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# Trends and Financial Variations in Executive Confidence: A Decade-Long Analysis

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## *Abstract*

*The present research is an endeavour to measure the extent of overconfidence bias among Chief Executive Officers (CEOs) in India. Additionally, this investigation seeks to examine the financial disparities among firms led by CEOs exhibiting different levels of overconfidence. This study is based on a sample of 500 large Indian companies listed on the Bombay Stock Exchange over a period of twelve years starting from 2009-2010 to 2020-2021. The findings reveal a downward trend in the overconfident behaviour of CEOs over the specified period, with notable exceptions during key corporate events like the introduction of the Companies Act in 2014 and the COVID-19 pandemic. Moreover, the t-test and ANOVA estimation results unveil that firms led by CEOs with different overconfidence levels have significant variations in their returns, size, age, liquidity, and growth. The study offers valuable insights into behavioural finance literature and serves board members, investors, and policymakers by expanding the understanding of executive psychology within the Indian context. Additionally, to the best of the authors' knowledge, this present study is the first to analyse the decade-long trends and financial implications of cognitive attributes of top executives in the Indian corporate sector.*


***Keywords**: CEO Confidence, Corporate Finance, Decision Making, Behavioural Biases, India*

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## 1. Introduction

Recently, academic research on behavioural biases has acknowledged executive overconfidence as the most influential managerial bias in the corporate environment (Brown & Sarma, 2007; Malmendier & Tate, 2005; Schumacher et al., 2020). CEO overconfidence has attracted substantial scholarly interest over the last two decades to unearth the sources of distorted decision-making in business. CEO overconfidence reflects the tendency of the CEO to overestimate his/her ability to accurately predict the future course of action. Hackbarth (2008) in its experimental psychology reports suggests that overconfident CEOs tend to have cognitive dispositions in their thinking restraining them from conforming to the basic tenets of logic, probabilities, and plausibility. Thus, they often overestimate their knowledge, performance, and quality of decisions relative to their peer group. This increases the likelihood of systemic errors in CEO's expectations and estimations and thereby, can influence their decision-making abilities (Kim et al., 2022).

Most of the studies covering CEO overconfidence are based on Upper Echelon Theory (UET) which embraces the behavioural aspects of top executives and calls for the consideration of the same while dealing with the financial aspects of a business (Hambrick & Mason, 1984; Li et al., 2023; Ting et al., 2015). The UET theory extends the framework of behavioural finance literature by advancing the conceptual background to the significance of overconfidence bias among CEOs and its relationship with the internal and external environment of a firm. The UET has helped to unearth the reasons for the differences in performance of firms operating in the same country and industry, having similar size and investment avenues (Ben-David et al., 2013). The theory revealed that one of the major reasons behind these performance variations could be the cognitive biases of top managers. Therefore, Hambrick and Mason (1984) emphasized the role played by the personality traits of a CEO such as expertise, knowledge, preferences, values, and cognitive biases in shaping the strategic direction of the firm. Overall, the theory proposes that CEO's idiosyncrasies and fixed behavioural aspects can play a crucial role in the estimation of strategic choices, organizational outcomes, and the performance level of a firm (Goel & Thakur, 2008; Li & Tang, 2010).

Heaton (2002) claimed that CEO overconfidence can contribute significantly to the value of firms such as superior innovation and more optimal investment level (Cho et al., 2021; Hirshleifer et al., 2012), but it also inspires them to make risky and irrational decisions, which can impact the profitability of a firm (Certo et al., 2008). As the CEO is the prime decision-maker of the firm and has a significant influence on the business (Ford & Kiran, 2008), detecting the overconfident bias among CEOs is vital for the sustainable and continuous success of the business (Roll, 1986). The academicians have confronted paramount challenges while defining and measuring overconfidence bias among CEOs (Burkhard et al., 2018). However, in order to build a satisfactory case about the effect of CEO overconfidence on the firm's corporate decisions and performance, a stable and accurate measure to measure

overconfident bias among CEOs must be developed or identified. Therefore, this work is an endeavour to congregate the proxies for CEO overconfidence developed in various parts of the world and employ it to gauge overconfidence bias among CEOs in India for 12 years starting from 2010 to 2021.

With the growing global market presence, India has witnessed several recent corporate scams and failures such as the Satyam Scam and the Yes Bank fiasco. One of the major factors inducing these scams and failures is found to be high confidence among Indian CEOs which leads them to make irrational and risky decisions (Singh et al., 2010; Deb, 2021). These instances showed that both CEOs intentionally controlled the firm's corporate actions including disclosures, investments, and board decisions to window-dress their own failures. This situation undoubtedly indicates the prevalence of overconfidence bias among Indian CEOs and thus, the crucial need to explore these aspects in the Indian context. Moreover, most of the research on CEO confidence has focused on exploring CEO overconfidence in developed countries and Western contexts only (Campbell et al., 2011; Galasso & Simcoe, 2011; Malmendier & Tate, 2005). In this regard, existing research indicates that individuals from Asian cultures considerably differ from individuals from Western cultures in terms of their cognitive attributes as Western individuals are more prone to analytical thinking, while Asians often rely on an intuitive, holistic mindset that emphasizes contextual factors (Levinson & Peng, 2007; Nisbett & Masuda, 2003). Moreover, the collectivist approach and hierarchal power distance of upper echelons make them more prone to behavioural biases in Asian cultures. However, there is a notable lack of research addressing the behavioural aspects of managers in Asian contexts (Czerwonka, 2017; Mundi & Kaur, 2019, 2022; Saini & Singh, 2023). Thus, the current study aims to explore the behavioural attributes of executives to provide a comprehensive demonstration of the trends and financial dynamics of overconfidence bias among CEOs in a non-western context (i.e. India). Additionally, there is a lack of a concrete and standardized approach for measuring overconfidence bias among managers. Moreover, the inefficiencies of qualitative measures have made an urgent call to scholars all over the world to quantify executive confidence in a manner other than surveys and interviews. Therefore, the present research is unique as it is the first longitudinal study focusing on the comprehensive measurement of CEO overconfidence in India through four major quantitative measures developed based on the revealed beliefs of CEOs and the investment decisions of CEOs.

## 2. Literature Review

Numerous studies have quantified the level of competition using the structural and non-structural approaches in the panel as well as the time series framework. The significance of behavioural attributes of top executives in business was initially recognized by Moore (1977). The author claimed that top executives are more likely to exhibit overconfidence due to various inducement factors such as the illusion of

control over future events and commitment to outstanding performance to maintain their image. Thereafter, the role of CEO confidence in the corporate world was clearly emphasized in Roll's (1986) hubris hypothesis theory by recognizing CEO overconfidence as the major determinant of corporate decision-making. He discusses that behavioural biases can induce top executives to overestimate their managerial skills and capabilities which affect corporate investments at the firm level. These theoretical discoveries of Roll (1986) gained the attention of management scholars and encouraged them to thoroughly explore the concept of CEO overconfidence. However, the measurement of CEO overconfidence is a prerequisite to investigate its causes and real effect on various corporate decisions and outcomes, but it is a complex attempt. Despite the immense significance of behavioural biases of top managers in paving corporate success, it is still maculated with a non-concrete definition and lacks a standardized technique of measurement.

Traditionally, academicians have used survey-based approaches to capture behavioural attributes of an individual such as interviews or questionnaire methods. However, the CEOs being the highest authority in the management, usually do not have time to respond to these interviews or questionnaires. Moreover, the other shortcomings of qualitative techniques (low response rate, acquiescence bias, social desirability bias, and confirmation bias) have developed an urge among scholars to gauge overconfidence bias among CEOs through a technique other than survey-based approach. Their efforts resulted in the identification of several quantitative measures of CEO overconfidence including proxies based on the portfolio decisions of CEOs (Campbell et al., 2011; Galasso & Simcoe, 2011; Hirshleifer et al., 2012; Tang et al., 2020; Malmendier & Tate, 2005), media reports (Brown & Sarma, 2007; Chen et al., 2015; Malmendier & Tate, 2008), investment decisions (Ahmed & Duellman, 2012; Duellman et al., 2015; Dashtbayaz & Mohammadi, 2016; Killins et al., 2021), and personal characteristics (Liang et al., 2020). Table 1 provides insight into all the major proxies developed by researchers in empirical studies to capture CEO confidence in different country settings.

Malmendier and Tate (2005, 2008) made their first move to develop quantitative proxies to capture CEO overconfidence in US firms using the portfolio decisions taken by the CEOs namely Holder67, Longholder, and Net Buyer. The Holder67 measure labels a CEO as overconfident if he/she holds on to the vested and highly in-the-money (more than 67%) stock options in the fifth year before the option expiration date. The Longholder proxy classifies a CEO as overconfident if he/she holds on to the vested stock options that are at least 40% in the money until the last year of the expiration period. Net Buyer considers CEOs as overconfident if they expose themselves to the firm's specific risk by acquiring additional stock of the firm. In line with the work of Malmendier and Tate (2005, 2008), Sen and Tumarkin (2015) employed the Share Retainer approach that was based on the stock trading behaviour of CEOs to measure CEO overconfidence. If a CEO retains all or some of the shares acquired upon exercising the stock options, he/she is categorized as an overconfident CEO.

**Table 1. Different Proxies of CEO Confidence Developed in Prior Empirical Studies**

| Proxy | Authors | Country |
|---|---|---|
| Based on Investment Decisions of CEOs (Excess Capx and Excess Asset Growth) | Ahmed & Duellman, 2012; Duellman et al., 2015; Dashtbayaz & Mohammadi, 2016; Killins et al., 2021. | Iran and USA |
| Based on Portfolio Decisions of CEOs (Holder 67, Longholder, Net Buyer) | Malmendier & Tate, 2005; Campbell et al., 2011; Galasso & Simcoe, 2011; Hirshleifer et al., 2012; Tang et al., 2020. | USA and China |
| Based on Mass-media Comments on CEOs | Brown & Sarma, 2007; Malmendier and Tate, 2008; Chen et al., 2015; Zavertiaeva et al., 2018. | USA |
| Based on CEO's Corporate Earnings Forecasts | Hribar & Yang, 2010; Huang et al., 2011. | Taiwan and USA |
| Based on CEO's Personal Characteristics | Liang et al., 2020. | China |
| Based on CEO's Compensation | Hayward & Hambrick, 1997; Huang et al., 2011. | USA |
| Based on the entrepreneur status of a CEO | Barros & Silveira, 2008 | Brazil |

Source: Compiled from empirical studies

Likewise, Reyes et al. (2022) and Vitanova (2021) also gauged the overconfidence bias among CEOs of publicly listed US firms with the Holder67 measure. However, CEO overconfidence cannot be judged exclusively based on portfolio decisions taken by the CEOs due to the availability of insider information, and varied risk tolerance levels of different executives. Also, the limited accessibility of data related to the timing and value of stock options exercised by a CEO in emerging and underdeveloped economies has restricted the usage of this measure globally.

The burgeoning literature related to CEO confidence has been extended by developing additional measures in various parts of the globe to capture the overconfidence bias among top executives (Kumar & Choudhary, 2023). In this context, Liang et al. (2020) conducted a study on managerial overconfidence in China using a sample of 1243 firms listed on the Shanghai Stock Exchange from 2000 to 2012. They measured CEO overconfidence by employing a composite measure based on the personal characteristics of the CEO such as age, tenure, education, experience, gender, and duality. Ahmed and Duellman (2012) explored managerial overconfidence with a sample of S&P 1500 firms for the period 1993 to 2009 using Conf_Capx and the asset growth model. Likewise, Duellman *et al.* (2015) scrutinized the association between managerial overconfidence and audit fees by using a sample of 7661 company-year observations from 2000 to 2010 with investment-based overconfidence measures. Also, Khajavi and Dehghani (2016) gauged CEO overconfidence in firms listed on the Tehran Stock Exchange from 2005 to 2012 with CAPX and Over-Invest proxies of overconfidence. Moreover, Killins et al. (2021) also measured CEO overconfidence using the CEO's corporate investment decisions (Excess CAPX and Excess Asset Growth) in US firms from 2002 to 2018. In addition to this, Hribar & Yang (2010) and Hirshleifer *et al.* (2012) captured CEO overconfidence

using a proxy constructed on the basis of press portrayal of CEOs. This measure classifies a CEO as overconfident if the number of published articles mentioning the CEO as confident exceeds the number of published articles mentioning the CEO as risk-averse or under-confident. Similarly, Zavertiaeva et al. (2018) studied CEO overconfidence using a sample of 766 firms from seven countries such as the United Kingdom, France, Italy, Spain, Germany, Switzerland, and the Netherlands for 6 years from 2008 to 2013. They measured the prevalence of CEO overconfidence in all these countries by employing press-based measures of CEO overconfidence.

Studies covered in the above discussion are mostly conducted in developed nations with huge corporate databases and thus, favourable for researchers to capture the media comments, earning forecasts, and stock and investment decisions of managers. Moreover, the literature review section of the study points towards the critical requirement to gauge CEO overconfidence globally that can guide concerned parties in making correct judgments. Thus, the need to explore the behavioural biases of top executives in emerging economies for a better understanding of business dynamics and corporate growth aspects has encouraged this research endeavour in the Indian context.

## 3. Research Methodology

### 3.1. Sample and Data

All the Indian companies listed on the Bombay Stock Exchange constitute the universe of the study. An initial sample of S&P Indexed top 500 Indian companies listed on the Bombay Stock Exchange was selected and extracted in January 2020. The banking and financial institutes have been eliminated from the study due to their distinctive nature and separate rules and regulations involved. In addition to this, firms with inaccessible annual reports and inadequate variable data are also ignored. The data related to CEO overconfidence has been collected manually from the Annual Reports and the official websites of the sampled firms. The data related to CEO-specific variables, corporate governance indicators, and control variables is extracted from the Ace Equity Database, the official Bloomberg website, and the Annual Reports of companies. Table 2 provides detailed information on the ultimate sample of the study.

## Table 2. Sample of the Study

| Particulars | No. of firms (N) | No. of firm-year observations (n) |
|---|---|---|
| Initial Sample | 500 | 6000 |
| Less: Banking and financial institutes | (97) | (1164) |
| Less: Inaccessible annual reports | (15) | (180) |
| Less: Inadequate variable data | (73) | (876) |
| **Final sample** | **315** | **3780** |

Source: Authors' Computation

## 3.2. Measurement of CEO Confidence

Overconfidence is a psychological bias and is subjective in nature. Thus, it is difficult to measure directly. The research world has given several qualitative as well as quantitative measures to reflect managerial overconfidence. Various proxies used to measure managerial overconfidence include proxies based on the investment behaviour of the CEO (Ahmed & Duellman, 2012; Chyz *et al.,* 2019; Dashtbayaz & Mohammadi, 2016; Khajavi & Dehghani, 2016) based on the stock options behavior (Deshmukh *et al.,* 2013; Kim *et al.,* 2022; Malmendier & Tate, 2005, 2008), CEO experience (Ting *et al.,* 2016), press portrayal of CEO (Chyz *et al.,* 2019; Deshmukh *et al.,* 2013; Malmendier & Tate, 2008; Zavertiaeva *et al.,* 2018) and managerial forecast errors (Dashtbayaz & Mohammadi, 2016; Huang et al., 2011). The present study uses the following proxies:

### 3.2.1. Based on CEO's Revealed Beliefs: Net Buyer

The present study uses the net buyer measure to capture the overconfident behaviour of CEOs as suggested by Malmendier and Tate (2005). This measure focuses on the CEO's tendency to buy the additional stock in their own company. A dummy variable has been established with a value of one representing overconfident CEOs and zero otherwise.

### 3.2.2 Based on CEO's Investment Decisions: Conf_Capx

The second measure of CEO confidence namely Conf_Capx overconfidence has been derived from the current CEO's investment strategies (Ahmed & Duellman, 2012). This is a dummy variable that is assigned as 1 if the capital expenditure scaled by lagged total assets is greater than the median of this ratio in the firm's respective industry, otherwise 0 (Ahmed & Duellman, 2012; Schrand & Zechman, 2012).

### 3.2.3 Based on CEO's Investment Decisions: Conf_Growth

This study gauges the overconfidence bias among CEOs using the asset growth model. Following the literature, a CEO's investment decisions are used to measure CEO confidence (Chyz et al., 2019; Dashtbayaz & Mohammadi, 2016; Killins et al., 2021). Conf_Growth measure captures the excess investment in assets from the residuals of a regression model of total assets on sales growth. The baseline asset growth model is presented below:

$$Total\ Asset\ growth = \alpha + \beta 1\ Sales\ growth + \varepsilon$$

This variable is assigned as 1 if the residual from the model is positive, otherwise 0.

### 3.2.4 Composite Measure: Conf_Composite

It is an ordinal measure developed by aggregating the scores of three binary metrics of overconfidence i.e. Net Buyer, Conf_Capx, and Conf_Growth. The overconfidence scores range from "Non overconfident CEOs" to "High overconfident CEOs" each assigned a score from 0 to 3. This variable reflects the order in terms of the likelihood

of the CEO exhibiting overconfident behaviour in his/her corporate decisions. Conf_Composite has four ordered categories formed based on total confidence score namely firms with non-overconfident CEOs with 0 score, low overconfident CEOs with 1 score, moderate overconfident CEOs with 2 score, and high overconfident CEOs with 3 score.

### 3.3. Other Variables

Various financial variables of firms such as ROA, Tobin's q, firm size, firm age, liquidity, leverage, sales growth, and fixed asset turnover ratio have been taken into consideration to assess the financial differences between firms led by overconfident CEOs and those led by non-overconfident CEOs. Appendix A offers a detailed description of the measurement methods for all these variables.

## 4. Extent of CEO Confidence in India

This section explains the extent of CEO overconfidence in the Indian corporate sector. First, the year-wise measurement of CEO overconfidence of 315 Indian firms has been presented for 12 years with the help of four measures of CEO overconfidence. Four measures of CEO confidence namely Net Buyer, Conf_Capx, Conf_Growth, and Conf_Composite have been constructed and tested. Then, the degree of overconfidence among Indian CEOs is ascertained and presented. Finally, industry-wise measurement of CEO overconfidence is done by segregating whole sampled firms into 14 major industries of the Indian corporate sector.

### 4.1. Year-wise Measurement of CEO Overconfidence in India

It can be observed from Table 3 that as per the Net Buyer measure of CEO overconfidence, 4.13% of the total sampled firms were managed by overconfident CEOs in the year 2010. This percentage increased to 20% in the year 2011 and 23.49% in the year 2012. However, this percentage started to decline from 20.95% in 2013 to 11.11% in 2019. After this, the proportion of firms led by overconfident CEOs started increasing to 18.10% in the year 2020 and 35.56% in the year 2021. To conclude, it can be deduced that the percentage of Indian firms with overconfident CEOs is lowest in the year 2010 and highest in the year 2021. Also, the proportion of firms managed by overconfident CEOs has increased nearly 10 times by the last year of the study period. The overall proxy results show an average of 17% of firms are managed by overconfident CEOs in India. Table 3 further shows that according to Conf_Capx proxy of CEO overconfidence, 55.56% of the Indian firms are managed by overconfident CEOs in the year 2010. This percentage increased to 64.76% in 2011 and 64.44% in 2012. However, this percentage started declining from 59.05% in 2013 to 27.62% in 2021. Also, the proportion of firms with overconfident CEOs was at its peak in the year 2011 with 64.76% and the lowest in the year 2021 with 27.62%. Overall, out of a total of 3780 firm-year observations, nearly 50% of firms are managed by overconfident CEOs in the Indian corporate sector as per the Conf_Capx measure.

## Table 3. Year-wise measurement of CEO overconfidence

| Year | Net Buyer | | Conf_Capx | | Conf_Growth | |
|---|---|---|---|---|---|---|
| | Total | (%age) | Total | (%age) | Total | (%age) |
| 2010 | 13 | 4.13 | 175 | 55.56 | 159 | 50.48 |
| 2011 | 63 | 20.00 | 204 | 64.76 | 149 | 47.30 |
| 2012 | 74 | 23.49 | 203 | 64.44 | 134 | 42.54 |
| 2013 | 66 | 20.95 | 186 | 59.05 | 109 | 34.60 |
| 2014 | 69 | 21.90 | 154 | 48.89 | 103 | 32.70 |
| 2015 | 37 | 11.75 | 153 | 48.57 | 91 | 28.89 |
| 2016 | 45 | 14.29 | 161 | 51.11 | 97 | 30.79 |
| 2017 | 38 | 12.06 | 152 | 48.25 | 98 | 31.11 |
| 2018 | 35 | 11.11 | 139 | 44.13 | 95 | 30.16 |
| 2019 | 35 | 11.11 | 141 | 44.76 | 82 | 26.03 |
| 2020 | 57 | 18.10 | 135 | 42.86 | 69 | 21.90 |
| 2021 | 112 | 35.56 | 87 | 27.62 | 78 | 24.76 |
| Total | 644 | 17.04 | 1890 | 50 | 1264 | 33.44 |

*Source: Authors' Computation*

Also, Table 3 demonstrates the measurement of CEO overconfidence in India using the Conf_Growth measure. The findings reveal that 50.48% of the total sampled firms were managed by overconfident CEOs in India in the year 2010. This percentage declined to 47.30% in 2011 and 42.54% in 2012 and continued to decline from 34.60% in 2013 to 24.76% in 2021. All in all, the results show a downfall in the number of firms that are managed by overconfident CEOs in India. Also, the highest proportion of overconfident firms was observed in 2010 at 50.48% and the lowest proportion in 2020 at 21.90%. Finally, the findings of the Conf_Growth measure suggest that 33.4% of firms are run by overconfident CEOs in the Indian corporate sector. Figure 1 provides the graphical representation of the year-wise measurement of CEO overconfidence using the Net Buyer, Conf_Capx, and Conf_Growth proxies.

Table 4 enumerates the year-wise measurement of CEO confidence in the Indian corporate sector using the Conf_Composite measure. The sampled firms were segregated into four categories using scores from the composite measure of CEO confidence. The first category, with a 0 score indicates firms with non-overconfident CEOs, the second category with a 1 score shows firms led by low overconfident CEOs, the third category with a score of 2 specifies firms managed by moderately overconfident CEOs, the fourth category with a 3 score demonstrates firms managed by high confidence CEOs. The results show that the percentage of firms managed by non-overconfident CEOs decreased notably from 23.81% in 2010 to 15.87 % in 2012 followed by a steady increase in the subsequent years from 2013 to 2020 and then again rapid decrease in 2021. The overall percentages exhibit an increasing trend from the first year 2010 (23.81%) to the last sampling year 2021 (34.92%).

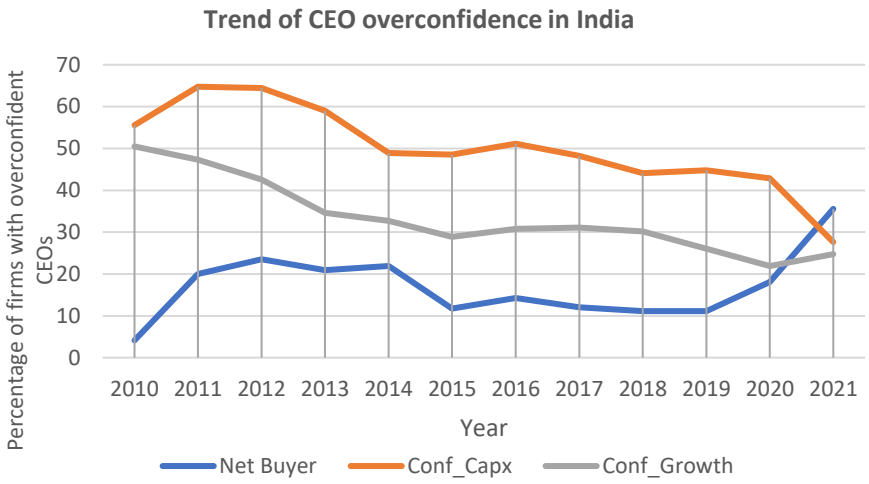


**Figure 1. Year-wise measurement of CEO overconfidence in the Indian corporate sector**

*Source: Authors' Computation*

**Table 4. Year-wise measurement of CEO overconfidence (Conf_Composite)**

| Year | No Overconfidence Score (0) | | Low Overconfidence Score (1) | | Moderate Overconfidence Score (2) | | High Overconfidence Score (3) | |
|---|---|---|---|---|---|---|---|---|
| | No. of Firms | (%age) | No. of Firms | (%age) | No. of Firms | (%age) | No. of Firms | (%age) |
| 2010 | 75 | 23.8095 | 137 | 43.4921 | 99 | 31.4286 | 4 | 1.26984 |
| 2011 | 52 | 16.5079 | 132 | 41.9048 | 109 | 34.6032 | 22 | 6.98413 |
| 2012 | 50 | 15.873 | 146 | 46.3492 | 92 | 29.2063 | 27 | 8.57143 |
| 2013 | 80 | 25.3968 | 121 | 38.4127 | 102 | 32.381 | 12 | 3.80952 |
| 2014 | 97 | 30.7937 | 125 | 39.6825 | 78 | 24.7619 | 15 | 4.7619 |
| 2015 | 109 | 34.6032 | 140 | 44.4444 | 57 | 18.0952 | 9 | 2.85714 |
| 2016 | 104 | 33.0159 | 128 | 40.6349 | 74 | 23.4921 | 9 | 2.85714 |
| 2017 | 114 | 36.1905 | 129 | 40.9524 | 57 | 18.0952 | 15 | 4.7619 |
| 2018 | 120 | 38.0952 | 131 | 41.5873 | 54 | 17.1429 | 10 | 3.1746 |
| 2019 | 125 | 39.6825 | 132 | 41.9048 | 48 | 15.2381 | 10 | 3.1746 |
| 2020 | 126 | 40 | 126 | 40 | 54 | 17.1429 | 9 | 2.85714 |
| 2021 | 110 | 34.9206 | 142 | 45.0794 | 54 | 17.1429 | 9 | 2.85714 |
| Total | 1162 | 30.7407 | 1589 | 42.037 | 878 | 23.2275 | 151 | 3.99471 |

*Source: Authors' Computation*

Specifically, After the COVID-19 pandemic, the proportion of firms with non-overconfident CEOs significantly decreased from 40% in 2020 to 34.92% in 2021. Moreover, it is observed that 43.49% of total sampled firms were led by low overconfident CEOs in the year 2010. This proportion rose to 46.35% in the year 2012

followed by a decline to 38.41% in 2013. Afterward, this proportion of firms with low overconfident CEOs started to rise again from 39.68% to 45.05% from the year 2014 to 2021. Overall results show that a total of 42.03% of firms are being managed by less overconfident CEOs during the observation period. As a whole, the percentage of companies with low overconfident CEOs has exhibited an upward trend from 43.49% in 2010 to 45.08% in 2021. The findings reported in Table 4 reveal that firms managed by moderately overconfident CEOs constituted 31.43% in 2010 and increased to 34.60% in the year 2011 followed by a gradual decrease in the next ten years starting from 29.21% in 2012 to 17.14% in 2021.

Overall, a downfall trend has been witnessed during the study period in the proportion of firms run by moderately overconfident CEOs from 31.43% in 2010 to 17.14% in 2021. Lastly, the results obtained for the fourth category of sampled firms with highly overconfident CEOs expose that only 1.27% of sampled firms were led by highly overconfident CEOs in the year 2010. However, a notable upward trend has been observed in this ratio in the two subsequent years with 6.98% in 2011 and 8.57% in 2012. From 2013 onward, the percentage of firms run by highly overconfident CEOs began to decrease until 2021. Conclusively, the overall results suggest that on average, CEOs of approximately 4% of Indian companies exhibited extreme overconfidence over 12 years.

Moreover, the results presented in Table 4 uncover that after the COVID-19 pandemic in 2020, the proportion of companies with non-overconfident CEOs suddenly decreased by 6% and the percentage of firms with low overconfident CEOs suddenly increased by 5% from 40% in 2020 to 45% in 2021. This shows that CEOs who had not previously displayed overconfidence began to do so in the wake of the COVID-19 outbreak as several relaxations with new compliances and regulatory changes were provided to Indian companies to survive the economic shock. The shift might be due to the fact that less regulatory pressure and increased autonomy to companies lead their top executives to pursue their empire-building dreams without adequate checks and assessment of risk factors. The findings of PWC's 25th annual global CEO survey (PWC, 2022) conducted in 2021 showed that 94% of Indian CEOs were overoptimistic about global economic growth over the next 12 months. Consistent with this observation, the outcomes of the present study reveal that the fraction of companies with non-overconfident CEOs dropped during the COVID-19 pandemic, whereas the ratio of firms with low-overconfident CEOs surged during this time. To have a clear understanding of the extent and degree of overconfidence bias among CEOs in the Indian corporate sector, the graphical portrayal of overall results obtained through the Conf_Composite measure has been presented in Figure 2. Figure 2 demonstrates the degree of overconfidence bias among Indian CEOs captured during the observation period with the help of the Conf_Composite measure. The majority of Indian firms are managed by less overconfident CEOs as these firms constitute 42.04% of the total sampled firms and 30.74% of the total sampled firms have been run by non-overconfident CEOs in India. The third category of firms with moderately overconfident CEOs consists of 23.23% of the total firms

observed in this research work. Finally, the fourth and last category of firms led by highly overconfident CEOs is approximately 4% of the total sampled firms.

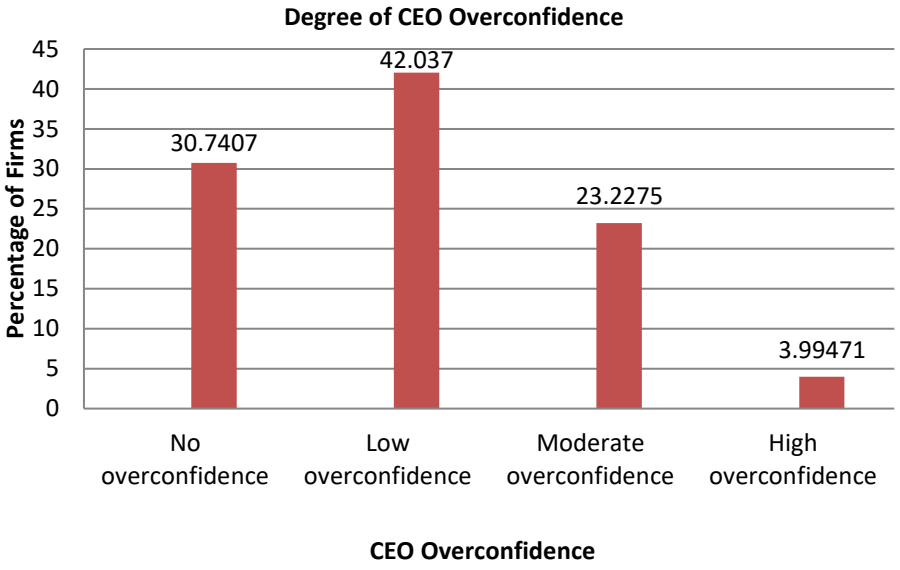


**Figure 2. Degree of CEO overconfidence in India**

*Source: Authors' Computation*

## 4.2. Comparative Analysis of Financial Traits of Firms Led by CEOs with Different Levels of Overconfidence

Brown and Sarma (2007) claimed that overconfident CEOs differ from rational CEOs in terms of their behavioural aspects as the former tend to make unethical, narrow, and self-centred decisions. Considerable research endeavours provide strong evidence that firms managed by overconfident CEOs are likely to have different corporate strategies and policies for investment and financing plans as compared to those managed by non-overconfident CEOs. These research undertakings on CEO overconfidence also discovered that firms led by overconfident and non-overconfident CEOs significantly differ from each other in terms of their characteristics such as age, size, profitability and leverage (Hirshleifer et al., 2012; Malmendier & Tate, 2005). Based on the above discussion, this section compares the financial characteristics of firms with and without overconfident CEOs for 12 years starting from 2010 to 2021. First, the whole sample is classified into two groups of firms with and without overconfident CEOs according to the three binary measures of CEO overconfidence. Thereafter, t-tests and Mann-Whitney tests are conducted to ascertain the significance of mean and median differences of variables between the two groups. Similar patterns are followed for each overconfidence measure.

### 4.2.1. Comparative Analysis of Firms' Financial Characteristics Based on Net Buyer Measure

Table 5 reports the mean and median of all the variables considered in this study for two subsamples i.e. firms with and without overconfident CEOs. The final sample is segregated into two groups based on the Net Buyer measure of CEO confidence. Out of a total of 3780 firm-year observations, 644 observations fall under the overconfident category and the rest of 3136 observations are covered under the non-overconfident category.

## Table 5. Independent sample t-test and Mann-Whitney U test results examining financial differences of firms categorized by Net Buyer

| Variables | Firms without Overconfident CEOs (n= 3136) | | Firms with Overconfident CEOs (n= 644) | | Differences | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | Mean Difference | Median Difference |
| Dividend Payout Ratio (DPR) | 32.10 | 21.95 | 26.99 | 21.66 | 5.11 | 0.29 |
| ROA | 8.39 | 7.01 | 8.86 | 7.41 | -0.47 | -0.40 |
| Tobin's Q | 2.25 | 1.40 | 2.35 | 1.53 | -0.07 | -0.13 |
| Firm Size (FS) | 8.38 | 8.26 | 8.21 | 8.05 | 0.17*** | 0.22*** |
| Leverage (Lev) | 0.49 | 0.27 | 0.67 | 0.25 | -0.18** | 0.02 |
| Current Ratio (CR) | 2.62 | 1.50 | 2.28 | 1.51 | 0.34 | -0.01 |
| Firm Age (FA) | 42.35 | 35.50 | 39.84 | 34.00 | 2.50*** | 1.50** |
| Cash Flow from Operating Activities (CFOA) | 9.316 | 9.251 | 9.30 | 9.246 | 0.0116 | 0.005* |
| Sales Growth (SG) | 13.21 | 9.35 | 14.07 | 10.58 | -0.86 | -1.23 |
| Fixed Asset Turnover (FAT) | 7.29 | 2.29 | 5.59 | 2.36 | 1.7 | -0.07 |

*Note: The asterisk symbols ***, **, and * represent the significance levels at 1%, 5%, and 10% respectively.*
*Source: Authors' Computation*

As can be observed from Table 5, firms run by overconfident CEOs are smaller in size as compared to firms run by non-overconfident CEOs as the average firm size of overconfident and non-overconfident groups is 8.21 and 8.38 million respectively. The descriptive results revealed that firms with overconfident CEOs are usually younger (39.84 years) than those without overconfident CEOs (42.35 years). Also, the average cash flow from operating activities for the overconfident group is 9.30 which is lower than the average of the non-overconfident group (9.316) indicating firms run by overconfident CEOs have fewer operating funds. The mean and median differences between the two groups (firms with and without overconfident CEOs) are significant for firm size, firm age, and cash flow from operating activities. These results obtained from the Net Buyer measure reveal that firms managed by overconfident CEOs significantly differ from firms managed by non-overconfident CEOs in terms of their size, age, and cash flow from operating operations. The reported results have been graphically demonstrated with the help of Figure 3.

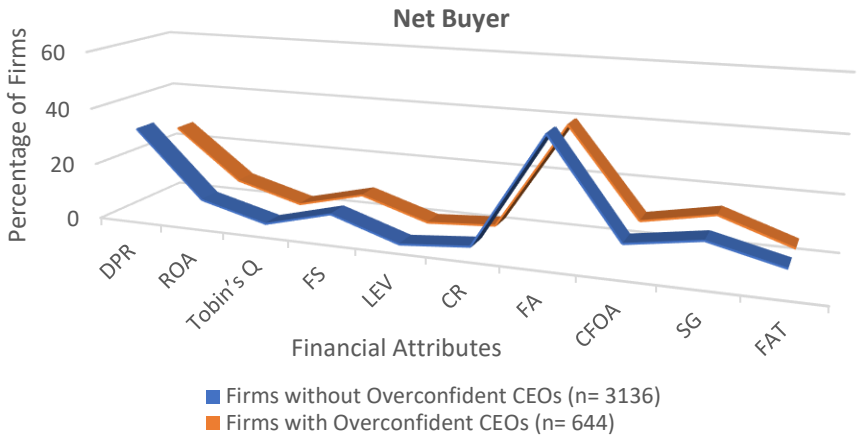


**Figure 3. Comparative Analysis of Firms' Financial Characteristics**

*Source: Authors' Computation*

### 4.2.2. Comparative Analysis of Firms' Financial Characteristics Based on Conf_Capx Measure

Table 6 reports the mean and median of all the variables considered in this study for two subsamples of firms with and without overconfident CEOs. The sample is segregated into two groups based on the Conf_Capx measure of CEO confidence. Out of a total of 3780 firm-year observations, 1890 observations (50% observations) have been covered under the overconfident group. The remaining 1890 fall under the non-overconfident group. The results obtained with the Conf_Capx measure in Table 6 revealed that firms managed by overconfident CEOs pay lower dividends to their shareholders as their average dividend payout ratio is 26.93% less than that of the non-overconfident group (35.53%). The overconfident group earns an average of 9.68% return on their assets whereas the non-overconfident group earns an average of 7.26% return from their assets. Firms managed by overconfident CEOs have a higher Tobin's q ratio as compared to those managed by non-overconfident CEOs (2.37 > 2.25). Also, the average firm size of the overconfident group is 8.23 million which is comparatively lower than the non-overconfident group (8.47 million). In addition, firms with overconfident CEOs have an average leverage ratio of 0.50 which means debt constitutes nearly 50 percent of the total capital of overconfident firms. Firms led by overconfident CEOs have lower leverage than firms led by non-overconfident CEOs in India (0.50 > 0.53). The average liquidity ratio of firms with overconfident CEOs is 1.81 which is lower than firms without overconfident CEOs (3.32). The descriptive statistics also claim that overconfident firms are younger than non-overconfident firms (40.64 < 43.20). In addition, the overconfident group enjoys more operating cash as their average operating cash flow is 9.33 whereas the non-overconfident group has an average operating cash flow of 9.29.

**Table 6. Independent sample t-test and Mann-Whitney U test results examining financial differences of firms categorized by Conf_Capx**

| Variables | Firms without Overconfident CEOs (n= 1890) | | Firms with Overconfident CEOs (n=1890) | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | Mean Difference | Median Difference |
| Dividend Payout Ratio | 35.53 | 23.03 | 26.93 | 20.70 | 8.60 | 2.33** |
| ROA | 7.26 | 5.34 | 9.68 | 8.90 | -2.42*** | -3.56*** |
| Tobin's Q | 2.25 | 1.33 | 2.37 | 1.48 | -0.12 | -0.15*** |
| Firm Size (Log of total assets) | 8.47 | 8.39 | 8.23 | 8.02 | 0.24*** | 0.37*** |
| Leverage (Debt to Equity) | 0.53 | 0.21 | 0.50 | 0.32 | 0.03 | -0.12*** |
| Current Ratio | 3.32 | 1.55 | 1.81 | 1.45 | 1.50*** | 0.10*** |
| Firm Age | 43.20 | 37.00 | 40.64 | 34.00 | 2.55*** | 3.00*** |
| Cash from Operating Activities | 9.29 | 9.248 | 9.33 | 9.253 | -0.04*** | -0.005*** |
| Sales Growth | 15.81 | 9.13 | 10.89 | 10.04 | 4.92*** | -0.91 |
| Fixed Asset Turnover | 11.05 | 2.54 | 2.95 | 2.14 | 8.10*** | 0.40*** |

*Note: The asterisk symbols ***, **, and * represent the significance levels at 1%, 5%, and 10% respectively.*
*Source: Authors' Computation*

Furthermore, firms with overconfident CEOs have a lower fixed asset turnover ratio as compared to firms without overconfident CEOs (2.95 <11.05). The findings of the t-test and Mann-Whitney test put forward that the financial attributes of firms led by overconfident CEOs significantly differ from those led by non-overconfident CEOs except for sales growth. The findings show that companies with overconfident CEOs are younger, smaller, more profitable, less liquid, and pay lower dividends compared to those led by non-overconfident CEOs. These results have been graphically demonstrated with the help of Figure 4.

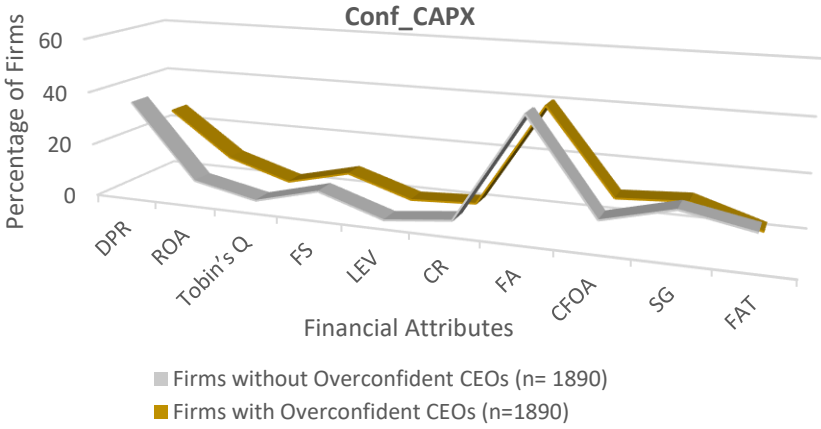


**Figure 4. Comparative Analysis of Firms' Financial Characteristics**
*Source: Authors' Computation*

### 4.2.3. Comparative Analysis of Firms' Financial Characteristics Based on Conf_Growth Measure

Table 7 reports the mean and median of all the variables for two subsamples of firms led by overconfident and non-overconfident CEOs. The final sample of 3780 firm-year observations is segregated into two groups as per the Conf_Growth, 1264 observations fall into the overconfident group and the remaining 2516 observations are covered under the non-overconfident group.

## Table 7. Independent sample t-test and Mann-Whitney U test results examining financial differences of firms categorized by Conf_Growth

| Variables | Firms without Overconfident CEOs (n = 2516) | | Firms with Overconfident CEOs (n = 1264) | | Differences | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | Mean Difference | Median Difference |
| Dividend Payout Ratio | 34.14 | 23.27 | 25.43 | 20.00 | 8.71 | 3.27*** |
| ROA | 7.16 | 6.01 | 11.07 | 10.07 | -3.91*** | -4.05*** |
| Tobin's Q | 2.07 | 1.25 | 2.79 | 1.81 | -0.72*** | -0.56*** |
| Firm Size (Log of total assets) | 8.46 | 8.32 | 8.13 | 8.00 | 0.33*** | 0.32*** |
| Leverage (Debt to Equity) | 0.53 | 0.26 | 0.49 | 0.26 | 0.04 | 0.00 |
| Current Ratio | 2.58 | 1.49 | 2.54 | 1.52 | 0.05 | -0.02** |
| Firm Age | 43.47 | 37.00 | 38.84 | 32.00 | 4.64*** | 5.00*** |
| Cash from Operating Activities | 9.32 | 9.252 | 9.30 | 9.247 | 0.02** | 0.005*** |
| Sales Growth | 14.22 | 9.22 | 11.61 | 10.64 | 2.61 | -1.42 |
| Fixed Asset Turnover | 7.82 | 2.15 | 7.37 | 2.56 | -0.55 | -0.41*** |

*Note: The asterisk symbols ***, **, and * represent the significance levels at 1%, 5%, and 10% respectively.*
*Source: Authors' Computation*

The findings in Table 7 show that the overconfident group keeps their dividend payments lower than the non-overconfident group (25.43 < 34.14). Firms managed by overconfident CEOs earn higher returns than those run by non-overconfident CEOs as average ROA and Tobin's q for the overconfident group are 11.07% and 2.79% respectively and for the non-overconfident group are 7.16% and 2.07% respectively. Also, the results for the firm size variable revealed that firms with overconfident CEOs are smaller in size as compared to those without overconfident CEOs (8.13 < 8.46). The average current ratio for overconfident and non-overconfident groups are 2.54 and 2.58 respectively and this difference is significant at a five percent level of significance. The average operating cash flow for the overconfident group is 9.30 less than firms led by the non-overconfident group with 9.32. Firms led by overconfident CEOs have an average age of 38.84 years and are younger than those led by non-overconfident CEOs with an average age of 43.47

years. Akin to the findings of Conf_Capx, the overconfident group has a lower fixed asset turnover ratio of 7.37 compared to the non-overconfident group (7.82).

The results of the t-test and Whitney test claim that the mean and median differences for all the variables are significant across two groups except leverage and sales growth. Overall, the findings suggest that firms managed by overconfident CEOs pay lower dividends to reserve additional funds for future investments, earn greater returns from their assets and equity capital, and have fewer liquid resources, but are younger in age and smaller in size. These results have been graphically demonstrated with the help of Figure 5.

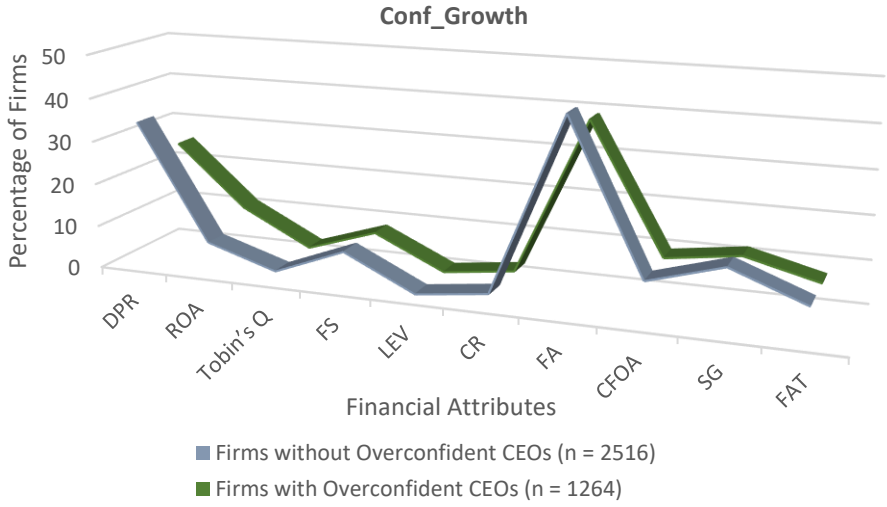


**Figure 5: Comparative Analysis of Firms' Financial Characteristics**

*Source: Authors' Computation*

### 4.2.4 Comparative Analysis of Firms' Financial Characteristics Based on Conf_Composite Measure

Table 8 demonstrates the ANOVA results applied to ascertain the financial differences between four groups of firms categorized based on the overconfidence levels of their CEOs using the Conf_Composite measure. The whole sample is categorized into four sub-samples ranging from "firms with non-overconfident CEOs" to "firms with high overconfident CEOs", each assigned a score from 0 to 3. The presented findings offer substantial insights into the divergence of a firm's financial attributes across distinct classifications of companies characterized by varying levels of CEO overconfidence by applying the ANOVA test. F-statistics and p-values are reported to help assess the significance of these differences across different overconfidence categories.

## Table 8: ANOVA test and Kruskal Wallis test results examining financial differences in firms categorized by Conf_Composite

| Variables | Firms with Non overconfident CEOs Score (0) | Firms with Low overconfident CEOs Score (1) | Firms with Moderate overconfident CEOs Score (2) | Firms with High overconfident CEOs Score (3) | ANOVA Results | Kruskal Wallis Results |
|---|---|---|---|---|---|---|
| | Mean Values | | | | Test Statistics | |
| Dividend Payout Ratio | 38.78 | 30.28 | 25.33 | 17.23 | 1.44 | 1.28 |
| ROA | 6.08 | 8.57 | 10.89 | 11.56 | 47.57*** | 82.67*** |
| Tobin's Q | 2.06 | 2.28 | 2.62 | 2.72 | 5.78*** | 25.39*** |
| Firm Size (Log of total assets) | 8.82 | 8.41 | 8.09 | 7.79 | 22.1*** | 9.46*** |
| Leverage (Debt to Equity) | 0.44 | 0.59 | 0.51 | 0.37 | 1.27 | 0.03 |
| Current Ratio | 3.25 | 2.53 | 1.85 | 1.84 | 3.93*** | 0.06 |
| Firm Age | 44.63 | 42.30 | 38.51 | 36.93 | 13.64*** | 6.02** |
| Cash from Operating Activities | 9.29 | 9.32 | 9.31 | 9.29 | 2.54* | 1.87* |
| Sales Growth | 10.14 | 7.13 | 3.35 | 2.89 | 4.874*** | 1.61 |
| Fixed Asset Turnover | 17.99 | 10.55 | 12.35 | 12.97 | 7.51*** | 0.04 |

*Note: The asterisk symbols ***, **, and * represent the significance levels at 1%, 5%, and 10% respectively.*
*Source: Authors' Computation*

It is evident from Table 8 that the dividend payout ratio tends to decline as the overconfidence level of CEOs increases. The ANOVA statistics revealed that this difference is not statistically significant with a p-value of 0.23. In terms of profitability, ROA and Tobin's Q tend to increase as the CEO overconfidence level rises. The test statistics indicate statistically significant differences (p-value < 0.01) among the four groups of firms managed by CEOs having different overconfidence levels. Moreover, the obtained ANOVA results confirmed the significance of this distinction in firm size across various groups as a p-value of less than one percent has been obtained. The findings for leverage across the four categories indicate slight fluctuations without a clear trend across the four subsampled firms managed by CEOs with different overconfidence levels. This variation turned out to be insignificant with a p-value of 0.28. The ANOVA test results confirmed that firms led by overconfident CEOs significantly vary (decrease) in terms of their liquid resources as the level of overconfidence exhibited by their CEOs changes (increases). Furthermore, as can be perceived from Table 8, firm age tends to decrease as the overconfidence level among CEOs increases and this declining trend is statistically significant. The observed differences in cash from operating activities highlight notable differences in the operational cash capacity among firms managed by CEOs with varying levels of overconfidence. Moreover, firms managed by CEOs having

varying overconfidence levels have significant differences in their fixed assets turnover ratio and sales growth with a p-value of 0.00.

This indicates that with the increased tendency of CEOs to display overconfidence bias, the fixed assets ratio tends to decline as overconfident CEOs often concentrate more on large-scale initiatives or acquisitions without properly weighing the effectiveness of utilizing current fixed assets that lead to lower fixed assets turnover efficiency of an organization. These results have been presented graphically to provide a comprehensive view of estimation in Figure 6.

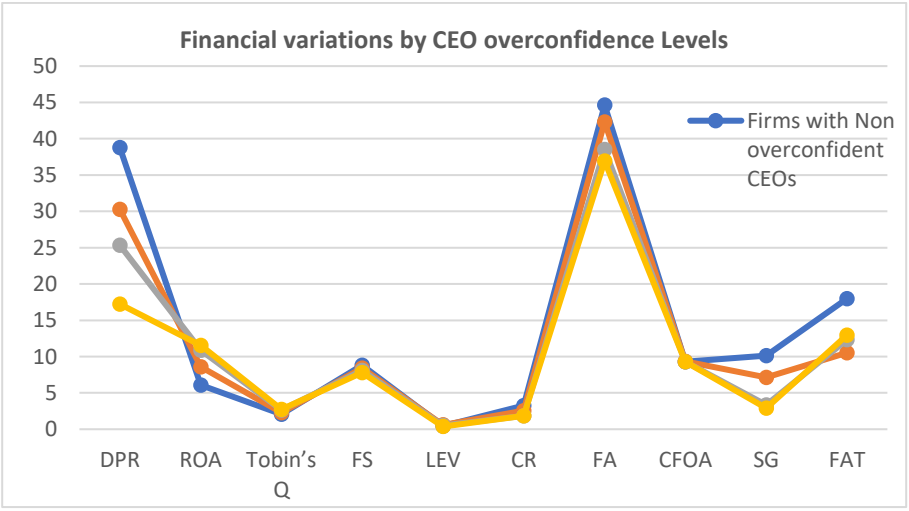


**Figure 6: Comparative Analysis of Firms' Financial Characteristics**

*Source: Authors' Computation*

The ANOVA results also lend empirical support to the plausible relationship between CEO overconfidence and various corporate aspects. It is observed from the findings that firms controlled by CEOs with different overconfident levels have significant variations in their returns, size, age, liquidity, and growth, thereby providing preliminary evidence of the promising significance of CEO overconfidence in the corporate world. The present research has confirmed the premise of upper echelon theory, which posits that the behavioural biases of top executives significantly influence various business dimensions, including growth, leverage, liquidity, and overall profitability (Hambrick & Mason, 1984).Thus, this study offers empirical evidence for UET's assertion that corporate actions and performance may result from the emotional, professional, and demographic characteristics of top managers, by investigating the financial variations among firms led by executives with differing levels of overconfidence.

Moreover, the presented findings are at par with the previous studies conducted in different settings. For instance, Kim and Jang (2021) unveiled that overconfident CEOs are mostly employed in smaller firms earning huge profits. Likewise, Biddle et

al. (2009) claimed that CEOs employed in firms with high liquidity and low leverage are likely to exhibit overconfidence. Similarly, Killins et al. (2021) and Reyes et al. (2022) found that firms led by overconfident CEOs enjoy higher returns on their assets as compared to firms led by non-overconfident CEOs.

## 5. Implications

The present research integrates theoretical frameworks such as the upper echelon theory and the irrational agent hypothesis with empirical analysis, offering a comprehensive perspective on how cognitive traits influence corporate decisions and outcomes. Additionally, this work offers an innovative viewpoint for organizational learning to take senior executives' behavioural aspects into account for a better understanding of organizational dynamics in emerging markets like India. The findings of this study have significant implications for corporate governance and investor decision-making. Understanding the extent of overconfidence bias among CEOs can help boards and stakeholders implement measures to mitigate potential risks associated with overconfident leadership. It is recommended that corporations adopt robust governance practices to promote efficient resource allocation, mitigate risks, and foster rational decision-making. This can be achieved through the appointment of qualified independent directors, aligning CEO compensation with long-term goals, and rigorously scrutinizing CEO's financing and investment choices.

Additionally, the analysis of financial differences among firms led by CEOs with varying degrees of overconfidence provides valuable insights into how such biases can impact firm performance, guiding investors in making more informed decisions and aiding firms in developing strategies to counteract the adverse effects of overconfident behaviour in executive leadership. Moreover, this paper clarified the basic directions for academicians interested in studying overconfidence bias among top executives by providing precise and robust measurements to the critiques that have hobbled conventional research procedures.

Also, prior literature elucidated that overconfident executives could make irrational business decisions (Brown & Sarma, 2007; Chen et al., 2015), thereby the empirical evidence of the presence of overconfident CEOs in Indian companies highlights the need to arrange time-to-time consultation with external professional bodies to reduce the discretionary and intuitive decisions of overconfident CEOs. Furthermore, CEOs' appointment and selection policies should be framed with consideration of the psychological factors of CEOs along with their other demographic traits. Additionally, the identification of the existence of overconfidence bias among Indian CEOs behoves the policymakers, regulators, owners, scholars, and investors to incorporate the behavioural traits of an executive in their assessment indicators and evaluate his/her personality from the outside in. Finally, this work opens up a new area of theoretical and empirical inquiry into the dominance of overconfidence bias among CEOs of large firms in emerging economies.

## 6. Limitations and Future Research Direction

Acknowledging the shortcomings of a study can provide avenues for the improvement of future research works. First, this paper is based on large publicly listed firms, so the robustness and relevance of current findings to smaller companies may be limited. Hambrick and Finkelstein (1987) claimed that large firm size provides a conservative setting to the top managers and limits their discretion in bringing his/her new ideas into action. Thus, future research efforts could be directed to investigate this issue in small firms and different institutional settings such as non-listed firms or financial firms. Second, the present work has used four quantitative measures of overconfidence bias among CEOs. Hence, it is suggested that interested scholars should work with other data approaches such as surveys, interviews, or other quantitative measures to improve the reliability of the results. Third, this work has employed Net Buyer proxy based on the stock purchase decisions of CEOs to capture overconfidence among them. However, a few constraints of this measure such as insider access to positive information, signalling (additional stock purchases to project optimism to the market), and a generally higher risk appetite among top executives add to the limitations of the current study. Fourth, as the present work has focused on the measurement of overconfidence bias in the Indian corporate sector, in the future, scholars should account for the factors affecting CEO confidence and its potential impact on various corporate outcomes of a firm such as financial performance, and innovation. Lastly, the current research concentrated on one managerial behavioural bias only i.e. overconfidence; future research could pay attention to other cognitive biases prevalent among top executives (CEOs and CFOs) such as anchoring, framing, and herd behaviour.

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# Appendix

## Table A1: Measurement of Variables

| Variables | Acronym Used | Measurement |
|---|---|---|
| Return on Assets | **ROA** | ROA is computed by dividing the earnings before interest, tax, depreciation, and amortization (EBITDA) to book value of total assets |
| Tobin's Q | **TQ** | The market value of a firm divided by total assets |
| Firm Size | **FS** | Natural log (Total Assets) |
| Leverage | **LEV** | Natural Log (The sum of total long-term debt and total debt in current liabilities divided by shareholder's equity in a year) |
| Liquidity | **CR** | Natural Log (The sum of current assets divided by current liabilities in a year) |
| Cash Flow from Operating Activities | **CFOA** | Natural Log (Total cash flow from operating activities of a firm at the end of the year) |
| Firm Age | **FA** | Natural Log (Number of years since the year of incorporation of the firm till the year of sampling) |
| Fixed Asset Turnover | **FAT** | Natural Log (Net sales divided by average fixed assets) |
| Sales Growth | **SG** | Natural Log (The difference between last year's sales and current year's sales divided by last year's sales) |