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The Impact of CEO's Overconfidence on Operational Risks of Listed Companies in Vietnam

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Abstract. The study examines the impact of CEO overconfidence on the business risks of listed companies in Vietnam during the period 2012-2022. The author utilizes two measures of overconfidence: one based on excess cash flow and the other on excess earnings, as well as two measures related to revenue management and cost management. Additionally, the study considers the moderating roles of ownership structure, income diversity, and stock market growth in influencing CEO overconfidence. The results indicate that overconfidence, driven by cash flow or earnings, tends to increase business risks. In contrast, overconfidence related to earnings management reduces risks, likely due to the involvement of multiple stakeholders in monitoring the behavior of listed companies. Furthermore, the findings reveal that the interaction effects of overconfidence can be both positive and negative. These results provide valuable implications for controlling CEO overconfidence to mitigate operational risks for businesses.

Keywords. CEO overconfidence; operational risk and listed companies in Vietnam

1. Introduction

Research on corporate performance and operational risk has traditionally been approached from a financial perspective. However, behavioral finance research examining the impact of CEO overconfidence on firm performance and risk remains scarce and often controversial. Existing studies predominantly explore the influence of CEOs on business performance Bilicka [1] or corporate risk Kim et al [2], focusing on conventional measures, with mixed results. In Vietnam, recent studies Truong Dinh Bao Long [3] have primarily adopted the measures proposed by Malmendier and Tate [4] to assess the impact of CEO overconfidence on investment, financing policies, and company debt.

According to Trieu Van Huan et at [5], Vietnam's stable policies have made it a standout in the region. The country ranked 12th in the financial health rankings of 66 emerging economies (The Economist, 2020), placing it among the safer countries

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following the Covid-19 pandemic, with stable financial indicators. Furthermore, the National Assembly's ratification of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) in 2018, along with the signing of the Free Trade Agreement (EVFTA) and the Investment Protection Agreement (IPA) with the EU in 2019, created opportunities for attracting large-scale investments, fueling strong growth recovery.

While favorable business conditions create opportunities, they may also foster overconfidence, particularly among CEOs. This overconfidence, often associated with strong performance, can lead to overinvestment and misguided decisions such as unrelated diversification, increasing business risks and reducing efficiency Vu Thanh et al [6]. Previous research has largely focused on the relationship between overinvestment and operational risk, without examining the specific impact of CEO overconfidence on business performance.

2. Literature Reviews

Optimistic overconfidence, i.e. overestimation of average outcomes, is measured using options-based approaches Malmendier and Tate [7], earnings forecast-based approaches (Otto, 2014 [8]), and newspaper-based approaches Malmendier and Tate; Hirshleifer et al [9]. According to Otto, first create an indicator variable and compare it with the High Forecast, the overconfidence variable will equal 1 if a company's EPS forecast exceeds the actual EPS. Therefore, the high forecast provides a measure of a CEO's optimism about earnings. Huang and Kisgen [10] create another index, called the point estimate, which equals 1 when a company provides a point EPS forecast and equals 0 when it provides an EPS forecast within the range. Tien-Shih Hsieh et al. [11] used the Earnings Management measure as a measure for CEO overconfidence, the authors used models of: Accrual-based Earnings Management Dechow et al [12], Real Activities-based Earnings Management Cohen et al [13] and Threshold-based Earnings Management (Athanasakou et al) [14].

Operational risk is the risk of business loss due to inadequate internal processes, people, systems or external events (Klaus Böcker) [15]. Operational risk plays a key role in developing overall risk management programs that include business operations and disaster recovery planning, compliance measures, and information security. The most prominent methods used to measure operational risk include statistical risk distribution, probability, standard deviation, regression, and correlation. Many organizations rely on standard deviation from the historical mean as a measure of risk (Rachev, Stoyanov, and Fabozzi) [16]. Meanwhile, optimistic overconfidence means overestimating the average outcome, which is measured using options-based approaches (Malmendier and Tate, 2008), earnings forecast-based approaches (Huang and Kisgen, 2013; Otto, 2014), and newspaper-based approaches (Malmendier and Tate, 2008; Hirshleifer et al., 2012). Recent studies consistently show that companies with overconfident CEOs face a higher risk of failure, which means they take on more risk (Jingsi Leng et al) [17]. Which studied CEO overconfidence (measured by two measures of option and press) and the likelihood of firm failure in the UK and found that firms with overconfident CEOs faced a higher risk of failure, i.e., higher risk. The presence of overconfident CEOs led to a higher risk of bankruptcy in innovative environments, but the effect was insignificant in non-innovative environments.

Furthermore, overconfident CEOs may increase the risk of bankruptcy of firms with less conservative accounting practices.

Regarding the impact of firm size on performance, studies have yielded mixed results. Some research suggests that large firms tend to outperform smaller firms due to their ability to exploit economies of scale in transactions, which leads to higher profitability (Cuong Vu Hung et al) [18]. However, other studies indicate that larger firms may experience negative effects on performance due to inertia, bureaucracy, and other structural issues (Lin and Fu) [19].

In terms of business ownership, studies generally show a positive impact on firm performance, as ownership helps reduce agency costs by aligning the interests of decision-makers and owners (Lin and Fu). In contrast, Ping & Hsien [20] argue that business ownership does not significantly affect performance, suggesting that investors act as passive monitors, primarily concerned with short-term gains.

The debt ratio also plays a key role, influencing dividends and shareholder risk, which subsequently affects a firm's cost of capital and market value. Some studies report a positive relationship between leverage and financial performance (Dona Ganeesha et at) [21], while others highlight a negative correlation between financial performance and leverage (Umer Iqbal) [22].

Similarly, most research finds a positive relationship between liquidity and firm performance (Nguyen Ngoc Phuong Anh) [23]. Older companies tend to have more stable capital structures, greater resources, and extensive social experience, which allows them to invest more in R&D and thus improve competitiveness and firm value (Cuong Vu Hung). Conversely, younger companies often face limitations in terms of budget, experience, and market information, leading to lower competitiveness and declining performance (Liu Yilun) [24].

Industry characteristics also play a role in firm performance. Olokoyo [25] found that industry effects were not significantly related to book efficiency (ROA) but were significantly related to market efficiency (Tobin's Q), with the technology and service sectors being more efficient than other industries. Zbigniew Matyjas [26] demonstrated that industry characteristics influenced the book efficiency of Polish firms between 2007 and 2010. Similarly, Nguyen Trong Nghia [27] found that enterprises in the pharmaceutical, healthcare, information technology, and industrial production sectors performed more efficiently than those in other industries.

3. Data and Methodology

The author uses four measures of CEO overconfidence. To do this, the author regresses industry-specific and year-specific models to estimate the Over variable. For the first method, the author uses the expected operating cash flow model (Benjamin Noury et al) [28] according to the following model:

$$\mathbf{OCF_{it} = a_0 + a_1 OCF_{it-1} + a_2 AR_{it-1} + a_3 AP_{it-1} + a_4 INV_{it-1} + a_5 DEP_{it-1} + a_6 Other_{it-1} + e_{1it}} \quad \mathbf{(1)}$$

Where:

OCF_{it} is the operating cash flow in year t of company i (Operating cash flow: OCF = (EBIT + Depreciation - Tax)

OCF_{it-1} is the operating cash flow in year t-1 of company i

AR_{it-1} is the change in receivables for year t and t-1 of company i

AP_{it-1} is the change in payables for year t and t-1 of company i

INV_{it-1} is the change in inventories for year t and t-1 of company i
DEP_{it-1} is the depreciation for year t-1 of company i
$Other_{it-1}$ represents the accrual for year t-1 of company i, calculated as follows:
Other = E – (OCF + AR + INV – AP – DEP) (E=Earning)
Based on the postulate of Malmendier and Tate [29] and according to the overinvestment effect from excess cash flow (Le Ha Diem Chi and Nguyen Thi Minh Chau [30]), when company i experiences excess cash flow, it leads to overinvestment and thus overconfident behavior of the CEO, and then the residual (e_1) in the above model will have a positive value. The author uses model (1) of cross-sectional regression for each year, classified by industry group according to the standard (GICS) to find CEOs in companies with overconfidence behavior occurring when the residual (e) of the model >0 is assigned the value =1, companies with residual <0 will be assigned the value =0 (ie there is no phenomenon of CEO overconfidence). With this measurement, in this thesis, it is called the **Over1** variable.

For the second measure to calculate overconfidence behavior, instead of relying only on the difference between the announced plan number and the actual EPS achieved, the author applies the regression model through the origin (RTO) according to Hocking [31]. The proposed model is as follows:

$$\mathbf{EPS_{it}} = \overline{EPS_{it}} + \mathbf{e_{2it}} \quad \mathbf{(2)}$$

Also based on the postulate of Malmendier and Tate, the author uses regression according to equation (2) above, CEOs in companies with overconfidence behavior occur when and only when the residual (e2) of the model >0, assigned the value = 1, companies with residual <0 are assigned the value = 0. The author uses cross-sectional data to process for each year, classified by industry group. This helps to effectively evaluate both models of CEO overconfidence behavior when CEOs have cash flow or EPS expectations exceeding the average of the whole industry. This measure is very consistent with the concept of overconfidence of Alicke [32] when it is assumed that the overconfidence behavior of CEOs when they predict the results to be greater than the average or the "better-than-average" effect (Malmendier, U., & Tate. G) [33]. This measure, in this thesis, is called the **Over2** variable.

In addition, authors Cohen et al or Tien-Shih Hsieh et al argue that overconfident CEOs will try to manage earnings upward. To manage earnings upward, companies with overconfident CEOs will tend to increase cash flow from operations and reduce production costs more than companies with less confident CEOs

First, the author calculates the normal cash flow from operations by assuming that normal OCF is a linear function of revenue and changes in revenue, as follows:

$$\frac{OCF_{it}}{ASSETS_{it-1}} = k_1 \frac{1}{ASSETS_{it-1}} + k_2 \frac{SALES_{it}}{ASSETS_{it-1}} + k_3 \frac{\Delta SALES_{it}}{ASSETS_{it-1}} + \varepsilon_{3it} \quad (3)$$

In which: OCF = cash flow from operating; Asset = Total assets; Sales = Revenue

Abnormal cash flow from operations (R-OCF) = Actual OCF minus Normal OCF based on the estimated result from equation (3). In case of abnormal cash flow >0, it is coded = 1 (overconfidence exists) and otherwise =0 (no overconfidence of the CEO). R-OCF is used to measure the actual management of the company's activities related to accelerating the sales period through increasing price discounts or credit terms to be more favorable than usual. By this measure, the variable is called **Over3.**

In addition, assuming that the cost of production and business includes the total cost of goods sold, administrative costs, selling costs and other costs, the estimate of the normal cost of production and business in equation (4) is as follows:

$$\frac{PROD_{it}}{ASSETS_{it-1}} = l_1 \frac{1}{ASSETS_{it-1}} + l_2 \frac{SALES_{it}}{ASSETS_{it-1}} + l_3 \frac{\Delta SALES_{it}}{ASSETS_{it-1}} + l_4 \frac{\Delta SALES_{it-1}}{ASSEST_{it-1}} + \varepsilon_{4it} \quad (4)$$

Abnormal production costs (R-PROD) are actual production costs minus normal production costs as estimated from equation (4). Companies with abnormal production costs <0 are coded = 1 (overconfidence exists), otherwise assigned = 0 (overconfidence does not occur). Based on the actual OCF operating cash flow and the usual estimate, the business production cost, we can calculate the abnormal cash flow from operations (R-OCF), abnormal production cost (R-PROD) as a proxy for the actual management activities. By this measure, in this thesis called the **Over4** variable.

In models (1), (2), (3) and (4), the author uses cross-sectional data for each year, divided by industry group. This helps to effectively evaluate both models of CEO overconfidence behavior when CEOs have cash flow or income expectations that exceed the average of the whole industry.

Model for assessing the impact of overconfidence on operational risk:

Model 1:

$$\mathbf{Risk}_{it} = \beta_0 + \beta_1 Over1_{it} + \beta_2 FO_{it} + \beta_3 SO_{it} + \beta_4 D\text{-}income_{it} + + \beta_5 Stock\text{-}growth_{it} + \beta_6 CEO\text{-}Ownership_{it} + \beta_7 Size_{it} + \beta_8 Age_{it} + \beta_9 Growth_{it} + \beta_{10} Lev_{it} + \beta_{11} Liq_{it} + \beta_{12}(Over1*FO)it + \beta_{13}(Over1*SO)_{it} + \beta_{14}(Over1*D\text{-}income)_{it} + \beta_{15}(Over1*Stock\text{-}growth)_{it} + \beta_j \sum_{j=1}^{7} Indus_j + u_{it} \quad (7)$$

Model 2:

$$\mathbf{Risk}_{it} = \beta_0 + \beta_1 Over2_{it} + \beta_2 FO_{it} + \beta_3 SO_{it} + \beta_4 D\text{-}income_{it} + + \beta_5 Stock\text{-}growth_{it} + \beta_6 CEO\text{-}Ownership_{it} + \beta_7 Size_{it} + \beta_8 Age_{it} + \beta_9 Growth_{it} + \beta_{10} Lev_{it} + \beta_{11} Liq_{it} + \beta_{12}(Over2*FO)it + \beta_{13}(Over2*SO)_{it} + \beta_{14}(Over2*D\text{-}income)_{it} + \beta_{15}(Over2*Stock\text{-}growth)_{it} + \beta_j \sum_{j=1}^{7} Indus_j + u_{it} \quad (8)$$

Model 3:

$$\mathbf{Risk}_{it} = \beta_0 + \beta_1 Over3_{it} + \beta_2 FO_{it} + \beta_3 SO_{it} + \beta_4 D\text{-}income_{it} + + \beta_5 Stock\text{-}growth_{it} + \beta_6 CEO\text{-}Ownership_{it} + \beta_7 Size_{it} + \beta_8 Age_{it} + \beta_9 Growth_{it} + \beta_{10} Lev_{it} + \beta_{11} Liq_{it} + \beta_{12}(Over3*FO)it + \beta_{13}(Over3*SO)_{it} + \beta_{14}(Over3*D\text{-}income)_{it} + \beta_{15}(Over3*Stock\text{-}growth)_{it} + \beta_j \sum_{j=1}^{7} Indus_j + u_{it} \quad (9)$$

Model 4:

$$\mathbf{Risk}_{it} = \beta_0 + \beta_1 Over4_{it} + \beta_2 FO_{it} + \beta_3 SO_{it} + \beta_4 D\text{-}income_{it} + + \beta_5 Stock\text{-}growth_{it} + \beta_6 CEO\text{-}Ownership_{it} + \beta_7 Size_{it} + \beta_8 Age_{it} + \beta_9 Growth_{it} + \beta_{10} Lev_{it} + \beta_{11} Liq_{it} + \beta_{12}(Over4*FO)it +$$

$\beta_{13}(Over4*SO)_{it} + \beta_{14}(Over4*D\text{-}income)_{it} + \beta_{15}(Over4*Stock\text{-}growth)_{it} + \beta_j \sum_{j=1}^{7} Indus_j + u_{it}$ (10)

Operational risk in this study is calculated by the moving average of the standard deviation of ROA for 3 consecutive years. Regarding industry classification: In the research sample, the industry is divided based on the industry classification standard of GICS (built by MSCI and S&P Dow Jones Indexes). In this study, the author excludes the financial industry group, accordingly the remaining industry groups in the research sample include: (1) IT: information technology industry group (standard industry), (2) CN: industrial production, (3) YD: medical, pharmaceutical, (4) HHDV: consumer goods and services, (5) NVL: production of materials, (6) CN: industrial production, (7) TT: information and communication. Details of the variables and their calculations are detailed in Table 1 below.

Table 1. Summary of variable descriptions and calculations

Interpretation	Variable	Measure variables
Dependent variable		
Standard deviation of ROA	σ_{ROA}	Calculated by the standard deviation of the ROA index over 3 years using the continuous sliding method
Dependent variables		
+ CEO Overconfidence	Over1	Measured by operating cash flow surplus, from model (1)
+ CEO Overconfidence	Over2	Measured by the difference over the industry average EPS, from model (2)
+ CEO Overconfidence	Over3	Measured by excess abnormal operating cash flow, from model (3)
+ CEO Overconfidence	Over4	Measured by abnormal business production costs, from model (4)
Moderating variable		
+ The interaction between CEO confidence and foreign ownership	Over1*FO	Measured by the interaction variable between Over1 and foreign ownership. Examine the role of foreign ownership in CEO overconfidence behavior.
+ The interaction between CEO confidence and state ownership	Over1*SO	Measured by the interaction variable between Over1 and state ownership. Examine the role of state ownership in CEO overconfidence behavior.
+ The interaction between CEO confidence and income diversification	Over1*D-income	Measured by the interaction variable between Over1 and diversification. Examine the role of corporate income diversification on CEO overconfidence behavior.
+ The interaction between CEO confidence and foreign ownership	Over2*FO	Measured by the interaction variable between Over2 and foreign ownership. Examine the role of foreign ownership in CEO overconfidence behavior.

+ The interaction between CEO confidence and state ownership	Over2*SO	Measured by the interaction variable between Over2 and state ownership. Examine the role of state ownership in CEO overconfidence behavior.
+ The interaction between CEO confidence and income diversification	Over2*D-income	Measured by the interaction variable between Over2 and diversification. Examine the role of corporate income diversification on CEO overconfidence behavior.
+ The interaction between CEO confidence and foreign ownership	Over3*FO	Measured by the interaction variable between Over3 and foreign ownership. Examine the role of foreign ownership in CEO overconfidence behavior
+ The interaction between CEO confidence and state ownership	Over3*SO	Measured by the interaction variable between Over3 and state ownership. Examine the role of state ownership in CEO overconfidence behavior
+ The interaction between CEO confidence and income diversification	Over3*D-income	Measured by the interaction variable between Over3 and diversification. Examine the role of corporate income diversification on CEO overconfidence behavior.
+ The interaction between CEO confidence and foreign ownership	Over4*FO	Measured by the interaction variable between Over4 and foreign ownership. Examine the role of foreign ownership in CEO overconfidence behavior.
+ The interaction between CEO confidence and state ownership	Over4*SO	Measured by the interaction variable between Over4 and state ownership. Examine the role of state ownership in CEO overconfidence behavior.
+ The interaction between CEO confidence and income diversification	Over4*D-income	Measured by the interaction variable between Over4 and diversification. Examine the role of corporate income diversification on CEO overconfidence behavior.
+ The interaction between CEO confidence and stock market growth index	Over1*Stock-growth	Measured by the interaction variable between Over1 and stock growth. Examine the role of stock growth on CEO overconfidence behavior.
+ The interaction between CEO confidence and stock market growth index	Over2*Stock-growth	Measured by the interaction variable between Over2 and stock growth. Examine the role of stock growth in CEO overconfidence behavior.
+ The interaction between CEO confidence and stock market growth index	Over3*Stock-growth	Measured by the interaction variable between Over3 and stock growth. Examine the role of stock growth in CEO overconfidence behavior.
+ The interaction between CEO confidence and stock market growth index	Over4*Stock-growth	Measured by the interaction variable between Over4 and stock growth. Examine the role of stock growth on CEO overconfidence behavior.
Control variables		
+ CEO ownership	CEO-Ownership	Measured by percentage of shares owned by the CEO
+ Diversify income	D-Income	HHI = $(NON/NETOP)^2 + (NET/NETOP)^2$, NON is main income, NET is other income and NETOP is net income, NETOP = NON + NET, income diversity level is calculated by DINC = 1 – HHI (value from 0-0.5)

+ Stock market growth	Stock-growth	(Stock index year t- Stock index year t-1)/ Stock index year t-1)
+ Foreign ownership	FO	Number of foreign investors owning shares / Total shares
+ State ownership	SO	Number of state-owned shares/Total shares
+ Size	Size	Natural logarithm of total assets
+ Age	Age	Number of years in operation as of the calculation year
+ Growth	Growth	(Year t revenue minus year t-1 revenue) divided by Year t-1 revenue
+ Leverage	Lev	Total Debt/ Total Assets
+ Liquidity	Liq	Current Assets / Current Liabilities

Source: Compiled from the author

The data used in the study is in the form of balanced panel data, the author selected a sample of enterprises listed on the Ho Chi Minh City Stock Exchange and the Hanoi Stock Exchange. The data source is based on the database provided by Fiinpro (www.Fiinpro.com) and Refinitiv Eikon (formerly Thomson Reuters). Enterprise data is collected from audited financial statements or annual reports published by enterprises over the years. Data is collected annually, calculated from financial statements, annual reports, ownership reports and mandatory reports published in the period from 2012-2022.

4. Results and Discussion

Table 2. Descriptive results of variables

Variable	Obs	Medium	Standard deviation	Min	Max
σ_ROA	5.554	0,0286	0,0384	0,0001	0,5744
SO	5.554	0,2258	0,2520	0,0000	0,9927
FO	5.554	0,0988	0,1386	0,0000	0,9493
D-income	5.554	0,0902	0,1394	0,0000	0,4999
Stockgrowth	5.554	0,1086	0,2148	-0,3324	0,4781
CEO-Owner	5.554	1,6678	4,7383	0,0000	56,4800
Size	5.554	27,3888	1,5979	23,3300	33,9895
Age	5.554	9,2600	3,9700	5,0000	23,0000
Growth	5.554	0,3143	4,2667	-1,0000	244,4550
Lev	5.554	0,4757	0,2221	0,0006	1,3757
Liq	5.554	2,6573	4,6637	0,0338	146,9157

Source: Author's calculation

Table 2 shows the results of descriptive analysis of variables (excluding variables with binary values 0 and 1). The average risk value of ROA is about 2.86%. Regarding ownership structure, the average results show that state ownership accounts for 22.58%, while foreign ownership has a still low average value of 9.88%, despite the regulation allowing an increase in the foreign investor ownership ratio (Decree 60/2015/ND-CP on allowing an increase in the foreign investor ownership ratio). The level of income diversification calculated by DINC index = 1-HHI has a value from 0-0.5 (0.5 is high income diversification), with an average value of 0.09, meaning a low level of income diversification. Although diversification is a risk reduction strategy, this result also creates limitations when businesses generally focus on traditional business segments and income arising from pure business segments.

The stock index growth rate during the period had an average value of 10.86%, while the falling period caused the index to drop by -33.24%. The strong fluctuations in the stock index also caused instability in policies and financial situations for businesses. Regarding ownership ratio, the average value of CEO's stock holding is 1.67%, there are enterprises where CEO does not hold (0%), the highest percentage of CEO holding is 56.48% belonging to major shareholders with controlling power. The variables of size, age, revenue growth, leverage and liquidity have average values of 27.38; 9.26; 31.43%; 0.47 and 2.65 respectively. The deviation value and the difference between the smallest and largest values are also high. This phenomenon needs to be overcome in the quantitative results.

Table 3. Quantitative results of the impact of overconfidence on corporate operational risk

Variable	Model1	Model2	Model3	Model4
	Coefficient	Coefficient	Coefficient	Coefficient
Over1	0,0005			
Over2		0,0063(*)		
Over3			-0,0010	
Over4				-0,0091(*)
SO	-0,0196(*)	-0,0168(*)	-0,0191(*)	-0,0253(*)
Over1*SO	0,0008			
Over2*SO		-0,0053		
Over3*SO			-0,0039	
Over4*SO				0,0066
FO	0,0050	0,0198(*)	0,0028	-0,0137(**)
Over1*FO	-0,0049			
Over2*FO		-0,0385(*)		
Over3*FO			-0,0004	
Over4*FO				0,0262(*)
D-Income	-0,0050	-0,0066	-0,0124(**)	-0,0040

Over1*D-income	-0,0008			
Over2*D-income		0,0021		
Over3*D-income			0,0108(***)	
Over4*D-income				-0,0027
Stockgrowth	0,0002	-0,0058(***)	-0,0019	-0,0087(**)
Over1*Stockgrowth	-0,0051			
Over2*Stockgrowth		0,0084(***)		
Over3*Stockgrowth			-0,0005	
Over4*Stockgrowth				0,0101(**)
CEO-Owner	-0,0001	-0,0001	-0,0001	-0,0000
Size	-0,0015(*)	-0,0014(*)	-0,0015(*)	-0,0014(*)
Age	-0,0004(*)	-0,0003(*)	-0,0003(*)	-0,0004(*)
Growth	0,0006(***)	0,0006(***)	0,007(***)	0,0006(***)
Lev	-0,0273(*)	-0,0287(*)	-0,0272(*)	-0,0257(*)
Liq	0,0003	0,0003	0,0003	0,0003
BDS	0,0006	0,0003	0,0006	0,0007
CN	0,0071(***)	0,007(***)	0,0072(***)	0,0076(***)
YD	0,0077	0,0079	0,0079	0,0082
HHDV	0,0036	0,0032	0,0037	0,0039
NVL	-0,0009	-0,0013	-0,0008	-0,0005
TT	-0,0137(*)	-0,0141(*)	-0,0136(*)	-0,0139(*)
Const	0,0897(*)	0,0858(*)	0,0904(*)	0,0934(*)

Source: Author's calculation (*); (**); (***) corresponding to significance levels of 1%; 5% and 10%

Table 3 presents the results of the analysis on the influence of CEO overconfidence and other factors, including the moderating effect of overconfidence on business risk. The findings show that overconfidence driven by surplus operating cash flow (OCF) or higher earnings compared to industry forecasts amplifies business risk. When a company has an abnormal surplus of OCF and higher-than-average income, it often leads to deviant investment behavior and the acceptance of higher-risk investment projects Nguyen Trong Nghia. This aligns with previous studies Zulfiqar Ali Memon et al [34] that show CEO overconfidence increases company risk, as overconfident CEOs tend to believe they are consistently successful (Hiller & Hambrick) [35], leading to faster decision-making based on a perceived perfect understanding of situations and opportunities. Similar results are observed when overconfidence is combined with excess OCF and higher-than-average industry earnings.

However, the results are contradictory when overconfidence is related to abnormal cash flow (Over3) linked to accelerated sales through increased price discounts or more

favorable credit terms, and abnormal cost control behavior (Over4). In these cases, overconfidence (measured by Over3 and Over4) has a negative relationship with business risk, meaning it reduces business risk. While confident CEOs can easily manipulate receivables, inventories, provisions, and accruals to adjust revenue, expenses, and gross profit (Omar et al.,) [36], the transparency requirements for public companies and the involvement of multiple monitoring parties make it easier to detect abnormal deviations (Jagjeevan Kanoujiya et al) [37]. This reduces overconfidence and mitigates risks for businesses.

Regarding state ownership (SO), the results indicate a negative relationship with operational risk, meaning that increased state ownership reduces business risk. This finding contrasts with the results of previous studies Tran Thai Ha Nguyen [38] but supports research from Kelly Anh Vu et al [39], which argue that state-owned enterprises (SOEs) benefit from political connections and policy incentives that enhance operational efficiency and competitiveness. Managers believe they can mitigate external uncertainties through political connections, and state-dominated ownership structures help curb CEO overconfidence, thus reducing risk (Zulfiqar Ali Memon et al) [34]. Additionally, the relinquishment of government control, the increase in private ownership, foreign investment, and improved governance institutions are key factors influencing corporate risk-taking behavior (Boubakri et al) [40].

Foreign ownership also influences corporate operational risk, with the results showing that its impact is moderated by overconfidence. Foreign ownership appears to support CEO overconfidence when excess OCF or earnings increase operational risk (Boubakri et al), but it helps to restrain risk when overconfidence leads to earnings management (Sekar Langit et al) [41]. Foreign ownership plays a risk-moderating role for CEO overconfidence behavior, reducing risk in cases where overconfidence increases risk, and increasing risk where overconfidence reduces it, thus helping to balance efficiency and risk for the company.

The research also shows that income diversification reduces operational risk. Diversification across production, business, and investment activities provides a buffer in case one segment underperforms (Camila Adam) [42]. However, income diversification interacts with CEO overconfidence (Over3), increasing operational risk when combined with revenue management behavior. Overconfident CEOs may seek to generate unexpected revenue through diversified activities, leading to heightened risk.

Stock index growth has a risk-reducing effect on businesses. A growing stock market reflects a positive macroeconomic environment with greater business and investment opportunities, improved financial conditions, and reduced risks (Nam Hoai Tran & Le Dat Chi) [43]. Additionally, when stock indexes rise, CEOs are more likely to make timely investment decisions—buying at market lows and selling at highs—resulting in future profits (Khoa Duong Dang et al) [44]. However, the interaction results show that overconfident CEOs, combined with a growing stock market, are further encouraged in their overinvestment behavior, thereby increasing business risk (Jie Cao) [45].

5. Conclusion and Recommendation

The objective of this study is to quantitatively analyze the impact of CEO overconfidence on the operational risk of listed companies. The findings indicate that

overconfident CEOs who aim to increase efficiency also tend to elevate business risk. Conversely, overconfidence driven by earnings management, when under controlled conditions, helps to reduce risk. Additionally, income diversification, company size, and state ownership play significant roles in mitigating risk. These factors are particularly relevant for both managers and investors who seek to minimize operational risk.

Moreover, industry-specific risks reveal that the information and communication sector, along with the raw materials production industry, exhibit lower operational risks compared to other sectors. In contrast, the industrial production industry faces higher risks, largely due to the numerous external factors influencing both its input and output.

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References

[1] Bilicka K. Are financing constraints binding for investment? Evidence from a natural experiment. Journal of Economic Behavior & Organization. 2020 Sep; 177: 618–640, doi: 10.1016/j.jebo.2020.06.029
[2] Kim, J. B., Wang, Z., & Zhang, L. CEO overconfidence and stock price crash risk. Contemporary Accounting Research. 2016;33(4), 1720-1749, doi: 10.1111/1911-3846.12217
[3] Truong Dinh Bao Long, Research on overconfidence behavior of managers in financial decision making for Vietnamese enterprises. PhD thesis in economics in 2018 at Ho Chi Minh City University of Economics. 2018
[4] Malmendier, U., & Tate, G. CEO overconfidence and corporate investment. The journal of finance, 2005; 60(6), 2661-2700; doi: 10.1111/j.1540-6261.2005.00813.x
[5] Trieu Van Huan et al. Promoting foreign direct investment attraction in Vietnam, Economic and Forecast Magazine. 2021 Dec; No. 35.
[6] Vu Thanh et al., Business diversification, efficiency and risk, Ho Chi Minh City Open University Journal. 2018
[7] Malmendier, U., & Tate, G. Who makes acquisitions? CEO overconfidence and the market's reaction. Journal of financial Economics, 2008; 89(1), 20-43; doi: 10.1016/j.jfineco.2007.07.002
[8] Otto, Clemens A, CEO optimism and incentive compensation, Journal of Financial Economics, 2014; 114, 366–404; doi: 10.1016/j.jfineco.2014.06.006
[9] Hirshleifer, David, Angie Low, and Siew Hong Teoh, Are overconfident CEOs better innovators? Journal of Finance. 2012; 67, 1457–149; DOI: 10.2139/ssrn.1598021
[10] Huang, Jiekun, and Darren J. Kisgen. Gender and corporate finance: Are male executives overconfident relative to female executives? Journal of Financial Economics. 2013; 108, 822–839; doi: 10.1016/j.jfineco.2012.12.005
[11] Tien-Shih Hsieh et al, CEO Overconfidence and Earnings Management During Shifting Regulatory Regimes, Journal of Business Finance & Accounting. 2014; 00(0), 1–23, XXX 2014; DOI: 10.1111/jbfa.12089
[12] Dechow, P. M., R. G. Sloan and A. P. Sweeney. Detecting Earnings Management, The Accounting Review, 1995; 70(2): 193–225
[13] Cohen, D. A., A. Dey and T. Z. Lys. Real and Accrual-based Earnings Management in the Pre- and Post-Sarbanes-Oxley Periods. The Accounting Review. 2008 May; 83(3):757–87
[14] Athanasakou, V., N. C. Strong and M. Walker. The Market Reward for Achieving Analyst Earnings Expectatioins: Does Managing Expectations or Earnings Matter? Journal of Business Finance & Accounting. 2011; 38(1 & 2): 58–94

[15]Klaus Böcker. Modelling and Measuring Business Risk, Working paper. 2008 Sep. https://www.researchgate.net/publication/228893285
[16] Rachev, S. T., Stoyanov, S. V., & Fabozzi, F. J. Advanced stochastic models, risk assessment, and portfolio optimization: The ideal risk, uncertainty, and performance measures. Chichester, England: John Wiley & Sons. 2008.
[17] Leng J, Ozkan A, Ozkan N, Trzeciakiewicz A. CEO overconfidence and the probability of corporate failure: evidence from the United Kingdom. The European Journal of Finance. 2021 Jan; 27(12):1210-1234. DOI: 10.1080/1351847X.2021.1876131
[18] Cuong VH, Tuong PV, Binh DT. The impact of firm size on the performance of Vietnamese private enterprises: A case study. Problems and Perspectives in Management. 2021; 19(2):243-250. doi:10.21511/ppm.19 (2).2021.20
[19] Lin YR, Fu XM. Does institutional ownership influence firm performance? Evidence from China. International Review of Economics & Finance. 2017; 49: 17-57; doi: 10.1016/j.iref.2017.01.021
[20] Lee SP, Chuang TH. The determinants of corporate performance: A viewpoint from insider ownership and institutional ownership. Managerial Auditing Journal. 2009; 24(3): 233-247. DOI: 10.1108/02686900910941122
[21] Kaluarachchi DGP, Fernando AAJ, Mallawarachchi R. The Relationship between Financial Leverage and the Performance of Sri Lankan Listed Manufacturing Companies. Journal of Accounting, Finance and Auditing Studies. 2021; 7(4): 99-118; DOI: 10.32602/jafas.2021.035
[22] Iqbal U, Usman M. Impact of Financial Leverage on Firm Performance: Textile Composite Companies of Pakistan. SEISENSE Journal of Management. 2018; 1(2), 70-78; DOI: 10.33215/sjom.v1i2.13
[23] Ngoc PAN, Thi TBD. Liquidity, corporate governance and firm performance: A meta-analysis. Cogent Business & Management. 2022 Nov; 9(1): 2137960; DOI: 10.1080/23311975.2022.2137960
[24] Md. Jahidur R., Liu Y. Firm Size, Firm Age, and Firm Profitability: Evidence from China. Journal of Accounting Business and Management (JABM). 2021 April; 28(1):101-115; doi: 10.31966/jabminternational.v28i1.829
[25] Olokoyo. Capital Structure and Corporate Performance of Nigerian Quoted Firms: A Panel Data Approach. African Development Review. 2012; 25(3); DOI: 10.1111/j.1467-8268.2013.12034.x
[26] Zbigniew M. Industry and Firm Influences on Performance: Evidence from Polish Public Firms. Journal of Management Policy and Practice. 2014;15(2)
[27] Nguyen Trong Nghia. The impact of overinvestment on firm performance of Vietnam's listed companies. Journal of Science, Technology, Business, Management and Law. 2022; 6(1):
[28] Noury B, Hammami H, Ousama AA, Zeitun R. The prediction of future cash flows based on operating cash flows, earnings and accruals in the French context. Journal of Behavioral and Experimental Finance. 2020 October; 28: 100414, DOI: 10.1016/j.jbef.2020.100414
[29] Malmendier U, Tate G. CEO overconfidence and corporate investment. The journal of finance.2005 Dec; 60(6): 2661-2700; doi.org/10.1111/j.1540-6261.2005.00813.x
[30] Le HDC, Nguyen TCM. Overinvestment and Free Cash Flow: Empirical Evidence from Vietnamese Enterprises. Asian Journal of Economics and Banking. 2019 Sep; 3(2)
[31] Ronald R. Hocking (1996). Methods and Applications of Linear Models -- Regression and the Analysis of Variance. Elsevier, ISSN 0167-9473. - Vol. 26.1998, 3, p. 378-379
[32] Alicke M. D. (1985). Global self-evaluation as determined by the desirability and controllability of trait adjectives. Journal of Personality and Social Psychology, 49(6), 1621; DOI: 10.1037/0022-3514.49.6.1621
[33] Malmendier, U., & Tate, G. CEO overconfidence and corporate investment. The journal of finance. 2005; 60(6), 2661-2700; doi.org/10.1111/j.1540-6261.2005.00813.x
[34] Zulfiqar Ali Memon et al. CEO overconfidence and future firm risk in China: the moderating role of institutional investors. Chinese Management Studies ahead-of-print(ahead-of-print).2021. DOI: 10.1108/CMS-04-2019-0147
[35] Hiller, N. J., & Hambrick, D. C. Conceptualizing executive hubris: The role of (hyper-) core self-evaluations in strategic decision-making. Strategic Management Journal. 2005;26(4), 297–319; doi.org/10.1002/smj.455
[36] Omar et al.. Predicting fraudulent financial reporting using artificial neural network. Journal of Financial Crime. 2017; 24(2):362-387; DOI: 10.1108/JFC-11-2015-0061
[37] Jagjeevan Kanoujiya et al. Transparency and Disclosure and Financial Distress of Non-Financial Firms in India under Competition: Investors' Perspective. Journal of Risk and Financial Management. 2013; 16(4):217; doi.org/10.3390/jrfm16040217
[38] Tran Thai Ha Nguyen et al. State Ownership and Risk-Taking Behavior: An Empirical Approach to Get Better Profitability, Investment, and Trading Strategies for Listed Corporates in Vietnam. Economies. 2020; 8(2): 1-21, June; DOI: 10.3390/economies8020046

[39] Kelly Anh Vu et al. Board characteristics, state ownership and firm performance: Evidence from Vietnam. International Journal of Managerial and Financial Accounting. 2018;11(2):167; DOI: 10.1504/IJMFA.2019.099774
[40] Boubakri, N., Cosset, J.-C., Saffar, W. The role of state and foreign owners in the corporate risk-taking: Evidence from privatization. Journal of Financial Economics. 2013; 108 (3), 641-658; doi.org/10.1016/j.jfineco.2012.12.007
[41] Sekar Langit et al. Ownership Structure and Company's Risk-Taking Behaviour. Conference: ICBMR FEB UI 2017 At: Padang, Indonesia;2018. DOI: 10.2991/icbmr-17.2017.5
[42] Camila Adam. Evidence of Diversification and Leverage in the Performance of Brazilian and Mexican Family Businesses. Latin American Research Review. 2023; 58: 892–907; doi.org/10.1017/lar.2023.10
[43] Nam Hoai Tran and Le Dat Chi. Financial conditions and corporate investment: evidence from Vietnam, Pacific Accounting Review. 2017; 29(2):183-203; DOI: 10.1108/PAR-07-2016-0066
[44] Khoa Duong Dang et al. Herding Behavior Based on Gambling Tendency: Empirical Evidence in Vietnam Stock Market. Center for Applied Finance and Economics (CAFE);2024
[45] Jie Cao (2010), CEO Overconfidence or Stock Mispricing and Growth? Reexamining the Effect of CEO Option Exercise Behavior on Corporate Investment, 17th Conference on the Theories and Practices of Securities and Financial Markets, 2009 (posted 2010).