



Original Research

## Investigating the Effect of the CEO's Narcissism on Investment Efficiency and Financing Methods of Companies admitted to the Tehran Stock Exchange

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### ABSTRACT

The behavioural characteristics of the chief executive officer (CEO) such as narcissism can have different effects on the investment and financing of companies. Accordingly, the present study was conducted to investigate the effect of CEO narcissism on investment efficiency and financing methods of companies listed on the Tehran Stock Exchange. The statistical population of the study was all companies listed on the Tehran Stock Exchange between 2012 and 2017, of which 143 companies were surveyed as a statistical sample. The results of the analysis of research hypotheses using combined regression and logistic regression showed that CEO narcissism does not have a significant effect on overinvestment and underinvestment, but CEO narcissism has a significant positive effect on corporate investment efficiency. High CEO narcissism leads to increased corporate investment efficiency. The narcissism of the CEO has a positive and significant effect on domestic financing, but does not have a significant effect on external financing.

## 1 Introduction

In psychology, narcissism or narcissism expresses extreme self-love and reliance on inner self-esteem. Narcissism is a personality structure that can influence managers' judgment of the probability of various outcomes because recent studies have shown that narcissism among managers plays a vital role in performing managerial activities. Narcissistic managers tend to highlight their role, appear more in the media, attribute positive things to themselves, and consider themselves deserving of more recognition [4]. The aim of the research is to investigate the effect of the CEO's narcissism on the investment and financing strategies of the company with the moderating role of the characteristics of the board of directors using statistical samples of a number of companies for a period of 5 years. The word narcissism is derived from the name of Narcissus, one of the Greek myths. Narcissus was a beautiful man who was attracted to many women, but he was indifferent to all of them and caused them grief. To punish him for his cruelty, he was condemned to love only himself. One day when Narcissus was bending down to

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drink a sip of water from a pond, he saw his reflection in the water and fell in love with it. It was at this moment that he realized that others had the same feeling for him that he now has for himself. He couldn't take his eyes off his image in the water, he fell into self-love and died of this grief by the pond. Narcissism is a term that was first used by Freud. The term narcissism is used to express the state of those whose power of love is towards themselves instead of towards others. This is the state of many who are neurotic or psychotic, they are exclusively self-absorbed and believe that they are superior to others or at least worthy of everyone's attention. At present, narcissism has become an epidemic, which emphasizes that narcissists and their behavior are a constant problem in the daily functioning of modern societies; However, research shows that in the past 20 years (between 1990 and 2010), the rate of narcissism has decreased slightly. Despite this decline, the recognition of narcissism remains an important issue, and research in this area is growing. In the literature, two types of narcissism can be identified: grandiose and vulnerable narcissism. Self-aggrandizing narcissism has been interpreted as a personality trait in society, while vulnerable narcissism is more closely related to clinical manifestations of narcissism. Furthermore, egocentric narcissism is associated with social dignity and self-reliance, while vulnerable narcissism is associated with emotional sensitivity. Narcissism is one of the personality variables that is closely related to the emergence and adjustment of behaviors. Therefore, the attention of social and personality psychologists to narcissism has increased greatly in recent years, and a general change has been made in their perspective on narcissism, so that non-clinical levels of narcissism are considered as a dimension and as a continuum from normal to narcissistic. Other personality traits are considered [10,27]. In this regard, researches have shown that narcissism has an effect on the forgiveness process and reported that it has an inhibiting effect on the forgiveness process. In connection with forgiveness, it has been shown that the variables of individual differences are effective on a person's reaction to a mistake [9]. Studies have shown that narcissistic people are less inclined to forgive individual mistakes [8]. In this regard, Van der Waal et al [33] investigated the relationship between narcissism and forgiveness in research and reported that high narcissism is associated with low forgiveness, that is, people who have more narcissism have less forgiveness. One of the most ponderable and challenging issues of the present era is the discussion of economic development. In this regard, the amount of investment is of particular importance; So, making decisions about investment and capital allocation is one of the key and fundamental decisions in companies. Therefore, an economic unit to invest in different projects, should pay attention to the limit or amount of investment according to the limited resources. This is despite the fact that in an imperfect market, information asymmetry and agency conflicts prevent optimal decisions and optimal investment. Excessive investment is an example of a non-optimal investment, one of the main reasons of which is the free cash flow of companies. Therefore, one of the main issues of this research is related to the type of investment and the CEO's attitude towards optimal decisions about choosing the type of investment. In order to solve or reduce this problem and considering the significant role that the quality of accounting information has in reducing information asymmetry, investing in various matters by companies has always been considered as one of the important ways of developing companies and preventing stagnation and backwardness. In the meantime, the limitation in resources has caused that, in addition to the development of investment, increasing the efficiency of investment is of great importance. In general, investment efficiency means accepting projects with a positive net present value, and investment inefficiency means choosing projects with a negative net present value (overinvestment) or not choosing investment opportunities (underinvestment). In determining investment efficiency, there are at least two theoretical criteria: the first criterion states that there is a need to collect resources in order to finance investment opportunities. In an efficient market, all

projects with a positive net present value should be financed. However, a large amount of research in finance has shown that financial constraints limit managers' ability to finance [21]. In perfect financial markets, all projects with a positive net present value should be financed and implemented. Despite this, there are many examples that violate this assumption. Market failure, along with information asymmetry and agency costs, can lead to the implementation of projects with a negative net present value (overinvestment) and the rejection of projects with a positive net present value (underinvestment). Excess and insufficient investment can be explained by stating the existence of information asymmetry between stakeholders. Considering the ethical risks, the conflict of interests between shareholders and managers and the lack of supervision of managers, it is possible to lead managers to try to maximize their personal interests. This happens through investments that may not be suitable for shareholders, and this leads to the expansion of management power and additional investment. Based on adverse selection, managers who have better information may make additional investments, if they sell the securities that have increased in price and obtain surplus funds, in order to avoid this, capital providers can ration capital or spend increase it, which will lead to the rejection of some profitable projects and subsequently insufficient investment due to restrictions. One of the basic points of attention of financial managers of economic enterprises is the methods and amount of financing. Progress in each country's industry and production growth requires short-term, medium-term and long-term investment plans, and through that, a huge support is obtained in the economy of each country. The sources of these investments can be provided through accumulated profits, sale of new shares, bank facilities or through a combination of these sources [19]. One of the important goals of financial management is to maximize shareholders' wealth. For this purpose, the goal of financial managers is to find ways to provide financial resources to achieve this goal. The main tasks of financial management are to make decisions related to financing, investment and profit distribution. In financing decisions, companies are faced with two sources of internal financing and external financing. Internal financial resources include cash flows resulting from operational activities, sale of assets and accumulated profits, and external financial resources include funds collected through the financial market, such as issuing bonds, issuing new shares, and receiving financial facilities from the bank. Managers must decide how to provide the funds they need and how to use the available financial resources. They can use these financial resources to pay dividends to shareholders, implement profitable investment projects, settle overdue debts and increase working capital [13]. Financing of companies and debt structure, including the type of debt and the maturity of the companies' debt, is one of the most challenging topics in the field of capital markets. The debt maturity structure has been proposed as the most important parameter affecting the value of companies and for their orientation in the capital markets. Deciding on the debt structure means the financing of the company, like other decisions of managers, affects the value of the company. Managers, as representatives of shareholders, adjust the composition of the company's debt structure in such a way as to have a positive effect on the process of increasing the company's value, which is the increase of shareholders' wealth. Therefore, determining an optimal structure and providing financial resources in companies is of particular importance [7]. The investment style followed by narcissistic managers is less productive because narcissistic CEOs generate lower profits and operating cash flow. Despite the negative relationship between CEO narcissism and firm performance, narcissistic CEOs receive higher compensation [26,20]. It is important to note that CEO narcissism is associated with heterogeneity in investment policies, performance and rewards, and remains a potential concern. Narcissistic CEOs have a different investment style and provide worse performance in the company, while receiving more rewards [23]. On the other hand, CEOs who have high narcissism may always try to beat competitors and

want to impress others by achieving success through innovations or investments [3]. Based on the mentioned contents, the current research seeks to investigate the effect of the CEO's narcissism on the investment efficiency and financing methods of the companies admitted to the Tehran Stock Exchange.

## **2 Theoretical Foundations and Research Background**

### **2.1 Managers' Narcissism**

People's personality traits are the foundation of their behaviours and considering that some behavioural factors involved in managers' personality will direct their decision-making, therefore identifying these factors and their effects can be effective in improving the decision-making process; One of these identified factors is the phenomenon of narcissism among managers. Narcissism is known as a personality structure that has symptoms such as the influence of personal desires, responsiveness to others, and cognitive processing bias [12]. Narcissism refers to people's efforts to be famous, admired and magnified in the eyes of others. Naturally, narcissism, compared to other personal characteristics, leads managers to take actions that break the norm and seek the attention and praise of others, and these actions will ultimately affect the performance of the organization. Narcissism among managers can have effects on organizational results, and this feature is applied through influencing the choice of managers in areas such as strategy selection, structure, and recruitment. Considering that it is the only strategy that can guide companies in the right direction in highly fluctuating and sensitive environments, like a guide map, and guarantee the continuation of the path by the company. Investigating the effect of narcissism as one of the behavioural factors affecting this phenomenon can be effective in improving the performance of the organization [29]. Narcissists give themselves a high score (much higher than reasonable) in a set of dimensions such as intelligence, creativity, competence and leadership power. The tendency to show aggressive actions and disregard for the rights of others can be related to inflated self-esteem caused by narcissism. Therefore, those who get high scores in the narcissistic personality test are relatively domineering, egotistical, self-centred and extreme people, and these traits can most likely make people with a high level of narcissism commit aggressive acts as a beneficial act. Meanwhile, many studies have confirmed narcissism with anger, hostility and aggression in adults and believe that the level of narcissism among people has a positive relationship with testosterone and cortisol [31]. In relation to the consequences of narcissism, it can also be stated that narcissism has the ability to influence managers' judgment of the possibility of various outcomes. Narcissistic managers are motivated by admiration; Sometimes such managers insist on their wrong decisions and spend a lot of time and money on it, which is problematic for the organization. In organizations, narcissistic managers often reward themselves more and thereby consolidate their position in the organization [30].

### **2.2 Investment Efficiency**

In relation to investment efficiency, it can be said that it is a factor to describe the ability and appropriate recognition of the company's resources in investments and pay its returns to the company's shareholders. It is also considered as an appropriate level of expected investment to achieve growth opportunities in the company [24]. In this regard, one of the important solutions for this issue is expansion and development of investment. Making any investment by itself is not appropriate and justified, and the company should also pay attention to the concept of investment efficiency. In determining the efficiency of investment, there are at least two criteria in theoretical foundations; The first criterion states that there is a need to raise resources in order to finance investment opportunities. In an efficient market,

all projects with a positive net present value should be financed, although a large amount of research in the field of finance has shown that financial constraints limit the ability of managers. One of the things that can be inferred is that the companies that are faced with financing restrictions may refuse to accept and carry out projects with a positive net present value due to high financing costs, which will reduce investment. The second criterion states that if the company decides to finance, there is no guarantee that the correct investment will be made. Conceptually, investment efficiency is achieved when the company only invests in all projects with a positive net present value [11]. From the market point of view, Farazini and Pederson [14] have studied the problem of investment inefficiency and use it as the basis for the theory of over-investment and under-investment. Frazini believes that the studies conducted in connection with insufficient investment, especially excessive investment, have usually focused on the market's reaction to capital expenditures, education or research and development. But the main challenge in the literature and theoretical foundations is that the net present value of the investment project cannot be measured directly. For this reason, he investigated the market reaction to find out the value of managers' activities for shareholders [14].

### 2.3 Financing

Financing means providing financial resources and funds to continue the company's activities and to create and launch development and income-generating projects of these economic units. Financing is mainly done through the issuance of shares, the sale of bonds, and loans and credits. Companies have access to many financial resources to settle overdue debts, implement profitable investment projects, increase working capital and pay dividends to shareholders. These sources include cash from operational activities and asset sales (as internal sources of financing), bank loan borrowing, issuance of partnership bonds, and issuance of new shares (as external sources of financing) [1]. The ability of companies to determine appropriate financial resources and make correct decisions in this regard are considered to be the main factors of the company's success. The most important goal that the management should pay attention to when choosing the financing method is to increase the shareholders' wealth. That is, considering the cost of each of the different sources of financing and its effects on the yield and risk of the company, choose sources that minimize the cost of financing. The appropriate combination of financing sources is accompanied by characteristics such as low capital cost and higher rate of return. The review of past researches shows that most of the studies of financing methods and its effect on profitability are on issues such as the relationship between the choice of financing sources and the efficiency of companies, the preference of extra-organizational sources of financing to internal sources, or vice versa, reaching an optimal capital structure and the relationship between the structure Capital and risk have been emphasized [28].

### 2.4 Theoretical Foundations

Based on the developments in today's world, especially in developing countries that are facing many threats, these countries need appropriate solutions to better use their God-given resources and wealth in order to solve their economic problems. In this regard, one of the important solutions is expansion and development of investment. Making any investment is not appropriate by itself, and the company should also pay attention to the concept of investment efficiency. There are two criteria for investment efficiency; Collecting financing sources and choosing and implementing investments correctly. Company managers have different policies to finance these investments, and according to the company's strategy and the decision and interests of the company manager, each of these sources is used [6].

The central core of every company is management and its decisions, and the behavioral characteristics

involved in the personality of managers direct their decision-making [22]. Perhaps this is the reason why researchers believe that there is a possibility that decision makers do not make completely rational decisions [25]. Emerging foundations in financial economics focus on the personality traits of managers. Narcissism, overconfidence and short-sightedness can be mentioned as the most important behavioral traits of managers. Narcissistic people show symptoms such as the influence of personal desires [12]. According to the mentioned materials, investigating the possibility of losing the company's financial resources and entering the stage of helplessness due to the appearance of these behavioral strains on the managers' decisions and making incorrect and far from reality decisions is a very important issue; Because it is important to identify the factors affecting helplessness, and if appropriate and timely measures are not taken to prevent it from happening, the helplessness stage may reach the bankruptcy stage [18]. Overconfidence can be defined as an unfounded belief about one's cognitive abilities, judgments, and intuitive reasoning [24]. Recent behavioural studies have examined the relationship between less than perfectly rational managerial behaviour and firm performance. These studies examine how managers apply biased self-evaluation that affects the company's financial policies, investment, and merger and acquisition decisions. According to the research conducted in this field, managers do not always behave in a completely rational way, under the influence of overconfidence and excessive optimism, they may make irrational decisions that have a significant impact on the financing activities of the company [20].

## 2.5 Theoretical Foundations

Fong et al. [15] in research titled leader narcissism and foreign direct investment: evidence from Chinese companies to examine the narcissism index of leaders of Chinese companies and examine the relationship between leader narcissism and foreign direct investment at the company level for the period of 2007- 2017 paid. The results showed that the leader's narcissism has a positive and significant effect on foreign direct investment at the company level. In addition, we find that firms with government ownership and political ties show a greater positive effect of leader narcissism on firm FDI.

He et al. [17] in research titled Managers' overconfidence, internal financing and investment efficiency: Evidence from China using companies listed on the Shanghai Stock Exchange of China and the Shenzhen Stock Exchange in the period from 2010 to 2015. Managers' excessive ego was tested on the choice of internal financing and investment efficiency (scale of investment, over-investment and under-investment). The results showed that internal financing can reduce business opportunities and capital shortages, but may cause overinvestment, especially in companies with overconfident managers. The problem of overinvestment is significantly related to the overconfidence of managers in public and non-governmental companies. Lai and Liu [24], in an article entitled management characteristics and investment performance of companies, examined the relationship between the characteristics of top management teams (TMTs) and investment performance of companies. After controlling for corporate governance and several other firm characteristics, they find that firms with better and more well-known management teams are negatively associated with overinvestment and underinvestment inefficiencies. Moreover, they found that characteristics of management teams complement the positive effect of financial reporting quality on investment returns. Also, the findings showed that the characteristics of better management teams can reduce the distortions caused by over-investment and under-investment. Taghizadeh Khangah and Badavar [32] in research entitled the relationship between management overconfidence, internal financing and investment efficiency investigated the relationship between management overconfidence, internal financing and investment efficiency of companies listed on the Tehran

Stock Exchange. In this way, 130 companies were selected for the period of 2016-2018. Investment efficiency was measured through over and under investment indicators. Also, capital expenditures and accumulated profit were used to measure management overconfidence and internal financing, respectively. The results showed that there is a positive relationship between management overconfidence and internal financing. Also, there is a positive relationship between management overconfidence with investment level and over-investment, and a negative relationship with under-investment. On the other hand, the results showed that there is a positive relationship between domestic financing and investment level and investment more than the limit and negative relationship with investment less than the limit. Finally, the findings indicated that internal financing has a positive effect on the relationship between management overconfidence and investment level, and the interactive effect of internal financing on the relationship between management overconfidence and investment is more positive and significant, while this relationship is for low companies. The investor is not meaningful. Khajawi et al. [22] by investigating the effect of managers' narcissism and profit management and financial performance, found that narcissistic managers try to show favorable financial performance in the short term to gain approval and encouragement from stakeholders, as well as to maintain and improve their position. are to profit management.

### 3 Research Hypothesis

Based on the stated principles, research hypotheses were designed as follows:

**H1:** CEO narcissism has a significant effect on the company's overinvestment.

**H2:** CEO narcissism has a significant effect on underinvestment of the company.

**H3:** CEO narcissism has a significant effect on the company's investment efficiency.

**H4:** CEO narcissism has a significant effect on the company's internal financing.

**H5:** CEO's narcissism has a significant effect on the company's external financing

### 4 Methodology

This research is applied research in terms of its purpose and descriptive research in terms of its nature, because, on the one hand, it provides the existing conditions to present a generalized model of the effect of the CEO's narcissism on the investment efficiency and financing methods of companies listed on the Tehran Stock Exchange in the market. examines Iran's capital. On the other hand, the relationship between various variables is determined by regression analysis. In addition, this research is in the field of post-event studies (use of past information) and is based on real past information of financial statements of companies listed in the Tehran Stock Exchange and other real information that can be generalized to the entire statistical population using the inductive method. Was. In this research, according to the type of data and available statistical analysis information, the method of time series data and panel data is used. Because in order to investigate the effect of the quality of accounting information and the investment performance of the company, with an emphasis on the audit quality and the cost of capital of the companies admitted to the Tehran Stock Exchange, they are tested. Also, to ensure the reliability of the results, default regression model tests were used. The variables are also tested and analyzed using Eviews10 econometric software. In this research, the statistical population includes all companies admitted to the Tehran Stock Exchange. The statistical sample includes a small number of members of the statistical community that explains the main characteristics of the community. In this research, in order for the statistical sample to be a suitable representative of the statistical community under investigation, conditions have been set for the selection of the statistical sample. For this purpose, the following five criteria are taken into consideration, and if a company meets all the criteria, it is selected as

a research sample, and the rest are removed. The sample selection process is presented in Table 1.

1) Due to the fact that to calculate some variables, data from previous years is also needed, so the company must be listed on the stock exchange before 2011 and be active on the stock exchange until the end of 2018.

2) Due to the specific nature of the activities of holding companies, insurance companies, leasing companies, banks, financial and investment institutions and their considerable difference from manufacturing and trading companies, the chosen company should not be other than the mentioned companies.

3) The financial year of the company ends on March 29 and the financial year does not change during the research period.

4) In the period from 2011 to 2018, the company's shares have been traded on the stock exchange (without a trading break of more than 6 months)

5) Financial information of companies should be available.

After considering all the above criteria, the number of 143 companies remained as the screened society. All of which have been selected as examples.

### 5 Operational Model and How to Calculate Research Variables

This research is a type of correlational research because it examines the relationships between variables. Based on this, each of the research variables is calculated from the financial statements of the sample companies and is analyzed by means of regression models corresponding to each hypothesis in Eviuse software. The regression models of hypothesis testing are:

The first hypothesis test model

$$\text{OVERINV}_{it} = \beta_0 + \beta_1 \text{WHR}_{it} + \beta_2 \text{BIND}_{it} + \beta_3 \text{BEXPER}_{it} + \beta_4 \text{BGENDIV}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{ROE}_{it} + \beta_7 \text{ROA}_{it} + \beta_8 \text{CF}_{it} + \beta_9 \text{TANG}_{it} + \beta_{10} \text{AGE}_{it} + \epsilon_{it} \quad (1)$$

The second hypothesis test model

$$\text{UNDERINV}_{it} = \beta_0 + \beta_1 \text{WHR}_{it} + \beta_2 \text{BIND}_{it} + \beta_3 \text{BEXPER}_{it} + \beta_4 \text{BGENDIV}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{ROE}_{it} + \beta_7 \text{ROA}_{it} + \beta_8 \text{CF}_{it} + \beta_9 \text{TANG}_{it} + \beta_{10} \text{AGE}_{it} + \epsilon_{it} \quad (2)$$

The third hypothesis test model

$$\text{INVEFF}_{it} = \beta_0 + \beta_1 \text{WHR}_{it} + \beta_2 \text{BIND}_{it} + \beta_3 \text{BEXPER}_{it} + \beta_4 \text{BGENDIV}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{ROE}_{it} + \beta_7 \text{ROA}_{it} + \beta_8 \text{CF}_{it} + \beta_9 \text{TANG}_{it} + \beta_{10} \text{AGE}_{it} + \epsilon_{it} \quad (3)$$

The fourth hypothesis test model

$$\text{INFIN}_{it} = \beta_0 + \beta_1 \text{WHR}_{it} + \beta_2 \text{BIND}_{it} + \beta_3 \text{BEXPER}_{it} + \beta_4 \text{BGENDIV}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{ROE}_{it} + \beta_7 \text{ROA}_{it} + \beta_8 \text{CF}_{it} + \beta_9 \text{TANG}_{it} + \beta_{10} \text{AGE}_{it} + \epsilon_{it} \quad (4)$$

The fifth hypothesis test model

$$\text{EXFIN}_{it} = \beta_0 + \beta_1 \text{WHR}_{it} + \beta_2 \text{BIND}_{it} + \beta_3 \text{BEXPER}_{it} + \beta_4 \text{BGENDIV}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{ROE}_{it} + \beta_7 \text{ROA}_{it} + \beta_8 \text{CF}_{it} + \beta_9 \text{TANG}_{it} + \beta_{10} \text{AGE}_{it} + \epsilon_{it} \quad (5)$$

OVERINV<sub>it</sub> = overinvestment of company i in year t (dependent variable)

UNDERINV<sub>it</sub> = investment below the limit of company i in year t (dependent variable)

INVEFF<sub>it</sub> = investment efficiency of company i in year t (dependent variable)

INFIN<sub>it</sub> = internal financing of company i in year t (dependent variable)

EXFIN<sub>it</sub> = external financing of company i in year t (dependent variable)



WHR<sub>it</sub> = narcissism of CEO of company i in year t (independent variable)

BIND<sub>it</sub> = independence of the board of directors of company i in year t (control variable)

BEXPER<sub>it</sub> = expertise of the board of directors of company i in year t (control variable)

BGENDIV<sub>it</sub> = gender diversity of the board of directors of company i in year t (control variable)

SIZE<sub>it</sub> = size of company i in year t (control variable)

ROE<sub>it</sub> = return on equity of company i in year t (control variable)

ROA<sub>it</sub> = return on assets of company i in year t (control variable)

CF<sub>it</sub> = cash flow ratio of company i in year t (control variable)

TANG<sub>it</sub> = fixed assets ratio of company i in year t (control variable)

AGE<sub>it</sub> = age of company i in year t (control variable)

$\beta$  = regression coefficients

$\varepsilon$  = error sentence

### 5.1 The Dependent Variables

Investment efficiency: In this research, through Richardson's model (2006), investment efficiency as well as the variables of under- and over-investment can be obtained. The residuals of this model represent the deviation of the actual investment from the expected investment. Positive residuals represent over-investment and negative residuals represent under-investment. To measure investment efficiency, the amount of deviation from the expected investment will be estimated using the model of Chen et al. [5] as follows:

$$\text{Investment}_{it} = \beta_0 + \beta_1 \text{NEG}_{it-1} + \beta_2 \text{SG}_{it-1} + \beta_3 \beta_1 \text{NEG}_{it-1} * \beta_2 \text{SG}_{it-1} + \varepsilon_{it} \quad (6)$$

Investment<sub>it</sub> = the investment of company i at time t is the change in tangible and intangible assets divided by total assets.

NEG<sub>it-1</sub> = dummy variable with a value of 1 if sales growth is negative and zero otherwise.

SG<sub>it</sub> = the sales growth ratio of the company.

In this model, the amount of residuals represents the deviation from the investment level and represents the inefficiency of investment, which represents the dependent variable in this research. To measure investment efficiency, the absolute value can be taken from the remaining values of the above model and then it is multiplied by negative one [5].

Internal financing: It is obtained from the ratio of accumulated profit to the total assets of the company [1]. External financing: It is calculated from the following relationship:

$$\Delta \text{EXFIN}_{it} = \Delta \text{EQUITY}_{it} + \Delta \text{DEBT}_{it} \quad (7)$$

$\Delta \text{EXFIN}_{it}$  = net external financing

$\Delta \text{EQUITY}_{it}$  = net flow of cash from financing activities from equity

$$\Delta \text{EQUITY}_{it} = \Delta (\text{TA}_{it} - \text{TL}_{it}) - \text{NI}_{it} \quad (8)$$

TA: Total assets

TL: Total Liabilities

NI: Net profit

$\Delta \text{DEBT}_{it}$ : Net cash flow of debt financing activities: the difference between cash flow received from long-term debt issuance and cash flow paid to repay long-term debt, along with the current share of long-term debt [1].

## 5.2 Independent Variable

CEO's narcissism: To measure the CEO's narcissism, three indicators of the CEO's signature, the CEO's photo, and the managers' cash bonus will be used. CEO Signature: It is equal to the ratio of the size of the CEO's signature to the size of the sheet (A4 based on square centimeters). J Image software will be used to measure signatures. The CEO's signature can be seen in the financial statements, and according to previous studies, the larger the size of the signature, the greater the narcissism [2]. Photo of the CEO: To measure the narcissism of managers, as in the research of Olsen et al. [37] and Olsen-Vaskelberg [35], two measures of the photo of managers and the cash reward index of managers will be used. financial is presented, it is used in the form of scoring, but because in Iran the photo of the financial managers is not presented in the financial statements, an alternative criterion is used according to the research of Wong et al. [36] and Jia et al. [38] from The criterion of the CEO's testosterone hormone index is used as follows:



The ratio of the width of the face divided by the height of the CEO's face, which is measured as the distance between the two temples (face width), divided by the distance between the eyebrow and the upper lip (face height). This width-to-height measurement is expressed as WHR. Studies show that WHR is a major cause of testosterone-related behaviors in men. Stirrat and Perrett [34] showed that measuring the width of the human face by the length of the face (width-to-height ratio) is a characteristic of gender deviation and testosterone hormone, which is a factor for measuring the degree of tendency to violent and aggressive behavior in men. Lewis et al. [25] also showed that the ratio of the width to the height of the face is associated with characteristics such as violence, immoral behavior, profit seeking in business and governance. Also, researches indicate that the level of testosterone in men is related to their level of narcissism. It is related. Finally, WHR is a dichotomous variable that is measured in this way: if WHR is greater than the average of the sample industry (which indicates high testosterone), it is considered numerical and zero otherwise. Directors' cash bonus: It is the natural logarithm of the cash bonus of the company's managers [22]. The ratio of the width of the face divided by the height of the CEO's face, which is measured as the distance between the two temples (face width), divided by the distance between the eyebrow and the upper lip (face height). This width-to-height measurement is expressed as WHR. Studies show that WHR is a major cause of testosterone-related behaviors in men. Stirrat and Perrett [34] showed that measuring the width of the human face by the length of the face (width-to-height ratio) is a characteristic of gender deviation and testosterone hormone, which is a factor for measuring the degree of tendency to violent and aggressive behavior in men. Lewis et al. [25] also showed that the ratio of the width to the height of the face is associated with characteristics such as violence, immoral behavior, profit seeking in business and governance. Also, researches indicate that the level of testosterone in men is related to their level of narcissism. It is related. Finally, WHR is a dichotomous variable that is measured in this way: if WHR is greater than the average of the sample industry (which indicates high testosterone), it is considered numerical and zero otherwise. Directors' cash bonus: It is the natural logarithm of the cash bonus of the company's managers [22].

## 5.3 Research Control Variables

Independence of the board of directors: It is the ratio of the non-obligatory members of the board of directors to the total members of the board of directors of the company.

Expertise of the board of directors: It is calculated from the ratio of the members of the board of directors who have financial, managerial and accounting expertise in the form of university education, divided by the total number of members of the board of directors in the company. Gender diversity of the board of directors: The meaning of gender diversity in this research is the presence of women on the board of directors of companies. Based on this, this variable is considered as a virtual variable, which is considered 1 if one of the members of the board of directors is a woman, and zero otherwise.

Company size: Company size is calculated from the natural logarithm of total company assets.

Return on equity: It is calculated from the ratio of net profit to the total equity of the company.

Return on assets: It is the result of dividing the net profit by the total assets of the company.

Cash flow ratio: It is calculated from the company's net operating cash ratio divided by the company's total assets.

Fixed assets ratio: It is calculated from the ratio of the book value of fixed assets to the total assets of the company.

Age of the company: It is calculated from the natural logarithm of the years of the company's presence in the stock market.

## 6 Findings

In this part of the research, by using the appropriate tools, the necessary information and data to test the hypotheses are expressed in an experimental way, then by using the appropriate statistical techniques that are compatible with the research method, the type of variables, etc., the data is collected.

**Table 1:** Descriptive Statistics Results of Research Variables

Variable		Mean	Mode	Max	Min	Std. Dev	Skewness	kurtosis
Investment efficiency	<b>INVEFF</b>	-0.051	-0.028	-0.0001	-0.725	0.078	-4.400	27.664
Domestic financing	<b>INFIN</b>	0.151	0.154	0.840	-0.964	0.207	-0.579	5.370
External financing	<b>EXFIN</b>	0.094	0.081	1.732	-2.327	0.382	-0.506	7.333
CEO narcissism	<b>WHR</b>	0.482	0.000	1.000	0.000	0.499	0.069	1.004
CEO narcissism	<b>WHR01</b>	0.499	0.000	1.000	0.000	0.500	0.003	1.000
CEO narcissism	<b>WHR02</b>	5.242	6.857	9.798	0.000	3.279	-0.832	1.952
Independence of the board of directors	<b>BIND</b>	0.666	0.600	1.000	0.000	0.182	-0.334	3.088
Expertise of the Board of Directors	<b>BEXPER</b>	0.131	0.200	0.800	0.000	0.134	0.828	3.809
Gender diversity of the board of directors	<b>BGENDIV</b>	0.085	0.000	1.000	0.000	0.279	2.960	9.767
size of the company	<b>SIZE</b>	14.391	14.179	20.183	10.492	1.561	0.993	4.515
Return on equity	<b>ROE</b>	0.269	0.272	9.486	-9.556	0.714	-0.526	10.093
Asset return	<b>ROA</b>	0.124	0.106	0.626	-0.404	0.142	0.474	4.099
Cash flow ratio	<b>CF</b>	0.105	0.087	0.687	-0.460	0.129	0.511	4.640
Fixed assets ratio	<b>TANG</b>	0.245	0.204	0.932	0.0002	0.169	0.919	3.341
Company age	<b>AGE</b>	2.909	2.890	3.970	1.609	0.400	0.240	3.129
Observation		1144	1144	1144	1144	1144	1144	1144

It is categorized and analyzed and finally the hypotheses are tested. Table (1) shows the descriptive statistics of the research.

One of the most important central indicators is the average. Among the variables, the highest average is related to the company size variable and the lowest average is related to the investment efficiency

variable. Also, the positive stretch coefficients indicate that the data distribution is higher than the normal distribution and the data is centered around the mean.

In order to ensure the results of the research and the non-fakeness of the relationships in the regression and the meaningfulness of the variables, the Mana test was performed and the unit root of the research variables was calculated in the models. The said test was performed using EViews software and methods of Levin, Lin and Chou test, Im, Sons and Shin test, generalized Fisher-Dickie-Fuller unit root test and Fisher-Phillips unit root test. In the unit root test, the null hypothesis indicates the existence of a unit root, and if the probability of the tests is less than 0.05, the null hypothesis is not accepted with a probability of 95%.

The results of the unit root test for the variables of the models are as described in Table 2.

**Table 2:** Results of the Maney Test of Research Variables

Variable	Levin, Lin & Chu		Im, Pesaran and Shin W-stat		ADF - Fisher Chi-square		PP - Fisher Chi-square	
	statistic	probability	statistic	probability	statistic	probability	statistic	probability
<b>INEFF</b>	-37.168	0.000	-11.232	0.000	637.641	0.000	784.702	0.000
<b>INFIN</b>	-21.375	0.000	-7.560	0.000	558.717	0.000	343.497	0.011
<b>EXFIN</b>	-20.232	0.000	-7.774	0.000	552.017	0.000	667.482	0.000
<b>ROE</b>	-26.370	0.000	-6.840	0.000	520.339	0.000	520.339	0.000
<b>ROA</b>	-18.090	0.000	-6.946	0.000	537.162	0.000	332.210	0.000
<b>CF</b>	-28.387	0.000	-11.922	0.000	678.471	0.000	803.740	0.000
<b>TANG</b>	-13.647	0.000	-2.762	0.002	418.515	0.000	445.921	0.000

**Table 3:** The Results of the Non-Collinearity Test of the Variables

Correlation	INEFF	INFIN	EXFIN	WHR	BIND	BEXPER	BGENDI	SIZE	ROE	ROA	CF	TANG	AGE
INEFF	1.000												
INFIN	0.140	1.000											
EXFIN	-0.160	0.296	1.000										
BANKFIN	0.102	0.125	0.124										
MRAKFIN	-0.251	0.135	0.115										
WHR	0.437	0.124	-0.058	1.000									
BIND	-0.060	0.060	0.094	0.004	1.000								
BEXPER	0.300	0.300	0.328	0.074	0.029	1.000							
BGENDIV	-0.580	0.580	-0.598	0.026	0.029	0.004	1.000						
SIZE	-0.048	0.048	-0.002	0.042	0.060	0.069	-0.085	1.000					
ROE	-0.088	0.088	0.140	0.273	0.034	0.024	0.019	0.051	1.000				
ROA	-0.165	0.165	-0.160	0.117	0.159	0.047	0.044	0.146	0.259	1.000			
CF	0.091	0.091	0.102	0.172	0.066	0.018	0.013	0.082	0.113	0.441	1.000		
TANG	-0.088	0.88	-0.251	0.007	0.022	0.051	0.037	0.029	0.097	0.101	0.107	1.000	
AGE	-0.102	0.102	0.437	0.063	0.111	-0.013	0.081	0.004	0.015	0.072	0.058	0.008	1.000

The results shown in Table (2) show that all research variables are significant. Before estimating the regression model of the research in order to test the hypotheses, the collinearity of the variables in the model should be checked. Pearson correlation analysis was used to check the existence or non-existence

of collinearity between research variables. Table (3) shows the Pearson correlation coefficients between the variables. According to the results of Table (3) and the co-linearity test of the variables, it is clear that the correlation coefficient values do not affect the results of the regression analysis, as a result, there is no co-linearity between the research variables.

The results of the estimation of the first hypothesis test model using the logistic regression method are shown in Table (4).

**Table 4:** Model Estimation Results of the First Hypothesis Test

Variable	Coefficient	Std. Error	Z-Statistic	Prob
WHR	0.808	0.577	1.400	0.161
WHR01	-0.606	0.604	-1.002	0.316
WHR02	-0.031	0.088	-0.354	0.723
BIND	-0.097	0.836	-0.116	0.907
BEXPER	0.631	1.162	0.543	0.586
BGENDIV	0.629	0.629	0.999	0.317
SIZE	-0.156	0.064	-2.429	0.015
ROE	0.023	0.131	0.175	0.860
ROA	-2.157	0.638	-3.379	0.000
CF	0.366	0.625	0.585	0.558
TANG	-4.806	0.458	-10.479	0.000
AGE	0.466	0.183	2.545	0.010
(C)	3.128	1.247	2.507	0.012
0.229 = McFadden coefficient of determination		(0.230) 2.852 = Statistics (probability) Hosmer - Lemshu		
181.594 =LR test			0.0000 =LR prob	

The results stated in Table (4) indicate that the Z-value of the LR statistic (which is similar to the F statistic in the linear regression model) was at the desired level, so it can be claimed that this model is significant and has high reliability. Also, the probability of the LR statistic indicates the rejection of the null hypothesis that all the coefficients of the explanatory variables are zero at the 95% confidence level, and as a result, the regression is significant. In order to check the fit of the estimated model, Hosmer-Lem show test was used. Considering that the probability of the Hosmer-Lem shew test statistic is greater than 0.05, therefore, the estimated model has a suitable fit and the explanatory variables of the model have the ability to explain the change of the dependent variable.

Also, the results in the Table show that McFadden's coefficient of determination is 0.229. This number indicates that 22% of dependent variable changes are explained by explanatory variables. The results listed in Table (4) show that the significance calculated for all CEO narcissism variables is greater than 0.05.

As a result, it can be stated that the CEO's narcissism indicators do not have a significant effect on the company's overinvestment. Based on this, the first research hypothesis is rejected at the 95% confidence level that the narcissism of the CEO has a significant effect on the company's overinvestment. The results of the estimation of the second hypothesis test model using the logistic regression method are shown in Table (5). The results stated in Table (5) indicate that the Z-value of the LR statistic (which is similar to the F statistic in the linear regression model) was at the desired level, so it can be claimed that this model is significant and has high reliability.

**Table 5:** The results of the second hypothesis test model estimation

Variable	Coefficient	Std. Error	Z-Statistic	Prob
WHR	-0.808	0.577	-1.400	0.161
WHR01	0.606	0.604	1.002	0.316
WHR02	0.031	0.088	0.354	0.723
BIND	0.097	0.836	0.116	0.907
BEXPER	-0.631	1.162	-0.543	0.586
BGENDIV	-0.629	0.629	-0.999	0.317
SIZE	0.156	0.064	2.429	0.015
ROE	-0.023	0.131	-0.175	0.860
ROA	2.157	0.638	3.379	0.000
CF	-0.366	0.625	-0.585	0.558
TANG	4.806	0.458	10.479	0.000
AGE	-0.466	0.183	-2.545	0.010
(C)	-3.128	1.247	-2.507	0.012
0.229 = McFadden coefficient of determination		(0.242) 2.829 = Statistics (probability) Hosmer - Lemshu		
		181.594 =LR test	0.0000 =LR prob	

**Table 6:** The Results of the Third Hypothesis Test Model Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob
WHR	0.031	0.006	4.736	0.000
WHR01	-0.009	0.009	-1.072	0.283
WHR02	0.002	0.001	1.589	0.112
BIND	-0.008	0.016	-0.508	0.611
BEXPER	0.013	0.015	0.833	0.404
BGENDIV	0.003	0.009	0.356	0.721
SIZE	-0.015	0.003	-4.459	0.000
ROE	-0.001	0.002	-0.558	0.576
ROA	0.002	0.009	0.219	0.826
CF	-0.002	0.007	-0.307	0.758
TANG	-0.153	0.014	-10.378	0.000
AGE	0.029	0.009	3.274	0.001
(C)	0.102	0.036	2.775	0.005
0.558 = coefficient of determination		0.485 = Adjusted coefficient of determination		
1.965 = Durbin-Watson Test	7.606 = F statistic		0.000 = F Prob	

Also, the probability of the LR statistic indicates the rejection of the null hypothesis that all the coefficients of the explanatory variables are zero at the 95% confidence level, and as a result, the regression is significant. In order to check the fit of the estimated model, Hosmer-Lem show test was used. Considering that the probability of the Hosmer-Lem shew test statistic is greater than 0.05, therefore, the estimated model has a suitable fit and the explanatory variables of the model have the ability to explain the change of the dependent variable. Also, the results in the Table show that McFadden's coefficient of determination is 0.229. This number indicates that 22% of dependent variable changes are explained by explanatory variables. The results listed in Table 5 show that the significance calculated for CEO narcissism variables is greater than 0.05. As a result, it can be stated that the CEO's narcissism indicators do not have a significant effect on the company's underinvestment. Based on this, the second research

hypothesis is rejected at the 95% confidence level that the narcissism of the CEO has a significant effect on the underinvestment of the company. The results of the estimation of the third hypothesis test model using the EGLS method are shown in Table (6).

Based on the results of the analysis of the research model in Table (6), the probability of the F test is at the desired level, so this model is significant and has high reliability. The adjusted coefficient of determination of the model is equal to 0.485, so it can be said that 48 percent of the changes in the dependent variable are explained by the explanatory variables of the model. According to the Durbin-Watson statistic, there is no autocorrelation in the model, and this is one of the regression assumptions. The results listed in Table 6 show that the significance calculated for one of the CEO's narcissism variables (WHR) is less than 0.05 and the coefficient of the variable is positive. As a result, it can be stated that the CEO's narcissism has a positive and significant effect on the company's investment efficiency. Based on this, the third research hypothesis is accepted at the 95% confidence level that CEO narcissism has a significant effect on investment efficiency. The results of the estimation of the fourth hypothesis test model using the EGLS method are shown in Table (7).

**Table 7:** The Results of the Fourth Hypothesis Test Model Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob
WHR	0.010	0.008	1.174	0.240
WHR01	0.020	0.011	1.742	0.081
WHR02	0.007	0.001	3.831	0.000
BIND	0.057	0.020	2.855	0.004
BEXPER	0.034	0.022	1.519	0.129
BGENDIV	0.001	0.010	0.192	0.847
SIZE	0.012	0.004	3.056	0.002
ROE	-0.003	0.003	-1.0009	0.317
ROA	0.947	0.014	65.859	0.000
CF	0.009	0.009	0.967	0.333
TANG	-0.037	0.012	-2.985	0.002
AGE	-0.039	0.013	-2.983	0.002
(C)	-0.101	0.041	-2.431	0.015
0.762 = coefficient of determination		0.756 = Adjusted coefficient of determination		
1.512 = Durbin-Watson Test		155.218 = F statistic		0.000 = F Prob

Based on the results of the analysis of the research model in Table (7), the probability of the F test is at the desired level, so this model is significant and has high reliability. The adjusted coefficient of determination of the model is equal to 0.756, so it can be said that 75 percent of the changes in the dependent variable are explained by the explanatory variables of the model. According to the Durbin-Watson statistic, there is no autocorrelation in the model, and this is one of the regression assumptions. The results listed in Table 7 show that the significance calculated for CEO narcissism variable (WHR02) is less than 0.05 and the variable coefficient is positive. As a result, it can be stated that the CEO's narcissism has a positive and significant effect on the company's internal financing. Based on this, the fourth hypothesis of the research is accepted at the 95% confidence level that the CEO's narcissism has a significant effect on the company's internal financing. The results of the estimation of the test model of the fifth research hypothesis using the EGLS method are shown in Table (8).

**Table 8:** The Results of the Fifth Hypothesis Test Model Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob
WHR	-0.087	0.055	-1.580	0.114
WHR01	-0.015	0.074	-0.214	0.830
WHR02	0.016	0.011	1.403	0.160
BIND	-0.037	0.126	-0.298	0.765
BEXPER	-0.162	0.122	-1.333	0.182
BGENDIV	0.074	0.057	1.302	0.193
SIZE	0.321	0.029	10.760	0.000
ROE	0.000	0.008	0.052	0.958
ROA	-0.645	0.082	-7.853	0.000
CF	-0.884	0.083	-12.032	0.000
TANG	-0.317	0.084	-3.772	0.000
AGE	-0.820	0.077	-10.535	0.000
(C)	-1.856	0.291	-6.356	0.000
0.557 = coefficient of determination		0.484 = Adjusted coefficient of determination		
1.882 = Durbin-Watson Test	15.798 = F statistic		0.000 = F Prob	

Based on the results of the analysis of the research model in Table (8), the probability of the F test is at the desired level, so this model is significant and has high reliability. The adjusted coefficient of determination of the model is equal to 0.484, so it can be said that 48 percent of the changes in the dependent variable are explained by the explanatory variables of the model. According to the Durbin-Watson statistic, there is no autocorrelation in the model, and this is one of the regression assumptions. The results listed in Table 8 show that the significance calculated for CEO narcissism variables is greater than 0.05. As a result, it can be stated that the CEO's narcissism does not have a significant effect on the company's external financing. Based on this, the fifth research hypothesis is rejected at the 95% confidence level that the narcissism of the CEO has a significant effect on the external financing of the company.

## 7 Discussion and Conclusions

The results of the hypothesis test showed that the CEO's narcissism has no significant effect on the indicators of investment inefficiency, i.e. over-investment and under-investment. Ham et al. [16] stated in their research that narcissistic CEOs play an essential role in unfavorable investment. This view is in some ways contrary to the findings of the present research. The calculated CEO narcissism variable is smaller than 0.05 and the variable coefficient is positive. As a result, it can be stated that the CEO's narcissism has a positive and significant effect on the company's investment efficiency. The results showed that CEO narcissism has a positive and significant effect on investment efficiency. The reason for this result is that narcissistic managers have a great desire to achieve success, so they try to increase the efficiency of the company's investment, this result is in accordance with the research results of Ham et al. [16] and contrary to the research results of Foster et al. [12] Is. Also, based on the results, it can be stated that the CEO's narcissism has a positive and significant effect on the internal financing, but it does not have a significant effect on the external financing of the company. This result can be caused by internal resources being controlled by narcissistic CEOs who use more internal financing to achieve their goals. According to the results of the research, it is suggested to the company's board of directors to consider the CEO's behavioral factors such as narcissism and false self-confidence in the evaluation



of the company's investment efficiency. and adjust the company's long-term and short-term investment plans accordingly. According to the results of the research, it is suggested to the board of directors of the companies to keep in mind the level of narcissism of the CEO of the company while injecting internal and external financial resources in the company in order to increase effective investment. It is suggested to investigate the effect of the CEO's narcissism on the investment and financing efficiency of the company with the moderating role of the company's ownership structure. This research was conducted among the companies present in the Tehran Stock Exchange; it is suggested to other researchers to carry out this research among the non-stock companies.

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