

Predicting the performance of companies under pressure based on CEO strength indicators using artificial neural network

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Abstract

This article identifies the relationship between the CEO's power indicators and the company's performance under-pressure in the companies listed on the Tehran Stock Exchange and adopts an Artificial Neural Network (ANN) to predict their performance. Accordingly, this paper examined the companies listed on the Tehran Stock Exchange for 10 years from 2011-2021. The regression test by SPSS 20 and 7 Eviews was used to analyze data from 135 companies. The results indicate that the efficiency and honesty of the management affect the performance of the company in the companies under pressure; however, the results did not confirm the effect of the ownership of the board members and the percentage of non-commissioned members of the board of directors on the performance of the company in the under-pressure companies.

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1 Introduction

From the point of view of management science, a financial organization or a commercial company is a set of written or unwritten contracts between owners, production agents, and customers. In other words, the presence of a business unit is based on its concluded contracts. These contracts specify the rights of each party in the company and the criteria for evaluating the performance of the parties and finally discuss the instructions for settlement and payments. In other words, the company is a network of contracts, and the parties to this contract are shareholders, employees, creditors, lenders, and consumers, each of the network agents has a relationship with each other, and management science is the regulator of these contractual relationships. The corporate governance system has addressed the management discussion as well as the principle of accountability and the rights and managers' remuneration; because the management system should be able to transform the conditions and circumstances of a company and design suitable conditions for dealings and behaviors. Many corporate governance systems have addressed the issue of managers' remuneration and encouraged them, increasing productivity and reducing agency crises through the remuneration system. In 2002, the Association of Corporate Governance System of the Australian Stock Exchange developed a corporate governance system, one of the most important aspects of which is the creation of a remuneration committee. The presence of a remuneration and encouragement system for managers is an important step to improve

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their performance and as a result accurate and timely information to shareholders. The aforementioned association believes that the presence of such a system improves the behavior of managers in large companies. This committee's tasks include a review of incentive policies, remuneration framework for managers, motivation planning, managers' retirement, and so on, and the remuneration committee is mostly composed of independent directors of the board of directors [26]. The purpose of managing economic enterprises according to modern financial paradigms is to create value for the owners. Value and value creation for owners and shareholders are done to acquire and maximize their wealth. Therefore, performance evaluation is considered one of the important issues in the management and value-creation process. The rational evaluation of performance depends on the recognition and application of financial and non-financial indicators [38]. According to the agency theory, the organization is a set of contracts. The existence of a business unit is based on its concluded contracts. These contracts can be written (such as managers' remuneration contracts, borrowing contracts, productivity remuneration contracts, etc.) or unwritten (such as unwritten work methods, remuneration plans announced by shareholders, etc.). The contract or remuneration plan between major shareholders and company managers is one of the most important of these contracts [33]. Financing strategy in companies is one of the important topics for financial and accounting scientists. One of the important goals of financing is investing in companies for greater profitability. Different financing methods include internal and external financing or a combination of these two types [21]. In the current era, due to the limitations of financial resources, especially in global trade and the narrowing of competition, the managers of economic enterprises are under increasing pressure to reduce operating costs and total costs and to choose the most affordable type of capital structure to carry out the activities of the economic enterprise to increase the value of the enterprise, timely payment of debts, continuity of activity and greater presence in the domestic and foreign markets. These pressures are usually from various groups such as shareholders, consumers, and other stakeholders to the managers of enterprises. Moreover, to achieve the aforementioned goals, the managers' strategies are to provide optimal financial resources with the lowest cost for the economic growth and development of the company's activities, increase profits and maximize the shareholders' wealth. Therefore, the main question of this research is which indicators of the CEO power are effective on the performance of under-pressure companies?

1.1 CEO Personality Characteristics

In their pioneering work, Hambrick and Mason [17] define organizational outcomes as "reflections of the values and cognitive bases of powerful actors". These powerful actors are the 'upper echelons' (executives) who wield influence over their organizations' strategic choices and effectiveness. In other words, organizations are viewed as reflections of both top executives' unique backgrounds and personalities [10]. Based on the idea that corporate strategic choices and decision outcomes can be predicted by individual managerial characteristics and idiosyncrasies, the upper echelons perspective proposes that experiences, values, and personalities of CEOs shape their interpretation of the environment, which in turn influences strategic choices and organizational effectiveness [16]. Personality psychology studies personality and its variation among individuals [22] and has been employed in the accounting and management literature. Martin Plöckinger et al. [36] review sixty studies that analyze the effect of upper echelons and/or executive characteristics on financial accounting choices. Their results suggest that top management executives, overseen by a board, exert significant influence on financial reporting decisions, supporting upper echelons theory predictions. Recent studies relate executives' behavioral traits to corporate financial policies approved by the board such as capital structure [15], financing [30], compensation packages [14], investment management style [31], and long-term firm survival [6]. The management literature further investigates which personality traits make CEOs more effective leaders. For example, Zhu and Chen [41] find that narcissistic CEOs exhibit strengths as well as weaknesses that often create considerable controversy about their leadership; Hamet and Tremblay [18] show how a CEO's narcissistic personality predicts misreporting behavior; and Chatterjee and Pollock [5], study how a narcissistic CEO affects governance structures and the acquisition of social approval benefits. Although an important personality trait, narcissism (a belief that an individual is uniquely special and entitled to praise and admiration) only characterizes an individual with respect to one angle. Studies examining only one trait, such as narcissism or hubris, likely omit other important constructs, some of which might be considered important in organizational outcomes [35]. Furthermore, personality traits (including narcissism) are difficult concepts to measure objectively in large samples. Recent studies have begun to make use of advances in content analysis techniques to understand executives' personality; however, rather than employing broader trait frameworks such as the Big Five, these studies tend to focus on discrete or binary attributes of CEOs and do not directly validate individual traits with existing psychometrics-based instruments. For example, narcissism is often estimated based on the prominence of the CEO's photograph in the company's annual report [12], the CEO's signature size in annual reports [34], the CEO's prominence in the company's press releases [41], the cash and non-cash compensation of the CEO relative to other top executives in the same company [40], and employees' subjective ratings of their CEO's personality [37]. Our study follows a stream of research that employs the Big Five personality

framework, which has emerged as the dominant taxonomy for understanding CEO personality because it provides a more holistic view of individuals' overall personalities. Our measure of risk tolerance is derived from the Big Five traits (orthogonal to one another) that portray basic underlying dimensions of personality [13] and are recognized as genetically based, relatively stable, and generalizable across cultures [7, 32]. For example, Colbert et al. [8] provide a detailed literature review on how the Big Five personality traits are theoretically associated with firm performance; Derue et al. [9] find that leaders' personality traits are often seen as either task oriented (conscientiousness, neuroticism, and openness) or interpersonally oriented (extraversion and agreeableness); and Judge et al. [22] indicate that openness to experience predicts performance in individual leadership effectiveness, that extraversion is the best personality predictor of leadership, and that high agreeableness does not contribute to success as a leader. This research stream has typically utilized Q & A sessions of conference calls (specifically, CEOs' answers to analysts' questions) as inputs for linguistic analysis [28, 29, 39]; to determine CEOs' personality traits that have been validated in a large sample setting [20].

2 Theoretical foundations and literature

2.1 Theoretical foundations

Han et al. [19] studied "the CEO power and the performance of the under-pressure company". The concentration of power is based on quick decision-making, examining the performance of companies with powerful CEOs when the industry is in bad shape and concentrated in industry stagnation indicates an external shock to the company, companies operating in competitive industries, and companies operating in specific industries by more management powers are relatively more. García-Hidalgo et al. [11] in research in Spain concluded that only ownership concentration has a positive and significant effect with the calculated Tobin's q of companies as a measure of company value.

Lin in his research on the impact of institutional ownership and company value in Taiwan, sought to find the optimal percentage threshold of institutional ownership [27]. His research was conducted on 221 Taiwanese companies from 1997 to 2006. He, who had used the simplified model of Tobin's q to determine the value of the company, reached the effect threshold of 81.2%. This means that if the institutional ownership is less than 81.2%, there will be no relationship between the institutional ownership and Tobin's q as a measure of the company's value, but when the institutional ownership is more than 81.2%, each company's one value increase in institutional ownership by 1.25%. He also believes that this increase in the value of the company is the result of the increase in the control of institutional shareholders over the company. Khansalar et al. [24] have conducted a study entitled "Structure of board of directors and company's performance". In this research, there is no positive relationship between the proportion of non-obligatory members and the company's performance and no relationship between the two variables of size and the number of women with the company's performance. Bhagat and Black have investigated the effect of board independence on the performance of Chinese companies [4]. In this research, the researcher has concluded that "companies demand more non-obligatory directors in response to the decrease in profitability." Abashi and Kordestani [1] investigated "the effect of customer focus on the company's financial performance". The effect of customer focus on company performance can be examined from two perspectives: the first perspective considers customer focus as a factor of pressure on the seller, and the second perspective considers it as a factor for increasing production coordination, inventory management, and information sharing in the supply chain. Increasing customer focus reduces sales costs and improves the company's financial performance. This research is designed to investigate the effect of customer focus on improving the company's financial performance. For this purpose, multivariate regression models have been estimated for panel data. The desired data was collected from 79 companies from 2002 to 2011. The findings show that customer focus has a positive relationship with financial performance, which is statistically significant. Therefore, increasing customer focus improves the financial performance of companies. Also, companies with high customer focus experience more optimal inventory management. The findings of this research support the importance of having major customers in the market. Abbasi and Ahmadi [2] investigated the relationship between governance and the presence of institutional investors in the board of directors and companies' value. Institutional investors, due to the ownership of a significant part of the companies' shares and their strategic role, have considerable influence in investable companies with incentives to monitor their activities. At the same time, they have enough motivation and power to exercise strict control over managers and create changes in management structures. In this research, the presence of institutional investors on the board of directors and the amount of institutional ownership, and Tobin's q were investigated as a measure of the value of the business unit. To test the research hypotheses, the data from companies listed on the Tehran Stock Exchange from the beginning of 2001 to the end of 2009 was used. Multiple correlation coefficients, determination coefficients, and multiple linear regression models were used for the statistical analysis of data and research hypothesis testing. The results of this study indicated the presence of a significant and positive relationship

between institutional ownership and the presence of institutional investors on the board of directors of companies with high value.

Amirhosseini and Mohseni Behbahani [3], by examining the relationship between the principles of corporate governance and the performance of the board of directors of companies listed on the Tehran Stock Exchange, found that there is a significant relationship between the principles of corporate governance and the performance of the company's board of directors. Among them, three variables of information disclosure and transparency, the role of stakeholders, and the same treatment with shareholders have a significant relationship with the performance of the board of directors of companies, and two variables of the rights of shareholders and the responsibilities of the board of directors do not have a significant relationship with the performance of the board of directors of companies.

2.2 Research hypotheses

The research hypotheses include one main hypothesis and three sub-hypotheses.

Main hypothesis: CEO power indicators affect company performance in under-pressure companies.

Sub-hypotheses of the research: Three sub-hypotheses should be examined to examine the main hypotheses of the research, as follows.

Sub-hypothesis 1: The ownership of board members affects company performance in under-pressure companies.

Sub-hypothesis 2: The percentage of non-obligatory members of the board of directors affects the company's performance in under-pressure companies.

Sub-hypothesis 3: Management efficiency affects company performance in under-pressure companies.

Sub-hypothesis 4: Management honesty affects company performance in under-pressure companies.

3 Research Variables

3.1 Company performance

To measure the company's performance, the company's value index and M/B ratio changes were used, according to studies by Kaplan and Minton [23] and Han et al. [19], as described in the following relationship:

$$\Delta \frac{M}{B} = \frac{M}{B_t} - \frac{M}{B_t - 1} \quad (3.1)$$

$$\frac{M}{B} = \frac{\text{book value of the company}}{\text{market value of the company}} \quad (3.2)$$

$$\Delta = \frac{\text{Changes in the ratio of book value of the company}}{\text{market value of the company}} \frac{M}{B} \quad (3.3)$$

$$\frac{M}{B_t} = \frac{\text{Book value of the company}}{\text{market value of the current year}} \quad (3.4)$$

$$\frac{M}{B_t - 1} = \frac{\text{Book value of the company}}{\text{market value of the company last year}} \quad (3.5)$$

3.2 CEO power indicators

3.2.1 Percentage of non-obligatory members of the board of directors

the ratio of non-obligatory members of the board of directors to the total number of members of the board of directors [19].

3.2.2 Ownership of the board members

the ownership shares of the board members in the company. This variable is measured as follows:

$$BODO = \frac{(\text{DIR STOCKS}_{i,t})}{\text{TOTAL STOCKS}_{i,t}} 100 \quad (3.6)$$

where,

DIR STOCKS: The number of shares owned by the members of the board of directors

TOTAL STOCKS: The total number of stocks in the company.

3.2.3 Management efficiency

the management's ability to use limited resources to achieve the company's goals. This variable is measured by the Demirjian index and by using data coverage analysis as follows:

$$MAEF_{i,t} = \left[\frac{(SALE_{i,t})}{SOGS_{i,t}} + SG\&A_{i,t} + DEPR_{i,t} + R\&D_{i,t} \right] \quad (3.7)$$

where,

SALE= sale.

COGS: Cost of sales.

SG&A: general, administrative and sales costs.

DEPR: Depreciation cost of tangible and intangible fixed assets.

R&D: is the cost of research and development.

3.2.4 Honesty of management

honest display of information in financial reports. This variable is measured by using the amount of extraordinary accrual items in financial reports and through the modified Jones index as follows [19]:

$$TA_{i,t} = \left[\beta_1 \left(\frac{1}{A_{i,t-1}} \right) + \beta_2 (\Delta REV_{i,t} - \Delta REC_{i,t}) + \beta_3 PPE_{i,t} + \epsilon_{i,t} \right] \quad (3.8)$$

where,

TA:Total accrual items

A:Total assets

ΔREV : Changes in sales revenue

ΔREC :Changes in trade accounts receivable

PPE: Gross of tangible fixed assets

E:Estimation error

$$TA_{i,t} = [OP_{i,t} + CFO_{i,t}] \quad (3.9)$$

where,

OP: Operating profit

CFO: Cash flow from operations

Extraordinary accruals are the absolute value of the residuals of the accruals regression model and are defined as a reverse indicator of management honesty in financial reporting.

3.2.5 Control variables

In this research, the size of the company is calculated as the natural logarithm of total assets.

$size_{i,t} = Ln(\text{total asset}_{i,t})$.

$SIZE_{i,t}$: size of company i in year t.

$Ln(asset_{i,t})$: logarithm of company i's assets in the year.

Financial leverage

$Lev_{i,t} = \frac{\text{total debt}_{I,t}}{\text{total asset}_{I,t}}$.

$Lev_{i,t}$: Financial leverage of company i in year t

Total debt $_{i,t}$: total debt of company i in year t .

Total asset $_{i,t}$: total assets of company i in year t.

3.2.6 Modifier variable

The under-pressure company:

According to the research by Han et al. [19], a company whose sales in the current year have decreased by 5% compared to the previous year's sales in the industry is referred to as under pressure. To be under the pressure of the change in internal and external financing that increases; we will consider.

Net index of change in domestic financing (ΔIFin) [25]: Cash from operations + Cash from the sale of assets

Net index of change in foreign financing (ΔXFin) [25]: Net change in capital financed from foreign sources + net change in debts created for the purpose of financing, which in this regard:

The net change in capital financed from external sources is equal to:

Cash input by shareholders - interest paid

The net change in liabilities created for financing is equal to:

Net increase in cash from liabilities from financing activities - income tax payable.

4 Research method

This is applied to deductive-inductive proof research. Also, the research methodology is post-event type; this means that the research is based on past information.

4.1 Study population and statistical sample

The statistical population of this research consists of companies listed in the capital market in the years 2008 to 2019. To select a statistical sample that is a suitable representative for the desired statistical population; first, the companies of the statistical population are examined using the systematic sampling method. Then, the companies that do not have the following characteristics will be removed from the sample. The companies listed on the Tehran Stock Exchange constitute the statistical population of the present study. The following conditions were set for the selection of the statistical sample due to the existence of some inconsistencies among the population, and the study sample was selected accordingly:

1. The financial year of the company should end at the end of March every year.
2. Does not include banks and financial institutions (investment companies, financial intermediaries, holding and leasing companies).
3. The company does not change its financial year during the years under review.
4. Be in the stock market for at least two consecutive years during the research period.
5. There should not be more than three months of trading breaks in the stock market each year.

A sample of 135 companies from the statistical population was selected to perform the tests following the application of the conditions in the systematic elimination sampling.

4.2 Data analysis method

In the first stage, data are analyzed descriptively. This section includes centrality and data dispersion statistics. A regression test was used to test the hypotheses. All the tests were done by spss20, and EvIEWS7 statistical software. The main central index is the mean, which represents the balance point and the center of gravity of the distribution, which is a good indicator to show the centrality of the data. In general, dispersion parameters are a measure to determine the degree of dispersion from each other or the degree of dispersion compared to the mean. Standard deviation is one of the key dispersion parameters. The degree of asymmetry of the frequency curve is called skewness. If the coefficient of skewness is zero, the population is completely symmetrical, and if this coefficient is positive, it is skewed to the right, and if the coefficient is negative, it is skewed to the left. A positive skewness coefficient indicates that the distribution is skewed to the right. The dispersion parameter of the amount of kurtosis is the tailedness of the probability distribution of a real-valued random variable compared to the standard normal curve. If the kurtosis is around zero, it means that the frequency curve is balanced and normal in terms of kurtosis, if this value is positive, it is a heavy-tailed and if it is negative, it is a platykurtic. The last level also shows observations.

Table 1: The results of the descriptive analysis of research variables at the level of total observations

Variable	Financial performance	Percentage of non-obligatory members	ownership of the board members	Management efficacy	Management honesty	Financial leverage	Company size
Sign	$\frac{M}{B}$	RNE	BODO	MAEF	TA	LEV	SIZE
Mean	1.08702	0.6046	0.28913	3.7667	2.8809	0.6855	13.7943
Median	0.76208	0.6	0.3	1.2258	61481	0.6114	13.6181
Max	5.3553	0.7	0.4	78.0455	9.0526	34.6222	18.3951
Min	0	0.5	0.2	0	46024	0.0964	11.0608
SD	0.9486	0.08415	0.08283	8.1792	9.5937	1.7028	1.4489
Skewness	1.5059	-0.0886	0.2043	4.6403	6.4510	19.6159	0.8067
Kurtosis	5.3955	1.42103	1.4897	30.2431	48.1999	391.4527	3.5171
Observations	1350	1350	1350	1350	1350	1350	1350

Descriptive analysis of research variables

The results of the hypothesis test:

Main hypothesis:: CEO power indicators affect company performance in under-pressure companies. The main hypothesis is compiled statistically as follows:

H0: CEO power indicators do not affect company performance in under-pressure companies.

H1: CEO power indicators affect company performance in under-pressure companies.

Table 2: Main hypothesis of the source

$MTB_{i,t+1} = \alpha_0 + \alpha_1 RNE_{iti,t} + \alpha_2 DUAL_{iti,t} + \alpha_3 BODO_{i,t} + \alpha_4 MACO_{i,t} + \alpha_5 MAEF_{i,t} + \alpha_6 TA_{i,t} + \alpha_7 NS_{i,t} + \alpha_8 Lev_{i,t} + \alpha_9 Size_{i,t} + \epsilon_{i,t}$				
P value	t statistic	Standard error	Estimated coefficient	Variables
0.2888	1.062190	0.683822	0.726350	C
0.8534	-0.184949	0.610476	-0.112907	BODO
0.0119	-2.527937	0.026858	-0.067895	LEV
0.0146	2.453399	0.006232	0.015290	MAEF
0.7790	0.280773	0.613991	0.172392	RNE
0.8589	0.177951	0.035936	0.006395	SIZE
0.0690	-1.823240	5.00E - 09	-9.11E - 09	TA
Durbin Watson	3.519972 f-statistic	0.073901 Coefficient of determination		
	0.000327 F value	0.052906 Adjusted coefficient of determination		

The estimation results show that the probability of the t-test for the fixed coefficient and the variables of dual duties of the CEO, financial leverage, and management efficiency is less than 5%, so the above relationship is statistically significant for these variables. Therefore, the hypothesis for these variables is confirmed with 95% certainty. The coefficient of determination shows the explanatory power of the independent variables, which can explain about 7% of the changes in the dependent variable. Since Durbin Watson is between 1.5 and 2.5; therefore, there is no autocorrelation in the model. The probability of the F statistic, which is less than 5%, indicates that the whole model is statistically significant. Also, according to the hypothesis, the H0 hypothesis is not rejected since the ownership variables of the board members and the percentage of non-obligatory members of the board of directors do not remain in the model. It means that the indicators of the CEO's power do not affect the company's performance in under-pressure companies.

Sub-hypothesis 1: The ownership of board members affects company performance in under- pressure companies.

The first sub-hypothesis is compiled statistically as follows:

H0: The ownership of the board members does not affect the performance of the company in under-pressure companies.

H1: The ownership of board members affects company performance in under-pressure companies.

The estimation results show that the probability of the t-test for the fixed and variable coefficient of ownership of the board members is greater than 5%, so the above relationship is not statistically significant. Therefore, with 95% confidence, the hypothesis is not confirmed for these variables. The coefficient of determination shows the explanatory power of independent variables, which can explain about 2% of changes in the dependent variable. Since Durbin Watson is between 1.5 and 2.5; therefore, there is no autocorrelation in the model. The probability of the F statistic, which is less than 5%, indicates that the whole model is statistically significant, and considering the hypothesis that the ownership variable of the board members does not remain in the model, the H0 hypothesis is not rejected. It means that the ownership of the board members does not affect the performance of the company in under-pressure

Table 3: First sub-hypothesis

$SIZE_{i,t} + \epsilon_{i,t,r} Lev_{i,t} + \alpha MTB_{i,t+1} = \alpha_0 + \alpha_1 BODO_{i,t} + \alpha$				
P value	t statistic	Standard error	Estimated coefficient	Variables
0.1940	1.300929	0.481264	0.626091	C
0.7673	0.296083	0.559667	0.165708	BODO
0.0277	-2.209424	0.027233	-0.060170	LEV
0.3055	1.025969	0.032102	0.032936	SIZE
0.7790	0.280773	0.613991	0.172392	RNE
0.3055	1.025969	0.032102	0.032936	SIZE
Durbin Watson	2.028246	f-statistic	0.014624	Coefficient of determination
	0.009328	F value	0.007414	Adjusted coefficient of determination

companies.

Sub-hypothesis 2: The percentage of non-obligatory members of the board of directors affects the company's performance in under-pressure companies.

The second sub-hypothesis is compiled statistically as follows:

H0: The percentage of non-obligatory members of the board of directors does not affect the company's performance in under-pressure companies.

H1: The percentage of non-obligatory members of the board of directors affects the company's performance in under-pressure companies.

Table 4: Second sub-hypothesis

$MTB_{i,t+1} = \alpha_0 + \alpha_1 RNE_{i,t} + \alpha_2 Lev_{i,t} + \alpha_3 Size_{i,t} + \epsilon_{i,t}$				
P value	t statistic	Standard error	Estimated coefficient	Variables
0.1847	1.328614	0.539138	0.716306	C
0.0264	-2.227654	0.027205	-0.060604	LEV
0.9064	-0.117630	0.548741	-0.064548	RNE
0.3092	1.018258	0.032130	0.032717	SIZE
Durbin Watson	2.003276	f-statistic	0.014446	Coefficient of determination
	0.012908	F value	0.007235	Adjusted coefficient of determination

The estimation results show that the probability of the t-test for the fixed and variable percentage of the non-obligatory members of the board of directors is greater than 5%, so the above relationship is not statistically significant. Therefore, with 95% certainty, the hypothesis for this variable is not confirmed. The coefficient of determination shows the explanatory power of the independent variables, which can explain about 2% of the changes in the dependent variable. Since Durbin Watson is between 1.5 and 2.5; therefore, there is no autocorrelation in the model. The probability of the F statistic, which is less than 5%, indicates that the whole model is statistically significant, and according to the hypothesis, because the variable percentage of non-obligatory members of the board of directors does not remain in the model; H0 hypothesis is not rejected; that is, the percentage of non-obligatory members of the board of directors does not affect the company's performance in under-pressure companies.

Sub-hypothesis 3: Management efficiency affects company performance in under-pressure companies.

The third sub-hypothesis is compiled statistically as follows:

H0.: Management efficiency does not affect company performance in under-pressure companies.

H1: Management efficiency affects company performance in under-pressure companies.

$$\begin{cases} H_0 : B = 0 \\ H_1 : B \neq 0 \end{cases}$$

The estimation results show that the probability of the t-test for the fixed and variable coefficient of management efficiency is less than 5%, so the above relationship is not statistically significant. Therefore, the hypothesis for these variables is confirmed with 95% certainty. The coefficient of determination shows the explanatory power of the independent variables, which can explain about 23% of the changes in the dependent variable. Since Durbin Watson is between 1.5 and 2.5, there is no autocorrelation in the model. The probability of the F statistic, which is less than 5%, indicates that the whole model is statistically significant, and considering the hypothesis that management efficiency remains in the model, the H0 hypothesis is rejected; that is, management efficiency has an effect on company performance in under-pressure companies based on product market competition.

Table 5: Third sub-hypothesis

$MTB_{i,t+1} = \alpha_0 + \alpha_1 MAEF_{i,t} + \alpha_2 Lev_{i,t} + \alpha_3 Size_{i,t} + \epsilon_{i,t}$				
P value	t statistic	Standard error	Estimated coefficient	Variables
0.0110	2.553820	0.469575	1.199211	C
0.0142	-2.461864	0.026973	-0.066403	LEV
0.0022	3.088043	0.006123	0.018909	MAEF
0.7744	-0.286847	0.034445	-0.009881	SIZE
Durbin Watson	5.197364	f-statistic	0.236723	Coefficient of determination
	0.001562	F value	0.229657	Adjusted coefficient of determination

Sub-hypothesis 4: Management honesty affects company performance in under-pressure companies.

The fourth sub-hypothesis is compiled statistically as follows:

H0.: The honesty of the management does not affect the performance of the company in under- pressure companies.

H1: Management honesty affects company performance in under-pressure companies.

$$\begin{cases} H_0 : B = 0 \\ H_1 : B \neq 0 \end{cases}$$

Table 6: Fourth sub-hypothesis

$MTB_{i,t+1} = \alpha_0 + \alpha_1 TA_{i,t} + \alpha_2 Lev_{i,t} + \alpha_3 Size_{i,t} + \epsilon_{i,t}$				
P value	t statistic	Standard error	Estimated coefficient	Variables
0.2136	1.245601	0.447147	0.556967	C
0.0280	-2.204758	0.027121	-0.059795	LEV
0.1757	1.356559	0.032357	0.043894	SIZE
0.0093	-2.615036	$4.90E - 09$	$-1.28E - 08$	TA
Durbin Watson	4.277125	f-statistic	0.230783	Coefficient of determination
	0.005465	F value	0.223586	Adjusted coefficient of determination

The estimation results show that the probability of the t-test for the fixed and variable coefficient of management honesty is less than 5%, so the above relationship is statistically significant. Therefore, the hypothesis for these variables is confirmed with 95% certainty. The coefficient of determination shows the explanatory power of independent variables, which can explain about 24% of the changes in the dependent variable. Since Durbin Watson is between 1.5 and 2.5, the model shows no autocorrelation. The probability of the F statistic, which is less than 5%, indicates that the whole model is statistically significant, and considering the hypothesis that management honesty remains in the model, the H0 hypothesis is rejected; that is, the management honesty has an effect on the company's performance in under-pressure companies based on product market competition.

4.3 Creation of artificial neural network

At this stage, we created an artificial neural network. The non-linear neural network is adopted in three modes: open loop, closed loop, and time delay for the high frequency of data change. Then, we should select a training function. Some functions are faster, some are better applied to more challenging problems, and some work better in situations with less memory. The selected training function is a non-linear self-regressive function. Next, the data is entered for training and simulation. According to the training, it is clear that the network has found the ability to predict performance. Therefore, the result obtained showed that by using the obtained data and creating a training algorithm in the artificial neural network, it is possible to predict the performance of the company as a result of the power of the CEO, and even by using the network one step forward predicted the result earlier.

5 Summary and conclusion

Most financial institutions and investment companies collect funds by selling their shares and then purchasing a set of securities and other financial assets from the provided resources. These institutions represent small and medium investors in the market, which is usually the representation of experts for non-experts. From this point of view, the presence of institutional investors in the financial markets plays two critical roles.

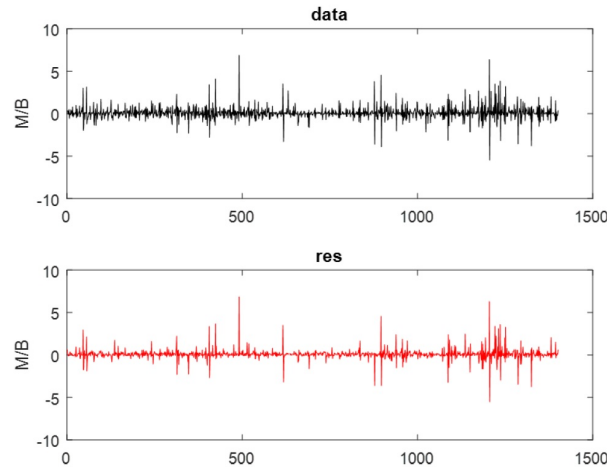


Figure 1: Training and simulation of data using non-linear self-regressive function

First, they minimize risk by diversifying the purchased financial assets and creating a suitable combination. Small investors do not have such a possibility and face much more risks in this market. Furthermore, institutions have much more capabilities in controlling managers.

Institutions create value by playing such roles because of having the necessary expertise to criticize and review the activities and performance of company managers.

The results show that the efficiency and integrity of management are related to the performance of the under-pressure company, but the effect of the ownership of the board members and the percentage of non-obligatory members of the board of directors on the performance of the company was not observed in the under-pressure companies.

Also, the research showed that entering the effective items on the under-pressure company's performance into the artificial neural network and training this network to calculate the company's performance, could predict the performance of the company before its realization using a network called prediction one step ahead (time delay), which can be done effectively in the optimal management of resources by investors.

Future research interested in investigating the effect of an individual trait of the five primary personality dimensions (openness, conscientiousness, extraversion, agreeableness, and neuroticism) might consider each trait as an independent construct.

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