i>	<i>Prob.</i>
LEV	184.232	0.0000
$\sigma$ ROA	69.121	0.0000
ROE	0.919	0.3408
ROA	64.988	0.0000
<i>Panel B: Test of Heteroscedasticity</i>		
<i>Model</i>	<i>Wald Test</i>	<i>Prob.</i>
LEV	88502.05	0.0000
$\sigma$ ROA	8.4e+05	0.0000
ROE	2.6e+05	0.0000
ROA	1.3e+06	0.0000

Source. own

### 3.3 Unit Root Test

An important test called LLC (Levin-Lin-Chu), suggested by Levin et al., (2002), is employed to test the stationarity of time series in this analysis. If the time series is not stationary at the level, the differences are regarded as either the first or second differences. Table 6 shows that all of the variables included in the analysis are stationary at the level and statistically significant, except for board size and company cash holding, where these two variables are found to be stationary at the first difference. Thus, based on all of the pre-test analyses, this study selects the Feasible Generalized Least Square (FGLS) method to analyze the models adopted. FGLS is able to deal with both heteroscedasticity and serial correlation problems in the analysis.

**Table 6.** Unit Root Test

<i>Variables</i>	<i>T-Statistic</i>	<i>P-Value</i>	<i>Result</i>
OC	-26.9422	0.0000	Stationary at Level
LEV	-6.1590	0.0000	Stationary at Level
$\sigma$ ROA	-25.5345	0.0000	Stationary at Level
ROE	019.3172	0.0000	Stationary at Level
ROA	-13.9176	0.0000	Stationary at Level
FZE	-18.5509	0.0000	Stationary at Level
BZE	-7.5872	0.0000	Stationary at 1st difference
CEO DUAL	-4.2447	0.0000	Stationary at Level
BM	-22.5024	0.0000	Stationary at Level
Age	-10.7405	0.0000	Stationary at Level
Cash	-12.0096	0.0000	Stationary at 1st difference

OC is CEO overconfidence, LEV is financial leverage,  $\sigma$  ROA is standard deviation of return on assets, ROE is return on equity, ROA is return on assets, BZE is board size, CEO DUAL is CEO duality, FZE is firm size, BM is book to market ratio, Age is firm age, Cash is cash holding.



### 3.4 Discussion Results

Table 7 displays the findings of model 2, which tests the relationship between CEO overconfidence and risk. In the first column in Table 7, the results under corporate financial risk were measured by leverage, while in the second column, the dependent variable is the volatility in the ROA as an indicator of volatility in accounting profit. Under both measures, a positive and significant relationship is found between CEO overconfidence and risk measures. This indicates that CEOs who are more confident take higher risks. The positive relationship observed in Table 7 is consistent with arguments of the upper echelons' theory (Hambrick & Mason, 1984). This theory explains the overconfident CEO's behaviour toward corporate risk, since those CEOs often overestimate their ability to solve problems. In this regard, due to this misconception, the CEO could overstate the advantages of a particular strategic choice, as seen in Camerer and Lovo (1999).

Additionally, an overconfident CEO has a tendency to underestimate the amount of resources needed to carry out important projects. Thus, CEO overconfidence encourages optimism regarding the success of risky strategic initiatives (Shane and Stuart, 2002). The positive relationship between CEO overconfidence and corporate risk is consistent with the hubris hypothesis (Roll, 1985). In this respect, CEOs who are more confident tend to underestimate uncertainties in their working environments, assuming that they have better knowledge and information than others (Hiller & Hambrick, 2005). Taken together, the reasons mentioned above explain theoretically how confidence may lead to higher risk. Our findings are in line with several previous studies (Park and Kim, 2009; Hirshleifer et al., 2012; Aabo et al., 2020, Zhong and Yan, 2022).

For the control variables in Table 7, a positive and significant relationship is found between firm size and risk, indicating that larger firms take higher risks. This positive relationship is similar to the results reported by Sheikh (2019) and Zhong and Yan (2022). Board size is positively but insignificantly related to both risk measures. CEO duality is negatively and significantly related to both risk measures. Book to market ratio, firm age, and cash holding are strongly and positively correlated with both risk indicators. These findings are consistent with previous studies, see Sheikh (2019) and Zhong and Yan (2022), for example.

**Table 7.** CEO Overconfidence and Risk Regression Results

Independent Variables	Dependent Variable: Risk			
	Leverage		σ ROA	
	Coefficient	(p-value)	Coefficient	(p-value)
C	-1.605	0.000***	0.110	0.000***
OC	0.0201	0.000***	0.001	0.032**
FZE	0.2110	0.000***	-0.014	0.000***
BZE	0.005	0.979	0.008	0.806
CEODUAL	-0.039	0.000***	-0.004	0.007***
BM	0.292	0.000***	0.031	0.000***
Age	0.002	0.000***	0.004	0.000***
Cash	0.235	0.020**	0.204	0.010**
Adjusted R <sup>2</sup>	22%		15%	
F-test (p-value)	577.79 (0.000)		295.50 (0.000)	
Number of Groups	74		74	
Number of Time Periods	14		14	
Number of observations	1,036		1,036	

OC is CEO overconfidence, LEV is financial leverage, σ ROA is standard deviation of return on assets, BZE is board size, CEO DUAL is CEO duality, FZE is firm size, BM is book to market ratio, Age is firm age, Cash is cash holding.

Source: own

**Table 8.** CEO overconfidence and Performance Regression Results

Independent Variables	Dependent Variable: Performance			
	ROA		ROE	
	Coefficient	(p-value)	Coefficient	(p-value)
C	-0.187	0.000***	-0.463	0.000***
OC	0.024	0.000***	0.027	0.000***
FZE	0.033	0.000***	0.060	0.000***
BZE	0.001	0.772	0.005	0.890
CEODUAL	-0.039	0.000***	-0.004	0.057*
BM	0.186	0.000***	0.031	0.000***
Age	0.003	0.001***	0.006	0.000***
Cash	0.011	0.438	0.154	0.341
<b>Adjusted R<sup>2</sup></b>	<b>31%</b>		<b>25%</b>	
F-test (p-value)	583.00 (0.000)		743.85 (0.000)	
Number of Groups	74		74	
Number of Time Periods	14		14	
Number of observations	1,036		1,036	

Source: own

Table 8 reports the results of model 3, which examines the relationship between CEO overconfidence and corporate performance. Corporate performance is measured by two variables: ROA and ROE, respectively, as shown in Table 8. The findings show a strong positive and significant association between CEO overconfidence and corporate performance under two measures.

More confident CEOs positively enhance corporate performance. This positive association is backed by arguments of the upper echelons' theory and hubris hypothesis (Hambrick and Mason, 1984; Roll, 1985). According to these arguments, more confident CEOs believe that they have better information and abilities than others, which enables them to take all decisions on their own (Owen and Davidson, 2009). Moreover, overconfident CEOs can positively improve firm performance because they make most decisions efficiently as they need less effort for coordination (Alonso et al., 2008). Most importantly, the positive signals that overconfident CEOs send either internally or externally, play an important role in improving corporate performance (Vitanova, 2019). Our results are consistent with several prior works, e.g., Reyes et al., (2022), among others.

The results on the control variables, in Table 8, are in line with previous research. For instance, larger firms achieve better performance. However, board size has an insignificant relationship with the two performance measures. Duality has a negative significant effect on corporate performance. Both book-to-market ratio and firm age are positively and significantly related to performance. The corporate cash holding, however, has a positive coefficient but is insignificant. These findings are similar to several previous studies (Lan et al., 2017; Zhong and Yan, 2022).

### 3.5 Robustness Check

#### 3.5.1 Alternative Measures of Risk and Performance

We repeat our analysis using different measures for risk and performance. Tobin's Q is used as a market-based proxy for performance and it is calculated as the ratio of the market value of equity and the book value of total liabilities divided by the book value of total assets (Anderson and Gupta 2009). Our risk

measure is the standard deviation of the monthly stock return for the past 12 months (Yu et al., 2022). Table 9 displays the results which confirm our previous findings. CEO overconfidence is still positive and significant under performance and risk measures.

### 3.5.2 Alternative measure of CEO overconfidence

In this section we repeat the analysis using an alternative measure of overconfidence. Equation (1) is used again, but the main variable is treated differently, if the calculated confidence level is no less than four then the OC i.e. overconfidence variable will take 1, and zero otherwise (Zhong and Yan, 2022). The results are quite similar to those reported in the above tables which confirm our main results. To save space we do not report these findings here.

**Table 9.** Alternative Measures of Risk and Performance

Independent Variables	Dependent Variables			
	TQ		$\sigma Ri$	
	Coefficient	(p-value)	Coefficient	(p-value)
C	-0.575	0.000***	0.190	0.000***
OC	0.0201	0.000***	0.057	0.002***
FZE	0.185	0.000***	-0.005	0.048**
BZE	0.008	0.741	0.002	0.910
CEODUAL	-0.028	0.000***	-0.008	0.032**
BM	0.315	0.000***	0.074	0.006***
Age	0.090	0.000***	0.010	0.007***
Cash	0.050	0.000**	0.206	0.040**
Adjusted R <sup>2</sup>	26%		17%	
F-test (p-value)	785.01 (0.000)		298.12 (0.000)	
Number of Groups	74		74	
Number of Time Periods	14		14	
Number of observations	1,036		1,036	

OC is CEO overconfidence, TQ is Tobin's  $Q$ ,  $\sigma Ri$  is the standard deviation of monthly stock return ( past 12 months) , BZE is board size, CEO DUAL is CEO duality, FZE is firm size, BM is book to market ratio, Age is firm age, Cash is cash holding.

Source: own

## CONCLUSION

This study investigates how CEO overconfidence is related to corporate outcomes. More specifically, this study shows how the confidence of the CEO affects corporate risk and performance using a large dataset of all of the Jordanian industrial and service firms that are listed in ASE during the period 2009–2022.

The outcomes of this work reveal a positive and significant effect of CEO overconfidence on corporate risk measured by financial risk and the volatility in the accounting profit. Furthermore, CEO overconfidence also has a positive and significant influence on corporate performance using ROA and ROE as proxies for corporate performance. These findings indicate that more confident CEOs are value enhancing for their companies. Thus, our research emphasizes the benefits of CEO overconfidence and its consequences on corporate outcomes.

The findings of this study therefore could have important implications for researchers, policymakers, investors, shareholders, and even corporate CEOs. For instance, considering these findings, researchers are advised to consider CEO overconfidence when analyzing determinants of corporate risk and performance. Overconfidence is also recommended to be considered for senior positions since it can determine the success or the failure of their companies. Furthermore, investors are advised to consider psychological biases e.g. overconfidence, prior to making an investment choice because it has an impact on all corporate outcomes.

Future studies searching for other proxies to calculate overconfidence, interviews, and questionnaires could be other possible instruments to evaluate CEO overconfidence. CEO overconfidence might also be linked to other important indicators such as investment decisions and capital structure.

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