The Impact of corporate governance and free cash flow on over-investment

Empirical Evidence from Egypt

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Abstract

      This study explores the impact of corporate governance and free cash on over-investment. Based on a sample of 80 firms in the Egyptian business environment during the period 2012 to 2016. The full sample is divided into subsamples: over-investment firms and under-investment firms then focus on over-investment firms only. For over-investment firms, the study indicates that board duality and audit committee size have a positive effect on over-investment, whereas board independence and managerial ownership do not have an effect on over-investment. The results of these study investigations also show that there is positive and significant relationship between free cash flow and over-investment. In other words free cash flow may increase over-investment. It can be implied according to these finding that free cash flow is deemed as a key factor in creating over-investment and it leads to the occurrence of some agency problems of information asymmetry issues. These results are consist with findings from (Yang and Jiang, 2008) , (Biddle et al., 2009), (Richordson,2007) and (Chen et al.,2016). Shareholders, owners and investors in Egypt's capital market are recommended to pay attention to the factor of free cash flow upon evaluation of investment and include this factors in their decision making models.

Keywords: corporate governance. Free cash flow. Over-investment.

1- **Introduction**

Corporate managers are agents of shareholders, a relationship fraught with conflicting interests. Agency theory, the analysis of such conflicts currently plays a major role in economics literature. The payout of cash to shareholders creates major conflicts that received little attention. Payout to shareholders reduces the resources under managers´ control, thereby reducing managers´ power and making it more likely they will incur the monitoring of the capital markets which occurs when the company must obtain new capital (Rozeff, 1982 and Easterbrook,1983).

The manifestation of inefficient investment includes both over-investment, which shows that a company may undertake some projects with negative net present value, and under-investment which indicates that a company could postpone some investment opportunities that would have positive NPV in the absence of adverse selection (Biddle, Hilary and Verdi, 2009). From a principal- agent perspective, if interest conflicts between the managers and shareholders are reflected in a firms´ investment decision and in order to obtain much more monetary and nonmonetary private benefits associated with a larger company size, such as pursuit of power, as well as perquisites , self-interested managers would continue to invest in some low-return or even loss projects that are beneficial from the view point of managers but are costly from the perspective of shareholders (Jensen, 1986).

Over-investment makes firm's funds sunk costs in idle fields of production capacity, which wastes scares resources and result in reduction in firm value. Therefore, in nature, over-investment is not only whether a

company's investment is efficient ,but also it is an agency problem. The free cash flow hypothesis suggested by Jensen (1986) states that when there exists rich internal cash flows in excess of that required to fund all projects that have positive net present value which are discounted at the relevant capital cost, managers ' empire buildings incentives will create the potential to misuse those funds rather then pay them out to shareholders.

Free cash flow is one of the factors that influence over-investment. According to Jensen´s definition (1986), the free cash flow is cash flow in excess of that required to fund all projects that have positive NPV. He believes that the large amount of free cash flow of a firm increases the potential for over-investment. The sensitively of free cash flow to over-investment naturally becomes the focus of management and shareholders. Lang and Lizenberger, (1991) put forward that the large amount of free cash flow would make management choose some investment projects with negative NPV.

Corporate governance is a mechanism designed to mitigate the agency problem based on monitoring and incentives. Therefore, companies with better governance will be less vulnerable to the over-investment problem and managers will choose better investment opportunities. Firms with poor governance will have higher level of investment compared to other firms in the same industry. Moreover, there is other evidence showing that firms with poor governance make investment too little, which is known as under-investment problem (Tangjitprom et al.,2015).

Following Richardson (2006) creative approach to measure over-investment and free cash flow, and since the free cash flow hypotheses

advanced by Jensen (1986), free cash flow has become one of the most important factors to be considered in the over-investment research. Due to agency problems, there are interest conflict in terms of the use of free cash flow between managers and shareholders. Managers have incentives to hoard and abuse free cash flow and invest the excess funds in some projects with negative NPV which are beneficial from managers' perspective but are costly from shareholders perspective.

Over-investment is investment of surplus cash (free cash flow) in value destroying projects . It also means investing in projects that have negative NPV. Over-investment enhances manager's private benefits, destroys company value and thus reduces shareholders wealth. So the main research problem will be addressed in the form of two questions:

1- What is the impact of corporate governance on over-investment?

2- What is the impact of free cash flow on over-investment ?

2-Significance of the research problem

It is important to study the over-investment problem for Egyptian firms for a number of reasons. First to obtain a complete understanding of investment barriers because investment is the driving force of economy and it has become one of the most important components of aggregate demand level for the development. Second, avoiding over-investment problem reduces investing in projects with negative NPV, reduces amount of resources under mangers control, increases company value, keeps scares resources in the firm and increases shareholders wealth.

Third, results of the present study can be seen as an extension of US, China and other countries studies. Should the present study fail to document

the over-investment effect of free cash flow of Egyptians firms, the generalization of other findings would be doubtful. By documenting the effect of distinct characteristics of corporate governance and free cash flow on over-investment, value is added to comparative studies of over-investment of free cash flow. The researcher also tests for other factors that affect over-investment and adds some of corporate governance characteristics which seem to be not tested directly in previous literature.

3-Research objectives and expected contribution

3.1. Research objectives

The purpose of this study is to investigate the relationship between free cash flow and over-investment and the relationship between corporate governance and over-investment.

The reminder of this research is organized as follows: section 2 present theoretical background on corporate governance, free cash flow and over-investment. Section 3 present literature review of the relationship between free cash flow and over-investment and also the relationship between corporate governance and over-investment. Laying down hypotheses related to corporate governance mechanisms are at the end of section 3. Section 4 describes the sample, method of selection and the validation of the log model used in the tests and also presents the empirical evidence on the relationship between free cash flow and overinvestment and the relationship between corporate governance mechanisms and overinvestment which cover two issues that have not been tested in the previous literature, ownership structure and audit committee characteristics. Section 5 summarizes, concludes and outlines future research directions.

4- Literature Review and Research hypotheses

The literature review is arranged as follows: relationship between corporate governance and over-investment and relationship between free cash flow and over-investment.

4.1.Corporate governance and over-investment

This section describes in details the various literature supporting a positive relation between corporate governance and over-investment.

There are studies that are interested in studying the relation between corporate governance and over-investment problem such as (Farooq, et al ., 2015) which expects that over-investment and under-investment is a cause of concern because inefficient investment affects firm performance, leading to a reduction of firm value and economic growth. There is empirical evidence in the literature that corporate governance can reduce some agency problems, such as improving firm performance, reducing agency costs and dismissing poorly performing CEO's. This study also constructs a corporate governance index of Australian firms and tests it's efficiency in improving investment efficiency by mitigating both over-investment and under-investment and finding a strong evidence that high corporate governance quality mitigates both over-investment and under-investment.

Liang et al.,(2018) examine the effect of CEO's gender on corporate cash holdings and over-investment in Taiwan listed firms and find that female CEO's are more concerned with the precautionary motive of cash and are careless about the opportunity cost of cash , and thus hold more cash

compared to male CEO's and also find that firms with female CEO's have a lower level of over-investment of free cash flow than firms with male CEO's.

These findings support the conjecture that risk –adverse females are associated with a lower level of agency problem and thus mitigate the over-investment problem of free cash flow. Overall, all these results indicate that female CEO's are more conservative relative to male CEO's. Shareholders should be aware that female CEO's are more inclined to hold more cash, which increases the possibility of missing profitable investment opportunities and reducing shareholders value . On the other hand, female CEO's can moderate the over-investment of free cash flow, which reduces agency costs and increases shareholders value.

Pawlina and Renneboog., (2005) investigate the investment cash-flow sensitivity of a large sample of the UK listed firms and confirm that investment is strongly cash flow sensitive. In general, this study confirms earlier evidence that investment is strongly cash flow sensitive. Future - more, they find that a cash flow-dependent investment policy results mainly from agency problems. This study also finds a negative relationship between the investment-cash flow sensitively and corporate efficiency, lower efficiency in the subsample of low-q firms that are associated with a high cash flow sensitively of investment indicates that less efficient firms suffer from high agency costs of free cash flow.

In a study titled ″Corporate governance and over-investment of surplus cash″ (Richardson.,2007) examine the role that governance mechanisms play in mitigating over-investment in USA. The study analyzes the role of governance structure in two folds. First examine whether governance

mechanisms arise endogenously to mitigate over-investment in the presence of surplus cash. It is reasonable to expect that shareholders will take action to protect their interests given the potential for agency costs from surplus cash and also document that the presence of outsiders helps mitigate agency costs related to over-investment.

The evidence in this study suggests that over-investment is a common problem for publicly traded US firms, the average firm overinvest 20 percent of its available free cash flow. Future, the majority of free cash flow is retained in the form of financial assets. For an additional dollar of free cash flow the average firm in the sample retains 41 cents as either cash or marketable securities. There is little evidence that free cash flow is distributed to external shareholders, thereby creating the potential for retained free cash flow to be over-invested in the future. Supplemental analysis finds only weak evidence that governance structure is effective in mitigating the extent of over-investment. Based on the analysis above, The first hypotheses follows:

H_1 : There is an inverse impact of board independence on over-investment.

Another aspect of independence of the board of directors relates to duality which occurs when the same person undertake the combined roles of chief-executive officer and board chairman (Hanson and song,2006).The ability of board of directors to fulfil monitoring function will be weaken when chief-executive officers also serves as board chairman. The appointment of chief-executive officer to the position of board chairman can lead to a concentration of power (Beasley, 1996) and possible conflict of

interest, thus resulting in a reduction in the level of monitoring (Davidson et al.,2005). As specific from of agency problem in the modern company, the occurrence and the level of over-investment of free cash flow is obviously influenced by the governance effectiveness of the board of directors. Based on the analysis above, The second hypotheses follows

H_2 : There is a direct impact of board duality on over-investment.

Chen et al., (2016) in China, divided the full sample into two samples : overinvestment and underinvestment firms. For overinvestment firms, the evidence indicates that higher state ownership concentrations boots overinvestment, while firms with higher proportion of tradable shares, larger board size of supervisors or higher leverage mitigate overinvestment. For underinvestment firms, the evidence shows that firms with higher state-ownership concentration, large board size of directors or higher proportion of outside directors are associated with under investment, while firms with higher leverage or higher proportion of tradable shares alleviate underinvestment.

Governance factors that are used in this study fall into three categories: the characteristics of ownership structure, the characteristics of board of directors, and the characteristics of board of supervisors. They choose those factors from an agency perspective and a perspective of ownership concentration together with Chinese unique two tier corporate mechanisms. That is, they take into account the separation of ownership and control. At the same time they consider whether the majority ownership is held by the government, institution, or individuals. However, the governance factors they obtained in china are different from those in the United States because

of Chinese firms' unique institutional background and corporate governance mechanisms. Based on the above discussion, it is expected that managerial ownership has an impact on over-investment in the following hypotheses:

H_3 : There is an inverse impact of managerial ownership on over-investment .

Tuanye and Chucan ., (2013) the study investigates the corporate governance, internal control and over-investment under insider control in china. It is a process of realizing the goal which is practiced by the board of directors, board of supervisors, executives and all the staff. The study demonstrates that sound internal control reduces over-investment, insider control significantly weakens internal control boots over-investment. Empirical results show that sound internal control restrains over-investment enormously, management control weakens internal control and promotes over-investment. Executive compensation also significantly improves the quality of internal control and facilities corporate investment behaviors. The study suggests that companies should reduce over-investment by enhancing internal control system, refrain from insiders control possibility and improve the incentives mechanism of top executives. Board of directors and audit committee are the bodies primarily responsible for management in corporate governance structure of a firm, which includes the internal governance of a firm.

An effective audit committee can control and monitor the performance of management and becomes more effective when the size of the committee goes up, due to the fact that when a company faces problems, it has more

resources (man power) to solve these problems. When the size of the committee is big, it also means there are more skills and knowledge sharing which can be utilized to monitor the financial reporting and procedures. The study predicts that the efficiency of audit committee increases when the size of audit committee goes up, especially in the matters where a company faces problems concerning over-investment because it has more options for resolving this problem. Based on the above discussion, it is expected that audit committee size has an inverse impact on over-investment in the following hypotheses:

H_4: There is an inverse impact of audit committee size on over-investment.

4.2. Free cash flow and over-investment

The following literature shows the relationship between free cash flow and over-investment. (Young et al., 2015) Due to information asymmetry, Chinese listed corporations' s unreasonable ownership structure and limited corporate governance to satisfy the company management' s needs, they abuse free cash flow to expand investment projects and enlarge their controlling desire, which cause serious excessive investment consequences. The study analysis A-share listed corporations in china. The results reveal that free cash flow and over-investment have a significant direct positive correlation, and the institutional investment ownership and free cash flow had an inverse negative correlation, which has a certain binding force on the company over-investment.

(Tangjitprom., 2015) examines whether there is a relationship between over-investment and free cash flow. Based on theory, the investment decision

should be independent of free cash flow in the perfect capital market. However, the market frictions (e.g. agency costs) can lead to different results. The results reveal that there is a positive association between over-investment and free cash flow. Firms with higher free cash flow may invest too little, this evidence supports the agency costs of free cash flow and firms with higher free cash flow will be more vulnerable to the agency problem because managers may over-invest this free cash flow for their own private benefits and this will finally deteriorate shareholders value.

Prior research has confirmed that over-investment exists in firms with high free cash flow. Over-investment may become serves in the presence of rich internally generated cash flow. In perfect capital markets, a firm´s investment activities would not be influenced by internally generated cash flow. If a firm needed additional cash to finance an investment activity it would raise that cash from external capital markets. If the firm has excess cash beyond that needed to fund available positive NPV projects (including options for future investment) it would distribute free cash flow to external markets. However, firms don´t operate in such a perfect world.

In addition, managers don't always act to maximize shareholders value. When managers' objectives differ from those of a shareholders, managers may squander internally cash flow. Prior studies suggest that managers have motives to invest more even at the expense of shareholder´s interests. So management may engage in additional investment in self -serving projects rather than distribute the free cash flow to shareholders. Thus the following hypothesis is

H_5 : Firms with high free cash flow tend to over-invested.

5-The Empirical Study

5.1. Models development and research variables

5.1.1 Regression model.

A multiple regression analysis is used for over-investment and free cash flow besides using other control variables which are found to be related to over-investment in prior research as control variables. The research develop the following Regression equations to evaluate the research hypotheses.

Regression model of over-investment

Over. Inv$_{it}$ =B0 + B1FCF$_{it}$ + B2BINDIT + B3BDualit+ B4MGTit + B5ACSizeit +B6Size it+B7 Lev it +B8 Profit it +B9 Dividit+ ε it

Where:

Over.Inv   :   over-investment for firm i at year t.

FCFit   :   Free cash flow for firm i at year t.

BIND it   :   Board independence for firm i at year t.

BDual it   :   Board duality for firm i at year t.

MGTit   :   Managerial ownership for firm i at year t.

AC Size   :   Audit committee size for firm i at year t.

Size it   :   Firm size for firm i at year t.

Lev it   :   Financial leverage for firm i at year t.

Profit it   :   Return on assets for firm i at year t.

Dividends it   :   Dividends paid for firm i at year t .

5.1.2. Measurement of variables:

1- Dependent variable: Over-investment

Following Richardson (2006) and Verdi (2006). Over-investment is measured by the residual of a regression of total investment on investment opportunities, as follows Investment-full it=B0+B1Qi,t-1+eit

This model is computed by year and by sector as Verdi (2006), investment-full is the sum of capital expenditures, R & D1 expenditures and acquisitions minus sales of PPE and depreciation and amortization multiplied by 100 and divided by beginning total assets.

Tobin's (1982) Q is computed as the ratio of the market value of total assets to the book value of total assets.

The market value of total assets is defined as total assets plus the product of stock price and the number of common stocks outstanding minus the book value of equity all divided by beginning total assets. Then, the research computed the residual (Inv-efficiency-full) from this equation .Negative residuals represent underinvestment, and positive residuals represent overinvestment.

2- Independent variable:

Free cash flow

Variable	Abbreviation	Operational Definition
Free cash Flow	FCF	Operating cash flow (Cfo) minus cash paid for property, plant and equipment minus dividends.

(1) **Verdi(2006) ,includes the research and development (RD) when computing total investment (I_{TOTAL}) and (CF$_{AIP}$), a measure of cash flow generated from assets in place. For Egyptian listed firms during our sample, (RD) is not disclosed as an independent item but as a non-extracting part of operating expense in financial statements, thus we don't include it in computing I_{TOTAL} and CF$_{AIP}$. Since the level of RD in Egypt is still low, our estimates of I_{TOTAL} and CF$_{AIP}$ are not likely to have significant biases if RD is excluded.**

Corporate Governance

Variable	Abbreviation	Operational Definition
Board independence	BIND	Measured as the number of non executive directors on the board divided by total number of directors on the board at the year end
Board duality	BDual	The Presence of CEO duality is measured by "1" if chief Executive officer is the chairman and zero otherwise.
Managerial ownership	MGT	Measured as the percentage of stock owned by board of directors
Audit Committee size	ACSIZE	Measured as the total of audit committee members

Measurement of control variable:

Variable	Abbreviation	Operational definition
Firm Size	Size	Measured as the natural log of year-end of total assets
Financial leverage	Lev	Measured as total debt to total assets
Return on assets	Profit	Measured as the net income to year end of total assets
Dividends	Divid	Dummy variable equals "1" for firms that pay dividends during the year, 0 otherwise.

5.2. Data description and descriptive statistics

5.2.1. Population and Sample selection

A random sample of (80) firms is selected from (9) different sectors for the period (2012-2016) to obtain (400) observation for each variable in the study, and (170) observation are then eliminated because they are under-investment firms, leaving (230) firm-year observations to be used in the study of the impact of corporate governance and free cash flow on over-investment.

The researcher used several criteria to choose the sample of study:

1- Excluding banks and financial institutions because the demarcation between operating, investing and financing activities is ambiguous for these firms and also these firms have special rules and standers for corporate governance that are different from others firms

2- Excluding firms that stopped their dealings and also that have scarceness in dealing with their shares during 2012 -2016

3- Excluding firms that don't have board of directors reports because of the importance of board of director report as a part of financial report, and a basic resource to determine board of directors and ownership structure for their firms .

Table (1): The sample formulation

NU	Sector	Years and numbers of companies				
		2012	2013	2014	2015	2016
		Nu of firms	Nu of firms	Nu of firms	Nu of firms	Nu of firms
1	Healthcare and pharmaceuticals	6	6	6	6	6
2	Industrial goods and services	6	6	6	6	6
3	Real Estate	13	13	13	13	13
4	Travel & Leisure	4	4	4	4	4
5	Food and Beverage sector	12	12	12	12	12
6	Chemicals sector	6	6	6	6	6
7	Construction and materials	18	18	18	18	18
8	Personal and household sector	3	3	3	3	3
9	Basic Resources	4	4	4	4	4
Number of firms in sample		72	72	72	72	72
Number of firms listed		212	212	212	212	212
(-) Banks and Financial Services		38	38	38	43	46
Number of nonfinancial firms listed		174	174	174	169	166
Percentage of sample		43.4%	42%	42%	43%	43.4%

*Sector classification according to Egyptian Stock Exchange.

5.2.2. Descriptive statistics and correlation analysis.

5.2.2.1. Descriptive Statistics

Table (2): Descriptive statistics provide simple summaries about the sample and the observations that have been made; it is used to describe the initial characteristics of the data and to provide background information on the data used in the study

Variable	Obs	Mean	Std. Deviation	Min	Max
Over-investment	230	.04685	.05535	.00101	.42387
Board independence	230	.67424	.22589	0	1
Managerial ownership	230	.17917	.26473	0	.91838
Audit committee size	230	3.4434	.84823	2	7
Leverage	230	.42175	.36079	.00498	4.3989
Return on assets	230	.04065	.09885	-.47658	.37010
Size	230	19.952	1.3872	17.251	23.329

Over-investment (dependent variable) has a mean value of 0.04685, maximum of .42387 and a minimum of .00101. The standard deviation is 0.05535.

The board independence (independent variable) has a mean value of 0.67424, maximum of 1 and minimum of 0. The standard deviation is 0.22589

The managerial ownership (independent variable) has a mean value of .17917, maximum of .91838 and a minimum of 0. The standard deviation is 0.26473 .

Audit committee size (independent variable) has a mean value of 3.4434, maximum of 7 and a minimum of 2. the standard deviation is 0.84823.

Leverage (control variable) has a mean value of .42175, maximum of 4.3989 and a minimum of .00498. The standard deviation is 0.36079

Return on assets (control variable) has a mean of .040656, maximum of .37010 and a minimum of -.47658. The standard deviation is 0.098856

Firm size (control variable) has a mean of 19.952, maximum of 23.3296 and a minimum of 17.2513. The standard deviation is 19.9529

Table (3): Frequency of Board duality

Board duality	Frequency	Percent	Cum
0	54	23.48	23.48
1	176	76.52	100
Total	230	100	

Board duality (independent variable) indicate that the firms that have duality on the board are 176 firms with 76.52 percent, while the firms that don't duality on the board are 54 firms with 23.48 percent

Table (4): Frequency of dividends

Dividends	Frequency	Percent	Cum
0	84	36.52	36.52
1	146	63.48	100
Total	230	100	

Dividends (control variable) indicate that the firms that pay dividends 146 firms with 63.48 percent and the firms that don't pay dividends 84 with 36.52 percent.

5.2.2.2. Correlation Analysis

Table (5) shows the Pearson pair-wise correlation between all variables used in the regression models. This table shows positive relation between over-investment and board duality, managerial ownership and free cash flow. However, there is negative relation between over-investment and board independence, audit committee size, financial leverage, return on assets, dividends and firm size.

The correlation analysis indicates that there is negative correlation and insignificant relation between board independence and over-investment, there is positive correlation and significant relation between board duality and over-investment in level (5% and 10%), there is positive correlation and insignificant relation between managerial ownership and over-investment, there is negative correlation and significant relation between audit committee size and over-investment in level (10%).

There is negative correlation and insignificant relation between financial leverage and over-investment, there is negative correlation and significant relation between return on asset and over-investment in level (1%,5% and 10%) , there is negative correlation and insignificant relation between dividends and over-investment, there is negative correlation and insignificant relation between firm size and over-investment, there is positive correlation and insignificant relation between free cash flow and over-investment.

Table (5): Correlation analysis

	Over-investment	BIND	DUAL	MOWNER	ACSIZE	LEV	ROA	DIV	SIZE	FCF
Over-investment	10000									
Board independence	-.0236 .7219	1.0000								
Board duality	.1376 .0371	-.3071 .0000	1.0000							
Managerial ownership	.0367 .5799	.1907 .0037	.0082 .9020	1.0000						
Audit committee size	-.1211 .0667	.1591 .0157	-.0491 .4586	.0773 .2429	1.0000					
Leverage	-.0547 .4092	-.0485 .4646	.0224 .7356	-.0662 .3173	-.0453 .4946	1.0000				
Return on asset	-.1991 .0024	.0023 .9729	-.0720 .2770	.2058 .0017	.1072 .1050	-.1910 .0036	1.0000			
Dividends	-.0441 .5062	-.0510 .4416	-.0367 .5800	.0604 .3621	.0667 .3138	-.0512 .4400	.4506 .0000	1.0000		
Firm size	-.0747 .2591	.1064 .1074	.3485 .0000	.0210 .7519	.1878 .0043	.0600 .3650	.2610 .0001	.2479 .0001	1.0000	
Free cash flow	.0562 .3960	-.0280 .6731	.0258 .6974	.0464 .4839	.0289 .6627	.0063 .9241	.1814 .0058	-.0273 .6807	.1765 .0073	1.0000

5.3   Regression analysis and empirical results

5.3.1 Model validation

To use OLS regression analysis in estimating the study models, the researcher should make sure that OLS assumptions are met, and these assumptions are:

a. Normality of residuals

The first assumption of the (OLS) method requires that the residuals follow the normal distribution with zero mean and constant variance. This

assumption is not necessary for the estimation of regression parameters, but it is necessary for the statistical inference namely hypotheses tests (Gujarati, 2003). Shapiro- wilk tests for normal data and Skewness / Kurtosis tests for normality of residuals.

Table (6): Shapiro-Wilk test for normal data

Vari variable	observation	W	V	Z	Prob >Z
R	230	.72028	47.149	8.928	0.0000

In all models of this study the Shapiro-wilk test sig is less than the level of significance 5%. So the null hypothesis which state that the residual of regression is not normally distributed is accepted.

Table (7): Skewness / kurtosis tests for normality

Var variable	Obsobs	Pr (s pr(skewness)	Pr (k pr (kurtosis)	Adj Adj chi2(2)	Prob prob>chi2
R R	230	0.00 0.0000	0.00 0.0000		0.0 0.0000

The residual of the regression is not normally distributed because the value of chi 2 0.0000

B. Multi-collinearity

The second assumption of the (OLS) method is multi-collinearity, which means there is a perfect or exact linear relationship between some of independent variables of the regression model of the study. The variance inflation factors (VIF) will be checked for multi-collinearity, which indicates a linear relationship between the potential independent variables. As the degree of multi-collinearity increases, the estimated coefficients will become unstable as well as the standard errors. A VIF higher than 10 will lead to the conclusion that there is a multi-collinearity (Gujarati, 2003).

The VIF for all variables in the study models are less than 10. Therefore, there is no multi-collinearity in the study model.

Table (8): Variance inflation factors

Variable	VIF	1/ VIF
Return on asset	1.46	0.685490
Firm size	1.35	0.742981
Dividends	1.33	0.754385
Board duality	1.27	0.789359
Board independence	1.19	0.841218
Managerial ownership	1.10	0.911673
Free cash flow	1.09	0.917284
Audit committee size	1.07	0.935005
Financial leverage	1.06	0.943216
Mean VIF	1.21	

C. Heteroscedasticity

The third assumption in (OLS) method is heteroscedasticity by using (white test) to test the assumption of heteroscedasticity, the results indicate that there isn't heteroscedasticity problem because the chi2 is grater then .05%

Prob > chi2 =0.2301

d. Autocorrelation

The fourth assumption of the OLS method is autocorrelation, which means that there is a correlation between the members of series observations ordered in panel data. Wooldridge test is used to indicate autocorrelation between observations

The Wooldridge statistic is 3.177. Based on the sample size and the number of explanatory variables at the level of significant 5%.

Accepting the null hypothesis states that there is no autocorrelation. As a result there is no autocorrelation in the research data.

Testing of Hypotheses

5.3.1. Regression results:

The multiple linear regression model results enable the testing of the effect of the independent variables on over-investment. Previously it is clear that the most important conditions for using the regression model and the absence of estimated regression models from any standard problems affects its results.

Depending on the program Stata version (14) in conducting statistical analyzes the panel Data regression analysis was used to assess if any explanatory variables has an effect on the dependent variable, as well as to indicate the contribution rate of each variable in explaining the relationship with dependent variable, as follows

Table (9): Regression results

Over-investment	Coefficient	Robust Std. Err.	Z	P>|Z|	[95% Conf. Interval]	
BIND	.0075309	.0235746	0.32	0.749	-.0386745	.0537363
Dual	.0172806	.0096236	1.80	0.073*	-.0015812	.0361425
MOWINER	.0023667	.0163168	0.15	0.885	-.0296137	.0343471
ACSIZE	-.0095005	.0055143	-1.72	0.085*	-.0203084	.0013074
Leverage	-.0185356	.0068391	-2.71	0.007***	-.0319399	-.0051312
ROA	-.1206991	.0383013	-3.15	0.002***	-.1957682	-.04563
Dividends	.015869	.0089073	1.78	0.075*	-.001589	.0333271
Firm Size	-.0012801	.0041575	-0.31	0.758	-.0094287	.0068685
FCF	.0682057	.0235019	2.90	0.004***	.0221428	.01142685
Nu of years= 5 Nu of sector= 7 Adjusted R^2=0.025719 F statistics= 0.0000 Between = 0.3241 Wald Chi2 =68.03						

The overall model is highly significant (0.025719)

Adjusted R^2 = 0.3241

Which means that 0.3241 of the variation in the dependent variable is explained by the independent variables in the right side of the model.

The degree of board independence (BIND) has not significant effect on over-investment, (p=.749 which means that the null hypothesis H0 cannot be rejected and H1 should be rejected) .

The degree of board duality (DUAL) has significant positive effect on over-investment, (P=.073 which means that the null hypothesis H0 cannot be accepted and H1 should be accepted).

The degree of managerial ownership (MOWNER) has not significant effect on over-investment,(P=.885 which means that the null hypothesis H0 cannot be rejected and H1 should be rejected).

The degree of audit committee size (ACSIZE) has significant effect on over-investment,(P=,085 which means that the null hypothesis H0 cannot be accepted and H1 should be accepted).

The financial leverage (LEV) has significant effect on over-investment,(P=.007 which means that the null hypothesis H0 cannot be accepted and H1 should be accepted).

The return of asset (ROA) has significant effect on over-investment,(P=.002 which means that the null hypothesis H0 cannot be accepted and H1 should be accepted).

The dividends (DIV) has significant effect on over-investment,(P=.075 which means that the null hypothesis H0 cannot be accepted and H1 should be accepted).

The firm size (Size) has not significant effect on over-investment,(p=.758 which means that the null hypothesis H0 cannot be rejected and H1 should be rejected).

The degree of free cash flow (FCF) has significant effect on over-investment,(p=.004 which means that the null hypothesis H0 cannot be accepted and H1 should be accepted).

Conclusion

This study investigates the impact of corporate governance and free cash flow on over-investment. Corporate governance includes: (board independence, board duality, managerial ownership and audit committee size). Four control variables are included (firm size, financial leverage, return on assets and dividends). A sample is used consisting of 80 Egyptian firms during the period 2012 to 2016. I divide the full sample into two subsamples: over-investment firms and under-investment firms then I focus on over-investment firms only. For over-investment firms, This study indicates that there is no significant effect of board independence on over-investment. This finding confirms this point that the board of directors has no motive identically to supervise over corporate performance. In other words members of the board don't play their regulatory role property in the position of corporate governance, while such a corporate governance mechanism may reduce power of directors to purse their personal benefits and in return lost trust to investors. Board duality and audit committee size have a significant effect on over-investment, but managerial ownership has no significant effect on over-investment.

The results of this study investigations also show that there is a positive and significant relationship between free cash flow and over-investment. In other words free cash flow may increase over-investment in a company. According to these finding, free cash flow are deemed as a key factor in creating over-investment and it led to occurrence of some agency problems (information asymmetry issues). These results are consist with findings of (Yang and Jiang, 2008 , Biddle et al., 2009, Richordson,2007 and(Chen et al.,2016). Shareholders, owners and investors in the Egyptian capital market are advised to pay attention to the factor of free cash flow upon the evaluation of investment and include this factors in their decision making models, since the free cash flow is assume to be a clear message about the rise of over-investment.

Future Research

According to the results of this study prove, the researcher sees that there are many fields that used in future research as follows:

- Use other mechanisms of corporate governance.
- Use under-investment firms
- Make many comparing studies between Egypt and different countries that related to corporate governance and over-investment, especially with developed markets.

References

Biddle, G., and G.Helary. 2006. Accounting quality and firm level capital investment The Accounting Review 81: 963-982.

Biddle, G , G.Hilary, and Rodrigo S . Verdi. 2009 . How Does financial reporting quality relate to investment efficiency ? Journal of Accounting and Economic 48: 112-131.

Chen ,X.,Sun,Y andX.Xu,.2016. Free cash flow, over-investment and corporate governance in china. Pacific-Basin finance Journal 37:81-103.

Easterbrook, F. H., and Fischel, Daniel R., 1983 . Voting in Corporate Law. Journal of Law and Economics 26(2): 395-426.

Farooq, S., Ahmed, S ., and K. Saleem. 2015. Over-investment, Growth opportunities and firm performance: Evidence from Singapore Stock Market. Corporate Ownership & Control / Vol 12, Issue 3, Spring.

Jensen , M .c .1986. Agency costs of free cash flow ,corporate finance and takeoverAmerican Economic Review76 : 323-329.

Jeffery, et al., 2014. CEO overconfidence and over-investment under product market competition. Managerial and Decision Economics 35:569-574.

Liang, S.H., Hsieh, Y. T., Lin, H.C.,& Chi, P. 2018. The effect of CEO Gender on corporate cash holdings and over-investment problems. Advances in Economics and Business 6 (1):26-35

Luo, J .H and D. Wan.2012. The non-monotonic governance effects of large shareholdings in Chinese listed companies : an overinvestment perspective 'Corporate governance . The International Journal of Business in Society 12 (1): 3-15.

Myers, S. and N. Majluf. 1984. Corporate financing and investment decisions when decisions when firms have information that investors do not have. Journal of Financial Economics 13: 187-221.

Officer, M. S. 2011. Over-investment, corporate governance and dividend initiations. Journal of Corporate Finance17 (3) : 1-29.

Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson. 1999. The determinants and implications of corporate cash holdings. Journal of Financial Economics 52(1): 3-46.

Pawlina, G. and L . Renneboog. 2005. Is investment –cash flow sensitivity caused by agency costs or asymmetric information? Evidence from the UK, European Financial Management 11: 483-513.

Pindado, J   C.and de la torre . 2009. Effect of ownership structure on underinvestment and over investment . Empirical Evidence from Spain 49:363-383.

Rezaee, Z. 2009. Corporate Governance and Ethics. The International journal of Accounting 44 (3): 306-307.

Richardson, S. 2003. Corporate governance and the over-investment of surplus cash .PHD thesis , Business administration ,The university of michigan , USA

Richardson, S . 2006. over-investment of free cash flow. Review of Accounting studies 11:159-189.

Tangjitprom,N . 2015. Over-investment and free cash flow, International conference on Business, Economics and Management (ICBEm´15).

Tuanye, Y ., and C, Chucan., 2015 . Corporate governance, internal control and over-investment under insider control . Journal of applied sciences, Engineering and technology 6(22) 4247-4253.SHS Web of conferences (Vol.17,P.01027) . EDP Sciences.

Young, L ., Sheng ,D and L, Haiyue. 2015. An empirical study on institutional investors , free cash flow and overinvestment . Journal of Business and Economics , Issn, USA6 (8): 1414-1421 .