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In the Name of God

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Structure of second page until the end of manuscript is as follow:

- *Introduction* Some paragraphs contain explaining the problem, literature review, object (purpose), importance and necessity of it.
- *Literature review* A review of the literature investigates only related researches chronologically and the results exploit at the end of the section theory matrix or conceptual model that document research variables and Formulate research hypotheses.
- *Methodology* including Methods, data collection tools, population, sample size and sampling methods, analysis and model testing hypothesis, definition of study variables and operational definition of them can be in presented the same section that model testing is represented and there is no need to repeat.
- *Results* including the findings compare it with the findings of previous and interpretation of compliance or inconsistency of findings with research findings and theories.
- *Conclusion* includes a summary of the problem, provide a summary of the results and overall conclusion and recommendations based on the results (policy recommendations is necessary only in applied research and, if necessary, recommendations for future research accordant with the research limitations or how development of current research;
- *References* are as Section 3-2 and
- *Endnotes* terminology and some necessary explanations provide in the endnote (no footer) and as a two-column table (contains the endnote number and content of endnote with invisible lines (No Border). Numbering the endnotes are as text and doing without the use of EndNote technique.

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- In order to reference within the text (APA) method should be used; so the author's last name with the year of publication it is presented in the text respectively. If there are two authors, last names' will be separated by "and" and if more than three people, "et al." will be used
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Editor's Note

I am pleased to announce that the Ferdowsi University of Mashhad is publishing Iranian Journal of Accounting, Auditing & Finance (IJAAF). On behalf of the board of the IJAAF and my co-editors, I am glad to present the Volume 1, Issue 1 of the journal in December 2017; the journal will publish four issues in a year. The board includes experts in the fields of accounting, finance and auditing, all of whom have proven track records of achievement in their respective disciplines. Covering various fields of accounting, *IJAAF* publishes research papers, review papers and practitioner oriented articles that address significant issues as well as those that focus on Asia in particular. Coverage includes but is not limited to:

- Financial accounting
- Managerial accounting
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Perspectives or viewpoints arising from regional, national or international focus, a private or public sector information need, or a market-perspective are greatly welcomed. Manuscripts that present viewpoints should address issues of wide interest among accounting scholars internationally and those in Asia in particular.

Yours faithfully,

Mahdi Moradi

Editor in Chief

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Research Article

Impact of Corporate Lobbying on Board Compensation and Audit Quality

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Abstract

Corporate lobbying is one of the most important ways companies, society, and even citizens can directly and legally influence the development and implementation of new laws and regulations. Theoretically, lobbying can be a threat to auditor independence as well. This study investigates the impact of corporate lobbying on board compensation and audit quality. Using a sample of 150 companies listed on the Tehran Stock Exchange over period 2012-2018, the study shows that corporate lobbying has a significant impact on board compensation and audit quality. This is the first study investigating the impact of corporate lobbying on board compensation and audit quality of companies listed on the Tehran Stock Exchange.

Keywords: Audit quality, Corporate Lobbying, Board Compensation, Auditor tenure, Stock Exchange, Stock returns

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1. Introduction

Advocacy groups work to affect the process of socio-political decision-making and meet their interests. Meanwhile, what separates the advocacy groups from a party is the reluctance of these groups to nominate a candidate. In other words, while parties are trying to enter the authority structure through peaceful means of authority, the pressure groups only seek to influence statesmen and the process of decision-making. Corporate political activity, including campaign assistance, lobbying, participation in political operations committees, the office of public relations, and executive certificates, are critical factors for corporate performance (Lux et al., 2011). This relationship between political activity and corporate performance is within managing directors' power (Hadani et al., 2015). Lobbying is a type of corporate political activity that has been widely studied in the financial literature. The main purpose of corporate lobbying is to affect the favorable laws that provide competitive advantages for companies. Executive managers who are successful in political lobbying can receive greater compensation (Edwards, 2010). Previous studies show that lobbying is beneficial for companies because companies that lobby have far better performance than the market average and can increase corporate performance and stock value (Chen et al., 2010). In the American political term, lobbying means to affect the legislature via contacting and influencing the members of both chambers, through which we can implement our own opinions. Such groups, by influencing or contacting the Senate or House of Representatives' members in the halls or parts of the Congress that everyone can access, make their efforts to reject or approve the bills by various ways of bribery, threats, enticement. In a general definition, advocacy groups are those groups that work to influence the process of socio-political decision-making and to provide their interests. Meanwhile, what separates the advocacy groups from a party is the reluctance of these groups to nominate a candidate. In other words, while parties are trying to enter the authority structure through peaceful means of authority, the pressure groups only seek to influence statesmen and the process of decision-making (Bertrand et al., 2014). Corporates invest in the lobby because the executive managers are rather compensated in the lobbying companies. An increase in the companies' value participating in the lobby is more probable (Ozer, 2010). In an interview with lobbyists, Drutman (2010) found that the executive managers who had been politically active in the past would decide that their company need to participate in political efforts. Hence, executive managers might affect their lobbying efforts and actively monitor and receive private information from their corporate lobbyists. This is shown in the case of investment fund managers who use private lobbyists' information to participate in informed business activities (Gao & Huang, 2016). Ungson and Steers (1984) stated that the managing director could participate directly or indirectly in the political lobby. Brown et al. (2017) showed that executive managers who visit Congress have more information that leads to political uncertainty, and they can use such information in their private stock trading. Mindock (2017) showed how lobbying activities could build relationships and gather information. Jacolinser et al. (2016) found that political communications can provide access to internal political information, which managers can use to participate in the business. Unsal et al. (2016) stated that managers of companies that lobby are more likely to receive higher compensation packages than their counterparts in the companies that do not lobby. Excessive compensation might be given by the executive managers related to politicians active in the domestic trade (Jenter, 2005). Lawmakers and lobbyists have access to internal information. Companies that use lobbyists' main purpose is for their political connections (Bertrand et al., 2014). Bazerman and Moore (2011) declared that independent auditing could help the profitability of this process and return of capital markets by improving the reliability and increasing the financial reporting process's

credibility. Audit quality depends on many factors, especially the independence of the auditor. Thus, less independence of the auditor can directly affect the audit quality and auditor opinion. Also, the political activities of accounting firms are a serious obstacle to their independence. Audit lobbying for audit clients can pose a threat to auditor independence, reducing the audit quality. Shaub (2005) said that lobbying for legislators supports clients' political interests, leading to a threat of support. According to Grey (2018), observers' concern reveals that official lobbies will not be disclosed, while accounting firms have strong incentives to lobby for clients. Despite the complexity of the process, companies can receive significant advantages from lobbying. Corporate lobbying is one of the most important ways the companies, associations, and even private citizens can directly and legally affect the development and implementation of new laws and regulations. Lobbying is distinct from other forms of political participation because it is not based on the final company commitment for winning the election to create the desirable policies, but can use lobbyist's political capital to achieve these goals (Reid et al., 2015). Therefore, the present research seeks to answer the question of whether corporate lobbying affects board compensation and audit quality or not.

This paper contributes to the lobbying corporate lobbying by studying how corporate lobbying influences board compensation and audit quality.

2. Literature Review and Hypothesis Development

2.1. Corporate Lobbying and Board Compensation

Brodmann et al. (2019) showed that lobbying has a significant impact on board compensation and government contracts' value and achievement. Khondkar et al. (2017) showed that corporate social responsibility has a significantly negative relationship with cash-based compensation ratio, while it has a significantly positive relationship with stock value-based compensation ratio. Unsal et al. (2016) represented that lobbying companies show better performance. Political communications can provide access to internal political information, which managers can use to participate in private trading. Political lobbying is a means of establishing political communications. The managers of lobbying corporates are more likely to receive higher compensation packages than their counterparts in the companies that do not lobby. Chen et al. (2015) stated a significantly positive relationship between corporate lobbying activities and corporate financial performance. Corporate lobbying and political costs are likely to cause organizational problems because these costs can consider managers' political interests and the interests of shareholders/corporations; thus, corporates' political costs attract the attention of the media and large corporations (Bebchuk, Jackson, 2013). Ming Tee (2017) concluded a significantly positive relationship between corporate political connections and stock price synchronization. Institutional owners moderate the relationship between corporate political connections and stock price synchronization. Lin et al. (2015) showed that higher political connections in companies provide the possibility of access to long-term and lower-cost resources; consequently, in companies with higher political connections, the ratio of long-term debts is increased. Boubakri et al. (2012) investigated the impact of political connections on firm performance and financing decisions. They found that, first, companies improve their performance and increase their debt after establishing political connections; second, political connections are strongly correlated with varied leverage and operational performance; and third, companies with political connections have easier access to credit resources. Datta (2012) demonstrated that political connections affect a company's value and lead to volatility in companies with higher political connections than anything that market movement can explain. They say that

companies' return with political connections is considerably different from their counterparts without political connections. They concluded that such relations in any country would lead to the global corruption index's growth and increase the probability of rent-seeking and the emergence of relational capitalism. Managers might use political communications to transfer wealth or profit from the company to their interests, violating shareholder rights. They showed that the expropriation activities in companies with political connections are higher than other companies. Beneficial activities of politicians, information asymmetry problems, and potential expropriation of shareholders could affect the systemic risk and cost of capital of companies with political connections. Therefore, shareholders demand a higher return for investment in these companies (Francis et al., 2005). Martin et al. (2016) showed that companies choose conditional conservatism to reduce information asymmetry. Therefore, if companies with higher lobbying intensity are associated with information asymmetry, a significantly positive relationship is anticipated between accounting conservatism and lobbying intensity, given the opposite side's demand reasoning.

Hypothesis 1: Corporate lobbying has a significant impact on board compensation.

2.2. Lobbying and Audit Quality

Grey (2018) stated that, in many cases, the polluting firms lobby against environmental protection. Political support of corporations can take a step for governments trying to protect the environment. A polluting firm invests in green and clean technology and then succeeds in environmental protection because it changes its competitor's market share with no clean investment. Lobbying increases the return of the company to being green. Burnett et al. (2016) found that the perceived audit quality (measured using the earnings response coefficient) has a significantly negative relationship with lobbying. Lobbying investors believe auditors are detrimental to the political benefits of clients for audit quality. Evidence suggests that reputation and litigation risk concerns provide sufficient incentives for auditors to maintain their independence in threat of auditor independence support. Reid et al. (2015) found that although audit fees are increased after recent changes, this increase is not significantly different from the previous year's increases. Therefore, recent changes in reporting have not increased the audit fee. They also found no evidence for the negative impact of recent changes on late audit reporting. Finally, they found that recent changes have increased the audit quality and failed to impose additional costs on companies. Watts and Zimmerman (1978) believe that companies use conservatism to prevent public oversight caused by lobbying, highlighting the importance of examining public oversight in political spending hypotheses. American companies spent a great deal of above $ 3.3 billion in 2012 on lobbying of the Congress and various federal agencies in Washington, DC (Chen et al., 2015). The political cost hypothesis shows that companies are lobbying to reduce the regulatory uncertainty and the lobbying companies under public oversight are likely to adopt the accounting conservatism (Watts, 1977). Guedhami et al. (2014) showed that companies with political connections are more likely to choose more reliable auditors, indicating that policy-dependent companies are likely to have better financial reporting quality. Prior research shows that corporate lobbying activities lead companies to achieve a variety of economic benefits. In particular, lobbying helps companies achieve favorable laws (Dean et al., 1998). Recent studies indicate a significant positive relationship between corporate lobbying activities and financial performance (Hill et al., 2013). One of the common features involving lobbying's economic benefits is that companies can produce and maintain exclusive rentals. In the political science literature, corporate lobbying is an activity for strong companies' benefit (Brasher & Lowery, 2006).

Hypothesis 2: Corporate lobbying has a significant impact on audit quality.

3. Research Methodology

3.1. Research Sample

The statistical population of this research included all companies listed on the Tehran Stock Exchange. In this research, the systematic elimination method was used to select the statistical sample. Hence, the following criteria were considered and, if a company had met all the criteria, it was selected as the research sample, and the rest were removed.

1. Corporate was listed on the stock exchange before 2012 and was active on the stock exchange until 2018.
2. Due to the specific nature of the holding corporations' activities, insurance firms, leasing companies, banks, financial and investment institutions, and their considerable differences from the manufacturing and trading companies, the selected firm was not among the listed companies.
3. Corporate financial information was available.

After meeting all the above criteria, a number of 150 companies remained as a screening population, all of which were selected as samples. Hence, our observations over the period 2012-2018 reached 1050 year-company (7 years ×150 companies). In this research, the regression method and Eviews were employed for data analysis and hypothesis testing.

3.2. Research Variables and Models

In this research, the multivariate and logistic regression models were used for hypothesis testing to estimate the independent variable's impact on the dependent and set of control variables.

Hypothesis Test Model 1:

$$COMP_{i,t} = \beta_0 + \beta_1 LOBBY_{i,t} + \beta_2 LI_{i,t} + \beta_3 spread_{i,t} + \beta_4 Return_{i,t} + \beta_5 duality_{i,t} + \beta_6 AO_{i,t} + \beta_7 CFO_{i,t} + \beta_8 SIZE_{i,t} + \beta_9 LEV_{i,t} + \beta_{10} GROWTH_{i,t} + \beta_{11} LOSS_{i,t} + \beta_{12} REST_{i,t} + \beta_{13} MTB_{i,t} + \beta_{14} Tenure_{i,t} + \beta_{15} Duvol_{i,t} + \varepsilon_{i,t}$$

Hypothesis Test Model 2:

$$Quality_{i,t} = \beta_0 + \beta_1 LOBBY_{i,t} + \beta_2 LI_{i,t} + \beta_3 spread_{i,t} + \beta_4 Return_{i,t} + \beta_5 duality_{i,t} + \beta_6 AO_{i,t} + \beta_7 CFO_{i,t} + \beta_8 SIZE_{i,t} + \beta_9 LEV_{i,t} + \beta_{10} GROWTH_{i,t} + \beta_{11} LOSS_{i,t} + \beta_{12} REST_{i,t} + \beta_{13} MTB_{i,t} + \beta_{14} Tenure_{i,t} + \beta_{15} Duvol_{i,t} + \varepsilon_{i,t}$$

The definition of all the variables in the above 12 models is presented in Table 1.

Table 1. Definition of research variables

Variable name	Symbol	Type	Definition
Lobbying	*LOBBY*	Independent	Lobbying signs are as follows: Presence of board members affiliated to government, parliament, and such political institutions or existence of a major state and quasi-state shareholder (owning at least 10% of voting shares). This variable was made through careful examination of notes and financial statements and board reporting to the General Assembly by identifying managing director, board members, major shareholders, affiliates, and those in interaction with sample companies in various ways. If the company has a political manager or owner and, in general, political connections, it is equal to 1; otherwise, 0 is considered in the model.

Board compensation	*comp*	Dependent	According to Article 134 of the Commercial Code of Iran, approved in 1968, as per the articles of association, the General Assembly could allocate a certain proportion of the company's annual net profit as compensation to the board members per Article 241 of this law, provided that the amount of compensation considered for managers in public and private corporations should not exceed 5% and 10% of the profits paid to shareholders in the same year, respectively. The board's non-obliged members should not continuously or non-continuously receive a fee from the company, except as provided for in this article and for their managerial position as salaries or compensation.
Audit quality	*Quality*	Independent	The variable is a dummy. If the audit is from an audit organization, it is 1; otherwise, it is 0.
Stock returns	*Return*	Control	To calculate a company's return, three factors of rial difference in stock prices at the end of the period compared to the first period, amount of profit split over the period, increased capital of companies in time limit are used, which are as follows: Stock returns = $(\frac{Right\ of\ priority+Stock\ award+Dividend\ (day\ price+base\ price)}{Percentage\ of\ capital\ increase\ from\ profit*1000+base\ price})$
Liquidity	*LI*	Control	It is equal to the ratio of current assets to current liabilities.
Down to up volatility	*DUVOL*	Control	We divide a particular weekly return into one of two samples for each company of the year: "low" weeks with weekly returns lower than the company's annual returns and "high" weeks with weekly returns higher than the company's annual average. Then, we calculate the weekly yield deviations for each of the two samples separately and use the natural logarithm of the ratio of deviations for the low weeks to the deviations for the high weeks. Algebraically, DUVOL for each company-year is calculated as follows: $DUVOL_{it} = log[\frac{(n_u-1)\ \sum_{Down} R_{it}}{(n_d-1)\ \sum_{up} R_{it}}]$ Ri,t is the companies' weekly stock returns above, and nd (nu) is the number of weeks with weekly returns lower (higher) than the company's annual returns.
Auditor tenure	*Tenure*	Control	It is equal to the number of consecutive years that the company has retained its auditor.
Auditor change	*Change*	Control	If the firm audit is changed in year t, it is 1; otherwise, it is 0.
Information asymmetry	*Spread*	Control	In this study, to measure information asymmetry, the bid-ask spread of stocks is used. $SPREAD_{i,t} = \frac{1}{D_{i,t}} \sum_{d=1}^{D_{i,t}} \frac{(ASK_{i,d} - BID_{i,d})}{(ASK_{i,d} - BID_{i,d})/2}$ SPREADi,t: The bid-ask spread of stocks of the company i per year t; the larger the bid-ask spread of stocks, the greater the information asymmetry would be. ASKi,d: Best (lowest) ask price of the stock for the company i; BIDi,d: Best (highest) bid price of the stock for the company i; The calculation process of bid-ask spread refers to extracting data of bid-ask prices of stocks for each of the companies during each year and, then, for the year that the following criteria are met, the "maximum bid price" is determined as "best bid price of stock" and the "minimum ask price" is determined as the "best ask price of stock" per year.

Auditor opinion	*AO*	Control	If the auditor gives a favorable opinion on the company's financial statements, it is 1; otherwise, it is 0.
Company size	*SIZE*	Control	Company size is measured using the natural logarithm of total sales of the corporation.
Financial leverage	*LEV*	Control	The Debt-to-asset ratio represents the company's financial leverage.
Sales growth	*GROWTH*	Control	Percentage change in total sales
Loss	*LOSS*	Control	The variable is virtual. If it is a loss firm, it is 1; otherwise, it is 0.
Restatement	*REST*	Control	The above variable is a 0-1 virtual variable. If financial statements are restated, it is 1; otherwise, it is 0.
Market to book value ratio	*MTB*	Control	The market to book value ratio is obtained from dividing the multiplication of the final share price by the number of shares issued or in the hands of shareholders by the book value of corporate stock owners' total salaries.
Managing director duality	*Duality*	Control	If the managing director is the board's chairperson, it is 1; otherwise, it is 0.
Operating cash flow	*CFO*	Control	This variable is derived from the following equation: Net Profit + Non-Cash Expenses + Working Capital

4. Results

4.1. Descriptive Statistics

Descriptive statistics is the arrangement and classification of data, graphical representation, and calculation of values such as facade, mean, median, etc., indicating the characteristics of members of the discussed population. In Tables 2 and 3, information on central indicators (mean, median, maximum, and minimum) and data scattering (standard deviation, skewness, and elongation) are provided. The degree of asymmetry of the frequency curve is called skewness. If the skewness coefficient is zero, the population is quite symmetrical; if the coefficient is positive, it is skewed right, and if it is negative, it is skewed left. The positive elongation coefficients indicate that the distribution of variables is longer than the normal distribution, and data are centered about the mean.

Table 2. Descriptive statistics of variables

	COMP	*QUALITY*	*LOBBY*	*LI*	*SPREAD*	*RETURN*	*DUALITY*	*AO*
Mean	1267.620	0.234286	0.729524	1.362176	0.026751	44.39977	0.256190	0.467619
Median	840.0000	0.000000	1.000000	1.236474	0.028266	12.25305	0.000000	0.000000
Maximum	17486.00	1.000000	1.000000	6.138485	0.052546	859.4925	1.000000	1.000000
Minimum	0.000000	0.000000	0.000000	0.164266	0.000000	-65.80506	0.000000	0.000000
Std. Dev.	1594.240	0.423753	0.444418	0.666593	0.011761	98.76169	0.436736	0.499188
Skewness	2.768876	1.254696	-1.033412	2.109409	-0.384958	3.060652	1.117039	0.129796
Kurtosis	17.77403	2.574263	2.067940	10.35148	2.312855	17.31671	2.247776	1.016847
Observations	1050	1050	1050	1050	1050	1050	1050	1050

Table 3. Continued descriptive statistics

	CFO	*SIZE*	*LEV*	*GROWTH*	*LOSS*	*REST*	*MTB*	*TENURE*	*DUVOL*
Mean	0.116159	13.91586	0.630144	0.195224	0.120952	0.710476	2.443886	4.217143	-0.084437
Median	0.103037	13.77544	0.617672	0.146558	0.000000	1.000000	2.036009	3.000000	-0.071140
Maximum	0.642210	19.72257	4.002704	3.579455	1.000000	1.000000	121.5096	16.00000	1.220855
Minimum	-0.460088	8.899731	0.108494	-0.739613	0.000000	0.000000	-53.21793	1.000000	-1.220105
Std. Dev.	0.126717	1.490523	0.255054	0.379882	0.326227	0.453757	6.139267	4.100558	0.357400
Skewness	0.272236	0.788515	3.446115	2.457554	2.324933	-0.928146	8.266898	1.479157	0.066282
Kurtosis	4.716726	4.859551	36.99769	17.32864	6.405311	1.861454	187.4198	3.912600	3.235513
Observations	1050	1050	1050	1050	1050	1050	1050	1050	1050

4.2. Correlation of variables

In order to investigate the presence or absence of collinearity among the research variables, Pearson's correlation analysis is used. Table 4 shows the results between the variables.

Table 4. Correlation coefficients of variables

	COMP	*QUALITY*	*LOBBY*	*LI*	*SPREAD*	*RETURN*	*DUALITY*	*AO*
COMP	1	0.088	0.006	0.256	-0.126	0.047	-0.082	0.108
QUALITY		1	0.240	-0.152	0.050	0.038	0.077	0.004
LOBBY			1	-0.170	0.045	-0.017	0.018	0.149
LI				1	0.005	0.103	-0.139	0.098
SPREAD					1	-0.035	0.122	-0.095
RETURN						1	-0.015	-0.019
DUALITY							1	0.009
AO								1

According to the results of Table 4, it is found that there are no values of too high or too low correlation (close to +1 and -1) that affect the results of the regression analysis. As a result, there is no collinearity between the independent variables of the study.

4.3. F-Limer test for model 1 study

The F-Limer test is first used to select from among the panel and integrated data methods in the multivariate regression. If the p-value calculated is greater than the 0.05 error level, the integrated data will be used. Otherwise, panel data will be used. Table (5) shows the results of the F-Limer test.

Table 5. F-Limer test

Hypothesis	Test type	Prob	Result
1	F- limer	0.3236	Pooled
	Hausman	-	-

According to Table 5, according to the significance level (Prob) obtained from the F-Limer test, the first hypothesis's testing methods are specified. The logistic regression method is also employed to estimate model 2.

4.4. Research hypotheses testing

Table 6. Estimation results of model 1

Dependent Variable: COMP				
Method: Panel EGLS (cross-section weights)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-5406.866	655.1043	-8.253443	0.0000
LOBBY	161.4073	68.37319	2.360681	0.0185
LI	161.0690	39.37019	4.091140	0.0000
SPREAD	-2384.989	1492.998	-1.597449	0.1105
RETURN	0.114569	0.075422	1.519038	0.1291
DUALITY	-84.58111	40.09855	-2.109331	0.0352
AO	135.3853	33.27370	4.068839	0.0001
CFO	105.2869	89.98189	1.170090	0.2423
SIZE	431.4686	45.28030	9.528836	0.0000
LEV	-189.8763	87.34069	-2.173973	0.0300
GROWTH	-66.46790	27.33735	-2.431395	0.0152
LOSS	41.24313	36.10286	1.142379	0.2536
REST	-10.55897	26.02271	-0.405760	0.6850
MTB	2.045803	1.756487	1.164713	0.2444
TENURE	-19.67914	5.413981	-3.634873	0.0003
DUVOL	-8.854545	25.34597	-0.349347	0.7269
R-squared	0.802863	Mean dependent var		2057.225
Adjusted R-squared	0.799290	S.D. dependent var		2020.907
S.E. of regression	949.2387	Sum squared resid		7.96E+08
F-statistic	224.7569	Durbin-Watson stat		2.076220
Prob(F-statistic)	0.000000			

Table 6 shows the results of model 1 estimation using EViews software. The results in Table 6 show that the F test's significance level is 0.0000, which is smaller than 0.05, and the F statistic indicates the overall reliability of the model. As a result, the model has a significant level of 95% and is very reliable. The adjusted coefficient of determination of this model is 0.799290. This figure indicates that the model explanatory variables can explain about 79% of the dependent variable changes. Since the Durbin–Watson statistic of the model is 2.076220 between 1.5 and 2.5, it can be said that there is no first-order in the autocorrelation model. Table 6 shows that the firm lobbying variable's significance level is 0.0185, which is smaller than 0.05. Therefore, the first hypothesis of the research is confirmed.

The results of the model testing using the logistic regression method are presented in Table 7. Since the LR statistic's significance level is less than 0.05, it can be claimed that this model is significant and highly reliable at a significance level of 95%. The results presented in Table 7 also show that the significance level calculated for the lobbying variable (0.0002) is smaller than 0.05. As a result, it can be said that lobbying has a significant impact on audit quality. Accordingly, hypothesis 2 is confirmed at a significance level of 95%. The results represented in Table 7 show that the coefficient of determination pseudo R2 (McFadden) is 0.642949. This figure indicates that explanatory variables explain 64.2% of the dependent variable changes.

Table 7. Estimation results of model 2

Dependent Variable: QUALITY				
Method: ML - Binary Logit (Newton-Raphson / Marquardt steps)				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	-10.75339	1.708959	-6.292363	0.0000
LOBBY	1.565539	0.420110	3.726496	0.0002
LI	-0.657246	0.318504	-2.063538	0.0391
SPREAD	-12.25594	13.48019	-0.909181	0.3633
RETURN	0.005161	0.001171	4.406354	0.0000
DUALITY	-0.739370	0.373839	-1.977777	0.0480
AO	-0.042445	0.271465	-0.156355	0.8758
CFO	0.179892	1.128559	0.159399	0.8734
SIZE	0.502097	0.096678	5.193482	0.0000
LEV	-1.190958	0.965235	-1.233853	0.2173
GROWTH	-0.490802	0.434710	-1.129032	0.2589
LOSS	-0.380319	0.568597	-0.668872	0.5036
REST	-0.388033	0.288392	-1.345506	0.1785
MTB	0.017947	0.033706	0.532464	0.5944
TENURE	0.647643	0.045604	14.20138	0.0000
DUVOL	-0.059444	0.386082	-0.153967	0.8776
McFadden R-squared	0.642949	Mean dependent var		0.234286
S.D. dependent var	0.423753	S.E. of regression		0.233990
Akaike info criterion	0.419236	Sum squared resid		56.61300
Schwarz criterion	0.494764	Log-likelihood		-204.0989
Hannan-Quinn criter.	0.447874	Deviance		408.1978
Restr. deviance	1143.247	Restr. log-likelihood		-571.6233
LR statistic	735.0489	Avg. log-likelihood		-0.194380
Prob(LR statistic)	0.000000			
Obs with Dep=0	804	Total obs		1050
Obs with Dep=1	246			

Table 8. Goodness-of-Fit Evaluation for Binary Specification
Andrews and Hosmer-Lemeshow Tests

Model	**Test**	**Statistics value**	**Prob. Chi-Sq**	**prob**
2	H-L Statistic	11.5276	8	0.1736

In order to investigate the fit of the estimated model, the Hosmer-Lemeshow test is employed. Since the Hosmer-Lemeshow test statistic's significance level in model 1 is 0.1736, which is greater than 0.05, the estimated model has a good fit. The explanatory variables of the model can explain the dependent variable.

5. Discussion and conclusion

This research investigates the impact of corporate lobbying on board compensation and audit quality for 150 Iranian stock companies from 2012 to 2018. The development level of financial markets, especially the stock market, and its impact on corporate financing have a significant impact on economic growth. Financial development's main determinants include the legal origin - institutions - open economic policies and political factors. In the meantime, political factors are important sources that originated from the implemented legal and institutional policies and frameworks and affect the financial system's development. The dynamic political economy framework shows that economic institutions and legal traditions affect economic growth and financial development. One of the most important characteristics of the capital market in any country is political issues. Political changes in the governing body have a tangible and rapid impact on the stock market because of the following perspectives. The influence of the wealth and power elements diverted lobbying from its mainstream. It necessitated its regulation, especially in countries that have adopted this problem as a part of policy-making and legislation. In developing countries, where the economic systems are often based on connections, one of the key factors affecting the management's motivations in financial reporting compared to other factors is the political factors of managers and owners of companies. The state-owned corporations and large industries affect the economy and the system's governing rule, the state-owned economy. In this method, social phenomena are caused by political and economic factors. According to political economy theory, most market-oriented economic societies are commercial units focusing on the economic, social, and political interactions between different groups. Therefore, introducing the connections between economic, social, and political groups is essential to perceive commercial units' varying characteristics. According to the above theory, accounting information is provided only for the support of influential groups in the social, political, and economic areas, information that can be used by the authorities for their benefit. Corporate lobbying activities let companies achieve a variety of economic benefits. In particular, lobbying helps companies obtain favorable laws. Lobbying also helps increase the relationship of companies with legislators. Accounting figures play an important role when the company is at risk of takeover. In particular, companies are reporting higher leverage and cash to limit local officials' potential authority so that corporate lobbies can cause public oversight. Corporate lobbying is probably the company's strategic actions for legal uncertainty management and corporate actions to establish political connections. Corporate lobbying and political costs are likely to cause organizational problems because these costs can consider managers' personal political interests and shareholders/companies. As a result, the political costs of companies attract the attention of the media and large corporations. It is suggested to pay attention to this issue that managing directors use political lobbying with internal political information to introduce and approve a financial support bill for their stock trading and profitability that increases their wealth and compensation. Results of the research hypotheses analysis show that corporate lobbying has a significant impact on board compensation. Managers of lobbying companies are more likely to receive higher compensation packages than their counterparts in the companies that do not lobby, which should be considered by investors. Excessive compensation might be given by the lobbying executive managers working in domestic trading.

Political information is used for opportunities to obtain profit from private information. This strategy may occur prior to public disclosure of positive corporation information, which increases the firm's performance and profit through self-business. Companies do not disclose lobbying information; to discover this information, we have to investigate whether the auditor works in a company with political managers or owners and, in general, political connections or not. The results also show that corporate lobbying has a significant impact on audit quality. Attention to the concerns raised by the stock exchange and the general public about auditor lobbying for clients could affect the audit quality. It must be noted that companies use accounting flexibility to achieve political goals. They use earnings management to reduce reported earnings. Companies use politicians to manage profits by reducing profits while they are re-electing their politicians. However, reputation and litigation risk concerns provide incentives for auditors to maintain independence and provide a high audit quality, even in lobbying for an audit client. The investors are suggested to consider their companies' political activities during decision-making on investment. Therefore, when investors lobby through a client, they might ask about the auditor's objectivity and perceive the auditor as the lower audit quality.

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Appendix 1:

Stationary test of variables

Prior to using these variables, it is necessary to ensure that they are stationary or non-stationary. In order to ensure the results of the research and non-dummy relationships in the regression and significance of the variables, efforts are made to perform the stationary test and calculate the unit root of research variables in the models. The above test is performed using EViews software and Levin, Lin & Chu, IM test, Sons and Shin, Fisher-type unit-root test, Dickey-Fuller Fisher-Phillips unit root test. The null hypothesis indicates the unit root; if the table's probability is smaller than 0.05, the null hypothesis is not confirmed at a probability of 0.95. The results of the unit root test are described in Table 9.

According to the results of Table 9, the probability value of the tests for all the variables is smaller than 0.05; thus, the above variables are at the stationary level.

Error homogeneity of variance test

One of the regression model hypotheses is the fixed error variance. Despite the homogeneity of variance in the model, an increase or decrease in the independent variable, the dependent variable variance equal to the residual variance is varied. In this research, in order to verify the results, Bartlett's method is used to investigate the homogeneity of variance in the combined data. In Bartlett's homogeneity of variance method, the null hypothesis is based on the homogeneity of variances, and the opposite hypothesis is considered the homogeneity of variances. Table 10 shows the results of the homogeneity test of the research models.

Table 9: Panel unit root test

Variables	Levin, Lin & Chu	
	Prob	Statistic
LOBBY	0.0001	-3.69843
LI	0.0000	-21.6333
SPREAD	0.0000	-27.8770
RETURN	0.0000	-44.5583
DUALITY	0.0000	-9.18842
AO	0.0000	-17.7048
CFO	0.0000	-30.7207
SIZE	0.0000	-32.6286
LEV	0.0000	-18.7091
GROWTH	0.0000	-33.1757
LOSS	0.0000	-16.1436
REST	0.0000	-25.0522
MTB	0.0000	-82.2325
TENURE	0.0000	-70.2945
DUVOL	0.0000	-57.4473

Table 10: Model error homogeneity of variance test

Test result	Significance level	Type of test	Model
Heterogeneity of variance	0.000	Bartlett	1
Heterogeneity of variance	0.000	Bartlett	2

According to the results of Table 10, which indicates the probability of smaller than 0.05, it can be said that the variance of the errors is heterogeneous, and the null hypothesis based on the fixed variance of the model is rejected. Therefore, in order to resolve the heterogeneity of variance, the generalized least squares regression (GLS) is utilized.

Cointegration testing of variables

When variables used in the regression are not stationary, a phenomenon known as false regression occurs. But if all the variables used in the regression model become stationary together, i.e., the residuals of the model are static, then the cointegration phenomenon is created. Hence, the term "cointegration" becomes gradually popular, and any stationary time series is called cointegrated. In general, if two variables (series) are integrated of the same order, for example (d)I, their linear combination can also be cointegrated. In such cases, the regression is significant on the two variables' values, meaning that the regression is not dummy anymore, and no long-term information would be lost. In short, if we found that the residuals of the regression are I(0) stationary, the traditional regression methodology, including t-test and F-test, can be used for data. The concepts of the unit root of the cointegration help identify the stationary of regression residuals. Kao test is used to examine the cointegration.

If the Kao test's significance level is less than 0.05, the H0 hypothesis based on the absence of a collinear relationship is rejected. As a result, the regression will not be false.

Table 11: Cointegration test using Kao test

Test	Statistics	Significance level
Kao	2.958044	0.0015
Kao	-4.583685	0.0000

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Research Article

The Effect of Cost Categories and the Origin of their Stickiness on Earnings Forecast: A Comparative Study

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Abstract

The main aim of this study is to separate the origins of "selling, general, and administrative costs (SG&A)" and "cost of goods sold (COGS)" stickiness and investigate their sources effects on earnings forecast accuracy (EFA). In previous research, various micro and macro factors have been shown to affect asymmetric cost behavior. These factors are rooted in the industry and firm-specific characteristics or specific events, which may occur each year at national or international scales. In this study, a new methodology is presented to separate the cost stickiness sources in the first step, including a novel method for calculating cost stickiness for each firm-year. In the second step, we investigated each firm-year stickiness effect and each stickiness source on the EFA. The study's statistical population consisted of all companies listed on the Tehran Stock Exchange, from which 1080 observations in the 2014-2018 period were selected and reviewed. Our results indicated that EFA has a negative and significant relationship with SG&A and COGS stickiness, each year's stickiness, and each company. Still, no significant relationship was found with the stickiness of each industry. Our results demonstrated that the stickiness of SG&A to COGS has a greater effect on the EFA. The findings suggest that each year's events and the intra-organizational events of each company have a greater impact on cost behavior. Hence, managers and financial analysts must consider each source of cost stickiness, especially year-specific events and firm-specific characteristics, and consider their earnings forecast effects to improve their EFA.

Keywords: Cost stickiness, Cost categories, Earnings forecast, Origin of cost stickiness.

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1. Introduction

Over the past two decades, a growing body of accounting research has looked into the asymmetric response of costs to changes in activity levels. The results of these studies suggest that costs fall (rise) when the level of activities fall (rise), but the rate of costs reduction is less than the reduction in activities. In contrast, the rate of increase in costs is almost proportional to the improvement in the level of activities. This type of cost behavior is called cost stickiness. Anderson et al. (2003) were the first to focus on asymmetric SG&A to illustrate that cost stickiness has a negative effect on the firm's current earnings. It is because a reduction in costs does not offset sales shrinkage. In their view, senior managers have authority over SG&A costs. By reviewing and criticizing traditional models of cost behavior, they presented a new model in which costs do not change relative to changes in the level of activities. Rather, changes are based on decisions made by managers. They declare that two main causes of cost stickiness are "the theory of manager's personal considerations" that serve the personal interest and "the theory of adjusted costs ". According to the former theory, managers do not always make decisions that provide the best outcomes for shareholders. Managers tend to maximize their own interests and may therefore be reluctant to cut back on resources in order to prevent a power reduction. One of the consequences of opportunistic contracts is a managerial empire, meaning that management tends to overgrow the company and maintain untapped resources in order to preserve and increase personal interests, including prestige, position, power, reward, and credibility.

According to "the theory of adjusted costs" or "cost adjustments", managers can eliminate redundant resources and adjust the associated costs when demand for an organization's products and services falls. If the decreased activity level is temporary, the cost adjustment and the subsequent increase (due to the raised activity level) will likely exceed the cost of retaining redundant resources that have been temporarily conserved. The resource adjustment costs may include severance payments to dismissed employees, assets disposal costs, and penalties for terminating contracts. In addition, if the demand for products keeps rising after the cost adjustment, the firm will incur costs such as acquiring new assets based on the company's conditions, recruiting and training new employees, and negotiating costs for signing new contracts. Therefore, costs are proportionate to the current sales level and may rely on managers' expectations for future sales.

However, sometimes there are reasons other than the company level that complicates the adjustment of resources despite managers' pessimism about the company's future. In this study, these factors are divided into a macro to micro levels. At the first level, macroeconomic factors stem from global and national developments, contributing to cost stickiness. For example, events such as war, tariff warfare, sanctions, or global political crises at the international arena and changes in domestic policies (including amendments of laws or changes in political drivers that are expected to alter corporate support) affect management behavior in handling cost and therefore stickiness at the macro level. Given that these factors may vary at different times, the time factor (year) has been used to differentiate their effects. At the second level of stickiness, we look into industry-level factors. The industry-specific characteristics such as operational and production environment, the intensity of competition, and cost structure in different industries are other variables that influence the degree of cost stickiness. At the third level, there are factors related to the company, including managers' ability to forecast future conditions and varying risk aversion levels.

Identifying the source of these factors enables managers to make appropriate decisions regarding resource adjustment. By identifying and measuring the sources of cost stickiness, managers can clarify and evaluate their reasons for cost stickiness and

non-adjustment of costs, improving the company's flexibility in the face of diminishing demand for its goods or services. This helps improve the company's accountability process. By knowing the cost behavior, company owners can also determine whether management is imposing unnecessary costs on the firm. It is also useful to ascertain external users' cost behavior (such as analysts) who intend to evaluate the company's performance. Therefore, identifying the origin can effectively measure and control the degree of cost stickiness and its consequences.

Based on the theoretical framework of financial reporting, cost segregation provides more comprehensive information on the behavior of different types of costs. When costs are considered total costs, we can only judge the behavior of total costs at the time of the sales change, while each type of cost may have different behaviors. Therefore, in this study, to further investigate the behavior of costs, costs are categorized based on function and examined. For this purpose, in this research, costs are divided into two groups: Selling, general, and administrative (SG&A) and cost of goods sold (COGS).

As noted in a few previous research, one of the significant cost consequences of stickiness is its effect on the EFA. Most financial managers and analysts project earnings irrespective of cost stickiness on future expenses, underline the EFA. However, they can forecast earnings more accurately by assessing the cost stickiness and the impact of its sources on future earnings. Therefore, as the second goal of this study, we consider the importance of accurate earnings forecast and its impact on users' decisions and investigate the effect of the degree of cost stickiness on EFA and measure each stickiness source's relative share EFA.

Therefore, the main contributions of this research to the literature on cost stickiness are:

1) Identifying, separating, and measuring stickiness sources,

2) Examining the separate consequences and impacts of each cost stickiness source on EFA.

The theoretical foundations and research background are first discussed, and the hypotheses are proposed. Then the data are described, and descriptive statistics are presented. In the next section, following the separation of cost stickiness sources, each source's impact on the EFA is evaluated. Finally, the study results concluded, and suggestions presented.

2. Literature Review and Hypothesis Development

According to previous research, multiple factors influence cost stickiness. Each of these factors is related to specific characteristics of each year [Lee et al. (2020), Awad and Awad (2015)], country [(Calleja et al. (2006), Byzalov & Chen (2013), Banker & Byzalov (2014), Kama & Weiss (2013),], industry [Banker, Flasher & Zhang (2014), Subramaniam et al. (2016)] and firm [Banker et al. (2014), Subramaniam et al. (2016), Dierynck & Renders (2009), Kama and Weiss (2013), Hay et al. (2010), Banker et al. (2011) and Chen et al. (2011)]. For example, setting varying tariffs by the United States on European and Chinese goods in 2018 is one of the events that can affect the parties' economies, production level, and even the degree of cost stickiness in continental Europe, China the United States. Moreover, the imposition of various economic sanctions against Iran affects GDP, sales, and the degree of cost stickiness based on managers' optimism or pessimism about the country's economic future. Besides, a number of factors such as technology level, which is rooted in the development of a country, and industry membership, can affect the degree of cost stickiness. Besides, each country's laws and regulations, corporate governance, and a host of other factors can influence the degree of cost stickiness. Each of these sources can trigger cost stickiness, but as noted by researchers [(Calleja et al. (2006), Banker, Byzalov & Chen

(2013), Banker & Byzalov (2014), Lee et al. (2020), Awad and Awad (2015)] identifying some of these factors could be ambiguous and increase the probability of errors in decisions. As mentioned earlier, in this study, the sources of stickiness are divided into three levels: year, industry, and firm. Each of these three levels is discussed in detail below.

Certain global and local events alter the degree of cost stickiness. These factors can be provoked by special political or economic events such as sanctions, war, tariff warfare, elections, and political instability. According to Anderson et al. (2003), management considers a company's specific characteristics in declining demand. It analyzes the economic development in the product market and economic conditions on a global scale. Managers tend to see demand reduction as temporary whenever they expect significant economic growth. War and sanctions can make managers pessimistic about the future and influence their decisions about resource adjustment. Lee et al. (2020) suggested that even by controlling company-level and country-level factors, the cost behavior asymmetry (cost stickiness) in election years will be greater than in non-election years. Economic sanctions are also one of the major tools for achieving political goals, which prompt economical and political instability, especially in sanctioned years. In recent years, multiple sanctions imposed on Iran have engendered serious economic problems, so that the production and sale of almost all industries have been adversely affected. Sanctions have always been a major hurdle to Iran's progress and development, which, while hampering modern technologies' introduction to Iran and reducing oil and non-oil exports, have rendered investors pessimistic about the country's economic future and managers disappointed with corporate futures. Economic sanctions, as economic and political destabilizers, will modify the asymmetric behavior of costs. The asymmetric cost behavior and managers' pessimism about the company's future will negatively affect the degree of cost stickiness. In addition, Yazdifar and Haghigh (2020) indicated managers' optimism effects on cost models.

The industry-specific characteristics affect cost adjustment when the scale of the company’s activity is modified. These features can be split into two groups. The first group consists of the intensity of assets and employees. The second group embraces other industry-specific characteristics such as operating and production environment, competition intensity, fixed and variable cost ratios, and supply chain. Anderson et al. (2003) contend that assets and employee intensity are two main characteristics of the company that affects cost adjustment. It is assumed that assets' intensity alters resources' adjustment because a decrease in assets is not commensurate with the decline in the company's activities. In firms with higher asset intensity, the costs associated with their resources, such as depreciation, repairs, and maintenance costs will be higher, and failure to reduce costs relative to the activity level will lead to cost stickiness. Therefore, assets have a huge bearing on cost stickiness because small companies usually hold less fixed assets. This indicates low costs associated with assets, and when the level of activity shrinks, the stickiness in these companies will be lower. Employee intensity affects cost adjustment for three reasons. First, the redundant workforce's layoffs will impose additional costs on the firm, and managers will be worried about losing skilled, experienced, and loyal employees. Second, if the demand for products rises, the firm will be forced to hire new employees, which will incur recruitment and training costs. Third, layoffs will dampen the morale of other employees and diminish productivity. A mixture of these factors leads to employees' non-dismissal, consequently, the lack of resources and cost adjustment. Therefore, with a higher number of employees, the costs of de-escalating the level of activity stickiness will be higher. Their research looked into the effect of these two factors on cost stickiness, concluding that these factors positively affect the level of adjusted costs at the firm level.

Cost structure varies significantly in diverse industries. For example, according to Elie (1991), the ratio of cost to sales is 5% in the coal industry and 66% in the pharmaceutical production industry. Subramaniam et al. (2003) concluded that the highest cost stickiness rate belonged to manufacturing companies, followed by service and commercial companies. In contrast, they did not observe any sign of asymmetric cost behavior in financial companies. Anderson et al. (2004) investigated cost behavior in service companies, reporting the absence of sticky costs in the retail sector, while the entertainment sector had the highest cost stickiness. According to their research, the degree of cost stickiness varies in different industries. The factors that provoke cost sticky behavior may exert divergent effects in each industry. They reported that assets, staff, and the prospect of improved sales had no effect on the degree of cost stickiness in the entertainment sector. In contrast, these factors had an undeniable impact on the hotel and restaurant industry's degree of service costs.

Firm characteristics that could affect cost stickiness are asset intensity, employee intensity, redundant operational capacity, and management optimism. The intensity of asset and employee, as discussed above, not only affected by industry type but also the firm-specific features have a significant effect on them.

Banker et al. (2006a) verified the relationship between utilized capacity and sticky cost behavior, attempting to expand this concept. According to Anderson et al. (2003), managers' expectations of the company's future performance play a pivotal role in the adjustment/ non- adjustment of the company's resources.

In another study, Banker et al. (2011d) used indices of managerial optimism and pessimism to offer more empirical evidence for their argument, contending that managers' expectations are a determinant of cost behavior. Banker et al. (2011d) found that if these indicators transmit clear and continuous positive signals about the company's future, the degree of cost stickiness will increase. Still, if conflicting or negative signals are sent, cost stickiness will plunge. In another study, Banker et al. (2011c) tested the model of Banker et al. (2011d) on an international sample, and their findings ratified the above outcomes for most countries.

Overall, the existing literature and theoretical foundations present strong evidence for stickiness in diverse types of costs in different years, industries, and companies. The research literature offers various reasons for cost stickiness, including managers' optimism and pessimism about sales prospects, earnings management, the nature of costs (in terms of controllability and uncontrollability), government regulations, technology level, employment protection laws and systems, which can affect the degree of cost stickiness.

2.1. Hypothesis development

A variety of factors can influence the EFA. According to previous research [Weiss (2010), Cifitci and Salama (2018)], asymmetric cost behavior is one of the main factors affecting the EFA. Weiss (2010) contends that there is a negative relationship between cost stickiness and EFA. He states that sticky companies tend to forecast low future earnings, explaining the higher errors in future earnings projection. Cifitci et al. (2016) argue that no systematic relationship will be observed between cost behavior and EFE if analysts can fully understand cost behavior. On the other hand, if analysts fail to take cost stickiness into account in their forecasts, the degree of EFE will be significantly different at the time of declining and rising demand. Cifitci and Salama (2018) revealed a positive relationship between cost stickiness and EFE because managers and analysts do not consider the adverse consequences of cost stickiness in an earnings forecast. If financial analysts estimate variable costs or cost stickiness accurately, the EFE should be symmetrical with abnormal sales (desirable or undesirable). They stated that an

accurate cost forecast has a significant impact on the EFA. Therefore, according to the above, it can be stated that the degree of cost stickiness is one of the major factors that can influence the EFA. If financial analysts and managers fail to account for the degree of cost stickiness in their forecasts, they may have more earnings prediction mistakes. Based on the above, we can have a comprehensive analysis by separating the costs and analyzing each behavior. Based on previous research, it is expected that the stickiness intensity of different types of costs will be different and have a variety of effects on the EFA. Therefore, the first research hypothesis is developed as follows:

H1: SG&A and COGS stickiness have a different impact on EFA.

However, since the sources of cost stickiness are different and triggered by year, industry, and firm-specific events and circumstances, we expect that the impact of each of these sources on the EFA is different. Forecasting and controlling each year's events and identifying the firm-specific features is more complicated than other stickiness sources.

Therefore, the greater the impact of each source on *SG&A* and *COGS* stickiness, the lower the EFA. Hence, the second hypothesis is expressed as follows:

H2: Each source of SG&A and COGS stickiness has a different effect on EFA.

3. Research Design

3.1. Separation of cost stickiness sources

The degree of cost stickiness will be measured using the model of Anderson et al. (2003), according to model (1).

Model (1):

$$\mathrm{Log}\left(\frac{\mathrm{Cost_{f,t}}}{\mathrm{Cost_{f,t-1}}}\right) = \mathrm{B_0} + \mathrm{B_1}.\,\mathrm{Log}\left(\frac{\mathrm{Sales_{f,t}}}{\mathrm{Sales_{f,t-1}}}\right) + \mathrm{B_2}.\,\mathrm{DD}.\,\mathrm{Log}\left(\frac{\mathrm{Sales_{f,t}}}{\mathrm{Sales_{f,t-1}}}\right) + \mathrm{e_{f,t}}$$

As noted by Anderson et al. (2003), "If sales revenue rises, the dummy variable of sales decrease (*DD*) will be zero. Thus, coefficient B_1 shows an increase in costs due to a 1% rise in sales revenue. Moreover, since the coefficient of the dummy variable of sales is equal to 1 when revenue decreases, the sum of coefficients B1 + B2 denotes the percentage reduction in costs resulting from a 1% reduction in sales revenue.

In sticky cases, the percentage of increase in costs during the revenue growth period will be greater than the percentage of decrease in costs during revenue decrement. In other words, we will have $B_1 > 0$, $B_2 < 0$ $(B_1 + B_2 < B_1)$. If costs are anti-sticky, $B_1 > 0$ and $B_2 > 0$, in which case $B_1 + B_2 > B_1$. It indicates that for a 1% change in sales, the costs reduction will be greater than the rising costs.

We use three steps to separate the stickiness sources as follows. First, model (1) is run by all observations, and the B2 coefficient calculates overall stickiness. The calculated coefficient (B_2) is affected by year, industry, and firm. Then to control the effects of the year, model (1) is tested for each year, and the coefficient B_2 is calculated for each year ($B_{2,y}$) that is influenced by industry and company effects. Therefore, by comparing $B_{2,y,}$ and B_2, the degree of relative stickiness of each year (CS_y) can be calculated

Second, we use the previous calculated $B_{2,y,}$ and then, to control the industry's effects, model (1) will be run for each industry each year. When naming the coefficient $B_{2,y,\,i,}$ which is influenced by the company's effects. Therefore, by comparing $B_{2,y,\,i}$ and, the degree of relative stickiness of each industry in each year ($CS_{y,i}$) is obtained.

Third, since the number of observations is limited to one to determine the relative stickiness of each firm; hence, it is impossible to test regression for single data. However, for the homogeneity of calculations with previous steps, each company's relative stickiness can be obtained. Supposed line $CS_{y,i}$ indicates the regression

relationship of these points for a specific company in a given industry and year according to model 1 that ran in industry-year level with the slope of $B_{2,y,\,i}$. We assume that the intercept illustrates factors, which are the same in all observations of that industry-year. The difference of each observation is related to the specific cost stickiness of that point. The slope of each point (such as F1) with a line ($LF_{(y,i,f)}$) that originating from the intercept shows the total stickiness of that observation ($B_{y,i,f}$). In a similar way to other sources of cost stickiness, the relative cost stickiness of each firm-year is divided by the total cost stickiness of each observation ($B_{y,i,f}$) to $B_{2,y,i}$ calculated. A summary of the points discussed in this section and the conceptual model of separation of cost stickiness sources are presented in Figure 1.

Step	Sticky source	observations	Coefficient		Relative stickiness index
---	---	(1) Overall	B_2		---
1	Year	(1) Annual	$B_{2,y}$		$\frac{B_{2,y}}{B_2} = CS_y$ (2)
2	Industry	(1) Industry-year	$B_{2,y,i}$		$\frac{B_{2,y,i}}{B_{2.y}} = CS_{y,i}$ (3)
3	Company	(4)single observation	$B_{2,y,i,f}$		$\frac{B_{y,i,f}}{B_{2,y,i}} = CS_{y,i,f}$ (4)

3.2. Testing research hypotheses

According to previous research, multiple factors influence the EFA. To test the research hypotheses and explain how cost stickiness and its sources can reduce EFA, it is necessary to control other variables affecting EFA. Therefore, to test the research hypotheses, we used the models proposed by Weiss (2010), Cifitci and Salama (2018), and Anderson et al. (2007). In this research, we used model 5 to test the first hypothesis (*SG&A* and *COGS* stickiness); and model 8 for the second hypothesis (*SG&A* and *COGS* stickiness sources).

Model (5):

$$FE_{f,t} = \beta_0 + \beta_1 \boldsymbol{SGAS_{f,t}} + \beta_2 MV_{f,t} + \beta_3 LOSS_{f,t} + \beta_4 VSALE_{f,t} + \beta_5 OPLEV_{f,t} + \beta_6 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

$$FE_{f,t} = \beta_0 + \beta_1 \boldsymbol{COGSS_{f,t}} + \beta_2 MV_{f,t} + \beta_3 LOSS_{f,t} + \beta_4 VSALE_{f,t} + \beta_5 OPLEV_{f,t} + \beta_6 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

Model (6):

$$FE_{f,t} = \beta_0 + \beta_1 \boldsymbol{SGAS_y} + \beta_2 \boldsymbol{SGAS_{y,i}} + \beta_4 \boldsymbol{SGAS_{y,i,f}} + \beta_5 MV_{f,t} + \beta_6 LOSS_{f,t} + \beta_7 VSALE_{f,t} + \beta_8 OPLEV_{f,t} + \beta_9 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

$$FE_{f,t} = \beta_0 + \beta_1 \boldsymbol{COGSS_y} + \beta_2 \boldsymbol{SGAS_{y,i}} + \beta_4 \boldsymbol{SGAS_{y,i,f}} + \beta_5 MV_{f,t} + \beta_6 LOSS_{f,t} + \beta_7 VSALE_{f,t} + \beta_8 OPLEV_{f,t} + \beta_9 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

To verify the results' validity, we calculated the cost stickiness by Anderson et al.'s model (2007) and confirming our first hypothesis results with them. The main reason

for choosing this model is the ability to measure cost stickiness for each firm-year. We used their cost behavior proxies ($SGA\ Signal^{-}_{f,t}$; $SGA\ Signal^{+}_{f,t}$, $COGS\ Signal^{-}_{f,t}$, $COGS\ Signal^{+}_{f,t}$) and substituted them in model 5 with our proxy ($SGA_{f,t}$ & $COGS_{f,t}$) and obtained model 7. The results of this model

Table 1. Descriptions of variables (alphabetic)

Variable	Description
AP	*Actual earnings per share (EPS)*
COGS	*Total stickiness of cost of goods sold*
$COGSS_y$	*Relative COGS stickiness for each year when sales decrease and 0 otherwise, similar to Anderson et al. (2007).*
$COGSS_{,i}$	*Relative industry-year COGS stickiness when sales decrease and 0 otherwise, similar to Anderson et al. (2007).*
$COGSS_{,i,t}$	*Relative firm-industry-year COGS stickiness when sales decrease and 0 otherwise, similar to Anderson et al. (2007).*
Decrease _Dummy	*The dummy variable takes the value of 1 when sales revenue decreases between period t −1 and t, and 0 otherwise.*
FP	*Management earnings per share (EPS) forecasts*
FE	*The absolute forecast errors.* $FE_{f,t} = \left\lvert \frac{(AP_{f,t} - FP_{f,t})}{FP_{f,t}} \right\rvert$
LOSS	*Dummy variable that equals 1 if the reported earnings are negative and 0 otherwise.*
MV	*The logarithm of the market value of equity + Liabilities*
ΔNINCOME	*Indicator variable that equals 1 if the change in earnings from the prior year is positive, and 0 otherwise*
OPLEV	*The ratio of gross income (sales, minus COGS) and sales*
Sale	*Total revenue*
SGAS	*Total stickiness selling, general, and administrative costs*
$SGAS_y$	*Relative SG&A of cost stickiness for each year when sales decrease and 0 otherwise, similar to Anderson et al. (2007).*
$SGAS_{y,\,i}$	*Relative industry-year SG&A cost stickiness when sales decrease and 0 otherwise, similar to Anderson et al. (2007).*
$SGAS_{y,i,t}$	*Relative firm-industry-year SG&A cost stickiness when sales decrease and 0 otherwise, similar to Anderson et al. (2007).*
$SGA\ Signal^{-}$	*The SGA cost signal- (cost stickiness) of each firm-year when sales decrease and 0 otherwise.* The negative SGA cost signal based on Anderson et al.'s model (2007) is calculated as follows: $SGA\ Signal^{-} = \frac{COST_{i,t}}{SALES_{i,t}} - \frac{COST_{i,t-1}}{SALES_{i,t-1}}$
$SGA\ Signal^{+}$	*The SGA cost signal+ of each firm-year when sales increase and 0 otherwise.* The positive SGA cost signal based on Anderson et al.'s model (2007) is calculated as follows:: $SGA\ Signal^{+} = \frac{COST_{i,t}}{SALES_{i,t}} - \frac{COST_{i,t-1}}{SALES_{i,t-1}}$

$COGS\ Signal^{-}$	*The COGS signal- (cost stickiness) of each firm-year when sales decrease and 0 otherwise.* The negative COGS signal based on Anderson et al.'s model (2007) is calculated as follows: $COGS\ Signal^{-} = \frac{COST_{i,t}}{SALES_{i,t}} - \frac{COST_{i,t-1}}{SALES_{i,t-1}}$
$COGS\ Signal^{+}$	*The COGS signal+ of each firm-year when sales increase and 0 otherwise.* The positive COGS signal based on Anderson et al.'s model (2007) is calculated as follows:: $COGS\ Signal^{+} = \frac{COST_{i,t}}{SALES_{i,t}} - \frac{COST_{i,t-1}}{SALES_{i,t-1}}$
VSALE	*The percentage change in sales to the previous year.*
This table defines the main variables.	

are compared with model 5 for verifying our proposed measurement.

Model (7):

$$FE_{f,t} = \beta_0 + \beta_1 \boldsymbol{SGA\ Signal^{-}}_{f,t} + \beta_2 \boldsymbol{SGA\ Signal^{+}}_{f,t} + \beta_3 MV_{f,t} + \beta_4 LOSS_{f,t} + \beta_5 VSALE_{f,t} + \beta_6 OPLEV_{f,t} + \beta_7 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

$$FE_{f,t} = \beta_0 + \beta_1 \boldsymbol{COGS\ Signal^{-}}_{f,t} + \boldsymbol{\beta_2\ COGS\ Signal^{+}}_{f,t} + \beta_3 MV_{f,t} + \beta_4 LOSS_{f,t} + \beta_5 VSALE_{f,t} + \beta_6 OPLEV_{f,t} + \beta_7 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

Table 1 provides descriptions of all variables.

3.3. Description of Data

Our sample includes all industrial firms from 2013 to 2018. Table 2 describes the industry information. According to the first two-digit SIC-Codeindustry, the sample was chosen, which displays the code of identifying the major industry group. Since the regression model must be fitted in each industry-year to compute the cost stickiness in each industry-year. We also exclude firm-year observations in the financial services industry due to the disparity of financial report interpretations between these industries and other industries (Subramanyam, 1996).

Table 2. Industry Information

	Observation
Motor Vehicles	152
Mineral Mining	143
Chemical	193
Food	138
Base Metals	148
Building	160
Pharmaceuticals	146
Total	1080

Table 3 describes our sample selection procedure. Our sample consists of all companies listed on the Tehran Stock Exchange (TSE)[1] from 2013-2018. We trimmed the data to eliminate extreme observations by removing observations where any variable's value was in the top or bottom 0.5 percent of its distribution (Chen & Dixon, 1972). The final sample contains 1080 firm-year observations from 2014 to 2018.

1- The TSE is Iran's largest capital market. For detailed information about the TSE, refer to http://www.TSE.ir/.

Table 3. Sample selection procedures

	Observation
All companies listed on the TSE from 2013 to 2018	2219
Financial industry companies	966
Firms with insufficient information	173
Final sample	1080

Table (4) demonstrates descriptive statistics in three columns (low EFE, High EFE, and all sample data). The low and high EFE distinguished by the median static. By comparing the average *SGAS*, *COGSS*, and their resources in the two groups, it can be stated that *SGAS* and *COGS*, year origin of stickiness, industry, and firm source are higher in high EFE conditions.

4. Estimation Results

4.1. Separation of Cost stickiness sources

To separating the cost stickiness sources, we apply the model (1) three times, first with all observations that results showed in table 5, second for each year, and third for each industry-year (table 6), and then calculated relative stickiness of years and industries (table 6).

Table 4. Descriptive statistics of the full sample

Variables	low EFE		High EFE		All Sample Data	
	N	Mean	N	Mean	N	Mean
FE	540	0.356	540	2.005	1080	0.873
SGAS	540	0.010	540	0.233	1080	0.110
$SGAS_y$	540	0.240	540	0.354	1080	0.298
$SGAS_{y,i}$	540	0.112	540	0.157	1080	0.121
$SGAS_{y,i,f}$	540	0.295	540	0.340	1080	0.314
$COGSS$	540	0.187	540	0.430	1080	0.199
$COGSS_y$	540	0.314	540	0.528	1080	0.403
$COGSS_{y,i}$	540	0.160	540	0.232	1080	0.199
$COGSS_{y,i,f}$	540	0.361	540	0.775	1080	0.521
$SGA\ Signal^-$	540	0.004	540	0.009	1080	0.021
$SGA\ Signal^+$	540	-0.003	540	-0.0001	1080	-0.002
$SGA\ Signal^-$	540	0.009	540	0.011	1080	0.034
$SGA\ Signal^+$	540	0.0002	540	-0.024	1080	-0.005
MV	540	8.044	540	7.819	1080	7.935
VSALE	540	0.084	540	0.082	1080	0.081
OPLEV	540	0.284	540	0.221	1080	0.253
ΔNINCOME	540	-0.132	540	-0.441	1080	-0.257

The coefficient β_2 is a negative estimate that indicates the degree of stickiness in all observations, equal to -0.361 in *SG&A* and equal to -0.743 in *COGS*.

In table 6, Cost Stickiness ($B_{2,y}$) showed the stickiness of each year and could be influenced by industry and company effects. By comparing B_2 and $B_{2,y}$, the degree of relative stickiness related to each year was calculated, the results of which are presented in table 6.

Table 5. Results of Regressing Changes in Costs on Changes in Sales Revenue for the 5 years 2014–2018

Panel A: SG&A Model (1): $Log\left(\frac{SGA_{f,t}}{SGA_{f,t-1}}\right) = B_0 + B_1.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + B_2.DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + e_{f,t}$			
Independent variable	**Exp. sign**	**Coef**	**p-value**
$Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)$	+	1.088 (21.49)	0.000
$DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)$	-	-0.361 (-6.44)	0.000
Constant		0.003 (0.47)	0.637
Adjusted R Square	76.40%		
Observation	1080		
Panel B: COGS Model (1): $Log\left(\frac{COGS_{f,t}}{COGS_{f,t-1}}\right) = B_0 + B_1.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + B_2.DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right) + e_{f,t}$			
Independent variable	**Exp. sign**	**Coef**	**p-value**
$Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)$	+	1.160 (3.79)	0.000
$DD.Log\left(\frac{Sales_{f,t}}{Sales_{f,t-1}}\right)$	-	-0.743 (-2.36)	0.021
Constant		- 0.007 (-0.54)	1.032
Adjusted R Square	67.15%		
Observation	1080		

As depicted in Table (6), the relative stickiness in *SG&A* was the highest in 2017 and 2018, which indicates the strong effects of the events in 2017 and 2018 on the degree of stickiness. The most important event of 2018 was the withdrawal of the United States from JCPOA[۲] and the imposition of new sanctions against Iran, which was a major hurdle to the production and export of many industries in Iran and cut its production capacity so that companies faced significant unutilized resources.

Table 6. Cost Stickiness and Relative Cost Stickiness for Each Year each Industry-Year Over 2014–2018

Panel A: SG&A										
Origin	**2014**		**2015**		**2016**		**2017**		**2018**	
	Cost Stickiness	**Relative cost stickiness**	**Cost stickiness**	**Relative Cost Stickiness**	**Cost Stickiness**	**Relative Cost Stickiness**	**Cost Stickiness**	**Relative Cost Stickiness**	**Cost Stickiness**	**Relative Cost Stickiness**
Year	-0.033	0.091	0.082	-0.227	-0.278	0.770	-0.691	1.914	-0.852	2.360
Building	-0.121	3.666	-0.087	-1.060	0.345	1.241	-1.142	0.001	-0.125	0.146
Food	-0.057	1.727	-0.452	5.512	-0.214	0.769	-1.142	0.147	-0.078	0.091
Mineral Mining	0.145	-4.393	-0.254	-3.097	-0.254	0.769	-0.378	0.547	-0.275	0.322
Base Metals	-0.402	0.322	-0.075	0.102	-0.025	0.730	0.02	0.565	0.035	-0.041
Chemical	-0.111	3.636	0.001	0.012	-0.021	0.075	-0.052	0.075	0.214	-0.251
Pharmaceuticals	-0.055	1.666	-0.061	-0.743	-0.214	0.769	-0.124	0.200	-0.251	0.294
Motor Vehicles	0.004	-0.121	-0.010	-0.121	-0.241	0.866	-0.214	0.309	0.125	-0.146

2 *Joint Comprehensive Plan of Action*

Panel B: COGS										
Origin	2014		2015		2016		2017		2018	
	Cost Stickiness	Relative cost stickiness	Cost stickiness	Relative Cost Stickiness	Cost Stickiness	Relative Cost Stickiness	Cost Stickiness	Relative Cost Stickiness	Cost Stickiness	Relative Cost Stickiness
Year	0.253	-0.340	-0.619	0.833	1.432	-1.927	-0.127	0.170	-0.097	0.130
Building	-0.478	0.138	-0.103	0.257	-0.147	2.672	-1.445	11.829	-0.458	2.053
Food	-0.023	0.138	-0.365	0.912	-0.458	8.327	-0.555	4.512	-0.112	5.090
Mineral Mining	0.036	-0.216	1.512	-3.780	-0.585	10.636	-0.558	4.536	-0.745	3.340
Base Metals	-0.254	1.530	-0.221	0.552	-0.254	4.618	0.447	-3.634	0.025	-0.112
Chemical	0.444	-2.674	0.551	1.377	-0.112	2.036	-0.254	2.065	0.458	2.053
Pharmaceuticals	-0.551	-4.548	-0.122	-1.675	-0.222	-5.090	0.452	-1.772	-0.125	2.829
Motor Vehicles	0.551	-3.319	-0.254	0.635	-0.452	8.218	0.225	-1.829	-0.478	2.143

Table 6 also represents the results of executing cost stickiness regression at the industry-year level. By comparing this model's cost stickiness coefficient with the results of cost stickiness, the industry's relative effects on cost stickiness can be determined.

4.2. Testing Hypothesis

4.2.1. SG&A and COGS stickiness and EFA (H1)

The test results of the first hypothesis are presented in table 7 and 8. The hypothesis test results are reported in two columns of these tables; the first column is based on our model (model 5), and the second column is based on Anderson et al. (2007) model (model 6). As shown by the results in table 7, the *SG&A* stickiness of each company is positively and significantly correlated with the EFE, and the hypothesis is confirmed with both models. The results calculated by our model illustrates a stronger relationship between cost stickiness and EFE. and significant (t-statistic = 2.09), suggesting that the stickiness of *SG&A* is directly and significantly related to the EFE. As shown by the results in table 12, each company's COGS stickiness is positively and significantly correlated with the EFE, and the hypothesis is confirmed with both models. The results calculated by our model illustrates a stronger relationship between cost stickiness and EFE.

The *SG&A* stickiness coefficient estimated by our model was significantly positive (β_1 = 4.152, t-statistics= 4.20), which shows that the stickiness of *SG&A* is directly and significantly related to EFE, so that with a one-unit increase in the *SG&A* stickiness, the EFE rises by 4.152. The coefficient of *SG&A* estimated by Anderson et al. (2007) model was positive (β_1 = 19.03).

The *COGS* stickiness coefficient estimated by our model was significantly positive (β_1 = 6.165, t-statistics= 2.45), which shows that the stickiness of *COGS* is directly and significantly related to EFE, so that with a one-unit increase in the *COGS* stickiness, the EFE rises by 6.165.

Table 7. Regression Coefficient of Management Forecast Error on SG&A Stickines

Regression Model (7):

$$FE_{f,t} = \beta_0 + \beta_1 SGAS_{f,t} + \beta_2 MV_{f,t} + \beta_3 LOSS_{f,t} + \beta_4 VSALE_{f,t} + \beta_5 OPLEV_{f,t} + \beta_6 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

Regression Model (10):

$$FE_{f,t} = \beta_0 + \beta_1 SGAS\ Signal^{-}_{f,t} + \beta_2 SGA\ Signal^{+}_{f,t} + \beta_3 MV_{f,t} + \beta_4 LOSS_{f,t} + + \beta_5 VSALE_{f,t} + \beta_6 OPLEV_{f,t} + \beta_7 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

	Coefficient Estimates (*t*-statistics)	
Independent variable	**Model (5)**	**Model (6)**
SGAS	4.152*** (4.20)	
SGA Signal^{-}		19.03** (2.09)
SGA Signal^{+}		-1.932 (-019)
MV	-0.125** (-2.04)	-1.587** (-2.08)
LOSS	0.115* (2.31)	9.976** (2.92)
VSALE	-0.181* (-1.96)	-0.113 (-1.38)
OPLEV	0.251* (1.88)	0.958 (0.41)
Δ*NINCOME*	0.152 (0.44)	0.059** (-2.099)
Constant	7.251 (10.03)	-9.941 (-2.00)
Adjusted R-Square	27.25%	25.72%
Number of observations	1080	1080
*Significant level: *** 1%, ** 5% ,* 10%*		

Table 8. Regression Coefficient of Management Forecast Error on COGS Stickiness.

Regression Model (5):

$$FE_{f,t} = \beta_0 + \beta_1 COGSS_{f,t} + \beta_2 MV_{f,t} + \beta_3 LOSS_{f,t} + \beta_4 VSALE_{f,t} + \beta_5 OPLEV_{f,t} + \beta_6 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

Regression Model (6):

$$FE_{f,t} = \beta_0 + \beta_1 COGA\ Signal^{-}_{f,t} + \beta_2 COGS\ Signal^{+}_{f,t} + \beta_3 MV_{f,t} + \beta_4 LOSS_{f,t} + + \beta_5 VSALE_{f,t} + \beta_6 OPLEV_{f,t} + \beta_7 \Delta NINCOME_{f,t} + \varepsilon_{f,t}$$

	Coefficient Estimates (*t*-statistics)	
Independent variable	**Model (5)**	**Model (6)**
COGSS	6.165** (2.45)	
COGS Signal^{-}		11.866** (2.24)
COGS Signal^{+}		-5.532** (-2.32)
MV	-0.254** (-2.11)	-1.212** (-2.28)
LOSS	2.031** (2.21)	7.976** (2.52)
VSALE	-1.112 (-1.08)	-0.545 (-1.45)
OPLEV	0.087 (0.88)	0.452 (0.021)
Δ*NINCOME*	0.221 (0.15)	0.121 (0.10)
Constant	8.11** (3.03)	-11.491** (-3.00)
Adjusted R-Square	20.96%	18.25%
Number of observations	1080	1080
*Significant level: *** 1%, ** 5% ,* 10%*		

The coefficient of *COGS* estimated by Anderson et al. (2007) model was positive (β_1 = 11.866) and significant (t-statistic = 2.24), suggesting that the stickiness of *COGS* is directly and significantly related to the EFE.

4.2.2. SG&A and COGS stickiness sources and EFE (H2)

The test results of the second hypothesis are presented in Tables 9 and 10. The results illustrate that each year's relative stickiness and each company in both *SG&A and COGS* is significantly related to the EFE. At the same time, there is no significant relationship between the stickiness of each industry and EFE. The estimated coefficient of *SG&A* relative stickiness in each year was positive (β_1 = 0.145) and significant (t-statistic = 3.21), indicating that the relative stickiness in each year is directly and significantly correlated with EFE. With a one-unit increase in the relative stickiness of each year, the EFE rises by 0.145 units. The estimated coefficient of relative stickiness in each industry-year is positive (β_2 = 0.050) and not significant (t-statistic = 0.02), demonstrating that each industry's average relative stickiness did not induce a significant forecast error. At the company level, the estimated coefficient of relative stickiness was positive (β_3 = 0.24) and significant (t-statistic = 2.00), suggesting that each company's relative stickiness has a direct and significant relationship with EFE.

Table 9. Regression Coefficient of Management Forecast Error on the Sources of SG&A Stickiness

Regression Model (7):

$$FE_{f,t} = \beta_0 + \beta_1 SGAS_y + \beta_2 SGASS_{y,i} + \beta_3 SGASS_{y,i,f} + \beta_4 MV_{f,t} + \beta_5 LOSS_{f,t} + \beta_6 VSALE_{f,t} + \beta_7 OPLEV_{f,t} + \beta_8 \Delta NINCOME_{f,t} \varepsilon_{f,t}$$

Independent variables	Coefficient Estimates (t-statistics)
	Model (7)
$SGASS_y$	0.145** (3.21)
$SGASS_{y,i}$	0.050 (0.02)
$SGASS_{y,i,f}$	0.024** (2.00)
MV	-0.124** (-2.40)
LOSS	0.142 (0.18)
VSALE	0.010 (0.12)
OPLEV	0.12 (1.12)
ΔNINCOME	- 0.121 (-5.42)
Constant	0.124*** (10.37)
Adjusted R-Square	8.31%
Observation	1080

Significant level: *** 1%, ** 5% ,* 10%

As shown by the results in table 10, the estimated coefficient of *COGS* relative stickiness in each year was positive (β_1 = 0.121) and significant (t-statistic = 2.09), indicating that the relative stickiness in each year is directly and significantly correlated with EFE. With a one-unit increase in the relative stickiness of each year, the EFE rises by 0.121 units. The estimated coefficient of relative stickiness in each industry-year is positive (β_2 = 0.003) and not significant (t-statistic = 0.19), demonstrating that each

industry's average relative stickiness did not induce a significant forecast error.

Table 10. Regression Coefficient of Management Forecast Error on the Sources of COGS Stickiness

Regression Model (7):

$$FE_{f,t} = \beta_0 + \beta_1 COGSS_y + \beta_2 COGSS_{y,i} + \beta_3 COGSS_{y,i,f} + \beta_4 MV_{f,t} + \beta_5 LOSS_{f,t} + \beta_6 VSALE_{f,t} + \beta_7 OPLEV_{f,t} + \beta_8 \Delta NINCOME_{f,t} \varepsilon_{f,t}$$

Independent variables	Coefficient Estimates (t-statistics)
	Model (7)
$COGSS_y$	0.121** (2.09)
$COGSS_{y,i}$	0.003 (0.19)
$COGSS_{y,i,f}$	0.125** (3.10)
MV	-0.52** (-2.05)
LOSS	0.254** (3.12)
VSALE	0.125** (2.45)
OPLEV	0.541 (0.44)
ΔNINCOME	- 0.412** (-2.41)
Constant	0.441*** (12.68)
Adjusted R-Square	10.12%
Observation	1080

Significant level: *** 1%, ** 5% ,* 10%

At the company level, the estimated coefficient of relative stickiness was positive (β_3 = 0.125) and significant (t-statistic = 3.10), suggesting that each company's relative stickiness has a direct and significant relationship with EFE.

The comparison results illustrate that the year and company sources, regardless of the cost category, affect the EFE. The results of this comparison are presented in Table 11.

Table 11. Comparison of cost stickiness source coefficients.

Cost category	Year-Specific Characteristics	Industry-Specific Characteristics	Firm-Specific Characteristics
SG&A	0.145** (3.21)	0.050 (0.02)	0.024** (2.00)
COGS	0.121** (2.09)	0.003 (0.19)	0.125** (3.10)

5. Summary and Conclusion

According to previous research, one of the major consequences of cost stickiness is its adverse impact on the EFA. In the present study, we further investigated this subject by examining the relationship between the stickiness of each source of cost stickiness and the EFA. This study presented a method that separated stickiness sources and calculated cost stickiness for each year-company. Then, the effect of *SG&A* and *COGS* stickiness, and all of their sources on the EFA was investigated. The results showed that the degree of *SG&A* and *COGS* stickiness has a negative and significant relationship with the EFA, so that a higher degree of stickiness decreased the EFA.

Accordingly, investors, analysts, managers, and other users need to consider the consequences of total cost stickiness in forecasting future earnings and assessing the

company's value to estimate the company's future performance with the least error.

In addition, to further investigate the proposed method, each year-company stickiness was tested with the model of Anderson et al. (2007), and its effect on the EFA was explored. The results were aligned with those obtained from our proposed method. Findings also suggest that each year's stickiness and each company negatively affect the EFA among cost stickiness sources. It indicates that each year events and intra-organizational events have a greater effect on EFA than other sources of cost stickiness. Therefore, it can be contended that by separating the sources of cost stickiness and including them in earnings forecast models, a more accurate estimate of future earnings can be made. It is worth noting that the findings of this study are consistent with those reported by Shirzad et al (2020), Weiss (2010), Cifitci et al. (2016), Cifitci and Salama (2018), and Banker and Chen (2006).

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Research Article

Difference-in-differences Design and Propensity Score Matching in Top Accounting Research: A Short Guide for Ph.D. Students in Iran

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Abstract

In recent years, to increase the robustness of methodology sections of accounting research, applying quasi-experimental methods has become a popular approach in archival-empirical research of top-tier accounting journals. The purpose of this study is to discuss the usefulness of the two most robust methods, including difference-in-differences (DD) and propensity score matching (PSM). This paper discusses DD and PSM design and reviews DD and PSM's use in articles of American Accounting Associations' journals in recent years. In addition to a simple explanation of DD and PSM, this research provides a list of credible empirical accounting studies that have used these two methods. The research also explores the reasons for using the two methods in the empirical-archival studies of accounting and shows that in addition to extracting a causal relationship, the most important reason for using the two methods is to reduce the potential concerns surrounding the "omitted variables" "and "heterogeneity of treatment and control groups". Overall, by highlighting the importance and application of the DD and the PSM, this research can help the methodology sections' robustness in the empirical-archive accounting research that focuses on causal relationships and provide a simple and practical guide, especially for Ph.D. students in accounting.[1]

Keywords: Quasi-experimental methods, Causal relationships, Difference-in-differences, Propensity score matching, Archival-empirical accounting research.

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1. Introduction

Concluding causal relationships is often the primary objective of archival-empirical accounting research [Gow et al., 2016]. For this reason, in recent years, applying quasi-experimental methods has become a popular approach in archival-empirical accounting research (for example, see Dutillieux et al., 2016; Gunn and Michas, 2017; Kraft et al., 2018). Among the quasi-experimental methods, the two robust methods, including difference-in-differences (DD) and propensity score matching (PSM), in recent years, has attracted a lot of attention in accounting research. The purpose of this paper is to discuss the usefulness of these two methodologies, especially for Ph.D. students who tend to focus on the causal relationships in their dissertations.

As previously mentioned, DD and PSM methods have become increasingly popular ways to estimate causal relationships. DD consists of identifying a specific intervention or treatment (often the passage of the law). One then compares the difference in outcomes after and before the intervention for groups affected by the intervention to the same difference for unaffected groups. For example, to identify the incentive effects of specific disclosure regulation, one might first isolate firms under that regulation. Then compare changes in a dependent variable such as earnings management, for firms are under that regulation to the firms are not under that regulation. The great appeal of DD comes from its simplicity and its potential to circumvent many of the endogeneity problems that typically arise when making comparisons between heterogeneous individuals [Meyer, 1995]. DD has been widely used when evaluating a given intervention entails collecting panel data or repeated cross-sections. DD integrates the fixed effects estimators' advances with the causal inference analysis when unobserved events or characteristics confound the interpretations [Angrist and Pischke, 2009]. Whether serial correlation has led to a severe overestimation of t-statistics and significance levels in the DD literature so far depends on (1) the typical length of the time series used and (2) the serial correlation of the most commonly used dependent variables [Conley and Taber, 2011]. Further, DD is relevant for various cases where spillovers may occur between quasi-treatment and quasi-control areas in a (natural) experiment.

PSM is a matching technique that attempts to estimate the effect of a policy or other intervention by accounting for the covariates that predict receiving the treatment. PSM is for cases of causal inference and sample selection bias in empirical settings in which few units in the non-treatment comparison group are comparable to the treatment units or selecting a subset of comparison units similar to the treatment unit is difficult because units must be compared across a high-dimensional set of pre-treatment characteristics (Imai et al., 2004). **PSM** creates sets of participants for treatment and control groups. A matched set consists of at least one participant in the treatment group and one in the control group with similar propensity scores. The goal is to approximate a random experiment, eliminating many of the problems with observational data analysis.

Overall, in addition to a simple explanation of DD and PSM's method, this research provides a list of credible empirical accounting studies that have used these two methods. The research also explores the reasons for using the two methods in the empirical-archival studies of accounting and shows that in addition to extracting a causal relationship, the most important reason for using the two methods is to reduce the potential concerns surrounding the omitted variables and heterogeneity of treatment and control groups.

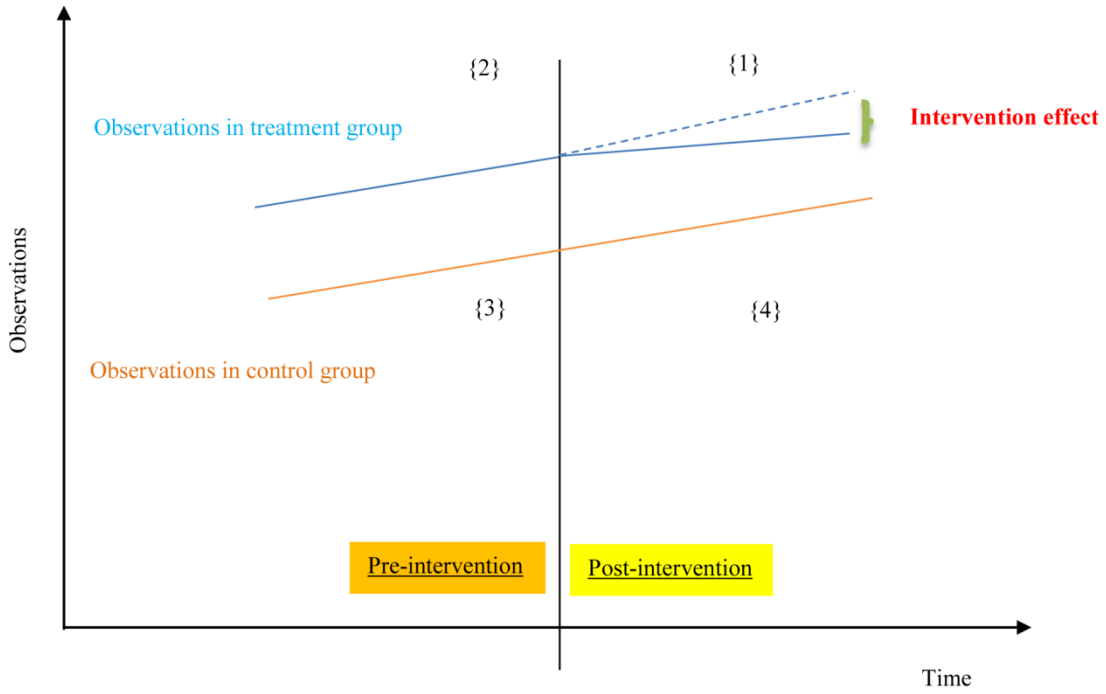
The paper's remainder is organized as follows: Section 2 discusses the DD methodology and Section 3 discusses the PSM methodology. Section 4 summarizes the study.

2. DD Method

Academic accounting researchers are often interested in interventions such as new policies like e new accounting standards and thought event studies. Simple event studies usually suffer from many variables that cannot be captured. Thus, a simple solution for mitigating this concern is randomization. In capital market settings, randomization to firms is unfeasible, and researchers are left with the need to use non-experimental studies to estimate the effects of these interventions. The fundamental challenge in such non-experimental studies is selection bias, in the sense that the firms experiencing the policy of interest may be different from those not exposed to it (Dutillieux et al., 2016). For example, firms that choose to apply a new standard may be quite different (and serve patients quite different) from those that do not apply. A common non-experimental design used to estimate the effects of policies at a particular point in time is a DD. DD compares changes over time in a group unaffected by the policy change to changes in a group affected by the policy change and attributes the differences to the policy's effect. DD provides unbiased effect estimates if the trend over time would have been the same between the treatment (intervention) and comparison groups in the intervention's absence. Because of information on the comparison group's temporal trends, DD is sometimes preferred over interrupted time series designs that do not necessarily have a comparison group.

Regarding the DD background, the first study using explicitly a DD is the (Snow, 1855). Snow (1855) was interested in the question of whether cholera was transmitted by (bad) air or (bad) water. He used a change in the water supply in one district of London, i.e., the switch from polluted water taken from the Themes in London's center to a supply of cleaner water taken upriver. Later on, the DD became relevant for other fields, like economics. For example, [Obenauer and von der Nienburg, 1915] analyzed the effect of a minimum wage by introducing the minimum wage for a particular group of employees, which led to higher wage rates in Portland, the largest city, compared to the rest of the state. Therefore, they documented the levels of various outcome variables for the different groups of employees in Portland before and after introducing the minimum wage and compared the respective changes to those computed for Salem, located in Oregon and thought to be comparable to Portland. Over time the field of economics developed literature. DD has been used to address many other important policy issues, like the effects of minimum wages on employment (e.g., Card and Krueger, 1994), or the effects of training and other active labor market programs for unemployed on labor market outcomes (e.g., Blundell et al., 2004).

DD may be a good choice when using research designs based on controlling for confounding variables or using instrumental variables is deemed unsuitable. At the same time, pre-treatment information is available. In many applications, “time” is an important variable to distinguish the groups. Figure 1 illustrates the DD. Besides the group which already received the treatment (post-treatment treated) {1}, these groups are the treated prior to their treatment (pre-treatment treated) {2}, the nontreated in the period before the treatment occurs to the treated (pre-treatment nontreated) {3}, and the nontreated in the current period (post-treatment nontreated) {4}.



Particularly, DD is used in settings where exchangeability cannot be assumed between the treatment and control groups; i.e., in the absence of treatment, the unobserved differences between treatment and control groups are the same over time. Hence, DD is a useful technique to use when randomization on the individual level is not possible. DD requires data from pre-/post-intervention, such as panel data (individual-level data over time) or repeated cross-sectional data (individual or group level). The approach removes biases in post-intervention period comparisons between the treatment and control groups that could result from permanent differences between those groups and biases from comparisons over time in the treatment group that could result from trends due to other causes.

Although other plausible methods are based on the availability of observational data for causal inference, i.e., instrumental variable, DD offers an alternative to reaching the un-confoundedness by controlling for unobserved characteristics and combining it with observed or complementary information. Additionally, the DD is a flexible form of causal inference because it can be combined with other procedures, such as the Kernel Propensity Score (Heckman, 1998).

Technically, to capture the effects in Figure 1, the regression below should be generated:

$$\text{Dependent Variable}_{i,t} = \gamma_0 + \gamma_1 \text{Treatment-ControlGroup}_{i,t} + \gamma_2 \text{Post}_{i,t} + \gamma_3(\text{Treatment-ControlGroup}_{i,t} \times \text{Post}_{i,t}) + \sum \varphi \text{ (Controls)}$$

Where *Treatment-ControlGroup* is set equal to one for the treatment group and zero for the control group. The coefficient of interest is γ_3, representing the differential change in the *Dependent Variable* between the treatment group and the control group. Controls are the control variables obtained from theory or prior studies.

An important assumption of the DD methodology is that shocks contemporaneous with the comment letters affect the treatment and control groups similarly (Johnston and Petacchi, 2017). To examine this assumption, a common way is to compare important variables for the treatment group and the matched control group. In the next section, I discuss more strong ways to examine the assumption.

DD has become a popular technique for concluding causal relationships in accounting research. Figures 2 and 3 present the relevant recent studies in the American

Accounting Associations' journals from 2016–2018. Specifically, Figure 2 overviews the studies that use DD, and Figure 3 overviews the reasons which explain why the studies use DD. Briefly, I find 17 studies that use DD from 2016 to 2018. Furthermore, the reason which the studies most refer is mitigating the concerns over omitted variables. For example, Kraft et al. (2018) discuss that the staggered timing of the change in reporting frequency gives us a natural group of control firms to implement a DD design in which they compare the change in investments of treatment firms around a reporting frequency increase relative to the contemporary change in investments for the control firms with unchanged reporting frequency. Therefore, they conclude that DD mitigates concerns about the effect of unobserved common shocks or cross-sectional differences across firms. Besides, Dutillieux et al. (2016) argue that the advantage of the DD design is that each sample firm acts as its own control over the test period, mitigating the concern for omitted correlated variables.

3. PSM Method

PSM is a statistical matching technique that attempts to estimate a treatment's effect by accounting for the covariates that predict receiving the treatment. PSM is for cases of causal inference and sample selection bias in non-experimental settings in which: few units in the non-treatment comparison group are comparable to the treatment units, or selecting a subset of comparison units similar to the treatment unit is difficult because units must be compared across a high-dimensional set of pre-treatment characteristics (Imai and Van Dyk, 2004).

PSM creates sets of participants for treatment and control groups. A matched set consists of at least one participant in the treatment group and one in the control group with similar propensity scores [Lunceford and Davidian, 2004]. The goal is to approximate a random experiment, eliminating many of the problems with observational data analysis.

The possibility of bias arises because the apparent difference in outcome between these two groups of the sample may depend on characteristics that affected whether or not a sample received a given treatment instead of due to the effect of the treatment per se. In randomized experiments, the randomization enables unbiased estimation of treatment effects; for each covariate, randomization implies that treatment-groups will be balanced on average by the law of large numbers. Unfortunately, for observational studies, the assignment of treatments to research subjects is typically not random. It is matching attempts to mimic randomization by creating a sample of units that received comparable treatment on all observed covariates to a sample of units that did not receive the treatment (Shaikh et al., 2009).

For example, one may be interested to know the consequences of smoking or the consequences of going to university. The people 'treated' are simply those—the smokers or the university graduates—who, in everyday life, undergo whatever it is the researcher is studying that. In both cases, it is unfeasible (and perhaps unethical) to randomly assign people to smoke or university education, so observational studies are required. The treatment effect estimated by simply comparing a particular outcome—a rate of cancer or lifetime earnings—between those who smoked and did not smoke or attended university and did not attend university would be biased by any factors that predict smoking or university attendance, respectively (Shipman et al., 2016). PSM attempts to control for these differences to make the groups receiving treatment and not-treatment more comparable.

Figure 2. Recent studies in AAA's journals who use DD

Authors (Year)	Title	Journal
Anantharaman et al. (2016)	State Liability Regimes within the United States and Auditor Reporting	The Accounting Review
Cheng et al. (2016)	Internal Governance and Real Earnings Management	The Accounting Review
Dutillieux et al. (2016)	The Spillover of SOX on Earnings Quality in Non-U.S Jurisdictions	Accounting Horizons
Lennox (2016)	Did the PCAOB's Restrictions on Auditors' Tax Services Improve Audit Quality?	The Accounting Review
Li and Yang (2016)	Mandatory Financial Reporting and Voluntary Disclosure: The Effect of Mandatory IFRS Adoption on Management Forecast	The Accounting Review
Chen et al. (2017)	XBRL Adoption and Bank Loan Contracting: Early Evidence	Journal of Information Systems
Francis et al. (2017)	Auditor Changes and the Cost of Bank Debt	The Accounting Review
Honaker and Sharma (2017)	Does Schedule UTP Have Uniform Long-Run Effects on Corporate Tax Planning?	The Journal of the American Taxation Association
Huang et al. (2017)	Product Market Competition and Managerial Disclosure of Earnings Forecasts: Evidence from Import Tariff Rate Reductions.	The Accounting Review
Kim and Klein (2017)	Did the 1999 NYSE and NASDAQ Listing Standard Changes on Audit Committee Composition Benefit Investors?	The Accounting Review
Dong and Zhao (2018)	Do Firms Do What They Say? The Effect of the American Jobs Creation Act of 2004 on R&D Spending	The Journal of the American Taxation Association
Jiang et al. (2018)	Big N auditors and audit quality: New evidence from quasi-experiments	The Accounting Review
Amin et al. (2018)	The Effect of the SEC's XBRL Mandate on Audit Report Lags	Accounting Horizons
Kraft et al. (2018)	Frequent Financial Reporting and Managerial Myopia	The Accounting Review
Li et al. (2018)	The determinants and consequences of tax audits: Some evidence from China.	The Journal of the American Taxation Association
Zhou and Chen (2018)	XBRL Adoption and Systematic Information Acquisition via EDGAR	Journal of Information Systems

Figure 3. The reasons for recent studies in AAA's journals for using DD

Authors (Year)	Why DD?
Lennox et al. (2018)	I use a difference-in-differences design to exploit a quasi-exogenous regulatory shock to the auditor-provided tax services (APTS) banned by the PCAOB. In contrast, prior studies undertake cross-sectional comparisons of companies that spend relatively more (less) on APTS.
Li and Yang (2016)	No certain/specified explanation
Anantharaman et al. (2016)	To more cleanly gauge the causal role of this legislation, we rely on a difference-in-differences approach that compares changes in outcomes in NJ to those in New York (NY) over the same period since these two states are geographically close and economically similar.
Cheng et al. (2016)	… DD research design to address endogeneity ….
Dutillieux et al. (2016)	The advantage of the difference-in-differences design is that each sample firm acts as its control over the test period, mitigating the concern for omitted correlated variables.
Kim and Klein (2017)	Event studies, however, have several empirical drawbacks, including the assumption of an efficient semistrong market during our sample period. Or, the market, although efficient, may underestimate the net benefits of the new listing standard. We also estimate difference-in-differences regressions to assess changes in financial reporting quality surrounding the 1999 rule change phase-in period to assuage these concerns.
Huang et al. (2017)	Our difference-in-differences design further mitigates concerns that other concurrent events confound our results.
Honaker and Sharma (2017)	The primary advantage of using a difference-in-differences technique is that it tests potential changes in the dependent variable over time. Given an event, it is a statistically powerful alternative to a change specification analysis. Its specification allows a firm to serve as its own control. Any random changes in firm characteristics over time are controlled, which also controls for non-independence in the variables of interest. A difference-in-differences estimation also controls for unobserved heterogeneity between the pre-and post-Schedule UTP periods that are constant over time.
Francis et al. (2017)	Employing a difference-indifferences research design to address potential endogeneity ….
Dong and Zhao (2018)	The standard diff-in-diff model is a tool to estimate treatment effects comparing the pre-and post-treatment differences in the outcome of a treatment and a control group. Therefore, it is commonly used for policy evaluation.
Kraft et al. (2018)	The staggered timing of the change in reporting frequency gives us a natural group of control firms to implement a difference-in-differences (DD) design in which we compare the change in investments of treatment firms around a reporting frequency increase relative to the contemporary change in investments for the control firms with unchanged reporting frequency. This design mitigates concerns about the effect of unobserved common shocks or cross-sectional differences across firms.
Zhou and Chen (2018)	No certain/specified explanation
Jiang et al. (2018)	Because the Big N acquisitions occurred at different points in time, not at the same time, we use a staggered difference-in-differences (DID) research design to estimate whether there is a Big N effect. This approach is consistent with studies focusing on settings with staggered treatment events

Studies using non-experimental data must mitigate endogeneity concerns introduced by non-random treatment assignment. In this regard, archival studies use multiple regression models to mitigate endogeneity concerns in observational data. However, multiple regression requires proper specification of the relation between outcome and explanatory variables to obtain unbiased estimates. If the relation between outcome and explanatory variables is misspecified, multiple regression can produce biased estimates. This potential bias increases as treatment groups become more dissimilar (Garrido, 2014). The PSM alleviates these concerns by decreasing reliance on the specification of the relationship between variables.

Regarding the general process of PSM, there are main four steps to apply the PSM efficiently: (1) Run logistic regression, where Dependent variable: Y = 1, if participate or for example, Y is higher than the median; Y = 0, otherwise; and independent variables are variables hypothesized to be associated with both treatment and outcome. (2) Obtain propensity score by extracting the predicted value from the regression in the previous step. (3) Match each participant to nonparticipants by propensity score. (4) Verify that covariates are balanced across treatment and matched control groups of a sample. For example, Eshleman and Guo (2014) use a logit regression for estimating propensity scores. After obtaining the fitted values from the logit regression, they match each non-Big 4 clients to the Big 4 client with the closest fitted value in the same year and same two-digit SIC code industry, requiring a maximum distance of 0.01 between the two fitted values. Then, they provide a test of covariate balance between matched pairs.

Similar to DD, but somewhat fewer, PSM has become a popular technique for concluding causal relationships in accounting research. Figures 4 and 5 present the relevant recent studies in the American Accounting Associations' journals from 2016–2018. Specifically, Figure 4 overviews the studies that use PSM, and Figure 5 overviews the reasons which explain why the studies use PSM. Briefly, I find 12 studies that use PSM from 2016 to 2018. Furthermore, the studies most refer to mitigating self-selection bias concerns and increasing treatment and control groups' comparability. For example, Gunn and Michas (2017) discuss that First, about potential selection bias, clients who choose to be audited by an auditor with multinational and/or country-specific expertise may exhibit firm-specific characteristics correlated with both this choice and our outcome variable. We perform a propensity score matching procedure, which can help alleviate this concern to the extent that clients and auditors are matching observable. In addition, Kraft et al. (2018) state that they use propensity score matching to identify control firms' sets.

4. Conclusions

The DD and PSM designs for empirical analysis of causal effects have a long history in outside accounting. Nowadays, they are certainly the most heavily used empirical research designs to estimate the effects of policy changes or interventions in empirical business. It has the advantage that the basic idea is intuitive and easy to understand for an audience with limited education. Compared to other methods, they have a further advantage that there is no need to control all confounding variables. This means that it can accommodate a certain degree of selectivity based on unobservables correlated with treatment and outcome variables. Its key identifying assumption is the common trend assumption that must hold unconditionally or conditionally on some observables (the treatment does not influence that). If the latter is the case, DD can be combined fruitfully with matching estimation techniques to flexibly accommodate such covariates.

Figure 4. Recent studies in AAA's journals who use PSM

Authors (Year)	Title	Journal
Bills et al. (2016)	Small Audit Firm Membership in Associations, Networks, and Alliances: Implications for Audit Quality and Audit Fees	The Accounting Review
Lennox (2016)	Did the PCAOB's Restrictions on Auditors' Tax Services Improve Audit Quality?	The Accounting Review
Li and Yang (2016)	Mandatory Financial Reporting and Voluntary Disclosure: The Effect of Mandatory IFRS Adoption on Management Forecast	The Accounting Review
Dutillieux et al. (2016)	The Spillover of SOX on Earnings Quality in Non-U.S Jurisdictions	Accounting Horizons
Garg et al. (2017)	Evaluating the Credibility of Voluntary Internal Controls Certification	Journal of International Accounting Research
Navissi et al. (2017)	Business Strategy, Over- (Under-) Investment, and Managerial Compensation	Journal of Management Accounting Research
Francis et al. (2017)	Auditor Changes and the Cost of Bank Debt.	The Accounting Review
Gunn and Michas (2017)	Auditor Multinational Expertise and Audit Quality.	The Accounting Review
Chi and Shanthikumar (2017)	Local Bias in Google Search and the Market Response around Earnings Announcements.	The Accounting Review
Huang et al. (2017)	Product Market Competition and Managerial Disclosure of Earnings Forecasts: Evidence from Import Tariff Rate Reductions.	The Accounting Review
Bauer et al. (2018)	Supplier Internal Control Quality and the Duration of Customer-Supplier Relationships	The Accounting Review
Kraft et al. (2018)	Frequent Financial Reporting and Managerial Myopia	The Accounting Review

Figure 5. The reasons of recent studies in AAA's journals for using PSM

Authors (Year)	Why PSM?
Bills et al. (2016)	No certain/specific explanation
Lennox (2016)	… propensity score matching helps to align the observable characteristics of the treatment and control groups.
Li and Yang (2016)	A concern with using all firms in non-IFRS countries as the control is their comparability with firms in IFRS countries in terms of disclosure incentives. We employ a propensity-score-matching (PSM) technique to pair firms in treatment and control groups based on observable characteristics to address this concern.
Dutillieux et al. (2016)	We used a matched propensity score methodology to derive the matched sample
Garg et al. (2017)	ICFR certification firms do not randomly decide to provide certification disclosure, which can result in self-selection bias. Bronson, Carcello, and Raghunandan (2006) examine firms' characteristics in issuing voluntary management reports on internal controls and suggest that some firms are more likely to make voluntary internal control disclosure than others. In order to rule out the probability that the results documented in the study are driven by differential firm characteristics rather than ICFR disclosures, we replicate our analyses using propensity score matching (PSM) of the control sample to control for self-selection.
Navissi et al. (2017)	We further mitigate the correlated omitted variable issue for the compensation hypotheses with propensity score matching procedure
Francis et al. (2017)	No certain/specific explanation
Gunn and Michas (2017)	First, about potential selection bias, clients who choose to be audited by an auditor with multinational and/or country-specific expertise may exhibit firm-specific characteristics correlated with this choice and our outcome variable. We perform a propensity score matching procedure, which can help alleviate this concern to the extent that clients and auditors are matching on observable variables
Chi and Shanthikumar (2017)	Visibility may affect the market response around earnings announcements in ways that linear models will not sufficiently control for. To address this issue, we use Propensity Score Matching (PSM) to form firm-year matched pairs that are most similar along with the set of firm characteristics included in equation (2) (the "covariates") but are most dissimilar in terms of their local bias in Google search (%Local)
Huang et al. (2017)	As a robustness test, we also perform a matched sample test based on the propensity score matching method.
Bauer et al. (2018)	we use a propensity score-matched (PSM) design to support that our primary findings do not suffer misspecification of the functional form (i.e., our ICW treatment firms are dissimilar to our non-ICW control firms)
Kraft et al. (2018)	We use propensity score matching to identify the set of control firms.

In conclusion, both DD and PSM are seen as strong non-experimental study design options for researchers, specifically Ph.D. students, who tend to find a causal effect. However, by combining them, we may make even more robust inferences, taking advantage of both important study design elements.

These methods also have their drawbacks. For example, most of the debate around the validity of a DD revolves around the possible endogeneity of the laws or interventions themselves. Sensitive to this concern, researchers have developed a set of informal techniques to gauge the extent of the endogeneity problem. Regarding DD and PSM's connection, it is worth stating that a concern with DD is that the intervention groups may differ in ways related to their trends over time, or their compositions may change over time. In this regard, PSM is commonly used to handle this confounding in other non-experimental studies.

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Research Article

CEO's Overconfidence, Cost Stickiness, and Value Relevance of Accounting Information

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Abstract

CEO's overconfidence is one of the essential indices that influences financial policies. When sales decline, overconfident CEOs have overconfidence in their ability to bring sales back to the previous level and tend to overestimate sales, thereby increasing cost stickiness. Further, cost stickiness by manipulating the natural and expected costs process can affect accounting information content. Therefore, the CEO's overconfidence by influencing cost stickiness can also affect the value relevance. This paper shows that there is a positive and significant relationship between overconfidence and cost stickiness. There is also a negative and significant relationship between overconfidence and value relevance. Nevertheless, the effect of overconfidence through cost stickiness on value relevance is not confirmed.

Keywords: Value relevance, Cost stickiness, CEO overconfidence, Stock price

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1. Introduction

In accounting and financial sciences have reported that CEOs' overconfidence explains why corporations are merging or combine confounding values and enter into other investments, financing, or accounting policies that can be costly. On the other hand, overconfidence can bring benefits to a company under certain conditions. For example, overconfident CEO's motivation for risk-taking activities is less costly than other managers (Campbell et al., 2011). Previous studies have shown that overconfidence differs from optimism, such that optimism is a kind of attitude, but overconfidence generally leads to an error estimation (Ben Mohammad et al., 2014). On the other hand, some researchers indicate that the increase in costs when increasing activity levels is more than the decrease in costs when decreasing activity volume. Cost stickiness is one of the indicative response to costs concerning activity level changes, indicating that the magnitude of the development degree in costs when the activity level is increased is greater than the magnitude of the cost reduction when the activity level is reduced. For example, if you see a 20-unit increase in sales level, you will probably see a 100-unit increase in costs, but if the sales level drops to 20, the cost reduction will be less than 100 (Marques et al., 2014). On the other hand, value relevance also refers to items' ability to explain price and stock returns (Roll, 1986). In other words, the more a variable has the ability to interpret returns, the more its value relevant. This concept derives from Roll (1986) about quality and value relevance.

Although both agency issues and overconfident CEOs tend to avoid eliminating excess distribution and sales costs, unlike agency issues where additional costs are held for opportunistic reasons, overconfident CEOs believe that they act in the best interests of shareholders save additional costs. Therefore, based on these arguments, it is expected that the stickiness of distribution and sales costs and cost value will increase with more CEO overconfidence. On the other hand, the greater the value of some of the factors affecting price in explaining efficiency, the greater their value relevance. However, costs stickiness by manipulating the natural and expected process of costs can affect the information content. Therefore, the CEO's overconfidence by affecting costs stickiness can also affect stock prices. Much research has examined the value relevance of items presented in financial statements. The value relevance approach requires the researcher to identify an item and codification its evaluation function against the impact on stock prices. Over the past two decades, many studies have surveyed the value relevance of accounting tables. Still, this study deals with the value relevance of one behavioral financial domain (CEO overconfidence). This study also examines CEO overconfidence's direct impact, but the indirect impact of CEO overconfidence will be measured through cost stickiness on value relevance. It will be considered to be the knowledge-building of the present study.

2. Literature review and hypothesis development

Overconfidence is a personal trait that can be defined as being biased and having unrealistic (positive) beliefs about any aspect of an outcome in uncertain circumstances. In this case, the average estimate will be exaggerated (Calleja, 2006). Evidence has shown that people perceive their capability and abilities more than reality. Overconfidence helps people maintain their spirits in tough and competitive situations. According to Sternberg (2008), people attribute successes to their capabilities and failures to bad luck and external factors, and environmental factors. On the other hand, CEO overconfidence is also mentioned as a behavioral interpretation for distribution and sales stickiness. When sales decline, management decisions to remove or continue resources of distribution and sales costs, to balance management's expectations about continuing decline in demand and the amount of adjusted costs associated with eliminating distribution and sales costs in the

short term and with relocating these costs while demand return (as past) shortly. Managers are more inclined to maintain additional costs if they expect future demand to recover sufficiently. When the demand returns to its original state, they are also reluctant to eliminate adjusted costs associated with eliminating costs and recovering them (which may be significantly high) (e.g., Anderson et al., 2007). In order to maintain and sustain adjusted costs, the CEO's expectations about decreasing demand performance are critical and effective in cost management decision making. On the one hand, managers motivated by power prefer to maintain the extra costs of distribution and sales to maximize their personal benefits (as follows power, status, and reputation) (Jensen, 1986), which results in greater cost stickiness. On the other hand, managers with earnings management incentives quickly eliminate the extra costs of distribution and sales to achieve optimized profit, resulting in less cost stickiness.

These studies focus on two main areas: 1- Increasing or decreasing the value relevance resulting from environmental changes or new accounting standards; 2- Impact of company and industry characteristics. Numerous studies have been conducted to investigate the relationship between earnings and stock prices and the effect of earnings announcement on price, and the relationship between cash dividends and stock price. Empirical evidence shows that information about corporate profits has great importance for investors. There are three main theories for measuring profit: 1- assets – liabilities theory; 2- income - expense theory and 3- balance sheet independence and profit and loss theory.

Koo et al. (2014) show that cost behaviors for-profit management is different. In particular, corporate profit management reduces cost stickiness when faced with declining sales. Namazi et al. (2012) show a significant negative relationship between cost stickiness and earnings management. Kim et al. (2016) showed that a stock crash risk in companies with overconfident managers is more than in other companies. The results also show that the effect of CEO overconfidence on the crash risk for companies with more conservative accounting policies is less. Xue and Hong (2016) examined earnings management, corporate governance, and cost stickiness in a study. They found an important connection between cost stickiness in the sample of non-profit companies and the sample of profit management companies. Also, empirical evidence has shown that good corporate governance can further reduce cost stickiness, although its effects are not as severe as those of earnings management companies.

Kim et al. (2016) examined the relationship between CEO overconfidence and drop stock risk. The results of his research showed that the risk of falling stocks in companies with overconfident CEOs is higher than in other companies. The results also show that the CEO's wrong overconfidence on the risk of falling for companies with more conservative accounting policies is less. Burkhardet al. (2018) examined the CEO's role overconfidence on corporate performance using a meta-analysis approach. Their results showed that CEO overconfidence is positively correlated with corporate performance, and the CEO's authority moderates this relationship. Wang et al. (2018) examined the impact of the CEO's political relationship and the CEO's overconfidence on the severity of R&D costs. Their research results show that political communications lead to lower R&D costs, but CEO overconfidence in R&D costs positively affects. Leng et al. (2018) examined the board of directors' impact on the probability of British firms' financial distress. The results show that overconfident executives increase the likelihood of financial distress, while firms with CEO's relative confidence are less distressed. Maaloul, Chakroun, and Yahyaoui (2018) examined the impact of political communication on Tunisian companies' presentation and value. Based on the results, political communication improves corporate performance and value. Investors tend to invest in companies with high political communication for greater interest.

Alnodel (2018) shows that the adoption of international financial reporting standards in the insurance industry has increased accounting information's value relevance. Yin et al. (2019) show that internal financing can reduce capital shortage, but it leads to over-investing, especially in firms with CEO overconfidence. In addition, the problem of over-investing in public companies is more than private companies. Hur et al. (2019) examined the effect of CEO overconfidence on R&D spending decisions. The results showed that overconfident CEOs, even if sales declined, did not reduce R&D costs because the CEO overconfidence had a direct and positive relationship with R&D costs. Chen et al. (2019) examined the interaction between overconfident CEO and overconfident CFO on spending behavior and cost stickiness adjustment in US firms. Results showed directly and positively correlated between overconfident CEO and overconfident CFO and cost stickiness, and after controlling overconfident CFO, overconfident CEO does not affect cost stickiness. Ben Rejeb Attia et al. (2019) show that delay in financial reporting leads to a decrease in value relevance.

In sum, one of the effective factors on the value relevance and stock price is managers' actions to prevent bad news and negative performance. Such managerial behavior, in addition to agency motives, can result from overconfidence. On the other hand, the CEO overconfident in reducing sales and keeping extra costs. Therefore, based on these arguments, it is expected that the stickiness of distribution and sales costs and cost value will increase with the CEO's overconfidence. On the other hand, cost stickiness by manipulating the natural and expected costs process can affect accounting tables' information content. Therefore the CEO overconfidence by affecting costs stickiness can also influence value relevance so that the following hypotheses will be codified and examined:

Hypothesis 1: CEO overconfidence influences the value relevance of accounting.

Hypothesis 2: CEO overconfidence influences cost stickiness.

Hypothesis 3: Cost stickiness influences the relationship between CEO overconfidence and value relevance of accounting.

3. Research Methodology

This research is practical according to purpose-based classification and has been done in terms of the correlational method using the post-event approach. Raw financial data were collected using Tadbir Pardaz software and referring to Research management, development, and Islamic studies management websites and using the Stock Exchange's information comprehensive network (Codal).

This research's statistical population is listed on the Tehran Stock Exchange from 2006 to 2016 (11 years). In this study, the samples were selected through systematic random sampling from the statistical population. As such, the sample consisted of all the companies in the statistical population that had the following conditions: 1- Their fiscal year ended at December 31 per year, so that the data could be put together and based on the results of the default tests, apply them in a panel or consolidated formats; 2- during the research period, there is no change in the financial period (year), so that their financial performance results are compared with each other; 3- Data required for research variables during the surveying period should be available so that the calculations can be performed as faultless as possible; 4- their stock must not be closed more than three months because the stock price quotes of companies are used in this study; 5. Companies that are not in the investment group, financial institutions, banks, insurance, and holding (due to differences in the balance sheet, specific nature of the activity, and unusual financial leverage). Finally, considering the above conditions, using the Cochran formula, 114 firms were identified and studied using random sampling.

The following regression is fitted for the first hypothesis test of the study that states

that the CEO overconfidence influence value relevance. (Olson, 1995):

$$Price_{i,t} = \alpha_0 + \alpha_1 BVPS_{i,t} + \alpha_2 EPS_{i,t} + \alpha_3 OverConf_{i,t} + \alpha_4 BVPS^* OverConf_{i,t} + \alpha_5 EPS^* OverConf_{i,t} + \varepsilon_{i,t}$$

Where:

Price is Market value per company share at the end of the year

BVPS is Book value per company share at the end of the year

EPS is net earnings per share at the end of the year

OverConf is CEO overconfidence at the end of the year

It should be noted that the CEO overconfidence variable while multiplying by the book value variables of each share and net profit per share has appeared as a moderating variable, thus affecting this variable on the value relevance between the book value of per share and net profit per share should be measured. In Olson's model, these coefficients are the basis of the decision. The relative status of corporate investments has been used to measure overconfidence (Ben Mohammed et al., 2014). Campbell et al. (2011) stated that the amount of corporates investment could include information about CEO overconfidence. He selected companies in the top five in terms of industry-adjusted investment (the ratio of company investment to the total investment in that industry) accepted as companies whose management is overconfident. The capital expenditure derived from the cash flow statement will be used to calculate corporate investment. If corporate management is defined as overconfident management, the variable will be set to one; otherwise, it will be zero.

The below regression model is applied to examine the second research hypothesis, which suggests that management's overconfidence is effective on cost adherence:

$$\Delta Cost_{i,t} = \alpha_0 + \alpha_1 \Delta S_{i,t} + \alpha_2 \Delta S \times D_{i,t} + \alpha_3 OverConfC_{i,t} + \alpha_4 \Delta S \times D \times OverConfCE_{i,t} + \alpha_5 TYD_{i,t} + \alpha_6 GG_{i,t} + \alpha_7 FAI_{i,t} + \alpha_8 LEV_{i,t} + \varepsilon_{i,t}$$

Where:

ΔCost is the dependent variable the change in the sum of the cost value of goods sold and general and sales costs (the natural logarithm of the ratio of the total sum of cost value, goods sold, and administrative costs, public expenditures and sales. ΔS is the natural logarithm of the ratio of company sales revenue; D is the dummy variable the decrease in sales revenue if sales revenue in year t declines compared to year t-1, it equals one, otherwise will be equal to zero.

Control variables of the model are as follows (Anderson et al., 2007):

TYD is a dummy variable that if the s sales revenue declines over two subsequent years (years t to t-1 and t-1 to t-2), equals 1, otherwise 0.

GG is gross domestic product growth equal to the gross domestic product ratio in year t to t-1.

FAI is the intensity of investment in fixed assets equal to the ratio of fixed assets to sales revenue. LEV is financial leverage equal to the ratio of total liabilities to total assets. To test the mediating effect of cost stickiness on the relationship between CEO overconfidence and value relevance, Baron and Kenny's (1986) method is used. They have suggested that the effect of the mediator variable should have three conditions: The first condition, independent variable (s) (CEO overconfidence) should affect the dependent variable (value relevance) in a regression of the independent variable on the dependent variable; second, the independent variable (s) should affect the mediator variable (cost stickiness); the third condition, the mediator variable must affect the dependent variable in a regression of the independent variables and the mediator variable on the dependent variable.

If there are the above conditions and the effect of the CEO overconfidence variable on the value relevance variable in the third equation is less than the first equation, it can be

concluded that the mediating variable effect is created using the significant level. Consequently, Baron and Kenny (1986) state that the full effect of the mediating variable is created when the independent variable(s) in the third equation does not affect the dependent variable, but in the third equation if the independent variable has less influence on the dependent variable than the first equation. If so, the effect of the mediator variable will be minor.

To test the third hypothesis of the study, which states that the CEO overconfidence through cost stickiness affects the value relevance, first of all, we should determine the companies with cost stickiness from the cost-value ratio of the goods sold and the general, administrative, and sales costs will be used. (Anderson et al., 2007):

$$\text{CostRatio} = \frac{\text{Cost}_t}{\text{Sales}_t} - \frac{\text{Cost}_{t-1}}{\text{Sales}_{t-1}}$$

Where:

Cost represents the cost value of goods sold and public, administrative, and sales costs, and Sales indicates sales revenue.

The following formula will be used for each year-company to determine companies with cost stickiness:

$$\text{CostStick}_{it} = \text{CostRatio}_{it} \times D_{it}^{Sales} \times D_{it}^{Cost}$$

Where:

CostStick_{it} It is a dummy variable that, if its value is greater than zero, will be equal to one, and otherwise, it will be zero.

D_{it}^{Sales} is a dummy variable which If the sale ratio in year t to year t-1 becomes greater than and equals one, it will be zero and otherwise equal to one. D_{it}^{Cost} It is a dummy variable that if the ratio of the cost of goods sold and the costs of public, office, and sales cost are less than or equals zero, it is considered zero; otherwise, they will be equal to one. For the year - companies in which the above formula is a positive indication that there is a cost stickiness in that year, and “zero" indicates no cost stickiness. Finally, the following model is estimated to investigate the third condition:

$Price_{i,t} = \alpha_0 + \alpha_1 BVPS_{i,t} + \alpha_2 EPS_{i,t} + \alpha_3 OverConf_{i,t} + \alpha_4 BVPS^* OverConf_{i,t} + \alpha_5 EPS^* OverConf_{i,t} + \alpha_6 CostStick_{i,t} + \alpha_4 BVPS^* CostStick_{i,t} + \alpha_5 EPS^* CostStick_{i,t} + \varepsilon_{i,t}$

All variables are defined in previous sections.

4. Research findings

Table 1 contains descriptive statistics of the research variables. This table presents the minimum, maximum, mean, median, and standard deviation of all variables.

Table 1: Descriptive statistics related to the research variables

Variable	Minimum	Maximum	Median	Mean	standard deviation
ΔCost	-1.449	1.802	0.160	0.159	0.319
ΔS	-1.308	1.412	0.151	0.151	0.349
OverConf	0.000	1.000	0.000	0.307	0.445
TYD	0.000	1.000	0.000	0.110	0.205
FAI	0.182	3.566	0.275	0.562	1.210
LEV	0.090	2.027	0.614	0.642	0.223
GG	1.051	1.341	1.230	1.201	0.101
Price	554.102	72111.482	7202.116	7110.612	5885.200
EPS	-1000.123	6203.515	659.306	711.003	512.705
BVP	752.802	8542.118	2142.809	2189.224	1035.505

Some panel data tests are used to choose between the consolidated data model, the fixed-effect model, and the random effect model. Like the Chow test and the Hausman

test, the results of these tests are shown in table 2:

Table 2. Panel test results

Description	Chow test		Hausman	
	Stastics	Probability	Stastics	Probability
Model1	1.112	0.263	-	-
Model 2	0.894	0.719	-	-
Model3	2.389	0.011	22.003	0.015

The Chow test statistic's probability in cases greater than 0.05 indicates the validation of the consolidated data model. If the consolidated data model were preferred, that's all. Otherwise, the Hausman test is necessary. The Hausman test statistic's probability for cases greater than 0.05 indicates the confirmation of the random-effects model. The regression conclusions of the effect of CEO overconfidence on value relevance are presented in table 3.

Table 3. Regression results of the effect of CEO overconfidence on value relevance

Explanatory variable	Coefficients	T Statistics	Probability
C	0.177	3.445	0.000
BVP	0.321	6.554	0.000
EPS	0.006	0.373	0.708
OVER	-0.381	-6.885	0.000
BVPOVER	-0.018	-2.352	0.018
EPSOVER	-0.022	-2.389	0.011

Stastics : F : 9.4418 Probability : 0.000 Statistics : DW : 2.315 Adj , R2 : 0.582

The calculated tables in table 3 show that the regression model is significant. The determination coefficient also shows that the mentioned model expresses about 58% of the stock price change. The Watson camera statistic also indicates that there is no first-order serial autocorrelation model. According to the coefficients calculated for each of the explanatory variables and their significance level, the CEO overconfidence variable has a negative and significant relationship with the stock price, with a coefficient of -0.3817 and a significant level of 0.000 at 95% confidence level.

Table 4. Regression results impact of management overconfidence on cost stickiness

Explanatory variable	Coefficients	T Statistics	Probability
C	0.084	0.726	0.467
S	0.775	19.279	0.000
SD	-0.054	-2.112	0.035
OVER	0.502	12.124	0.000
SDOVER	-0.412	-3.998	0.000
TYD	-0.021	-0.199	0.841
GG	0.028	2.333	0.019
FAI	0.060	-1.040	0.298
LEV	0.059	0.663	0.507

Also, CEO overconfidence at the time of multiplying book value per share, negative and significant relationship (with the significant level of 0.018) with the stock price and at the time of multiplying the earnings per share, negative and significant relationship (with the significant level of 0.011), at confidence level 95%. So, it can be argued that the first condition of Baron and Kenny (1986) and the first hypothesis of this study based on the effect of CEO overconfidence on value relevance is confirmed.

The regression results of CEO overconfidence on cost stickiness (second condition) are presented in table 4.

The calculated tables in table 4 show that the regression model is important. The determination coefficient also shows that the above model expresses about 56% of the change in costs. The Watson camera statistic also indicates that there is no first-order serial autocorrelation model. Regarding the calculated coefficients for each of the explanatory variables and their significance level, the CEO overconfidence variable with 0.000 meaningfulness level has a positive and significant relationship with cost changes (95% confidence level) at 95% confidence level. Also, the CEO overconfidence at the time of sales decline has a negative and significant relationship (with a significance level of 0.000) with cost changes. That is, overconfident CEOs are more reluctant to reduce costs when sales decline. Therefore, it can be argued that the second condition of Baron and Kenny (1986) and the second hypothesis of this study, that there is a relationship between CEO overconfidence and cost stickiness are confirmed.

Table 5. Regression results of the effect of CEO overconfidence through cost stickiness on value relevance

Explanatory variable	Coefficients	T Statistics	Probability
C	0.084	0.726	0.467
BVP	0.054	2.112	0.035
EPS	0.102	5.387	0.000
OVER	-0.018	-6.889	0.000
BVPOVER	-0.308	-6.902	0.000
EPSOVER	-0.028	-8.211	0.000
CostStick	0.087	3.933	0.000
BVPCostStick	0.105	1.040	0.298
EPSCostStick	0.221	0.663	0.507

The calculated tables in table 5 show that the regression model is significant. The determination coefficient also shows that the above model expresses about 57% of the stock price change. The Watson camera statistic also indicates that there is no first-order serial autocorrelation model. Regarding the coefficients calculated for each of the explanatory variables and their significance level, the CEO overconfidence variable has a significant negative relationship with the stock price, with a coefficient of -0.018 and a significant level of 0.000 at 95% confidence level. Also, CEO overconfidence at the time of multiplying the book value of each share, negative and significant relationship (with the significant level of 0.000) with the stock price and at the time of multiplying the profit per share, the negative and significant relationship (with the significant level of 0.000), at the level confidence 95 % that this significance is increased. Therefore, it can be stated that the third condition of Baron and Kenny (1986) and the third hypothesis of this study are not confirmed.

5. Results and suggestions

CEO overconfidence is one of the new issues in the behavioral-finance area. The subject mentioned that CEO overconfidence is that the overwhelming psychological bias and overconfidence among managers, especially senior executives, make them overly hopeful and reluctant to expose. Complete loss-making projects of the company because they believe that they will be covered in the future by their poor performance based on their overconfidence. In this way, they can create value for the company and increase shareholder wealth. Many psychologists have argued that overconfidence depends on one's ability to process information and provide two reasonable interpretations. First, they

do not use inferential methods sufficiently, and they use their information experience to confirm one possible answer. When they discover the answer to a question, they look for experiences that confirm or reject it. At this time, memory calling processes can access information to confirm their initial conclusions. Second, these people believe that the information stored in their memory is sufficient to decide and select an answer and does not require an inference process. Although both the agency and the CEO's overconfident tend to avoid eliminating the extra costs of distribution and sales (as opposed to the agency problem where the extra costs are held for opportunistic reasons); the CEO's overconfident believe that they do the best in regard of interests of shareholders and therefore save additional costs. Therefore, it can be said that CEO overconfidence affects cost stickiness. Therefore, cost stickiness can also influence value relevance by affecting CEO overconfidence. In this study, the conclusion of the first hypothesis test showed that there is a negative and significant relationship between CEO overconfidence and value relevance, it means the more overconfident CEOs is due to over-reliance on their abilities and adopting wrong investment policies, financing, etc. the less value and stock prices. The second hypothesis test showed a positive and significant relationship between CEO overconfidence and cost stickiness. One of the reasons is overconfident CEOs avoid eliminating surplus costs while sale declines. But the third hypothesis of this study that the mediating variable effect of cost stickiness on CEO overconfidence and value relevance was not confirmed. The findings of this study are generally consistent with the results of Xue and Hong (2016), Banker et al. (2013), and Bo et al. (2015). Board members are the most important users of this study because they can effectively select managers and provide necessary guidance for overconfident CEOs to perform their stewardship tasks better. The findings of this study are generally consistent with the conclusion of Xue and Hong (2016), Banker et al. (2013), and Bo et al. (2015). Board members are the most important users of this study because they can effectively select managers, provide necessary guidance to overconfident CEOs, and perform their stewardship tasks better. Also, given the direct impact of the CEO overconfidence on cost stickiness, it is difficult to predict operating costs in firms with overconfident CEOs compared to other companies, resulting in poor earnings prediction accuracy. So securities and stock exchange organizations are suggested to adopt appropriate strategies to expose this behavioral category effectively. Given the stickiness of costs and because auditors implicitly assume that costs vary with the volatility of sales when performing analytical techniques, understanding the phenomenon of stickiness and the relationships that exacerbate the phenomenon gives a better understanding to the auditor of how costs are changing and help the auditors to improve the performance of analytical models, so it is recommended that auditors pay attention to the results of this study. Besides, analysts and users of financial statements are advised to pay more attention to CEO overconfidence and cost stickiness in their analyses and applications. Researchers are suggested in future research to examine the role of company size, information asymmetry, and conservatism on the relationship between overconfidence and value relevance. In addition, it is proposed that this investigation be investigated in different fields of industry.

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Does Financial Statements Information Contribute to Macroeconomic Indicators?

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Abstract

This paper aims to analyze the impact of financial statement information on macroeconomic indicators, including the labor market and domestic product data growth. We attempt to examine the effect of variables by applying Classical and Bayesian analyses. We applied quarterly GDP (Growth Domestic Product) data from the real-time data set for macroeconomists maintained by the Statistical Center of Iran (SCI). Additionally, financial statement information is collected from the Tehran Exchange Market database. The results suggest that earnings growth dispersion provides related data about final GDP growth. The results suggest that after considering the effect of other influential factors, specifically real initial GDP, earnings growth dispersion is useful in forecasting future GDP changes. However, the results indicate that there is no link between earnings growth dispersion and GDP restatements. The findings are important for economists and policymakers to have more accurate economic estimation and prediction by applying for accounting numbers.

Keywords: Gross domestic product, Financial numbers, GDP prediction, GDP restatement, Aggressive earning, Earning growth dispersion

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1. Introduction

How will accurate macroeconomic factors be predicted in the future? This important question's response is the objective of macroeconomists and a bunch of decision and policymakers. The current study examines the applicability of financial statement analysis based on accounting earnings data extracted from individual firms to take the Iran economy's pulse.

The economic and finance researchers possess a long history of studying prices and earnings at the macroeconomic level; they mostly applied time series designs. Abstractly, ‘‘macroeconomic’’ variables include the meta-data of a region or nation, whereas practically the main indexes to measure them are prices and earnings provided by the capital market. In contrast, finance scholars have a long history of investigating the association between earnings and other financial variables, including the stock return and earning quality at the firm level. They mostly employed cross-sectional or pooled research designs. Abstractly, significant effective factors on earnings quality include timeliness, usefulness, conservatism, analyst forecast accuracy, value relevance, information asymmetry, trading volume, and liquidity at the firm level, mostly considered by a wide range of studies. The two kinds of literature have presented separately; but employing financial statement numbers to forecast economic activities at the firm level is traditionally a topic of accounting literature (Ou and Penman 1989; Penman 1992; Lev and Thiagarajan 1993; Abarbanell and Bushee 1998; Nissim and Penman 2001; Konchitchki 2011; Patatoukas 2012; Konchitchki and Patatoukas 2014; Nallareddy and Ogneva 2017). The current paper's main objective is to compare and contrast these approaches to how macroeconomic-level analysis is incorporated with accounting earnings reported by financial statements.

Prior studies evidence that changes in a firm’s return and its drivers are useful for forecasting economic activity at the firm level (Fairfield and Yohn, 2001; Nissim and Penman, 2001; Soliman, 2008), in which a little investigation is conducted about the usefulness of financial statement analysis for predicting the overall economy. Such an investigation provides evidence to fulfill this academic gap.

Listed firms on the Tehran stock exchange are required to present financial statements on an annual basis. The annual reports provide information about each firm that is the underlying economic activity at the national level. Since listed firms are incorporated with a large part of the economy, changes in their respective economic activities can be informative about shifts in overall economic activity (Fama, 1981). Further analysis also suggests that gross domestic product is explained by foreign direct investment in Iran's economy, whereas foreign capitals are likely to be invested in Iranian corporations (Sharifi-Renani and Mirfatah, 2012). In Saudi Arabia, Mensi et al. (2018) demonstrate that a negative private investment shock reduces non-oil GDP in both the short- and long-run. As a consequence, it is expected that if investment in private sectors and financial reports influence the changes in economic activity at the firm level, then financial statement numbers, including the firm return, will impact on macroeconomic-level that can provide relevant information for prospects of the real economy.

The current investigation is conducted. It also investigates whether real-reveled aggregate accounting details are applicable to make predictions about macroeconomic indicators and emphasize gross domestic product (GDP) changes to examine the rectifying role of individual firm data for omissions in early statements of GDP. On the one hand, government bodies and economists' major economic decisions are affected by microeconomic announcements, including the private sector's financial statements. On the other hand, inaccurate and incomplete data are the foundation of government bodies' early statements, including initial GDP statements, mostly restated during the upcoming

years or quarters as soon as more information becomes available. Therefore, earnings growth dispersion is likely to forecast GDP growth changes because it contains macroeconomic information that economists have not fully paid attention to (Nallareddy and Ogneva, 2017).

Additionally, the GDP is one of the most significant indexes in economic growth analyses and the critical proxy for a country's economic activity. Therefore, it is used by the Iranian Planning and Budget Organization (IPBO)[1] to get the annual budget ready to shape monetary policy as guidance of economic activities. The reason being, the annual budget is likely to be taken into consideration by the business enterprises as a key factor for investment, production, employment, and general financial decisions. Taken all together, it is expected that former GDP restatements contain more relative information rather than initially GDP statements.

In terms of financial issues, this paper provides several contributions to the current literature. At first, we extend recent accounting research on macroeconomic forecasts (Kothari et al., 2013; Konchitchki and Patatoukas 2014, Nallareddy and Ogneva 2017) by responding to the question; How accurate macroeconomic factors will be predicted? Whether the government economists' prepared economic indicators are fully incorporated with accounting details, especially in emerging markets. Second, the results emphasize the importance of macroeconomic estimates yearly and provide accurate and clear outcomes. When investigating macroeconomic predictions efficiently, it is noticeable that such an investigation is not considered in Iran's economy. Thirdly, while prior research mostly concentrates on aggregate earnings (e.g., Ball and Sadka 2015) and relatively little is known about earnings dispersion (Jorgensen et al. 2012). We add to the research on the information content of accounting aggregates. Specifically, we focus on the real-time prediction of restatements in initial estimates of GDP growth. Fourthly, in this literature line, prior investigations are mostly conducted in the U.S. economy (Nallareddy and Ogneva, 2017). Regardless of the different structure of the U.S. economy and lack of consideration of influential factors on GDP growth, they may not be generalized in emerging economies. Therefore, we consider other influential items (including; oil price, inflation and exchange rates, and import and export rates) on GDP growth in the Iran economy, which is more applicable by macroeconomists and private sector bodies. Finally, to provide a more accurate picture of an accounting figure's predictability and classical analysis, we employ a Bayesian statistical method. These different objectives lead to different research designs and inferences, leading to such an investigation.

The remainder of the study is presented as follows. Section 2 describes the related line of literature and develops the paper’s hypotheses. Section 3 discusses the data and details the empirical methods. Section 4 presents the results, and Section. 5 summarizes and concludes the findings.

2. Theoretical Framework and Literature Review

Statistical Center of Iran (SCI2) retains the responsibility of collecting and reviling periodical macroeconomic data. In this regard, we obtain applicable information from the official website3 of SCI. The accuracy and efficiency of early GDP estimates are incorporated with news and noise among macroeconomics. The news interpretation states that restatements are unpredictable at the initial estimate and occur only because of incorporating new information. In contrast, the noise interpretation suggests that

1- Planning and Budget Organization is a subsidiary of Iranian Executive Branch (government) which task is to prepare annual budget of country in order to propound to parliament to be approved. The official website of this organization is: http://www.mporg.ir

restatements reflect information available at the initial estimate time. Thus, initial estimates are not rationally reliable.

2.1. Macroeconomic indicators

An aspect of macroeconomic investigations concentrates on the widespread consequences of uncertainty. Previous analytical and empirical analyses show that uncertainty is an important determinant of macroeconomic activity (e.g., Bloom, 2009; Bloom et al., 2014; Baker et al., 2015; Kalay et al., 2016). These studies show that since investors and companies are uncertain about the prospects of their investments, then macroeconomic activities are expected to be slow during periods of high uncertainty, and leads to postponing investments. These postponements lead to a remarkable decrease in investment and output. Consequently, capital reallocation is delayed and causes lower growth in investments, production, productivity, and employment. In this regard, Kalay et al. (2016) suggest that dispersion in analyst forecast revisions captures labor reallocation and firm-level uncertainty. Kazerooni and Sajudi (2011) investigate the effect of uncertainty on economic growth; they evidence a negative influence of uncertainty in trading relations on Iran's economic growth rate.

The other aspect of macroeconomic and accounting research investigates the usefulness of financial statement numbers for predicting future changes in firm fundamentals (Ou and Penman 1989; Penman 1992; Lev and Thiagarajan 1993; Abarbanell and Bushee 1998; Nissim and Penman 2001; Konchitchki 2011; Patatoukas 2012; Nallareddy and Ogneva 2017). Patatoukas (2013) shows that earnings changes at the stock market level are correlated with new information about expected future cash flows and discount rates. He also reveals that aggregate earnings changes are tied to news about all components of the expected future stock market return, i.e., the real riskless rate, expected inflation, and the expected equity risk premium.

2.2. Firm-level indexes

One applicable factor for predicting future economic activities is the ratio of operating income after depreciation to net operating assets (RNOA), which is typically applied to measure overall firm performance. Operating income is explained as sales subtract the cost of goods sold, selling, general, and administrative costs and depreciation expense. Net operating assets are explained as operating assets, total assets subtracting cash and short-term investments, subtracting operating liabilities, total liabilities subtracting long- and short-term liabilities. Both operating income and net operating assets are abstracted away from the influences of financial leverage. Therefore RNOA presents a measurement for firm operating performance. The researchers also provide empirical evidence, confirm changes in RNOA and its drivers are useful for forecasting firm fundamentals (Fairfield and Yohn 2001; Nissim and Penman 2001; Soliman 2008).

The other suggested indicator for predicting economic activities is annual reported earnings through financial statements. Campbell (1991) states a theoretical guideline for understanding the simultaneous relationship between earnings changes and stock returns both at the firm and aggregate levels. At the firm level, earnings changes are employed to measure cash flow news, and strong positive simultaneous evidence between firm-level earnings changes and firm-level stock returns is reported. In this regard, Hecht and Vuolteenaho (2006) find a positive association demonstrating the association's complexity depends not only on the covariation of earnings changes with cash flow news but also on the covariation of earnings changes with the remaining components of realized stock returns. The common interpretation of firm-level findings is that higher earnings increase expected cash flows resulting in a positive association between

earnings changes and stock returns. At the aggregate level, inconsistent with firm-level findings, studies provide evidence of a weak, and in some cases, negative, simultaneous relationship between stock market returns and aggregate earnings changes. At the aggregate stock market level, existing literature suggests two points of view. On the one hand, Kothari et al. (2006) suggest that aggregate earnings changes are informational. Specifically, aggregate earnings changes are mostly unanticipated and correlated with value-relevant news that causes investors to revise their expectations about future cash flows and discount rates.

On the other hand, it is argued that aggregate earnings changes are non-informational. This view suggests that aggregate earnings changes provide little or no new value-relevant information and merely confirm investors' expectations (Sadka and Sadka 2009). Overall, previous literature suggests that earnings growth dispersion is applicable to predict financial events at both the firm and aggregate levels.

The other alternative measurement to predict future economic fluctuations is the stock return. The previous studies demonstrate stock market investors as a group of macro forecasters (Fama 1981; Fischer and Merton 1984; Barro 1990; Fama 1990). Based on their argument, stock market prices are related to investors' expectations of future overall economic activity. Konchitchki and Patatoukas (2014) investigate the usefulness of financial statement analysis based on accounting profitability data, emphasizing stock return from individual firms to take the pulse of the U.S. real economy. They provide evidence that the predictive ability of stock returns for future economic activity stretches over one year.

2.3. Accounting numbers dispersion and macroeconomic predictions

Many academic research studies put effort into the link between accounting data and nominal economic activity (Basu et al. 2010; Cready and Gurun 2010; Shivakumar 2010; Konchitchki 2011; Kothari, Shivakumar, and Urcan 2013; Konchitchki and Patatoukas 2013; Patatoukas 2013). The current investigation concentrates on the association between real GDP growth and accounting data. This line of literature provides mixed results. Early studies find some shreds of evidence about predictability in GDP growth restatements. Ball and Brown (1967) studied the association between an individual firm's earnings, competing in an industry, and all firms' earnings in the economy. They find that 35% to 40% of annual earnings variation can be associated with the variation of all firms' earnings, whereas 10% to 15% percent can be associated with the industry average. Mankiw and Shapiro (1986) conclude that restatements in real and nominal gross national product (GNP) growth estimates are unpredictable using initial GNP estimates, aggregate stock market returns, three-month Treasury bill rates, and lagged GNP growth estimates. In this regard, Bernstein (1993) indicates that the accrual system undertakes higher subjectivity degrees than the determination of cash flow.

Recent studies document restatement predictability, including; Faust et al. (2005) find that two-year (final) restatements in real quarterly GDP growth are not predictable (are predictable using the level of initial forecasts). Even other studies (Arnedo et al., 2007; Coppens & Peek, 2005) find that income decreasing actions are associated with private companies. Aruoba (2008) finds that three-year restatements in nominal and real GDP growth rates can be predicted using initially announced estimates, past restatements, and unemployment rates (the latter is a proxy for the business cycle stage). Furthermore, Trombetta and Imperatore (2014) find that, for analyzing the association between the business cycle and accounting information characteristics, the firms' situation, including financial distress, must be taken into full consideration; for this purpose, they indicate that the dynamics of financial crises and business cycles are not

entirely consistent. They also find that as the financial crisis's intensity becomes more severe, managers are more likely to employ earnings management practices.

Konchitchki and Patatoukas (2013) find that financial statement analysis of firm profitability drivers applied at the aggregate level yields timely insights relevant to forecasting real economic activity. They show that accounting profitability and stock return data aggregated across the one hundred largest firms have predictive content for subsequent real Gross Domestic Product (GDP) growth. Navarro-García and Madrid-Guijarro (2016) explore a relationship between economic conditions and financial reporting in a continental European country such as Spain. They also evidence that such a relationship may be weaker in the case of non-listed firms. Kalay et al. (2016) show that earnings dispersion and conditional dispersion relate to unemployment and industrial production, and aggregate stock returns.

Furthermore, they show that conditional dispersion predicts economists' forecast errors who forecast unemployment and industrial production. They also highlight that dispersion and conditional dispersion have separate, additive relations with the macroeconomy. Nallareddy and Ogneva (2017) investigate whether earnings growth dispersion contains information about labor reallocation trends, unemployment change, and, ultimately, aggregate output. They find that initial macroeconomic estimates released by government statistical agencies do not fully incorporate this information. Consequently, earnings growth dispersion predicts future restatements in nominal and real GDP growth (and unemployment change) in the in-sample and out-of-sample tests.

Further, they find statistically and economically significant effects on monetary policy prescriptions and banking regulation. Present literature concerning GDP estimates suggests that early GDP estimates are partly based on acquired data from prior periods. The precision of estimates and early GDP figures can be enhanced by analyzing accurate data related to any co-vary indicators with aggregate output. Taken together, evidence on GDP restatement predictability in emerging economies, specifically, the Iran market, is missing, furthermore presented documents in this line of literature according to the previous conclusion, internationally, is mixed. In current empirical tests, we control the previously documented predictability to establish whether aggregate earnings growth dispersion and stock return dispersion are incrementally applicable in forecasting GDP restatements.

3. Research Methodology and Sample Selection

3.1. Bayesian and Classical multilevel models

The current paper's statistical employed models include Classical and Bayesian methods, leading to the accurate exploration of facts or phenomena and perhaps new results.

3.2. Sample selection

We applied quarterly GDP and unemployment data from the real-time data set for macroeconomists maintained by Iran's Statistical Center (SCI). We adjust GDP growth rates to represent seasonally by percentage. Accounting numbers are collected from the Securities and Exchange Organization[2]'s database between 2004 and 2015. The paper's sample includes 170 firms listed on the Tehran stock exchange market. The exclusive features imply; companies are not sub-industry of the financial intermediation, holding, and banks industries. This is because such companies differ in terms of the nature of the activities and the classification of financial statements compared with other companies.

[2] https://www.codal.ir

The stock trading of companies should not be completely stopped during the research period. Companies have been listed on the Tehran Stock Exchange since the beginning of 2004. All required research data for those companies will be available and during the research period. Furthermore, the justification for the chosen period is data availability.

3.3. Earnings, employment, and Returns effects on GDP growth Predictors

3.3.1. Earnings Growth dispersion

Dispersion in aggregate earnings growth is measured in four steps, similar to Nallareddy and Ogneva (2017) and Kalay et al. (2016). First, we estimate annual earnings changes (ChEarn) for each firm *i* and year *t* as follows:

$$\text{ChEarn}_{i,t} = \frac{(\text{Earn}_{it} - \text{Earni}_{t-4})}{\text{BV}_{it-1}} \quad (1)$$

Earn_{it} (Earn_{it-4}) is realized earnings for firm *i* in year *t* (t-4), and BV_{it-1} is the book value of equity for firm *i* at the end of year t-1.

Second, we estimate aggregate earnings changes (AggChEarn) for year *t* is an equal-weighted average of firm-level earnings changes:

$$\text{AggChEarn}_t = \frac{1}{N_t}\sum_{i=1}^{N_t} ChEarn_{it} \quad (2)$$

Where ChEarn_{it} is as previously defined, and N_t is the number of firms in year *t*. Third, we estimate aggregate earnings changes dispersion (AggEarDisp) for quarter *t* as:

$$\sqrt{\frac{1}{N_t}\sum_{i=1}^{N_t}(ChEarn_{it} - \text{AggChEarn}_t)^2} \quad (3)$$

Where AggChEarn_t, ChEarn_{it}, and N_t are as previously defined.

Fourth, we are interested only in the new information contained in earnings dispersion that is not fully incorporated into macroeconomic estimates. Therefore, the earnings growth dispersion measure, Ear_Disp_t, is the innovation in aggregate earnings changes dispersion. We estimate it as a residual from the AR (2) model:

$$\text{AggEarDisp}_t = \rho_0 + \rho_1\text{AggEarDisp}_{t-1} + \rho_2\,\text{AggEarDisp}_{t-2} + e_t, \quad (4)$$

Where AggEarDisp_t, AggEarDisp_{t-1}, and AggEarDisp_{t-2} are aggregate earnings changes dispersion estimates for years t, t-1, and t-2, respectively; Ear_Disp_t is equal to the residual e_t. To avoid any look-ahead bias, we estimate the model on a rolling basis, using all observations prior to and including year *t*.

3.3.2. Dispersion in Employment Growth

Aggregate employment growth dispersion (EmpG_Disp) is based on annual employment data for the 3 economy super sectors reported by the SCI. We first calculate quarterly growth (year-over-year) in employment for each sector. Then we estimate employment growth dispersion as a standard deviation in these sectoral employment growth estimates. Finally, we remove the persistent component of the series. Specifically, the employment growth dispersion measure, EmpG_Disp, is the residual from the AR (2) model. We estimate the model on a rolling basis, using all observations prior to and including year *t*.

We estimate the following yearly cross-sectional regressions, where i and t subscripts correspond to firms and years, respectively (the t subscript for coefficients is omitted):

$$\text{EmpG\_Disp}_t = \alpha+\beta_1\text{ChEarn}_{i,t-1}+\beta_2\text{ChEarn}_{i,t-2}+\beta 3\text{EmpGr}_{i,t-1}+\beta_4\text{EmpGr}_{i,t-2} + \beta_5\text{Ret}_{i,t-1}+ \beta 6\text{Ret}_{i,t-2}+\varepsilon_{i,t} \quad (5)$$

$\text{EmpGr}_{i,t}$ is employment growth rate from year t-1 to year t; $\text{ChEarn}_{i,t}$ changes in annual earnings from year t-1 to year t, scaled by book value at the end of year t-1; and $\text{Ret}_{i,t}$ is the annual stock return for calendar year t.

3.3.3. Dispersion in Stock Returns

Aggregate return dispersion (Ret_Disp) is estimated using equations (2), (3), and (4) after replacing earnings changes with stock returns for the year. Aggregate return dispersion is autocorrelation-adjusted and represents a residual from the AR (2) model. We estimate the model on a rolling basis, using all observations prior to and including quarter t.

3.3.4. Alternative GDP Restatement Predictors

The main analysis of the current paper investigates whether earnings growth dispersion can predict GDP growth restatements after controlling for different expected GDP growth benchmarks, including the initially released GDP estimates (Initial_est) for year *t*, the GDP growth estimate for year *t-1*, revised by the year *t*, initial GDP release date (Est_{t-1}). We include some expanded regressions control for several additional variables that prior literature identifies as restatement predictors. In contrast, the employed model of Nallareddy and Ogneva (2017) has not taken into account other influential factors in real economic activities, therefore due to domestic findings of Zeinali and Bahadin (2013) and Behboodi et al. (2010) and Nazari and Barzgardovin (2015), demonstrating a significant impact of fluctuation in exchange and inflation rate, amount of annual export and import, and oil price on GDP growth, we indicate following variables in order to consider their effect in the statistical models, which are as follow; annual growth of oil price (A_OP), annual growth of export and import goods and services (A_EGS) and (A_IGS) which contain related data to GDP. We include exchange (A_EX) and inflation (A_INF) rates annually to control for their effects. In GDP (unemployment) prediction regressions, the GDP announcement date is used. We control aggregate stock market return (Mkt_Ret)—the equal-weighted average return on all stocks in the sample in a given year—for year *t* and the two prior years because it is a leading economic indicator. Prior research finds that macroeconomic forecasts do not fully incorporate the information in simple aggregated earnings (e.g., Konchitchki and Patatoukas 2014; Kothari et al. 2013).

Nevertheless, we include a lagged innovation in aggregate earnings changes (Eart-1) as an additional control variable. Eart-1 is the AR (2) residual from a rolling expanding-window regression (4), where AggEarDisp is replaced with AggChEarn from equation (2). Most restatement predictors, including GDP growth, are estimated using publicly available information by the end of quarter *t*. The quarter *t* employment growth dispersion, prior-quarter macro estimates, and initial macroeconomic estimates are available to economists when the initial GDP estimates for quarter *t* are announced. The purpose of including these variables is to rule out alternative explanations for the link between earnings growth dispersion and future restatements.

3.4. Earnings Growth Dispersion on GDP Growth

3.4.1. Predicting GDP Growth Restatements

This section investigates whether such publicly available data is fully incorporated within initially announced GDP estimates. The initially announced estimate represents a forecast of the final estimate plus error:

$$GDP\ final_t = \alpha + \beta\ Initial\ est_t + \varepsilon \quad (6a)$$

If the initially announced estimate is an unbiased predictor of the final estimate, then the coefficients from estimating (6a) using OLS should be $\alpha=0$ and $\beta=1$. To test whether the initial estimate is fully incorporated within information about earnings dispersion, we can evaluate the following regression:

$$GDP\ final_t = \alpha + \beta_1\ Ear\ Disp_{t-1} + \beta_2\ Initial\ est_t + \varepsilon_t, \quad (6b)$$

On the condition that the error in the initially announced estimate is associated with

earnings growth dispersion. Therefore the coefficient β1 should be significantly contrasting from zero. The final model, for answering the question; whether earnings growth dispersion contains information about the final GDP estimate, which is also incremental to other known GDP expectation benchmarks or restatement predictors, we can estimate a full regression specification considering (real and nominal) GDP estimates:

$$\text{GDP final} = \alpha + \beta_1 \text{ Ear Disp}_{t-1} + \beta_2 \text{ Initial est}_t + \beta_3 \text{ EmpG\_ Disp}_{t-1} + \beta_4 \text{ Ret\_Disp}_{t-1} + \beta_5 \text{ Est}_{t-1} + \beta_6 \text{ A\_OP}_t + \beta_7 \text{ A\_EGS}_t + \beta_8 \text{ A\_IGS}_t + \beta_9 \text{ A\_E}_t + \beta_{10} \text{ A\_INF}_t + \beta_{11} \text{ Mkt\_Ret} + \varepsilon_t, \quad (6c)$$

Where labor reallocation proxies include Ear_Dispt-1 (earnings growth dispersion for fiscal year t-1 earnings that are released in year t), EmpG_Dispt-1 (employment growth dispersion for year t-1), and Ret_Dispt-1 (dispersion in year t-1 returns); the final GDP growth expectation benchmarks include Initial_estt (the initially announced real or nominal GDP growth for the quarter I), Estt-1 (a revised GDP growth estimate for the quarter t-1 contained in the quarter t initial GDP release), Other control variables are discussed in the former section. It is noted that we analyzed both real and nominal GDP growth to obtain the association in this context. Since previous investigations report the results of a regression that is equivalent to (6c), which has the GDP restatement (i.e., GDP_final – Initial_est) on the left-hand side, in respect to be consistent with prior research on macro restatement prediction, specifically, we estimate the following regression model considering (real and nominal) GDP estimates:

$$\text{GDP\_Restatement}_t = \alpha + \beta_1 \text{ Ear Disp}_{t-1} + \beta_2 \text{ Initial est}_t + \beta_3 \text{ EmpG\_ Disp}_{t-1} + \beta_4 \text{ Ret\_Disp}_{t-1} + \beta_5 \text{ Est}_{t-1} + \beta_6 \text{ A\_OP}_t + \beta_7 \text{ A\_EGS}_t + \beta_8 \text{ A\_IGS}_t + \beta_9 \text{ A\_E}_t + \beta_{10} \text{ A\_INF}_t + \beta_{11} \text{ Mkt\_Ret} + \varepsilon_t, \quad (6d)$$

Where GDP_Restatement_t is the restatement in nominal and real GDP growth for quarter_t (equal to GDP_final – Initial_est). All coefficient estimates in (6d) equal their equivalents in (6c).

4. Empirical Results

4.1. Descriptive statistics

Table 1 reports descriptive statistics. The Table suggests that the mean (median) of nominal of real final GDP growth (Final NGDP t and Final RGDP t) are respectively 33.39 (6.6) and 247.6 (210). Furthermore, these indexes of nominal and real GDP_Restatemen are 127.26 (-15) and -55.85 (-280). Finally, the initial GDP growth (Initial NGDP t and Initial RGDP t) are respectively 60.73 (-7.5) and 302.56 (290). Both the mean and median of all variables are statistically significant. The results are economically significant. Moreover, it is observed that the sign of Initial NGDP growth is changed. Specifically, the nominal GDP growth estimates switch signs from negative to positive, which are -7.5 (Initial_NGDP t) and 290 (Initial RGDP t). Overall, the shift of GDP's growth, their extent ranges, and the variability of sign between the nominal and real initial GDP values suggest that the initial GDP restatements are economically significant. Other descriptive statistics of variables are presented in the following Table (1).

The coefficients above (below) the diagonal are the Pearson (spearman) correlation. The coefficients in bold are significant at the 0.05 level. The other coefficients are not significant at the 0.05 level. The sample is based on the years 2004 through 2015 and consists of 2040 firm-year observations from non-financial and non-utility industries. The results are presented in Table (2).

Table 1. Descriptive statistics of variables

Variable	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
Final NGDP	-341.6	-58.8	6.6	33.39	73.5	546.9
Final RGDP	-660	0	210	247.6	450	1230
NGDP Restatemen	-870	-130	-15	-27.26	90	760
RGDP Restatemen	-480	-340	-280	-55.85	130	1320
Initial_NGDP	-217.2	-60.2	-7.5	60.73	55.3	811.2
Initial_RGDP	-320	-90	290	302.5	720	790
Est	-800	-200	0	47.43	100	1600
EarnDisp	-17.785	-7.763	0	-1.127	0	400.763
EmpGDispr	-342.1	-205.3	-19.3	5.7	192.2	421.3
RetDisptrr	-78.16	-27.79	-11.49	-7.04	0	911.42
Oil price	-486	-90	132	87.49	283	403
Exports goods and services	-253	-26	0	-16.47	35	120
Imports goods and services	-231	-187	-18	-44.37	30	99
Exchange Rate	10	35	53	127.7	118	734
Inflation Rate	-575	-237	138	66.5	419	734
Mkt_ret	-283	-25	175.5	197.5	442	634

4.2. The classical regression results for employment changes determinants

Table 3 includes the result of the regression model selection of this study. For this purpose, the Chow test is applied to examine and choose between fixed effect and ordinary least square models. In this regard, results suggest that the fixed effect model is preferred. According to the Chow test, the fixed-effect model, including the time effect, is preferred. Next, using ALC, BIC, and LogLik tests, we chose fixed effects and fixed effects, including time effect models. The results suggest that the fixed effect is favorable to examine the models of this study.

After selecting the appropriate model to test this study's model, the Dickey-Fuller test is applied to test residuals' durability. According to the results, it is suggested that the residuals are durable. Durbin-Watson test is used to examine the correlation between the errors of the model. The results show a serial correlation between errors. Thus the generalized fixed effects model is applied to fix this problem. It is noticed that the results of other classic assumptions provide that the selected model is proper to test the hypothesis. According to the above results, the generalized fixed effect model is used to test the equation (5).

The results of empirical analyses indicate that only employment growth predictors are significantly associated with future employment growth. In contrast, earnings changes and stock returns are not statistically related to future employment growth. Therefore, current employment growth is incrementally useful in predicting employment growth for two years ahead. The findings of Nallareddy and Ogneva (2017) evidence that all three predictors—earnings changes, employment growth, and stock returns— are significantly associated with future employment growth.

4.3. The classical regression results for earnings growth dispersion and GDP restatement

Table 5 includes the result of the regression model selection of this study. For this purpose, the Chow test results show that the fixed effect model is proper, and the fixed effect model, including the time effect, is not preferred. Next, by using the Hausman test Ols model is determined. Finally, Godfrey test results demonstrate no serial autocorrelation between the model’s errors. According to the results, the fixed-effect model is used to test the equation (6c) after controlling for the initial real GDP.

Table 2. Pearson and Spearman correlations of variables

Variables	Final NGDP t	Final RGDP t	RGDP Restatemen t	NGDP Restatemen t	earnDispt-1	Initial_NGDP t	Initial_RGDPt	EmpGDisprr-1	RetDisptrrr-1	Est t-1	oil price	Exports	Imports	Exchange Rate	Inflation Rate	Mkt_ret t
Final NGDP t	1	0.247	0.609	0.884	0.004	-0.387	-0.257	-0.579	-0.038	-0.289	-0.604	-0.031	0.260	-0.083	-0.322	0.079
Final RGDP t	0.365	1	0.211	0.237	-0.007	-0.120	0.594	-0.355	-0.018	-0.079	-0.070	0.353	0.580	-0.404	-0.425	-0.148
RGDP Restatemen t	0.436	0.595	1	0.478	-0.009	-0.158	-0.461	-0.260	-0.028	-0.068	-0.656	-0.039	-0.032	0.070	-0.613	-0.121
NGDP Restatemen t	0.741	0.294	0.364	1	0.025	-0.829	-0.089	-0.471	-0.002	-0.340	-0.414	0.010	0.004	0.085	-0.111	0.257
EarnDispt-1	-0.005	0.069	0.132	0.037	1	0.115	0.094	0.027	0.436	0.054	0.144	0.145	0.159	-0.108	-0.134	0.058
Initial_NGDP t	-0.239	-0.039	0.077	-0.692	-0.040	1	0.062	0.565	0.135	0.445	0.315	0.013	0.189	-0.124	-0.141	-0.160
Initial_RGDPt	-0.086	0.438	-0.420	-0.194	0.001	0.054	1	-0.101	0.011	-0.009	0.662	0.438	0.682	-0.524	0.221	-0.025
EmpGDisprr-1	-0.553	-0.016	-0.226	-0.598	0.003	0.221	0.037	1	0.093	0.278	0.295	-0.297	-0.314	0.230	0.088	0.213
RetDisptrrr-1	-0.054	0.043	0.104	0.023	0.157	-0.042	0.102	0.024	1	0.079	0.207	0.155	0.164	-0.107	-0.096	0.160
Est t-1	-0.297	-0.290	0.150	-0.327	-0.003	0.247	-0.207	0.464	0.023	1	-0.120	0.445	-0.283	0.249	-0.405	-0.095
oil price	-0.400	0.229	-0.535	-0.534	-0.025	0.261	0.712	0.084	0.063	0.103	1	0.092	0.483	-0.424	0.441	0.222
Exports	0.036	0.216	0.107	0.106	-0.034	0.016	0.167	-0.519	0.035	0.176	0.454	1	0.362	-0.118	-0.454	-0.061
Imports	0.322	0.547	-0.027	0.132	-0.022	0.261	0.598	-0.462	-0.004	-0.102	0.517	0.642	1	-0.739	0.079	0.119
Exchange Rate	-0.010	-0.468	0.052	0.021	0.005	-0.131	-0.525	-0.052	0.033	0.162	-0.261	0.024	-0.540	1	-0.199	0.066
Inflation Rate	-0.153	-0.296	-0.780	-0.278	-0.023	0.024	0.232	0.074	0.018	-0.386	0.546	-0.192	-0.003	-0.080	1	0.467
Mkt_ret t	0.205	-0.143	-0.308	0.228	-0.028	-0.203	-0.079	0.199	0.061	-0.105	0.369	-0.030	0.075	0.106	0.467	1

Table 3. The regression test selection

Test	Statistics	P-value	H_0 Hypothesis	Results
F-limer	0.311	1.000	Priority of Ols	Priority of Ols
F-limer	-7.861	1.000	The priority of Ols (IET)	The priority of Ols (IET[3])
Kolmogorov-Smirnov	0.691	0.000	Priority of Ols	Priority of Gls
Durbin-Watson	1.616	0.000	Priority of Ols	Priority of Gls
Dickey - Fuller	-12.943	0.010	Non-durable	Durable
Test	AIC Test	BIC Test	LogLik Test	Results
OLS	-7331	-7289	3674	Priority of Ols (IET)
Ols (IET)	-103179	-103089	51606	Priority of Ols (IET)

Table 4. The estimated results by applying Gls regression model of equation 5

Variables	Value	Std.Error	T-value	P-value
(Intercept)	0.000	5.835	0.000	1.000
$Chearn_{,t-1}$	0.031	0.062	0.507	0.612
$Chearn_{,t-2}$	0.011	0.054	0.201	0.840
$EmpGri_{,t-1}$	0.191	0.017	11.436	0.000*
$EmpGri_{,t-2}$	0.124	0.017	7.074	0.000*
$Ret_{,t-1}$	0.000	0.123	0.003	0.997
$Ret_{,t-2}$	0.036	0.131	0.278	0.781
Residual standard error:	74.27 on 1963 degrees of freedom			
Multiple R-squared:	0.8983			
Adjusted R-squared:	0.8974			

Table 5. The regression test selection

Test	Statistics	P-value	H_0 Hypothesis	Results
F-limer	31.148	0.000	Priority of Ols	Priority of Ols
F-limer	31.148	0.000	Priority of Ols (IET)	Priority of Ols
Hausman	2750.000	0.000	The priority of random effect	Priority of Ols
Godfrey	7.564	0.006	there is no serial correlation	Priority of Gls

Table 6 is presented to determine the proper statistical model for testing equation (6c) after controlling for the initial nominal GDP. Finally, it suggests that the fixed effect is the best statistical model to determine the association.

Table 6. The regression test selection

Test	Statistics	P-value	H_0 Hypothesis	Results
F-limer	-3.9599	1	Priority of Ols	Priority of Ols
F-limer	-3.9599	1	The priority of Ols	The priority of Ols
Kolmogorov-Smirnov	0.68497	0	Priority of Ols	Priority of Ols
Durbin-Watson	1.5863	0.2565	Priority of Ols	Priority of Ols
Dickey – Fuller	-28.827	0.01	Non-durable	Durable
Test	AIC Test	BIC Test	LogLik Test	Results
OLS	-74036.05	-73964.76	37032.02	Priority of Ols
Ols (IET)	-74036.05	-73964.76	37032.02	Priority of Ols

Table 7 presents the results of regressing earnings growth dispersion and other predictors on GDP growth estimates. The coefficient and p-value of $Earndisp_{t-1}$, which are -0.009 and 0.915, suggest no association between earning growth dispersion and nominal GDP final. In contrast, reported results in real GDP final columns with the coefficient and p-value of $Earndisp_{t-1}$, which are -0.0278 and 0.000, at 0.05 level, suggest a negative association. It means that the real GDP final is predictable using earnings growth dispersion. The findings align with Nallareddy and Ogneva (2017) results, indicating a negative association between given variables in this context. The

[3] Including Effect of Time

reported findings in Table 7 suggest that after considering control variables, we can comprehend earning dispersion in former years also has predictive information to allocate change in real GDP final. Comparing real and nominal GDP results specify that earnings growth dispersion provides a forecasting feature for only real GDP. Therefore the effect of firms accounting numbers results in real GDP.

Table 7. the estimated results by applying Gls regression model of equation (6c)

	Final nominal GDP results					**Final real GDP results**				
Variables	**Estimate**	**Std. Error**	**T-value**	**Pr(>|t|)**		**Estimate**	**Std. Error**	**T-value**	**Pr(>|t|)**	
Intercept	86.916	3.124	27.824	0.000	*	164.143	15.409	10.652	0.000	*
EarnDispt-1	-0.009	0.080	-0.107	0.915		-0.537	0.307	-1.748	0.081	*
EmpGDisprr-1	-0.396	0.017	-23.289	0.000	*	-0.278	0.060	-4.637	0.000	*
RetDisptrrr-1	-0.065	0.031	-2.128	0.000	*	0.101	0.118	0.852	0.394	
Initial_GDPt	-0.109	0.009	-12.677	0.000	*	0.649	0.024	26.775	0.000	*
Est t-1	0.113	0.004	30.071	0.000	*	-0.044	0.014	-3.053	0.002	*
A_OPt	-0.789	0.014	-56.472	0.000	*	-0.778	0.055	-14.152	0.000	*
A_EGSt	-0.757	0.035	-21.839	0.000	*	0.119	0.128	0.927	0.354	
A_IGSt	2.073	0.044	47.119	0.000	*	0.973	0.138	7.035	0.000	*
A_Et	0.197	0.015	12.810	0.000	*	-0.365	0.050	-7.338	0.000	*
A_INFt	0.168	0.008	20.893	0.000	*	-0.502	0.030	-16.490	0.000	*
Mkt_ret t	0.313	0.009	36.744	0.000	*	0.426	0.028	15.167	0.000	*
R^2	0.911					0.700				
Adjusted R^2	0.910					0.698				

Further analyses evidence that employment fluctuation ($EmpGDispr_{r-1}$) is negatively associated with GDP final. It supports the idea of indicating the change in labor reallocation leads to a change in GDP final. The results also suggest that the sign of $Initial\_GDP_t$ differs in real and nominal GDP, suggesting that the initial GDP estimate is taken into account by statistic analyzers in the final GDP.

Further results of other control variables are presented in Table 7. The results are robust for the main analysis. By and large, the provided results are consistent with the idea that macroeconomists do not fully consider the informativeness of earnings growth dispersion.

4.4. The classical regression results for forecasting GDP restatements

Table 8 includes the result of the regression model selection of this study. For this purpose, the Chow test is applied, and the results show that the fixed effect model is preferred. Next, it is the Ols model that is determined by the Hausman test. Finally, Godfrey test results demonstrate the serial autocorrelations between the model's errors. Thus, the general last square model is applied to fix the problem.

Table 8. The regression test selection

Test	**Statistics**	**P-value**	**H_0 Hypothesis**	**Results**
F-limer	34.65700	0.00000	Priority of Ols	Priority of Ols
F-limer	34.65700	0.00000	Priority of Ols (IET)	Priority of Ols
Hausman	853.31000	0.00000	The priority of random effect	Priority of Ols
Godfrey	4.54400	0.03303	there is no serial correlation	Priority of Gls

Table 9 also are presented to determine a proper statistical model for testing equation (6d) for adjusted nominal (final) GDP growth. Finally, it suggests that the fixed effect is the best statistical model to determine the association.

Table 9. The regression test selection

Test	Statistics	P-value	H_0 Hypothesis	Results
F-limer	-1.4874	1	Priority of Ols	Priority of Ols
F-limer	-1.4874	1	The priority of Ols	The priority of Ols
Kolmogorov-Smirnov	0.69146	0	Priority of Ols	Priority of Ols
Durbin-Watson	1.9124	0.06762	Priority of Ols	Priority of Ols
Dickey - Fuller	-22.743	0.01	Non-durable	Durable
Test	AIC Test	BIC Test	LogLik Test	Results
OLS	-84136.54	-84065.25	42082.27	Priority of Ols
Ols (IET)	-84136.54	-84065.25	42082.27	Priority of Ols

Table 10. the estimated results by applying Gls regression model of equation (6d)

	Real GDP restatement results					Nominal GDP restatement results				
Variables	Estimate	Std. Error	T-value	Pr(>|t|)		Estimate	Std. Error	T-value	Pr(>|t|)	
Intercept	168.4152	15.5738	10.8140	< 2e-16	*	85.6801	3.1356	27.3250	0.0000	*
EarnDispt-1	-0.5450	0.3104	-1.7560	0.0792		-0.0087	0.0804	-0.1080	0.9138	
EmpGDisprr-1	-0.2597	0.0606	-4.2860	0.0000	*	-0.4028	0.0171	-23.5810	0.0000	*
RetDisptrrr-1	0.1004	0.1192	0.8420	0.3998		-0.0655	0.0309	-2.1230	0.0339	*
Initial_GDPt	-0.3563	0.0245	-14.5380	0.0000	*	-1.1082	0.0086	-128.9950	0.0000	*
Est t-1	-0.0422	0.0146	-2.8830	0.0040	*	0.1119	0.0038	29.7490	0.0000	*
A_OPt	-0.7868	0.0556	-14.1560	0.0000	*	-0.7795	0.0140	-55.5870	0.0000	*
A_EGSt	0.1390	0.1299	1.0710	0.2845		-0.7625	0.0348	-21.9180	0.0000	*
A_IGSt	1.0581	0.1398	7.5710	0.0000	*	2.0433	0.0442	46.2780	0.0000	*
A_Et	-0.3521	0.0503	-6.9980	0.0000	*	0.1906	0.0154	12.3500	0.0000	*
A_INFt	-0.4884	0.0308	-15.8620	0.0000	*	0.1568	0.0081	19.4350	0.0000	*
Mkt_ret t	0.4185	0.0284	14.7360	0.0000	*	0.3161	0.0085	37.0240	0.0000	*
R^2	0.7027					0.9700				
Adjusted R^2	0.7009					0.9699				

Table 10 presents the results of eq. 6d. Among all regression specifications, lagged earnings growth dispersion does not significantly forecast the adjusted GDP growth restatements after controlling for nominal and real initial GDP restatement. The findings mean that both the nominal and real GDP restatements are not predictable using earnings growth dispersion. Consequently, there is no link between earnings growth dispersion and final real (nominal) GDP restatements, which is not illustrated by final GDP changes. In this regard, Nallareddy and Ogneva (2017) find a predictive role of earnings growth dispersion for nominal and real GDP restatements. Their findings are inconsistent with this study finding in this way. Taken together, the findings suggest that government bodies still do not fully incorporate this information in reported restatements because no association is obtained from the presented results. Overall, the results are not consistent with the hypothesis that earnings growth dispersion is incorporated with GDP restatements because earnings growth dispersion does not affect GDP restatements.

4.5. Bayesian results

The one-level Bayesian tests lead to a calculation of 4000 numerical repetitions to achieve convergence and estimate of later samples. The possibility to calculate this volume of transactions and repeated numbers seems far-fetched to achieve a reasonable estimate or correct covariance for the investigation that uses Gypsum and Metropolis-Hastings sampling methods. Thus, in this study, we test the hypothesis using NUTS sampling algorithms run in the default package of STAN and by a statistical package of BRMS in R software that can compute the complex models with fewer than a thousand repetition number (transaction). The equations (6c) and (6d) are presented in table 11 by

applying a Bayesian multilevel correlation.

Table 11 the estimated results by applying Bayesian multi-level of equations (6c) and (6d)

Variables	Final nominal GDP results l-95%	U-95%	P_value		Final real GDP results l-95%	U-95%	P_value		Real GDP restatement l-95%	U-95%	P_value		Nominal GDP restatement l-95%	U-95%	P_value	
Intercept	80.66	92.76	0.00	*	135.76	194.31	0.00	*	139.18	198.87	0.00	*	79.08	91.55	0.00	*
EarnDispt-1	-0.22	0.12	0.58		-1.05	0.27	0.25		-1.09	0.26	0.23		-0.22	0.12	0.58	
EmpGDisprr-1	-0.43	-0.36	0.00	*	-0.40	-0.16	0.00	*	-0.38	-0.15	0.00	*	-0.44	-0.37	0.00	*
RetDisptrrr-1	-0.12	0.00	0.05	*	-0.14	0.32	0.45		-0.15	0.32	0.45		-0.12	0.00	0.05	*
Initial_GDPt	-0.13	-0.09	0.00	*	0.60	0.70	0.00	*	-0.40	-0.31	0.00	*	-1.12	-1.09	0.00	*
Est t-1	0.11	0.12	0.00	*	-0.07	-0.02	0.00	*	-0.07	-0.01	0.00	*	0.10	0.12	0.00	*
A_OP_t	-0.81	-0.76	0.00	*	-0.88	-0.67	0.00	*	-0.90	-0.68	0.00	*	-0.81	-0.75	0.00	*
A_EGS_t	-0.83	-0.69	0.00	*	-0.12	0.38	0.32		-0.11	0.41	0.25		-0.83	-0.70	0.00	*
A_IGS_t	1.99	2.16	0.00	*	0.70	1.24	0.00	*	0.77	1.32	0.00	*	1.96	2.13	0.00	*
A_Ex_t	0.17	0.23	0.00	*	-0.46	-0.27	0.00	*	-0.45	-0.25	0.00	*	0.16	0.22	0.00	*
A_INF_t	0.15	0.18	0.00	*	-0.56	-0.44	0.00	*	-0.55	-0.43	0.00	*	0.14	0.17	0.00	*
Mkt_ret t	0.30	0.33	0.00	*	0.37	0.48	0.00	*	0.36	0.48	0.00	*	0.30	0.33	0.00	*

The 4000 number repeat chain calculates the research model to obtain convergence and late Sampler Estimation. This model is examined by applying the NUTS estimator algorithm. According to the above explanations, the test hypotheses' results using Bayesian models, similar to the former section, despite the p-value less than 0.05 level, show no significant relationship between earnings growth dispersion and all GDP reports (including nominal and real GDP final and restatements). Furthermore, the p-values less than 0.05 level of $EmpGDispr_{r-1}$ in all equations reveal that labor reallocation is statistically associated with GDP statements, which means that the labor market has predictive content for GDP restatements. A different result is a consequence of more accurate analyses of Bayesian methods.

Overall, it is recommended that most, the empirical results of Bayesian models are similar to classic regression results (except earnings growth dispersion effect). Besides, the Bayesian method results besides its benefits mentioned former, which indicate their more credibility than classic models, are similar to classical regression methods, resulting in the robustness of the findings.

5. Conclusion and Discussion

Economists regard that one of the most indicative economic indexes for an economy's health is GDP growth. Because GDP fluctuation predictions, directly or indirectly, are recognized as a decision-making indicator by public institutions, private entities, stock market investors and analyzers, and governments' bodies, importantly. The only information provider, in this regard, in which publishing credible and reliable forecasts is the Statistic Center of Iran organization as part of the survey of professional forecasters, presenting the consensus required by professional macroeconomic experts—extending the unexplored line of literature linking Financial Statements Information to the macroeconomy and, more specifically, upon the paper of (e.g., Konchitchki and Patatoukas, 2013, 2014; Ball and Sadka, 2015; Nallareddy and Ogneva, 2017). This article provides an innovative way of forecasting the aggregate GDP growth by Iranian companies by investigating the predictive information in listed firms' earnings data in the Tehran stock exchange market.

The results of classical regression document that, at the firm level information, earnings growth dispersion based on accounting numbers have no predictive ability to determine the GDP growth estimates used in macroeconomic papers. In contrast, further analyses provide that, similar to (Nallareddy and Ogneva, 2017), after controlling the effect of other influential factors, at the macro level, earnings growth dispersion contribute to predicting GPD growth estimates in which government bodies and statistical information providers do not fully take into account this information. Moreover, Bayesian analyses provide contradictory findings suggesting no significant predictive effect of earnings growth dispersion on GDP growth estimates. The main reason for the distinct results refers to the accuracy of Bayesian regression methods. Further findings suggest that both the nominal and real GDP Restatements are not predictable when applying earnings growth dispersion. It is the notion that both statistical methods confirm the findings in this context.

Since the idea of investigating the association between firms' profitability variables to macroeconomic performance has only been developed in recent years, existing literature on this issue is still limited. Notably, such a study has not been conducted in Iran's economy. Therefore, this article is the first to investigate this geographical area. Furthermore, provided findings contribute to governmental bodies to provide more accurate estimations by considering firm-level information. Therefore accounting numbers may lead to practical and useful information for meta-programming of

countries' futures.

Opportunities for future works emerge from the limitations of this study. The unexplained macroeconomic content of firm-level details would further scrutinize the association between accounting disclosures and the macroeconomic indicators, including employment allocation. This paper only provides evidence about the effect of firm-level information on the macro-level economy. However, the correlation might be applicable in the opposite direction, with the GDP growth estimate as an indicator of predicting entities' profitability. An important limitation of this research is that listed firms' financial statements in the Tehran stock exchange are stated annually. If quarterly discloser was available, we might precede more accurate results.

Moreover, there is no control for the industry because of the applied sample selection method, which consists of 170 companies. Therefore it seems pretty small to permit subsamples of industry. Hence, future research could base their work on a more extended sample.

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Research Article

The Effect of Abnormal Audit Fees on Internal Control Weakness

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Abstract

The present study aims to assess abnormal the effect of audit fees on listed firms' internal control weakness on Tehran Stock Exchange. The multivariate regression model is used for testing research hypotheses. Ordinary Least Squares and fixed effects regression are used for more confidence in the hypothesis's test results. The present study's data include 1309 listed observations on the Tehran Stock Exchange, which are analyzed during 2012-2018. Stata Software is employed for data analysis and testing the hypotheses. The results show that there is a positive and significant relationship between abnormal audit fees and internal control weakness, and such a conclusion can be indicative of the fact that audit quality is lower in firms with abnormal audit fees, so internal control weaknesses of such firms is more than that of the others. The study outcomes may give great strength to researchers and policymakers. In this paper, four variables of the financial weakness of internal control, nonfinancial weakness of internal control, weakness in the IT system, and delay in the audit report are used for the first time to evaluate internal control weakness better using the exploratory factor analysis.

Keywords: Internal control weakness, Abnormal audit fees

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1. Introduction

Optimum utilization of internal resources is one of the significant criteria for preserving the continuity of firms in society, for appropriate efficiency of which several controlling mechanisms and methods are required to be signified to design managers and all infrastructures, among which internal auditors and internal controls are of great importance in this field (Eniola, and Akinselure, 2016). Internal controls are a set of effective and efficient policies that help the organization achieve its objectives, including increasing credit, reliability of accounting information, and risk evaluation and realization. Moreover, the provision of the Sarbanes-Oxley Act in 2002 for implementing internal control objectives has obliged the managers to disclose internal control reports, such that according to the said law, reports should be analyzed by an external auditor (Lai, Liu, and Chen, 2020).

Auditor reporting on internal control has a considerable impact on the amount of investment in firms. The disclosure about weakness in internal control causes the decrease of investors and, on the other hand, corrective reports attract the investors. Hence, the evaluation and disclosure of internal control significantly affect firm performance (Sun, 2016). The presence of significant weaknesses or defected disclosure can bear irreparable costs on the firm position in society and the firm's future activity, so the concerns about the firm's performance can negatively affect the decisions of investors. Hence, being familiar with the contributing factors to internal controls can, to a great extent, lower the educational costs, preserve the credit of a firm position in industrial society, and, more importantly, attract the capital.

One of the contributing factors to internal control weakness is the amount of audit fees. The higher the internal control weakness in firms, the more the audit risk would increase effort and audit hours and, consequently, enhance the audit fee (Ji, Lu, and Qu, 2018). Excessive growth of audit fees contributes to the independence of auditors in the business firm, leads to a type of economic dependency between the employer and auditors, and threats the audit quality (Choi, Kim, and Zang, 2010; Kraub, Pronobis, and Zulch, 2015) and since the relationship between audit quality and internal control weakness is inverse (Lari Dashtbayaz, Salehi, and Safdel, 2019), it is expected that excessive increase or decrease of audit fee, by leaving an impact on audit quality, to have an adverse effect on internal control weaknesses. Hence, the present study's main objective is to assess the relationship between abnormal audit fees and internal control weaknesses in firms. This paper seeks to figure out whether there is a significant relationship between abnormal audit fees and internal control or not and whether the paid abnormal fees by employers can increase or decrease the weakness in internal control or not.

Within the previous studies (Munsif, Raghunandan, and Rama, 2012; Lenard et al., 2016; Chen et al., 2019; Lai, Liu, Chen, 2020), only the presence of weakness in auditor report has been considered as a criterion for internal control weakness. In this paper, however, four variables of financial control weakness, nonfinancial control weakness, IT system weakness, and auditor’s report lag (Buslepp et al., 2019) are used for the first time in the framework of exploratory factor analysis. Moreover, the model of Blankley, Hurrt, and MacGregor (2012) is used in this paper to determine the abnormal fees.

2. Literature Review and Hypothesis Development

2.1. Internal control

Designing and establishing a robust internal control system have a considerable impact on attracting the trust of investors. Moreover, such a controlling system's quality contributes to capital efficiency (Cheng, Dhaliwal, & Zhang, 2013). Hence, the realization of contributing factors to the system is of great importance. In general, firms are always more willing to utilize the experience and specialized individuals in finance

because the recruitment of such people in finance and accounting software contributes to the decline of internal control weakness (Gao et al., 2020). Since there is a significant relationship between Information Technology and internal control in organizations (Abbaszadeh, Salehi, & Faize, 2019), IT can aid the evaluation of internal control structure in the organization, such that firms with IT weakness in their audit reports are more willing to assign IT specialist managers to preserve the eligibility of organizational position (Haislip et al., 2015). In addition to helping the effectiveness of internal controls and audit process efficiency, the IT system has a decreasing effect on the audit fee (Chen et al., 2014).

Heninger, Johnson, and Kuhn (2018) show that the IT system's weakness leads to increased abnormal accruals. Moreover, the rise of audit costs leads to the decline of prediction power and earnings quality (Kim, Richardson, Watson, 2018). The studies of Donelson, Ege, and McInnis (2017) indicate that the chance of receiving fraud in the audit report in firms with internal control weakness is more than in other firms. Given the significance of internal control weaknesses, disclosure or corrective reports about them can cause investors' distrust of auditors (He & Thornton, 2013). Further, such reports' publication date is also essential in that such information contributes significantly to investors for better allocation of resources (Dahawy & Samaha, 2010). Among the items that lead to a delay in the audit report is a weakness in the internal control system. It makes the auditors spend more hours auditing the firms, so audit report delays and an increase in audit fees would be evident (Luikko, 2017). The studies of Khlif and Samaha (2014) also show that internal control quality causes a delay in the audit report. Ettredge, Li, and Sun (2006) also observe that firms with weaknesses in internal control systems usually delay their audit reports. Hence, regarding the effectiveness of internal controls on delay in the audit report, we can expect that audit report delays to work as a signal of weakness in internal control systems of firms, so, in this paper, the variable of audit report delay is considered as one of the contributing components for evaluating internal controls.

2.2. Audit fees

The valuable accounting information position in financial markets has directed scholars and economists' attention toward this area. Financial reports are one of the significant information resources available to users for economic decision-making. The information gap, however, between factors inside and outside the organization requires independent judgment. To assess and give credit to financial reports, auditors ask for payment which is reflective of their attempts and economic costs and some factors, including employer risk, volume, and complication of employer operation (Habib, Jiang, & Zhou, 2015), audit firm size (Coffie & Bedi, 2019), auditor’s experience (Kimeli, 2016), auditor’s specialization (Habib, 2011) contribute to the amount of the price. Besides, the presence of major internal control weaknesses in nonfinancial reports influences audit fee determination because it increases audit risk by increasing customers' legal lawsuits (Ji, Lu, Qu, 2018). Hence, an increase in internal controls' quality decreases the risk of a legal lawsuit that firms are likely to face (Zhang, 2020). Yang et al.'s (2019) studies show a negative and significant relationship between internal control and audit fee, which means auditors ask for higher fees in facing firms with internal control weaknesses. Ji (2017) states that the decline of internal control quality increases audit fees because internal control weakness in a business firm obliges the auditors to spend more time. Since one of the determining criteria of audit fees is the audit process's duration, auditors ask for higher costs (Luikko, 2017). This is while the improvement of internal control weakness causes the firms to pay less than firms with weakness in the internal control system (Munsif et al., 2011).

Deviation from standard audit fees determined in each industry is referred to as

abnormal audit fees (Oladipupo and Monye-Emina, 2016). The abnormal increase or decrease in approved rates has some positive and negative consequences for the firm. Some of the scholars, including Krauß, Pronobis, Zülch (2015) and Choi, Kim, Zang (2010), believe that an increase in abnormal fee causes the decline of auditor's independence, so audit quality in firms' increases or decreases firms along with the rise of the abnormal fee. This is while other scholars, including Coulton et al. (2016) and Eshleman and Guo (2014), consider an increase in audit fees as a positive factor that elevates the audit's motivation and attempt to enhance the audit quality.

2.3. The theoretical principles between abnormal audit fees and internal control

Applying an internal control system in organizations and effectiveness and efficiency increases financial transparency and responsibility, leads to more alignment with governing rules and regulations in the firm, and prevents the outbreak of distortion and fraud in the firm. Since auditors have a supervisory role in the firm and support the investors, audit services play an essential role. The quality of presented services is also one of the significant aspects that the previous studies, including Lari Dasht Bayaz, Salehi, and Safdel (2019), introduced internal control weakness as one of the contributing factors to the quality of financial reporting and stated that increase in weaknesses leads to a decrease in audit quality. In this regard, the studies of Chen et al. (2012) also reveal a negative relationship between audit quality and internal control weakness, such that firms audited by high-quality firms improve their weaknesses during a shorter period. Presenting high-quality audit services always incurs some costs on organizations, which are referred to as audit fees. These costs are under the influence of several factors, including employer risk and auditor attempt.

Deviation from the determined fee is classified as an abnormal audit fee due to the auditor's more attempts to increase the audit quality (Eshleman and Guo, 2014; Coulton et al., 2016). Although positive abnormal audit fee causes a dependency between the employer and auditor that can threaten the independence of the auditor and lowers the audit quality (Krauß, Pronobis, Zülch, 2015), there is an inverse relationship between positive abnormal audit fee and audit quality (Choi, Kim, Zang,2010; Hapsore and Santoso, 2018). On the other hand, the excessive decline in audit fees can also negatively impact audit quality by decreasing auditor's attempt and via audit tests (Nugroho and Fitriany, 2019: Zhang, 2017). Thus, the decline of audit quality increases the weakness in internal controls. Under such circumstances, we expect an increase in abnormal audit fee to increase the number of internal control weaknesses by affecting the audit quality, so given the abovesaid facts, the research hypothesis is formulated as follows:

H1: There is a significant relationship between abnormal audit fees and internal control weaknesses.

3. Research Methodology

The present study is practical, objective, and correlational in terms of nature and content.

The statistical sample of the study includes those firms that listed at least until the end of 2011 on the Tehran Stock Exchange, had no more than six months of transaction halt, been active during 2012-2018 in Tehran Stock Exchange, their financial information was available, and finally, were no affiliated with investment firms, banks, insurance, and financial intermediaries. After imposing the said limitations, the statistical sample of the study is provided in Table (1) as follows:

Table 1. The statistical population

No.		Description	No. of firms
Limitations	1	The statistical population in the date of data collection	401
	2	Firms were not completely active during 2012-2017 in the Stock Exchange or listed on the Stock Exchange after 2012	(24)
	4	Their information is not available	(108)
	5	Are among financial and investment firms or financial intermediaries and insurance	(82)
Statistical population			**187**

3.1. Data collection and method

The primary information and data for hypothesis testing were collected using the Tehran Stock Exchange information bank, including Rah Avard-e Novin and the published reports of the Tehran Stock Exchange in Codal Website and, finally, the Stata Software carries out data analysis.

3.2. Data analysis method

The data analysis method is cross-sectional and year-by-year (panel data). In this paper, the multivariate linear regression model is used for hypothesis testing. Descriptive and inferential statistical methods are used for analyzing the obtained data. Hence, the frequency distribution table is used for describing data. At the inferential level, the F-Limer, Hausman test, normality test, and multivariate linear regression model are used for hypothesis testing.

3.3. Research model

$$Ln(Afee_{it}) = b_0 + b_1 lTA + b_2 CR + b_3 CA\_TA + b_4 ARINV + b_5 ROA + b_6 LOSS + b_7 FOREIGN + b_8 MERGER + b_9 BUSY + b_{10} LEV + b_{11} INTANG + b_{12} SEG + b_{13} OPINION + b_{14} MATWEAK + b_{15} INDCON + Year + \varepsilon_{it}$$

$$CI = b_0 + b_1 ABFEE + b_2 LTA + b_3 Loss_{it} + b_4 ROA_{it} + b_5 LEV_{it} + b_6 Employees_{it} + b_7 GCO_{it} + b_8 spec + b_9\ Cr + b_{10} Age + b_{11} invta + b_{12} Sale\ G + b_{13} Quick\ rate + b_{14}\ Restate + b_{15}\ Cfo + b_{16}\ FSM + b_{17}\ ISM + b_{18}\ audit\ change + b_{19} Z_{Altman} + b_{20}\ MTB + b_{21}\ Big4 + b_{22}\ busy + Year + INDCON + \varepsilon_{it}$$

where**:**

LN (FEE): natural logarithm of audit fee

CI: the following variables are used for measuring internal control quality

ABFEE: abnormal audit fee which is obtained from model residuals

Delay: is equal to the number of days spent between the end of the fiscal year of employer and data of auditor's opinion

IT Material Weaknesses: if weakness in the IT system is mentioned in auditor's report 1, otherwise, 0

Icwf: if financial weakness is mentioned in auditor's report 1, otherwise, 0

Icwof: if nonfinancial weakness is mentioned in auditor's report 1, otherwise, 0

LTA: the logarithm of total assets at the end of the fiscal year

CR: current assets divided by current liabilities

CA_TA: current assets divided by total assets

ARINV: total accounts receivable and inventory divided by total assets
ROA: Return on assets obtained from dividing operation profit into total assets of the firm
Loss: in case the firm is losing in the current year 1, otherwise, 0
FOREIGN: if the firm has any foreign operation 1, otherwise, 0
MERGER: if the firm has a merger 1, otherwise, 0
Busy: if the fiscal year is based on March 20 1, otherwise, 0
LEV: total liabilities to total assets of the firm
INTANG: intangible assets to total assets
SEG: the logarithm of the number of auditor's report clauses of the firm i in the year under study.
OPINION: if the audit report is adjusted 1, otherwise, 0.
MATWEAK: if weakness reports received in internal control 1, otherwise, 0.
INDCON: virtual variable of industry.
Year: virtual variable of year
Employees: is equal to the logarithm of the number of staff.
GCO: if the firm has continuity according to audit report 1; otherwise, 0.
Spec: the following model is used for calculating the auditor's industry specialization

Auditor's specialization =

$$\frac{\textit{total assets of all employers of every special audit firm in speciali ndustry}}{\textit{total assets of all employers in special industry}}$$

Suppose the obtained value is more than [(number of existing firms/1)*1.2]. In that case, the audit firm is specialized in that industry, so if an audit firm is an industry specialized 1, otherwise, 0 will be assigned (Habib & Bhuiyan, 2011).
Age: is the distance between firm establishment and the current year
Quick: current assets minus inventories divided by current debts of the firm i in the year understudy
Sales G: sales of the current year minus that of the previous year divided by sales of the previous year
Invta: inventory to total assets of the firm i at the end of fiscal year
FSM: if the firm CEO has a degree related to finance majors, including accounting, economics, and financial management 1, otherwise, 0.
ISM: if the firm CEO has a degree related to one of the related industries 1, otherwise, 0.
Audit Change: if the auditor has changes 1, otherwise, 0.
MTB: market value to book value of equity of the firm i in the year under study.
Big: if the firm is audited by the audit organization 1, otherwise, 0.

Z-Altman

If the following equation's obtained figures are lower than 1.8, the firm would be bankrupted within the upcoming two years with the 99% probability level. In case z is more than 3, the firm is bankrupted.

$Z - Score = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$

Where

Z= total index
X_1: working capital to total assets
X_2: accumulated earnings to total assets
X_3: profit before tax and interest to total assets
X_4: book value of the firm stock to book value of total liabilities
X_5: sales to total assets

4. Data analysis

4.1. Descriptive statistics

As can be seen in Table 2, the mean financial leverage is 0.612, which shows firm liabilities are, on average, more than half of their assets. Moreover, the number of observations in the CEO specialization variables and audit fee is lower due to nondisclosure in financial statements. The maximum and minimum internal control obtained from the factor analysis (financial weakness of internal control, nonfinancial weakness of internal control, weakness in the IT system, and audit report delay) is 0.007 and 1.932, respectively. The maximum and minimum abnormal audit fee, which is the residual of the model (1), are 5.385 and 6.903, respectively.

4.2. Inferential test

4.2.1. The results of the unit root test of variables

Given the obtained LM statistic in Table 3, all variables' unit root is mostly stationary.

4.3. The results of the Kolmogorov test

This test aims to assess the normal distribution of data, so the rejection of the Kolmogorov test is indicative of the normal distribution of data, and parametric statistical tests can be used in the study. This is while the acceptance of the test allows us to use nonparametric statistical tests. Regarding Table 4, most of the p-values of variables are more than the probability level (0.005), so variable distribution can be normal with an appropriate probability.

Table 2. Descriptive Statistic

variable	obs	Mean	Std. dev	Min	Max
LnAfee	1309	7.338	1.638	2.302	14.390
LTA	1309	14.301	1.542	10.532	19.773
CR	1309	1.4688	1.062	0.164	13.150
CA_TA	1309	0.656	0.193	0.065	0.985
ARINV	1309	0.607	1.249	0.002	36.685
ROA	1309	0.270	0.896	-16.845	10.045
LOOS	1309	0.139	0.346	0	1
FOREOGN	1309	0.892	0.310	0	1
MERGER	1309	0.411	0.492	0	1
BUSY	1309	0.684	0.464	0	1
LEV	1309	0.612	0.270	0.061	4.002
INTANG	1309	0.006	0.041	0	1.465
SEG	1309	2.633	0.236	1.945	3.465
OPINION	1309	0.522	0.499	0	1
MATWEAK	1309	0.346	0.475	0	1
EMPLOYEES	1309	5.789	1.449	1.397	10.087
ABFEE	1309	0.025	1.635	-5.385	6.903
GCAO	1309	0.066	0.248	0	1
CI	1309	0.567	0.454	0.007	1.932
ISM	1309	0.444	0.497	0	1
FSM	1309	0.305	0.460	0	1
BIG	1309	0.246	0.430	0	1
MTB	1309	4.842	11.770	-59.594	309.209
AUDID CH	1309	0.328	0.469	0	1
Z_ALTMAN	1309	0.396	0.489	0	1
CFO	1309	0.118	0.135	-0.460	0.871
RESTATE	1309	0.747	0.434	0	1
SPEC	1309	0.433	0.495	0	1
QUIKE	1309	0.875	0841	-4.091	10.433
AGE	1309	39.301	13.185	8	67
INVTA	1309	0.284	0.661	0	17.877
SALE G	1309	1.100	25.466	-1	902.671

Table 3. The results of the Hadari unit root test

Variable	Sig.	Variable	Sig.	Variable	Sig.
AUDIT CH	0.3647	*FOREIGN*	1.0000	*LN FEE*	0.2415
MTB	0.7985	*MERGER*	0.8456	*LTA*	0.5615
Z_ALTMAN	0.2139	*BUSY*	0.1892	*CR*	0.8450
BIG4	0.1406	*LEV*	0.9903	*CA_TA*	0.5486
SEG	0.9812	*INTANG*	0.1873	*ARINV*	0.8419
ISM	1.0000	*FSM*	0.2098	*ROA*	0.4781
MATWEAK	0.8750	*OPINION*	1.0000	*LOOS*	0.3512
AGE	0.8743	*SPEC*	0.3158	*EMPLOYEES*	1.0000
CI	0.2158	*SALE G*	0.2684	*INVTA*	0.4433
QUIKE	0.5017	*ABFEE*	0.1982	*RESTATE*	0.2981
CFO	*0.6812*				

4.4. Results of the linearity test

The linearity test aims to assess the correlation among independent variables in the regression. To some extent, linearity exists among variables, but an important point here is the amount and severity of that. As shown in Tables 5 and 6, the value of VIF statistic for all variables is less than 10, so there is no linearity among existing variables in models.

Table 4. The results of the Kolmogorov Smirnov Test

Variable	Sig.	Variable	Sig.	Variable	Variable
AUDIT CH	1.000	*FOREIGN*	0.397	*LN FEE*	0.280
MTB	0.000	*MERGER*	1.000	*LTA*	0.291
Z_ALTMAN	0.000	*BUSY*	0.099	*CR*	0.210
BIG4	0.995	*LEV*	0.924	*CA_TA*	0.435
SEG	0.002	*INTANG*	0.397	*ARINV*	0.855
ISM	0.032	*FSM*	1.000	*ROA*	0.024
MATWEAK	0.001	*OPINION*	0.000	*LOOS*	0.733
AGE	0.002	*SPEC*	1.000	*EMPLOYEES*	0.000
CI	0.000	*SALE G*	0.000	*INVTA*	0.000
QUIKE	0.000	*ABFEE*	0.555	*RESTATE*	0.005
CFO	0.000	*GCAO*	0.029		

Table 5. The results of the VIF test for model 1

Variable	VIF	1/VIF
LEV	1.78	0.561
CR	1.71	0.583
LTA	1.41	0.707
CATA	1.37	0.729
MERGER	1.22	0.817
FOREIGN	1.21	0.824
SEG	1.20	0.833
LOOS	1.16	0.861
BUSY	1.08	0.925
MATWEAK	1.07	0.938
OPINION	1.06	0.945
ARINV	1.06	0.946
ROA	1.04	0.966
INDCON	1.03	0.967
INTANG	1.02	0.981
Mean VIF	1.23	

Table 6. The results of the VIF test for model 2

Variable	VIF	1/VIF
CR	9.35	1.106
QUIKE	9.22	0.108
INVTA	3.74	0.267
LTA	2.44	0.409
LEV	2.01	0.498
CFO	1.69	0.590
ZALTMAN	1.53	0.652
SPEC	1.47	0.678
EMPLOYE	1.41	0.708
BIG1	1.38	0.725
ISM	1.37	0.731
FSM	1.29	0.776
ROA	1.27	0.788
LOOS	1.24	0.805
BUSY	1.19	0.840
GCAO	1.14	0.879
ADCHANGE	1.13	0.888
RESTATE	1.07	0.934
AGE	1.06	0.942
MTB	1.05	0.953
ABFEE	1.05	0.954
SALEG	1.02	0.981
Mean VIF	2.19	

Table 7. The Sensitivity test for model 1

	LNAFEE	LTA	CR	CATA	ARINV	ROA	LOOS	FOREIGN	MERGER	BUSY	LEV	INTANG	SEG	OPINION	MATEWEAK	INDCON
LNAFEE	1.000															
LTA	0.093	1.000														
CR	0.043	-0.157	1.000													
CATA	-0.012	-0.178	0.287	1.000												
ARINV	-0.019	-0.080	0.026	0.111	1.000											
ROA	-0027	0.078	0.038	-0.002	-0.004	1.000										
LOOS	-0.021	-0.125	-0.124	0.015	-0.018	-0.129	1.000									
FOREGIN	0.062	0.0306	-0.074	0.032	-0.120	0.010	0.042	1.000								
MERGER	0.033	0.378	0.050	-0.137	-0.053	-0.028	-0.016	0.122	1.000							
BUSY	0.231	0.0125	0.031	0.023	-0.043	-0.009	0.042	0.139	-0.047	1.000						
LEV	-0.008	0.053	-0.500	0.182	0.052	-0.030	0.271	0.098	-0.140	0.011	1.000					
INTANG	0.004	0.005	0.006	-0.043	0.107	0.001	-0.012	0.012	0.013	0.033	-0.041	1.000				
SEG	-0.032	0.181	-0.107	0.007	0.043	-0.061	0.131	-0.032	0.198	-0.041	0.241	-0.032	1.000			
OPINION	-0.033	-0.055	0.048	0.015	0.005	0.050	-0.079	-0.041	-0.000	-0.091	-0.068	-0.041	-0.187	1.000		
MATWEAK	-0.117	-0.032	0.052	0.016	-0.035	-0.004	0.074	-0.096	-0.011	-0.143	-0.021	-0.031	0.070	0.099	1.000	
INDCON	-0.030	-0.040	0.014	0.045	-0.032	-0.002	-0.041	-0.146	-0.003	-0.057	-0.016	0.006	0.055	-0.042	0.038	1.000

Table 8. The Sensitivity test for model 1

	CI	ABFEE	LTA	LOOS	ROA	LEV	EMPLOYE	GCAO	SPEC	CR	AGE	INVTA	SALEG	QUIKE	REASTATE	CFO	FSM	ISM	ADCHANGE	ZALTMAN	MTB	BIG1	BUSY
CI	1.000																						
ABFEE	0.048	1.000																					
LTA	0.024	-0.158	1.000																				
LOOS	0.012	-0.000	-0.123	1.000																			
ROA	-0.103	-0.016	0.126	-0.204	1.000																		
LEV	0.002	-0.026	0.063	0.284	-0.316	1.000																	
EMPLOYE	0.135	-0.016	0.401	0.151	0.028	0.075	1.000																
GCAO	-0.001	-0.049	0.023	0.114	-0.083	0.243	0.037	1.000															
SPECE	0.016	-0.050	0.461	-0.068	0.092	0.061	0.206	0.050	1.000														
CR	0.006	-0.023	-0.165	-0.124	0.153	-0.497	-0.114	-0.065	-0.145	1.000													
AGE	0.031	0.024	-0.053	0.023	-0.087	0.020	-0.062	0.005	0.051	0.037	1.000												
INVTA	-0.055	0.027	-0.275	0.038	-0.049	0.035	-0.152	0.061	-0.089	0.157	-0.016	1.000											
SALEG	-0.025	-0.017	0.029	-0.015	-0.002	-0.014	0.000	0.015	-0.034	0.007	0.043	-0.037	1.000										
QUIKE	0.019	-0.055	-0.003	-0.111	0.134	-0.358	-0.006	-0.069	-0.057	0.788	0.053	-0.371	0.030	1.000									
REATATE	0.028	0.026	0.024	0.109	-0.023	0.069	0.112	0.041	-0.037	-0.028	-0.010	-0.032	-0.053	-0.021	1.000								
CFO	-0.006	-0.101	0.580	-0.047	0.254	-0.125	0.244	-0.012	0.246	-0.003	-0.110	-0.141	-0.003	0.046	0.042	1.000							
FSM	0.002	0.009	-0.090	0.008	-0.044	-0.016	-0.042	0.060	-0.090	-0.005	0.078	0.003	-0.025	-0.042	0.031	0.009	1.000						
ISM	-0.013	-0.037	0.157	-0.082	-0.041	0.127	0.061	0.057	0.143	-0.028	0.008	0.017	0.043	0.030	-0.066	-0.007	-0.393	1.000					
AUDITCH	-0.131	-0.072	-0.037	-0.023	-0.020	-0.013	-0.232	0.010	-0.062	-0.001	-0.046	0.017	-0.013	-0.007	0.042	0.034	0.024	-0.021	1.000				
ZALTMAN	0.057	-0.027	0.104	0.211	-0.339	0.480	0.021	0.115	-0.010	-0.372	0.037	-0.103	-0.032	-0.272	0.103	-0.067	0.046	0.065	0.003	1.000			
MTB	-0.125	0.004	-0.120	-0.000	0.023	-0.027	-0.087	-0.085	-0.045	0.002	0.0400	0.031	0.005	-0.000	-0.087	-0.051	0.005	0.038	0.006	-0.008	1.000		
BIG1	0.037	-0.046	0.317	-0.008	0.015	0.098	0.198	-0.036	0.420	-0.130	0.095	-0.038	0.046	-0.073	-0.112	0.115	-0.098	0.096	-0.212	0.004	-0.057	1.000	
BUSY	-0.011	-0.034	0.087	0.038	0.024	0.010	-0.097	-0.176	0.057	0.037	0.031	0.022	0.019	0.025	-0.008	0.060	-0.159	-0.128	0.039	-0.061	0.058	0.106	1.000

4.5. Sensitivity test

The aim of performing a sensitivity test is to assess binary relationships between variables.

4.6. Regression results

Table 9. The results of model 1

variable	Coef	Std.Err	Z	p-value
CONS	6.387	0.880	7.26	0.000***
LTA	0.069	0.026	2.66	0.008***
CR	0.099	0.053	1.85	0.064*
CA_TA	-0.665	0.316	-2.10	0.036**
ARINV	-0.000	0.000	-2.27	0.023**
ROA	-0.033	0.006	-5.04	0.000***
MERGER	0.018	0.003	5.01	0.000***
BUSY	0.774	0.112	6.86	0.000***
LEV	0.363	0.089	4.06	0.000***
INTANG	-0.438	0.177	-2.47	0.013***
SEG	-0.165	0.073	-2.26	0.024**
OPINION	-0.058	0.020	-2.80	0.005***
MATWEAK	-0.293	0.100	-2.93	0.003***
EMPLOYEES	-0.003	0.001	-1.91	0.057**
Weighted Statistics				
R_Squared	0.0077			
Adjusted R-Squared	0.2383			
Model p-value	Chi2(15)=99.55			
	0.000			
F_ Limer	F(173,864)=1.33			
	0.005			
Hasman	Chi2(14)=20.21			
	0.1235			

***denotes the significance level at 99% **denotes the significance level at 95% *denotes the significance level at 90%

Table 10. The results on model 1 with the Least Square Regression

variable	coef	Std.Err	Z	p-value
CONS	6.376	0.777	8.20	0.000***
LTA	0.073	0.039	1.85	0.065*
CR	0.116	0.059	1.97	0.049**
CA_TA	-0.183	0.061	-2.98	0.003***
ARINV	-0.086	0.046	-1.87	0.061*
ROA	-0.036	0.016	-2.27	0.024**
MERGER	0.012	0.006	1.90	0.057**
BUSY	0.774	0.116	6.66	0.000***
LEV	0.588	0.079	7.41	0.000***
INTANG	-0.028	0.005	-4.90	0.000***
SEG	-0.251	0.228	-1.10	0.272
OPINION	-0.014	0.005	-2.80	0.005***
MATWEAK	-0.289	0.106	-2.71	0.007***
EMPLOYEES	-0.002	0.007	-0.34	0.736
Weighted Statistics				
R_Squared	0.7795			
Adjusted R-Squared	0.6893			
p-value	F(15,1036)=5.33			
	0.000			

***denotes the significance level at 99% **denotes the significance level at 95% *denotes the significance level at 90%

Table 11. The results of the first model with fixed effect

variable	coef	Std.Err	Z	p-value
CONS	8.539	2.430	3.51	0.000***
LTA	0.056	0.016	3.41	0.001***
CR	0.173	0.078	2.21	0.027**
CA_TA	-0.353	0.050	-6.97	0.000***
ARINV	-0.003	0.012	-1.92	0.054**
ROA	-0.034	0.010	-3.32	0.001***
MERGER	0.022	0.012	1.78	0.075*
BUSY	0.363	0.180	2.01	0.046**
LEV	0.744	0.063	11.67	0.000***
INTANG	-0.511	0.242	-2.11	0.035**
SEG	-0.092	0.051	-1.80	0.075*
OPINION	-0.014	0.005	-2.80	0.005***
MATWEAK	-0.318	0.120	-2.64	0.008***
EMPLOYEES	-0.010	0.025	-0.40	0.689
Weighted Statistics				
R_Squared	0.0183			
Adjusted R-Squared	0.0166			
p-value	F(14,864)=1.15			
	0.3103			

***denotes the significance level at 99% **denotes the significance level at 95% *denotes the significance level at 90%

Model (1) analysis is for calculating abnormal audit fees, which is obtained from the residuals of model (1) and depicted in Table 9. Ordinary Least Squares and Fixed Effects tests are used for ensuring the soundness of the selected test, the results of which are illustrated in Tables 10 and 11, respectively.

Table 12. The results on model 2 with the Least Square Regression

variable	coef	Std.Err	Z	p-value
CONS	0.652	0.209	3.12	0.002***
ABFEE	0.002	0.000	3.64	0.000***
LTA	-0.010	0.002	-4.96	0.000***
LOOS	-0.002	0.000	-2.10	0.036**
ROA	-0.372	0.118	-3.13	0.002***
LEV	-0.009	0.004	2.02	0.045**
EMPLOYEES	0.040	0.011	3.52	0.000***
GCAO	-0.000	0.000	-3.51	0.000***
SPEC	0.003	0.000	9.62	0.000***
CR	0.030	0.013	2.35	0.020**
AGE	0.118	0.046	2.55	0.012***
INVTA	-0.233	0.141	-1.64	0.101
SALE G	-0.001	0.000	-8.93	0.000***
QUIKE	-0.030	0.013	-2.34	0.021**
REATATE	0.111	0.049	2.26	0.026**
CFO	0.118	0.062	1.88	0.060*
FSM	-0.000	0.000	-1.75	0.083*
ISM	-0.008	0.004	-1.77	0.076*
AUDID CH	-0.097	0.031	-3.05	0.002***
Z_ALTMAN	0.051	0.036	1.42	0.157
BUSY	0.185	0.072	2.57	0.010***
Weighted Statistics				
R_Squared	0.8539			
Adjusted R-Squared	0.8766			
p-value	F(22,958)=3.07			
	0.000			

***denotes the significance level at 99% **denotes the significance level at 95% *denotes the significance level at 90%

In the present study, we should determine whether the data are pooled or panel by the F test. This test's null hypothesis is that the data are pooled, and hypothesis 1 claims that data are panel. In case H0 is rejected after performing the F test, the question here is that based on which models of fixed effects or random effects does the model is analyzable, which is determined by the Hausman test. The results of Table (13) indicate a rejection of H1 that shows the data are panel. Hence, the regression of ordinary least squares is used in this paper, and the fixed effects model is used to gain more confidence in the regression. The least-squares regression results in Table (12) demonstrate a positive and significant relationship between abnormal audit fees and internal control weakness. The P-value is 0.000, lower than the significance level. Moreover, the coefficient is 0.002. As depicted in Table (14), the results of fixed effects regression are in line with that because the p-value is 0.000, and the coefficient is 0.009, so the hypothesis is accepted.

5. Discussion and conclusion

Applying an appropriate internal control system in organizations and effectiveness and efficiency increases financial transparency and responsibility, leads to more alignment with governing rules and regulations in the firm, and prevents the firm's distortion and fraud outbreak. Establishing an effective internal control system contributes significantly to the decline of fraud and financial misuses in business firms (Barra, 2010). Internal control weakness causes investors' distrust of firm performance and creates problems in attracting capital and profitability (Su, Zhao, Zhou, 2014). In addition to the supervisory role of internal control and future interests, it bears for the firm, incorrect performance or the presence of weakness in the system can interrupt the financial reporting cycle and leave negative effects on audit quality (Chen et al., 2012). Hence, given the significance of audit quality from the users' point of view in the present study, this paper aims to assess abnormal audit fees' effect on internal control weaknesses. Thus, the model of Blankley, Hurrt, and MacGregor (2012) is used for examining the abnormal audit fee. Moreover, the exploratory factor analysis is used to measure the internal control variable for the first time. Four variables of financial control weakness, nonfinancial control weakness, weakness in the IT system, and audit report lag are considered internal control components.

The hypothesis testing results show a positive and significant relationship between abnormal audit fees and internal control weaknesses. These results suggest that abnormal fees can increase the weaknesses in the internal control of the firm. Since audit fees comprise the number of working hours and audit attempts, the excessive decline of payment can lower the audit quality and increases internal control weakness (Nugroho and Fitriany, 2019: Zhang, 2017). On the other hand, positive abnormal fees create an economic correlation between employers and auditors (Hapsore and Santoso, 2018; Kraub, Pronobis, Zulch, 2015; Choi, Kim, Zang, 2010) that threaten the main index of audit quality. Given the role of audit quality in realizing internal control weaknesses, the present study is in line with Lari Dashtbayaz, Salehi, and Safdel (2019) and Chen et al. (2012). They declare that there is a negative and significant relationship between audit quality and internal control weaknesses.

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Research Article

Impact of Board Incentives and Board Interlocks on Audit Fees

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Abstract

This study aims to examine how board incentives and board interlocks affect audit fees. Using multiple linear regression with panel data, this research shows a significant relationship between the board incentives and future audit fees. In contrast, this relationship is not significant for current audit fees. Furthermore, there is a significant relationship between board interlock in companies with future audit fees, while this relationship is not significant for the current audit fees. This paper contributes to the literature on the determinants of audit fees.

Keywords: Board incentives, Board compensation, Audit fees, Board interlock

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1. Introduction

To manage and organize daily company operations, guidance and leadership are transferred from board to president and from the president to the chief executive officer. Thus, as a representative of company shareholders, the board is responsible for monitoring and controlling the company. Therefore, executive officers of companies are responsible for daily operations and business processes. The board is also responsible for the company's ultimate operation and financial health (Salehi, 2020). The main responsibility of the board is to create effective corporate governance in the interests of shareholders and balance in the interests of its various stakeholders, including customers, employees, investors, and local communities, and provide independent oversight on CEO's performance and challenge management strategies and business decisions (Richardson et al., 2001). The meaning of board interlock, interlocks of the board that simultaneously hold the position board in another company (Mizruchi, 1996). While the board interlocks are playing a vital role in the organization (Fama and Jensen, 1983), interlocks' performance has positive and negative consequences for the organization (Erickson et al., 2006). Finally, it can be argued that independent audit fees can be used to measure the complexity of corporate financial reporting. In this research, by studying the board compensation effect and the existence of a board with an interlock on audit fees, we study that the managers, as their agents, improve their programs and performances, as well as reduce the risk of information uncertainty under seeking maximum compensation.

2. Theoretical framework and hypothesis development

The complexity of companies is one of the reasons for audit fees increasing. Companies that have complex operations and structures pay more wages to the CEO to manage their operations (Seifzadeh et al., 2020). On the one hand, managers who earn more profits will be eligible to receive more compensation (Fama, 1980).

When company operations are widespread and complex, the demand for monitoring the financial reporting process will increase. Companies with complex operations require many audit services (Salehi et al., 2019). As a result, they also pay more fees to audit firms. Also, these companies need non-executive directors to supervise the audit process; therefore, more compensation is paid to executives who are interlocks of the audit committee (Wysochi, 2010).

Despite the controversy about the relationship between the board's risk and compensation structure, the consensus is that if other conditions are equal, with uncontrollable risk increasing of company, the compensation paid to managers is also due to the acceptance of a higher level of risk will be increased. It should be noted that compensation of the board can override investment management decisions that affect the risk. So, risk can be limited by the type of compensation attributed to management (Jin, 2002; Coles et al., 2006). Hermalin (2005) believes that systematic increases in remuneration for CEO are due to the strengthening of the corporate governance system and higher managerial management over similar periods. Because strengthening a corporate governance system creates a possibility that if the manager's performance is weak, it will be removed (Salehi et al., 2020). Some managers optimally make decisions to earn more compensation and maintain their job position. In some cases, they are also protected by their friendly relations with board interlocks and receive more compensation. These managers' groups to defend their position are invited to auditors to make comments following their wishes (Bebchuk and Fried, 2005).

Managers' compensations emphasize short-term payments, which may create problems for the company. Therefore, an increase in earnings management, leading to an increase in managers' compensation, will also increase auditors' higher fees.

Another view is that if compensation agreements are properly designed, managers are motivated to do their job properly and may not need independent auditor services. With this description, there can be an inverse relationship between compensation and fees. Variation in compensation schemes can be another strategy to motivate managers, and with less incentive for the manager to manipulate profits, fewer costs are spent on auditing.

When managers' compensation is according to their performance, they tend to invest in capital and long-term plans. When the management goals are long-term, his incentive to manipulate profits decreases and the need for additional services for auditors is reduced. Finally, if managers are given compensation choices like an option, it can be expected that the manipulation of profits and additional fees to auditors will be reduced (Vafeas and Waegelein, 2007). When paying compensation is based on profitability, despite its high benefits, it may be manipulating profits. By manipulating profits, auditors face a higher risk of discovering manipulated cases (Heninger, 2001; Palmrose and Scholz, 2004). Because of profit management risk and its impact on management compensation, American Accounting Standards express that auditors must review managers' compensations. The purpose of this recognition is to determine the risk of significant errors. Managers may have financial or non-financial incentives to acquire assets and build governance structures. Some managers can apply for more compensation. In the process of creating this governing structure, the complexity of the organization may be greater. Fargher et al. (2013) reported that managers' stock portfolios reduced risk management incentives and had a negative relationship with audit fees. Bergstresser et al. (2006) found that management incentives are positively related to profit management levels, and profit management in this research has been measured through optional accruals. Cohen et al. (2008) found that an increase in accruals management was associated with increased compensations and reimbursement of co-management services before adopting the Sarbanes-Oxley act. Research on the compensation of directors and audit fees has been investigated, and the main hypothesis of the research has been explained. Gul et al. (2003) found that by increasing compensation to the CEO, their incentive to manipulate accruals, in other words, increased profits, required higher quality audit, and, consequently, higher payouts. Companies with more independent audit fees (indicating more demand for monitoring financial reporting by specialized individuals) have paid more and more fees to the audit committee (Engel et al., 2010). Bedard & Johnson (2004) concluded that with increasing corporate compensation based on corporate profit margins, the probability of profits manipulation was increased, and auditors demand higher fees for high-quality audits and detection of manipulation cases. Osma et al. (2007) showed that the board's compensation significantly determined the manipulation of profits. Therefore, this action's limitation is shaped by the board of directors' interlocks towards the independent board's interlocks. Ali shah et al. (2009) showed a negative relationship between institutional ownership and profit management, while the research results did not show a significant relationship between board compensation and profit management. Jones and Wu (2010) have shown that managers' compensation may change profit management. The result of Leventis and Dimitropoulos (2010) showed that there is a positive relationship between audit independence and audit pricing. The results also showed a positive relationship between audit pricing and profit management for small companies. Alali (2011) reported a strong correlation between increased discretionary accruals with increasing audit fees and increasing CEO compensation. This relationship is moderated by increasing managers' salaries. Lifschutz et al. (2010) concluded that the independence of the board (the ratio of independent directors to the entire board) and the persistence of the audit committee (number of meetings) had a

positive and significant relationship with audit fees. Kim et al. (2014) showed that option to buy managerial shares positively correlates with the audit fees after controlling abnormal accruals and other determinants of audit fees. Besides, they showed that the positive relationship between giving the buyer the option to buy managerial shares and audit fees for better corporate governance is reduced.

Rahman Khan et al. (2011) focus on company ownership of audit fees in emerging economies. The research results showed a significant negative relationship between audit fees with sponsorship and the focus of company ownership. This showed that companies controlling by sponsors and institutional investors paid a small amount of Bangladesh's audit fees. Gong & Li (2012) concluded that in high-yielding companies for CEO, the current year's profit will have more information to predict future earnings. In the prediction of profit, the CEO's predictive power for profit stronger than other predictive factors. They concluded that financial analysts did not use information about managerial shareholder benefits when forecasting profit. Xingze (2012) showed that there is a negative relationship between corporate governance and audit fees. The higher level of corporate governance will result in lower audit fees. The higher level of corporate governance will result in fewer audit fees. Guillet et al. (2012) showed that company performance criteria and managers' characteristics determine managers' compensation in these industries. Johnson et al. (2013) concluded a direct relationship between excessive self-confidence, management compensation, and audit risk estimation. In other words, if the auditor recognizes this personality trait of managers and overestimates the risk of financial reporting, he will demand more fees. Lauck et al. (2014) concluded that the CEO had a significant impact on audit services pricing. Newton (2015) explored the relationship between management compensation, organizational performance, and corporate governance quality in the United States and concluded a negative relationship between management compensation, corporate governance, and organizational performance. The results of Jiang et al. (2015) indicated that profit manipulation increases the likelihood of retrospective observations from profit management, but high-quality auditing limits this effect. However, they did not find such evidence for refinancing from cash flow; in other words, increasing the auditing quality does not affect the resumption of cash flow provision. Chen et al. (2015) also concluded that auditors are more risk-averse when managers' incentives to maintain or increase stock prices are higher; in other words, auditors have more remuneration than companies with more sensitive executives showing fluctuations in stock returns.

According to theoretical foundations and the related literature, the following hypotheses postulated in the study:

H_1: There is a significant relationship between the incentives of the board with current audit fees.

H_2: There is a significant relationship between the incentives of the board with future audit fees.

H_3: There is a significant relationship between the existence of board interlock and current audit fees.

H_4: There is a significant relationship between the existence of board interlock and future audit fees.

This research's statistical population is companies listed companies on the Tehran Stock Exchange and all industries during 2011-2016. Sample of this study, based on its subject, is of knock-out type sampling from a set of companies listed on the Tehran Stock Exchange that have the following conditions:

1. Companies are not interlocks of the financial intermediation industry, holding, and banks. Such companies differ in terms of activities and classification of financial

statement items with other companies.

2. Deals of companies should not be completely stopped during the research period (symbol of the company has not been withdrawn from the exchange).

3. Companies have been accepted at the Tehran Stock Exchange at least since the beginning of 2011.

All required research data for those companies is available during the research period. Considering the above conditions, 94 companies remained, which represents the actual statistical population. Hypotheses were tested using a multiple regression model. Excel was used for data preparation, and Eviews software was used to analyze the data.

3. Data Analysis and Hypothesis Testing

To investigate the relationship between board incentives (board compensation) and audit fees, according to Kim et al. (2016), using the following regression model.

$$LOG\ AUDITFEES = \beta_0 + \beta_1 LOG\ CEOVEGA + \beta_2 LOG\ CEODELTA + \beta_3\ Size + \beta_4 INVREC + \beta_5 LEVERAGE + \beta_6 QUICK + \beta_7 ROA + \beta_8 LOSS + \beta_9\ A\_Size + \beta_{10} EXPERTISE + \beta_{11}\ TENURE + \beta_{12} AUDITOR\ CHANGE + \beta_{13}\ CEOTENURE + \beta_{14}\ DINDUSTRY + e$$

Also, in order to investigate the relationship between board interlocks and audit fees, according to Kim et al. (2016), the following regression model is used:

$$LOG\ AUDITFEES = \beta_0 + \beta_1\ Board\_Interlocks + \beta_2\ Size + \beta_3\ INVREC + \beta_4 LEVERAGE + \beta_5\ QUICK + \beta_6\ ROA + \beta_7\ LOSS + \beta_8\ A\_Size + \beta_9 EXPERTISE + \beta_{10}\ TENURE + \beta_{11}\ AUDITOR\ CHANGE + \beta_{12} EOTENURE + \beta_{13}\ DINDUSTRY + e$$

The definitions of variables are presented below:

LOG AUDITFEES: audit fees logarithm

LOG CEOVEGA: Ownership of board shares, calculated by dividing the total number of board shares into the company's total number. It needs to be explained that the information needed to measure this variable will be extracted from the capital note in the financial statements.

LOG CEODELTA: Logarithm of board compensation that exists in financial statements and its explanatory notes.

Board_Interlocks: shows the presence of board interlock and, if the company has a board interlock, among the companies audited by an audit firm, the number 1 and otherwise it will be 0. More clearly, the purpose of this variable is that the presence of board interlock in two companies may lead to the selection of joint auditor in those companies; therefore, if the two companies have the same board of directors and auditors, this dummy variable will take 1; otherwise, it will be 0.

Size: The company size is equal to the logarithm of the company's sales.

INVREC: Total accounts receivable and inventory.

LEVERAGE: Financial leverage, which is the ratio of total debt to assets.

QUICK: Current ratio, the quick ratio for the company i in year t. This is calculated by dividing current assets into current debts.

ROA: Return on assets is calculated by dividing interest before deducting interest and tax on total assets.

LOSS: fictional variable, equivalent to 1 if the company is losing, otherwise it is 0.

A_Size: the size of the auditor, if the auditor belongs to the audit firm, is equivalent to 1 and otherwise equal to 0.

EXPERTISE: Audience industry expertise, equivalent to 1 if the auditor is an industry specialist and otherwise 0. To determine the auditor's specialty in the industry, we consider the share of auditors' markets so that institutions are considered as industry specialists, whose market share (equation 1) is greater than the equation (2) (Palmrose, 1989).

Equation 1 auditors market share= $\frac{total\ assets\ of\ all\ the\ owners\ of\ each\ industry\ audit\ firm}{Total\ assets\ of\ all\ owners\ in\ this\ industry}$

Equation 2: $[(\frac{1}{Companies\ in\ an\ industry})* 1.2]$

TENURE: Auditor's term time.

AUDITOR CHANGE: auditor's change, equivalent to 1 if the auditor changes, otherwise it is 0.

CEOTENURE LOG: The term time of CEO.

DINDUSTRY: Industry Indicator

Examinations related to research hypotheses

Hypotheses Test

Descriptive statistics

Table 1 shows the descriptive statistics of the research variables. As respects, the mean and median of all quantitative variables have a small difference. We can say that the variables have a normal distribution. On the other hand, as respects that the average logarithm of audit fees is close to the minimum, it is not unusual for audit firms to receive their fees. Also, the average board stock ownership is 0.054. The cash compensation logarithm of board interlocks was 2.525. The minimum was 0 that either company suffered losses, and no compensation was distributed, or it did not have a compensation distribution in the company's policy. The average tenure of the auditor is about

two years, and this amount is about 2.5 years for the CEO. In qualitative variables, out of 564 observations, 241 views had board interlocks. Also, 73 years of corporate loss and 167 observations were audited by a great audit firm. In 174 observations, auditors' changes, and in 330 views were audited by an expert auditor.

Table 1. Descriptive statistics of research variables

Variable	symbol	Mean	Median	S.d	Min	Max
audit fees	*LOGAUDITFEES*	8.888	8.837	0.431	8.314	10.038
Ownership of board shares	*CEOVEGA*	0.054	0.055	0.027	0.010	0.099
Logarithm of board compensation	*logceodelta*	2.525	2.916	1.172	0.000	3.281
Size of company	*Size*	13.660	13.585	1.489	10.156	18.936
The logarithm of receipts and inventory	*INVREC*	5.234	5.279	0.765	3.073	7.879
Financial Leverage	*LEVERAGE*	0.391	0.331	0.206	0.143	0.937
quick ratio	*QUICK*	1.648	1.480	0.886	0.244	3.838
Return on assets	*ROA*	0.328	0.374	0.344	-0.999	1.078
Auditor tenure	*TENURE*	1.755	2.000	0.876	1.000	4.000
President tenure	*CEOTENURE*	2.548	2.000	1.377	1.000	9.000

Qualitative Variables Frequency		
presence of a joint board	*Board_Interlocks*	241
Losing company	*LOSS*	73
Auditor Size	*A_Size*	167
Auditor's expertise	*EXPERTISE*	330
AUDITOR CHANGE	*AUDITOR CHANGE*	174
Observations	564	

3.1. Normality of variables

As the results of Table 2 show, none of the research variables follow normal distribution despite the Coincidence (significance of the Kolmogorov-Smirnov test in all of them is lower than 5%). Accounting data is usually not normal, and this Precondition can be ignored.

Table 2. The search variables Normality

Variable	Symbol	Kolmogorov-Smirnov test statistics	Sig.
Logarithms of audit fees	*LOGAUDITFEES*	0.08	0.000
Ownership of the board stock	*CEOVEGA*	0.094	0.000
The logarithm of board compensation	*Logceodelta*	0.195	0.000
size of the company	*Size*	0.052	0.001
The logarithm of receipts and inventory	*INVREC*	0.054	0.001
Financial Leverage	*LEVERAGE*	0.117	0.000
quick ratio	*QUICK*	0.164	0.000
Return on assets	*ROA*	0.073	0.000
Auditor tenure	*TENURE*	0.293	0.000
CEO tenure	*CEOTENURE*	0.190	0.000

3.1.1. The research variables Linearity

To better fit the regression model, the linearity relationship between independent variables should be considered. Regarding all variables, this factor is less than 5; there is no linearity between variables, and the model fitting can be made.

Table 3. variance inflation Factor for research variables

Variable	Coefficient of variance	Variance inflation Factor
CEOVEGA	0.889	1.125
LOGCEODELTA	0.265	3.771
Board_Interlocks	0.764	1.309
Size	0.434	2.307
INVREC	0.446	2.241
LEVERAGE	0.969	1.032
QUICK	0.942	1.061
ROA	0.446	2.146
LOSS	0.281	3.563
A_Size	0.555	1.803
EXPERTISE	0.322	3.105
TENURE	0.386	2.594
AUDITOR CHANGE	0.893	1.120
CEOTENURE	0.951	1.052

4. Findings

Descriptive statistics and assumptions for preparing variables for regression fitting and hypothesis testing were studied in the previous sections. In this section, the hypothesis test is examined. The dependent variable is the logarithm of current and future audit fees, and the independent variable is the compensation of the board of directors and the existence of board interlock.

First, to examine the effects of panel or combination, F Limer's test was performed. The significant value lower than 5% confirms the null hypothesis based on data fitted as a panel.

Table 4. F limer and Hausman tests

Test type	Statistics amount	Sig.
F limer	8.648	0.000
Hausman	24.607	0.026

After the F limer test, the Hausman test is performed to determine constant effects versus random effects. The test significance value is 0.026 and lower than 5%. Thus, the hypothesis test will be performed in panel form with constant effects.

According to Table 5, the Fisher statistic and significant value were 11.296 and 0.000, respectively, indicating proper model fitting at an error level of 5%. On the other hand, the adjusted coefficient is 0.659; independent variables explain 66% of the dependent variable. The Durbin-Watson statistic is 1/822 and located between 1.5 to 2.5, indicating a lack of autocorrelation in model error sentences. But for analyzing hypothesis test results, the significance of the variable is 0/527, and this value not lower than the 5% significance level, and the first research hypothesis is not confirmed. That means there is no significant direct relationship between the incentives of the board and current audit fees.

Table 5. Test results of the first hypothesis

Symbol	Variable	Coefficient	T Statistics	Significant
C	Constant factor	7.709	32.399	0.000
LOGCEODELTA	The logarithm of board compensation	-0.010	-0.566	0.572
CEOVEGA	Ownership of the board stock	-0.221	-0.337	0.736
SIZE	size of company	0.061	4.016	0.000
INVREC	The logarithm of receipts and Inventory	0.058	1.886	0.060
LEVERAGE	Financial Leverage	-0.009	-0.159	0.874
QUICK	*quick* ratio	0.005	0.363	0.717
ROA	Return on assets	-0.045	-1.000	0.318
LOSS	Being losing	-0.026	-0.447	0.655
A_SIZE	size of audit firm	0.022	0.478	0.633
EXPERTISE	Auditor's expertise	0.050	1.283	0.200
TENURE	Auditor tenure	0.027	1.535	0.126
AUDITOR_CHANGE	Auditor Change	0.037	1.733	0.084
CEOTENURE	President tenure	-0.005	-0.692	0.489
Industry	Industry type	Is included		
Fisher's statistic and significant		(0.000)11.296		
R^2		0.723		
Adjusted R^2		0.659		
Durbin-Watson Statistics		1.882		

First, to examine the effects of panel or combination, the F Limer test was performed. The significant value lower than 5% confirms the null hypothesis based on data fitted as a panel.

Table 6. F limer and Hausman tests

Test type	Statistics amount	Significant
F limer	9.830	0.000
Hausman	30.288	0.004

After the F limer test, the Hausman's test is performed to determine constant effects versus random effects. The test significance value is 0.004 and lower than 5%. Thus, the hypothesis test will be performed in panel form with constant effects.

According to Table 7, the Fisher statistic and significant value were 13.359 and

0.000, respectively, indicating proper model fitting at an error level of 5%. On the other hand, the adjusted coefficient is 0.736; independent variables explain 74% of the dependent variable. The Durbin-Watson statistic is 2/138 and is located between 1.5 to 2.5, indicating a lack of autocorrelation in model error sentences. But for analyzing hypothesis test results, the significance of the variable is 0/005, and this value not lower than 5%. Also, the T statistic was 2.809 and positive. In other words, the second research hypothesis is accepted, and there is a significant direct relationship between the incentives of the board and future audit fees.

Table 7. Test results of the second hypothesis

Symbol	Variable	Coefficient	T Statistics	Significant
C	Constant factor	7.781	31.276	0.000
LOGCEODELTA	The logarithm of board compensation	0.055	2.809	0.005
CEOVEGA	Ownership of the board stock	0.060	0.096	0.923
SIZE	size of company	0.027	1.843	0.066
INVREC	The logarithm of receipts and Inventory	0.089	2.534	0.012
LEVERAGE	Financial Leverage	0.016	0.300	0.764
QUICK	*quick* ratio	-0.008	-0.545	0.586
ROA	Return on assets	-0.023	-0.476	0.635
LOSS	Being losing	0.188	3.072	0.002
A_SIZE	size of audit firm	-0.018	-0.406	0.685
EXPERTISE	Auditor's expertise	0.128	2.628	0.009
TENURE	Auditor tenure	0.045	1.832	0.068
AUDITOR_CHANGE	Auditor Change	-0.012	-0.622	0.534
CEOTENURE	President tenure	-0.001	-0.118	0.906
Industry	Industry type	Is included		
Fisher's statistic and significant		(0.000)13.359		
R^2		0.759		
Adjusted R^2		0.736		
Durbin-Watson Statistics		2.138		

The third research hypothesis is as follows: There is a significant direct relationship between board interlock and current audit fees. To examine the effects of panel or combination, an F Limer test was performed. The significant value lower than 5% confirms the null hypothesis based on data fitted as a panel.

Table 8. F limer and Hausman test

Test type	Statistics amount	significant
F limer	8.678	0.000
Hausman	20.739	0.044

After the F limer test, the Hausman test is performed to determine constant effects versus random effects. The test significance value is 0.044 and lower than 5%. Thus, the hypothesis test will be performed in panel form with constant effects.

According to the results of Table 9, the Fisher statistic and significant value were 11.418 and 0.000, respectively, that indicating proper model fitting at an error level of 5%. On the other hand, the adjusted coefficient is 0.660; independent variables explain 66% of the dependent variable. The Durbin-Watson statistic is 1/823 and located between 1.5 to 2.5, indicating a lack of autocorrelation in model error sentences. But for analyzing hypothesis test results, the variable's significance is 0/718, and this value is not lower than 5%, and the third research hypothesis is not confirmed. That means there is no significant direct relationship between the incentives of the board and current audit

fees.

Table 9. Test results of the first hypothesis

symbol	Variable	Coefficient	T Statistics	significant
C	Constant factor	7.688	32.454	0.000
Board-Interlocks	The logarithm of board compensation	-0.008	-0. 361	0.718
SIZE	size of company	0.060	3.984	0.000
INVREC	The logarithm of receipts and Inventory	0.058	1.876	0.061
LEVERAGE	Financial Leverage	-0.009	-0.162	0.872
QUICK	*quick* ratio	0.005	0.324	0.746
ROA	Return on assets	-0.049	-1.101	0.271
LOSS	Being losing	-0.005	-0.110	0.912
A_SIZE	size of audit firm	0.021	0.455	0.649
EXPERTISE	Auditor's expertise	0.051	1.300	0.194
TENURE	Auditor tenure	0.027	1.526	0.128
AUDITOR_CHANGE	Auditor Change	0.037	1.716	0.087
CEOTENURE	President tenure	-0.005	-0.703	0.483
Industry	Industry type	Is included		
Fisher's statistic and significant		(0.000)11.418		
R^2		0.723		
Adjusted R^2		0.660		
Durbin-Watson Statistics		1.823		

The fourth research hypothesis is as follows: There is a significant direct relationship between a board interlock and future audit fees.

To examine the effects of panel or combination, the F limer test was performed. The significant value lower than 5% confirms the null hypothesis based on data fitted as a panel.

Table 10. F limer and Hausman tests

Test type	Statistics amount	significant
F limer	9.997	0.000
Hausman	22.433	0.032

Table 11. Test results of the fourth hypothesis

symbol	Variable	Coefficient	T Statistics	significant
C	Constant factor	7.929	133.108	0.000
Board-Interlocks	The logarithm of board compensation	0.016	3.291	0.001
SIZE	size of company	0.037	7.115	0.000
INVREC	The logarithm of receipts and Inventory	0.061	5.386	0.000
LEVERAGE	Financial Leverage	0.038	3.262	0.001
QUICK	*quick* ratio	-0.004	-1.128	0.260
ROA	Return on assets	0.008	0.670	0.503
LOSS	Being losing	0.034	3.221	0.001
A_SIZE	size of audit firm	0.013	0.732	0.465
EXPERTISE	Auditor's expertise	0.095	7.054	0.000
TENURE	Auditor tenure	0.040	6.285	0.000
AUDITOR_CHANGE	Auditor Change	-0.004	-0.832	0.411
CEOTENURE	President tenure	0.004	2.221	0.027
Industry	Industry type	Is included		

Fisher's statistic and significant	(0.000)13.978
R^2	0.796
Adjusted R^2	0.795
Durbin-Watson Statistics	2.025

After the F limer test, the Hausman test is performed to investigate the constant random variable's effects. It is observed that test significance is 0/032 and lower than 5%. In other words, the hypothesis test will be performed in panel form with constant effects.

According to the results of Table 11, Fisher statistics and significant value of 13.98 and 0.000 respectively, indicating proper model fitting at an error level of 5%. On the other hand, the adjusted coefficient is 0.795; independent variables explain about 80% of the dependent variable. But in the hypothesis test analysis results, the significance of the variable is 0/001 and lower than the 5% significance level. Moreover, T statistics is 3.291 and positive, and therefore, the fourth research hypothesis is confirmed. That means there is a significant direct relationship between the existence of board interlock and future audit fees.

5. Conclusion

The results of this study showed that there is no direct and significant relationship between the incentives of the board and current audit fees. The main reason for the rejection of this hypothesis is the inefficiency of the auditors' labor market in Iran, that mostly, the pricing of audit services does not follow theoretical and logical models, and in many cases, competitive pricing. The results of this hypothesis are consistent with the results of Hermalin (2005). He reported that systematic increases in executive officers' compensation were due to corporate governance and higher management leadership over similar periods. Some officers make decisions in the best way to earn more compensation and maintain their job position. To protect their position, these managers' groups are invited from auditors that submit comments following their request and agree on audit fees. The results also contradict Cohen et al. (2015), which argue that managers' stocks portfolio reduces risk aversion of management incentives and negatively relates to audit fees. The results of this study also showed that there is a direct and significant relationship between incentives of the board and future audit fees, and the results are contrary to the results of Cohen et al. (2015), which suggest that stock portfolios of managers have a negative relationship with audit fees. On the other hand, results are similar to the Wysocki study (2010). One reason to assume a positive relationship between the compensation of board and audit fees is that independent auditors expect managers who receive a high percentage of compensation annually and have more incentives to manipulate profits. With the increasing complexity and risk of the company, auditors are also asking for higher fees. Also, the results are similar to the study of Gul et al. (2003), who found that by increasing compensation to the manager, their incentive to manipulate accruals or profits has increased, which requires higher audit quality and, as a result, higher fees. Bedard and Johnson (2004), Engel et al. (2010) also concluded that companies with more independent audit fees (indicating more demand for monitoring financial reporting by individuals Specialists) paid more wages and compensations to the audit committee. The research findings also showed that there no direct relationship between the existence of board interlock of companies and current audit fees, and the reason for rejection of this hypothesis could be the lack of power of managers in the first year of attending board, because after attending The board of directors and the power and influence of decision making are considered a little conservative. The results of this study contradict the results of the study by Wysocki (2010). Similar to research findings, Guillet et al. (2012), and Coles et al. (2006) and in

the internal domain, Sajjadi et al. (2012) concluded that managers and Their policies could be effective in determining the auditor and, as a result, their current and future fees. Finally, the results showed a significant direct relationship between board interlock and future audit fees. Results are similar to Wysocki's results (2010), which states that the board chooses independent and high-quality auditors to limit manipulation of profits by the manager. Therefore, an increase in profit management, which leads to an increase in compensation for the CEO, will also increase auditors' higher fees. Chen et al. (2015) also reported that the existence of board interlock would reduce the board's independence, which affects the quality of the audit and undermines the auditor's independence. However, an audit can be useful as a powerful oversight mechanism to reduce representation problems. However, given that most board interlocks represent major shareholders, an independent board can also be considered a corporate governance mechanism that will influence the auditor's independence and, as a result, audit quality.

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