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Investigating the Influence of Managers' Androgenic Characteristics on Organizations' Fulfillment of Social Responsibility: Focus on Data Mining and Data Envelopment Analysis Models

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Abstract

The purpose of this research is to investigate the effect of androgenic characteristics of managers on the way companies fulfill their social responsibilities. To achieve this research goal, we reviewed the data of 143 companies admitted to the Tehran Stock Exchange between 2012 and 2021, which spans nine consecutive years. Then, to examine and analyze the data, we used statistical methods such as regression analysis of combined (panel) data and data mining methods like neural networks and decision trees. We applied Charnes and Cooper's function (1962) to ascertain corporate social responsibility (CSR). Results suggested that the androgenic characteristics of managers had significant positive effects on fulfilling companies' social responsibilities. This research was the first to study the androgenic feature as an independent variable associated with managers' appearance. In other words, in this research, for the first time, a non-financial variable that is related to a person's appearance has been investigated in relation to the way companies fulfill their CSR.

Keywords

Androgenic Characteristics, Behavioral Finance, Corporate Social Responsibility (CSR), Data Envelopment Analysis (DEA), Data Mining

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Introduction

Normative, positive, and behavioral finance theories suggest that the actions of managers inside an organization impact its growth, dynamics, and success. As a result, it is critical to examine managers' behavioral characteristics as key determinants of business unit performance. Managers' androgenic characteristics are one of the factors that influence their conduct. This characteristic is primarily determined by testosterone secretion. Leary's theory (1957) in the fields of medicine, biology, and psychology states that the level of testosterone hormone is linked to an increase in the drive to acquire rewards and gains. This hormone exerts an influence on the social status, interpersonal connections, and cognitive processes of managers. Additionally, this hormone induces managers to exhibit behaviors such as power-seeking, ostentation, striving for superiority, pride, exploitation, and self-reliance, as well as to actively pursue the attainment of ambitious objectives for their firms. Moreover, the presence of the testosterone hormone prompts managers to engage in audacious strategic-operational maneuvers and undertake ventures with a higher degree of risk. The key question that prompted this study was: Is the performance of business units correlated with the androgenic characteristics of managers, which involve the secretion of testosterone? Does this characteristic have an impact on how firms perform their social responsibilities?

The novelty of this research is in its evaluation of the managers' appearance characteristics (specifically, androgenic characteristics) in relation to their fulfillment of corporate social responsibility (CSR). This is the first time such an evaluation has been conducted. Furthermore, Charnes and Cooper's Data Envelopment Analysis (DEA) function (1962) has been utilized to determine the means by which firms might effectively meet their CSR. Indeed, this study focused on quantifying the influence of a non-monetary factor on how firms carry out their CSR. Several studies have explored the relationship between management characteristics and the financial and functional decisions of companies. However, there is limited evidence linking the physical appearance of managers to the non-financial performance of the company, specifically in terms of CSR. Psychological research indicates that individuals with androgenic characteristics tend to display psychological features associated with feelings of superiority and a desire for attention. Contrary to the substantial research on narcissism, there is a lack of comprehensive studies on androgenic features like personality or behavioral disorders among managers. This study seeks to investigate the influence of managers' androgenic features on organizations' CSR, and it intends to disseminate the results to stakeholders. This research has the potential to assist company owners in making more informed decisions when selecting managers for their organization in the future. This research has the potential to be advantageous for all firms, regardless of whether they are already listed on the stock exchange or newly founded. Its objective is to improve the level of trust that organizations have among their customers, employees, investors, creditors, and management by promoting CSR. Moreover, this research has the potential to mitigate the harm inflicted on organizations' business ecosystems.

Theoretical Framework and Research Literature

Behavioral Finance

Behavioral finance is an emerging and rapidly expanding field within finance that integrates the disciplines of psychology and economics. Behavioral finance has demonstrated that when making judgments and assessing economic matters, particularly investment decisions, it is important to consider the psychological aspects of the decision-making process. Behavioral finance is concerned with investor psychology and its influence on decision-making. It aims to elucidate individuals' economic choices by integrating psychological and behavioral theories with economic and financial theories. Behavioral finance has its roots in the past 170 years, but it gained prominence in the 1990s as a distinct topic that was featured in academic journals, trade publications, and local newspapers. Behavioral finance aims to manipulate psychological processes in decision-making. Behavioral finance illustrates the substantial impact of human emotions on decision-making, a reality that behavioral economics recognizes despite the typical disregard for emotions in economic modeling.

Androgenic Characteristics

The androgenic characteristic is an individual attribute that can influence the judgment and decision-making processes of individuals, especially company managers. Many studies conducted in Iran often equate or categorize this characteristic as a subcategory of narcissism due to the resemblance in performance and decision-making between individuals with this trait and narcissistic individuals. Internationally, research in behavioral finance examines this characteristic independently of narcissism.

According to the theories of human judgment and information processing in behavioral finance, several aspects, such as brain function, behavior, personality characteristics, emotions, and hormones, have an impact on people's decision-making. One of the impacts is the influence of testosterone on androgenic characteristics (Cardoos et al., 2017). Testosterone plays a significant role in shaping men's psychological characteristics (Kordsmeyer & Penke, 2019). This hormone is crucial in influencing the emotional state of men (Herbert, 2018). Individuals possessing this characteristic exhibit greater muscular development and demonstrate a heightened aptitude for discerning the emotions and sentiments of others through nonverbal cues. Testosterone has a significant influence on learning and memory processes. Research indicates that individuals in leadership positions within an organization possess higher levels of testosterone compared to their subordinates in lesser positions. The androgenic feature is a physical characteristic in men that can influence several aspects of appearance and personality because of its direct association with the testosterone hormone. Research conducted by Kordsmeyer and Penke (2019) showed a direct correlation between the release of testosterone hormone in individuals and their facial width-to-height ratio (fWHR, hereafter). Lefevre et al. (2013) asserted that there is a positive correlation between the fWHR of men's faces and their testosterone levels. The research conducted by Kordsmeyer and Penke (2019) demonstrates that the fWHR is a primary factor influencing testosterone-related behaviors in men. It is important to mention that fWHR does not change much after puberty. Therefore, it is efficient to find only one photo of the CEO at each point in time after puberty (Jia et al., 2013). This procedure was also employed in the current investigation. The photographs of the company's chief executive officers were obtained from Google Images.

CSR

CSR refers to the alignment and integration of an organization's actions and principles in a manner that incorporates the interests of all stakeholders, such as shareholders, customers, employees, investors, and the public, into the organization's policies and performance. Put simply, the firm must consistently view itself as an integral component of society, acknowledge its responsibility towards society, and make efforts to enhance public welfare regardless of the company's immediate interests (Foroughi et al., 2008).

According to McWilliams and Siegel (2001), CSR includes efforts to enhance the well-being of society that go beyond business objectives and legal obligations. CSR is a way for organizations to demonstrate their commitments to society. It is a mechanism that ensures the corporation and society both benefit by establishing a mutually beneficial connection and creating shared value for both parties. Simply put, CSR highlights the connection between a company and its stakeholders (Cadbury, 1992).

In reality, CSR is a moral framework and scope that assigns various duties, all beneficial to society, to a specific organization or company. CSR refers to a business unit's responsibility for their impact on society. More precisely, CSR means the performance of individual duties by each person in a society, which will create a proper balance between the ecosystem and the economy of the society. Using the word responsibility means that every person should be aware of his responsibility, accept his role in maintaining this balance, and perform it correctly.

Zhao and Xiao (2019) demonstrate that companies exhibiting greater CSR throughout all stages of their lifecycle—growth, maturity, and decline—experience reduced financial constraints. However, no significant correlation was found between CSR and financial constraints. Herbert (2018) conducted a research review to investigate the correlation between testosterone, cortisol, and the propensity to engage in financial risk-taking. The findings of his research demonstrated that financial risk-taking is a distinct manifestation of strategic decision-making and can occur in situations characterized by uncertainty. Additionally, these hormones can influence the likelihood of employment-related risks, the perceived value of rewards, cognitive processing, and the assessment of prospective gains and losses, both on an individual and societal level, while making decisions for a project. Jia et al. (2014) conducted a study on 1500 S&P companies from 1996 to 2010. They found that as managers' testosterone levels increased, their self-confidence also increased. This, in turn, resulted in a higher incidence of erroneous financial reporting.

Managers with strong self-confidence often resort to fraudulent practices in order to manipulate financial reports and get attention and praise from others. In their study titled "Designing the Model of Social Responsibility for Public Organizations in Iran (Ethical-Strategic Approach)," Sobhani et al. (2021) utilized the fuzzy inference system to investigate the impact of ethical approaches and organizational CSR strategies on various dimensions of CSR. The findings revealed a positive correlation between the effectiveness of these strategies, implemented from lower to higher levels, and all aspects of CSR. Meanwhile, the desired impacts varied depending on the spectrums and varied modes of these two factors on CSR. Grami Shirazi (2013) conducted a study investigating the impact of testosterone hormone levels and CEO overconfidence on the likelihood of inaccurate financial reporting in companies registered on the Tehran Stock Exchange. The research sample comprised 52 public trading firms over the period of 2003–2013. The findings indicated that the CEO's excessive self-assurance can have a favorable impact on the likelihood of financial misreporting. Additionally, the CEO's personality attributes effectively mitigate the likelihood of inaccurate reporting.

Research Hypothesis

According to the theoretical foundations presented, the research hypothesis is as follows: Androgenic characteristics of managers have an effect on how companies fulfill their social responsibilities.

Research Method and Statistical Population

This study employs the ex-post facto research method to analyze the correlations between variables based on historical data. Ex-post facto studies involve the collection and analysis of data from the natural environment or historical events that occurred without the researcher's knowledge. Consequently, the variables cannot be manipulated. Furthermore, as this study aims to examine and demonstrate the interconnections between variables, it falls under the category of correlation research. This research will begin by examining the overall status of the research variables using descriptive statistics. We utilized the J Image software to quantify the androgenic characteristics of managers. All the firms listed on the Tehran Stock Exchange between 2012 and 2021 comprised the statistical population of the present study. The research employed a systematic (targeted) elimination sampling strategy. The companies were chosen as representative examples, taking into account the following criteria:

- In order to ensure comparability, it is necessary for enterprises to conclude their financial year by the end of March annually.
- Throughout the duration of the research, they have remained consistently engaged in their activities and have maintained a stable financial status without any alterations.
- All necessary data from the companies for the study should be accessible.
- The firms should not belong to banks and financial institutions (investment companies, financial intermediaries, holding companies, leasing companies, and insurance companies).
- The companies were admitted to the stock exchange before 2012.
- In order to measure the level of testosterone hormone, it is necessary that the companies in question have male CEOs.
- The required financial and non-financial information, especially the personal photos of the CEOs, should be available at the end of the financial year to extract the required data.

After considering all the above criteria, a total of 143 companies remained in the screened population. All of which have been selected as samples of research.

Research Variables and How They Were Measured

Dependent Variable

The DEA was employed to assess the CSR of organizations, with consideration given to voluntary responsibility, moral responsibility, and legal responsibility, among other indicators (Ramezannia & Rezaei, 2018). The CSR of corporations was assessed through the utilization of a production function that was derived from the approach established by Charnes and Cooper in 1962. The maximum output values produced by a combination of input values are displayed by this function. The definitions of each of the aforementioned model variables are demonstrated in Table 1 below:

Table 1. Definition Variables

Variable Name	Symbol	Definition Of Variable and How to Measure It
Volunteer responsibility	I_1	Natural Logarithm of the Number of Employees of the Company
Volunteer responsibility	I_2	Number of Shareholders of the Company
Ethical responsibility	I_3	Measured Based on the Number of Discretionary Accruals
Legal responsibility	I_4	Disclosure Points According to the Annual Announcement of the Stock Exchange Organization
Legal responsibility	I_5	Employers' Insurance Contribution
Legal responsibility	I_6	Performance Tax
Economic responsibility	Q_1	Ratio of Market Value to Book Value of the Company
Economic responsibility	Q_2	Sales Growth Compared to Last Year
Economic responsibility	Q_3	Stock Returns for Firms

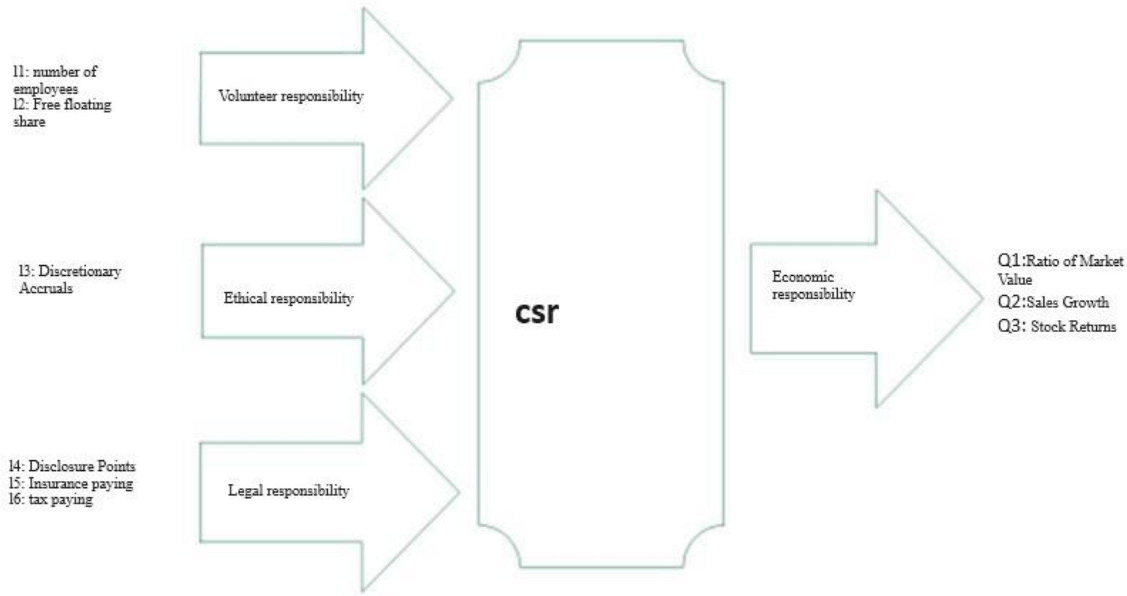

Figure 1. Variables related to CSR

Independent Variable

The current research uses the fWHR of CEOs as a criterion to measure their testosterone levels. According to Mills (2014), the androgenic feature is 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 temples (width of the face) divided by the distance between the eyebrow and the upper lip (height of the face). The ratio of this width-to-height measurement is expressed as WHR. Following Cardoos et al. (2017), all the photos of managers have been converted into 8-bit black-and-white images, and the WHR ratio of each CEO has been measured using the J Image software. We show the amount of testosterone hormone with THI in the descriptive statistics table (Table 2).

Controlling Variables

- **Age of the company**: calculated using the natural logarithm of the difference between the financial year under review and the company's founding year (Xiang & Song, 2021).
- **Company size**: measured using the natural logarithm of the stock market value (Xiang & Song, 2021).
- **Return on equity (ROE)**: obtained by using net profit divided by total equity (Xiang & Song, 2021).

- **Asset Leverage (LEV)**: calculated by dividing the liabilities by the total assets of the company (Xiang & Song, 2021).

Conceptual Model of Research

Figure 2 shows the conceptual model of the research.

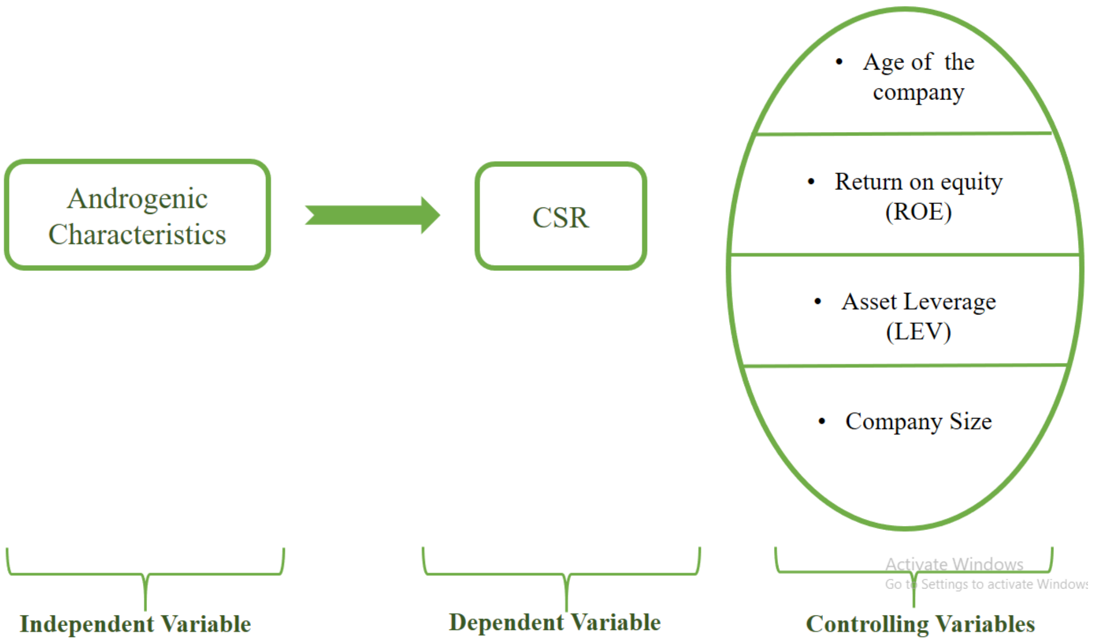

Figure 2. The conceptual model of the research

Hypothesis Testing of the Model

CSR i,t = α0 + α1 THIi,t + α2 Age i,t + α3 Size i,t + α4 ROV i,t + α5 LVE i,t + εi,t

Results

In this research, descriptive and inferential statistics have been used to analyze the data**.**

Table 2. Descriptive Statistics

Kurtosis	Skewness	Standard Deviation	Minimum	Maximum	Median	Mean	Variable
٢,٢٨٠	٠,٥٥١	٠,٢٣٨	٠,٠٠٠١	١,٠٠٠	٠,٢٨٧	٠,٣٣٤	**CSR**
١,٠١٨	-٠,١٣٧	٠,٤٩٨	٠,٠٠٠	١,٠٠٠	١,٠٠٠	٠,٥٣٤	**THI**
٣,٢٦٤	٠,١١٠	٠,٣٨٠	١,٦٠٩	٤,٠٠٧	٢,٩٩٥	٢,٩٩٤	**AGE**
٣,١١٢	٠,٥٣٤	١,٩٣٤	١٠,١٣٢	٢١,٨٨٨	١٤,٦٢٣	١٤,٩٦١	**SIZE**
٧٧,٨١٨	-٢٤,٨٥٠	١,٤٣٦	-٤٦,٠٧٣	٩,٤٨٦	٠,٢٩٩	٠,٢٥٥	**ROE**
٣,٩٤١	٠,٢٠٧	٠,٢٠٣	٠,٠٣١	١,٨٢٤	٠,٥٥٢	٠,٥٤٩	**LEV**
١٤٣٠	١٤٣٠	١٤٣٠	١٤٣٠	١٤٣٠	١٤٣٠	١٤٣٠	**Observations**

The ROE has the lowest mean in the above table, while the bank size variable (size) has the highest mean. Also, the positive Kurtosis coefficients indicate that the distribution of the variables is higher than the normal distribution and that the data are more concentrated around the mean. Table 3 shows the results of testing the research hypothesis using the EViews 10 software and the generalized least squares (GLS) estimation method.

Table 3. Coefficients of the regression model of the research hypothesis

P-value	t-statistic	standard error	Estimated coefficient	Variable
٠,٠٠١	٣,١٦٨	٠,٠٠٧	٠,٠٢٥	THI
٠,٨١٢	٠,٢٣٦	٠,٠٢٩	٠,٠٠٧	AGE
٠,٨٢٣	-٠,٢٢٢	٠,٠٠٣	-٠,٠٠٠٨	SIZE
٠,٠٠٠	٣,٥٥٢	٠,٠٠٣	٠,٠١١	ROE
٠,٠٢٦	-٢,٣٥٧	٠,٠١٣	-٠,٠٣١	LEV
٠,٠٠٠	٥,٦٣٤	٠,٠٥٨	٠,٣٢٩	(C) y-intercept
adjusted coefficient of determination = ٠,٥٥٠			٠,٦٧٦ = Coefficient of determination	
٠,٠٠٠ = P value		٣٠,٢٥٧ = F Statistic		١,٥٥٤ = Durbin-Watson statistic

Table 3 demonstrates that the F test's P value is 0.000, which is less than 0.05. Given that the F statistic demonstrates the model's overall validity, we can conclude that this model is significant with a 95% probability and exhibits high reliability. Furthermore, the results show that the model's adjusted coefficient of determination is approximately 0.550. This figure indicates that the explanatory variables of the model account for 55% of the changes in the dependent variable, and with the Durbin-Watson statistic of 1.554, which falls between 1.5 and 2.5, we can conclude that the model lacks autocorrelation.

The Results of the Research Hypothesis Test

The results of the hypothesis tests indicate that the variable of androgenic characteristics of managers has a P value (0.001) smaller than 0.05 and an estimated positive coefficient (0.025). Therefore, we can conclude that the androgenic characteristic of managers significantly and positively influences the company's CSR. With a 95% confidence level, this research accepts the hypothesis that the androgenic characteristic of managers influences how companies fulfill their social responsibility.

Conclusion

The current study demonstrated a correlation between androgenic traits and the manner in which firms fulfill their CSR. Ensuring that firms satisfy their CSR is highly significant and advantageous in contemporary cultures, particularly in developed nations. CSR refers to a corporation's acknowledgment of its responsibility towards people, the environment, and future generations in the community it operates in. The organization strives to proactively avoid any harm or disturbance to the resources it utilizes. When a company's performance exposes an error, its stock value experiences a substantial decline in industrialized nations. Consequently, developing countries should transition their management systems and decision-making processes to effectively implement CSR.

Carrying out any research work clears the way for future research, and the infinity of science causes further research to be carried out. In this regard, suggestions for future research are presented:

1) The effect of other behavioral variables such as optimism biases, overcontrol, and loss aversion tendencies on the way of fulfilling CSR in companies should be investigated.
2) The effect of androgenic variables and material variables on profit management based on corporate governance should be investigated.
3) The relationship between the independent and dependent variables of this research should also be measured on inflationary financial statements, and its effects should be considered.

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