



Governance mechanisms, managerial's commitment bias and firm's investment decision escalation: Failure of firm's crises communication: Bayesian network method

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Abstract

This paper studies the role of governance mechanisms, CEO's cognitive characteristics and firms' financial features in justifying the CEO's escalatory behavior in firm's investment decision. This study aims to provide evidence as to whether managers consider the persuasive influence of governance mechanisms and the firm's financial indicators to persevere his initial investment decision while he notes a high level of commitment bias. The proposed model of this paper uses Bayesian Network Method to examine this relationship. CEO's cognitive characteristics have been measured by means of a questionnaire comprising several items. As for the selected sample, it has been composed of some 220 Tunisian executives. Our results have revealed the inefficient role of governance mechanisms as a persuasive communication. Managers who note a high commitment level per severe a failed course of action and ignore the governance pressure and the firm financial strength. This article has implications for the development of new referential in building corporate governance system by incorporating the commitment dimension.

Keywords: Commitment bias, cognitive dissonance, firm's financial strength, ownership concentration, board independence, remuneration system, escalatory behavior

Introduction

Managers trying to make good decisions (Schermerhorn *et al.*, 2011). Thus, the process of decision making involves making choices based on the information available at your fingertips and the resulting solutions of this information (Gilboa, 2011).

Most managers think of themselves as rational decision-makers. This means that they have perfect information, distinguish all the alternatives, know all the consequences, and determine a preference scale complete (March 2010). However, reality shows that managers are subject to bounded rationality (Colquitt *et al.*, 2011; Nielsen, 2011). Bounded rationality means that policy makers are unable to know all information and solutions perfect alternative to the optimal choice (Simon, 1982, 1997, 2009).

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Agreed that policymakers usually not all necessary information and to make good decisions and solutions, then, are subject to bounded rationality, it is normally a source of error in the decision-making exist (George and Jones, 2008). "Start a bad deal" or climbing a decision is the major error in decision making, which is a human tendency to continue a course of action failing. There is a large amount of studies that show that individuals and groups degenerate initial decision on a course of action for failure to rationalize their initial choice (Boboceland Meyer, 1994; Bragger, 2003; Fai *et al.*, 2006; Hi and Mittal 2007; Mullins, 2007; Ross and Staw 1993; Staw *et al.*, 1997; Street and Street, 2006; Van Putten *et al.*, 2009, 2010 and Hamza and Jarbouï, 2012).

Theoretically, we can also explain the investment decision escalation by referring to contributions of the theory of commitment. Thus, a decider faced with negative feedback about a project may feel the need to justify the whole of time and money already sunk into the project Kundi (1997); Kundi *et al.* (2007). White (1986) expresses "commitment to a failing course of action is a need on the part of decision makers to maintain the illusion that they haven't erred". In Staw (1981) word, this happens because, even in the face of negative feedback, decision makers "continue investing commitment to a dying course on the assumption that short term problems are the necessary costs/losses for achieving long term large objectives".

Most of the researchers agree on the four fundamental causes of escalation which are: a) project related (Hamza and Jarbouï, 2012); b) human psychology/personality (Hamza and Jarbouï, 2012); c) social; and d) organizational features (Brockner, 1992; Keil *et al.*, 2000; Chee-Wee *et al.*, 2006; Nawaz, 2006).

Several theoretical studies have tried to express the causes of commitment escalation in different ways. Fox and Staw (1979) suggest that manager escalates if "he makes the initial decisions (responsibility pressure)" and/or "is under the pressure of being responsible for the consequences". They also indicate that job insecurity and policy resistance also increase the commitment to an initial chosen decision.

Empirical studies investigate that relating to investment decisions, escalatory behavior causes inefficient exploitation of funds, superior costs and severe organizational trouble by project failures (Meredith, 1988). These studies confirm that escalatory behavior is an observable fact which leads to systematic underperformance of dying decisions.

Referring to the study of Lange (1993), approximately 50 per cent of total R&D costs are exhausted in underperforming projects. In R&D fields, the majority of high risk projects are expected to fail. Most cost analysis in this field demonstrates that more funds are engaged to achieving failure projects than to winning ones (Lange, 1993).

These empirical studies obviously show the importance of managerial personal responsibilities on reducing the escalation of commitment (Lange, 1993). Whereas, Matthias (2007) recommends a lot of procedures and actions such: Overcoming perception threshold, reducing selective perception, limiting Self-Justification, reducing unquestioned decision scope, declining sunk cost-effect, and, limiting optimism.

While, building corporate governance serve to limit managerial discretion in CEO's behavior and to avoid, as possible, the managerial opportunism and behavioral deviation especially during crises periods. In these periods, crises communication between two parts of the agency contract is the most important solution to resist in such difficult moments.

Communication between principal and agent is qualified by an important effort of persuasion exerted by principal in order to align agent's interests. Persuasion is frequently proceeded by the

implementation of an efficient governance system containing, in one hand, incentives mechanisms and, in the other hand, monitoring and disciplinary mechanisms.

Numerous studies (Johnson *et al.*, 2000; Mitton, 2002) show the importance of corporate governance responsibilities on the preservation of firm performance during crises. Two features of this importance are advanced by authors. The first is that manager's opportunism is likely to become more intense during crises periods because the anticipated return on investment falls. Second factor is that in these periods, corporate governance is expected to effecting more restructuration to attain the efficiency. The authors have employed the East Asian financial crisis to scrutinize the role of outside ownership concentration, diversification, and management ownership on firm performance during crisis periods. Francis *et al.* (2012) have investigate how the quality of firm boards influences firm performance in these periods. They show that variety in corporate board quality participates in inducing changes in firm performance during crisis. Furthermore Beltratti and Stulz (2009), Fahlenbrach and Stulz (2009), and Fernandes and Fich (2009) approach how various country-level and bank-level governance mechanisms influence bank performance during the last financial crisis.

In this paper, our objective is to focus on the role of corporate governance on managing CEO's biases and deviation during reticent periods by its monitoring and incentives persuasive efforts. So, our study aims to enrich the literature by predicating a relationship between corporate governance, CEO's cognitive characteristics, firm's financial indicators and firm's investment decision escalation during crises. We intend to precise the importance of CEO's commitment bias as a first-order feature of escalation in firm's investment decision. Also we aim to prove that, the presence of a solid monitoring and incentive system (persuasive communication), don't interdict manager to persevere a failure course of action because of its cognitive characteristics especially its psychological commitment level.

By this evidence we hope investigate that with presence of a high commitment bias, we prove a failure crisis communication. Either the existence of block holders, outsider directors, or, incentive remuneration system may prohibit manager to persevere a failure investment decision.

Literature review

Ownership concentration and escalatory behavior in investment decision

High ownership concentration is generally related with a high firm performance and low agency costs (Berle and Means, 1932; Williamson, 1964). This favourable relationship can be explicated by many reasons.

First, managers do not accept the full costs of their choices; it is understood that executives attempt to choose investments and actions that maximize their personal profits. Executives can exploit information asymmetries to diverge from the firm performance maximization. The block holders are forced to minimize the resulting agency-costs by implementing solid incentive and monitoring mechanisms (Jensen and Meckling, 1976).

Though, Bebchuk and Fried (2004) affirm that executives have, commonly, authority to deviate the circumstances of their mission in their proper benefits which more arises the divergence of CEO and shareholders 'interests. Therefore, authors precise that the less important the presence of block holder; the lower are the encouragement to invest into management monitoring. Moreover, block holders habitually hold the required competences and industrial expertise to derive the manager competently. Also, Hart (2001) confirm that managerial latitude is as large as the ownership is concentrated.

In the perspective of agency theory, decisional latitude is well managed in the presence of block holders. It postulates that high ownership concentration affects the efficiency of CEO's control and consequently maximizing the firm value (Shleifer and Vishny, 1986; Agrawal and Mandelker, 1990). This results on the one hand that shareholders hold a significant part of the capital, are more interested in protecting their investments, they found an important means to control and discipline managers to limit their latitude and thus secure their investment. On the other hand, the interest of such shareholders is to persevere and encourage solid and permanent relations with managers often related to the development of communication, commitment and confidence which lead to a high performance emphasizing the common interest of two parts of the agency contract. From these points of view, the presence of block holders is regarded as a guarantee of effective management and control of managerial discretion by shareholders (Agrawal and Knoeber (1996), and Paquerot (2000)).

Our interest to studying the relationship between the ownership concentration and CEO's escalatory behavior in investment decision; stems from a scarcity of work dealing with this relationship.

Corporate governance literature approaches the relationship between ownership concentration and the manager's investment behavior: investment nature, horizon and/or riskiness choice. However, by referring to theories of behavior changing, the existence of a cause-effect relationship between persuasion and behavioral change is profusely challenged.

Thus, according to these theories, persuasion may conduct, consistently, to an attitude changes, rarely, to a behavioral intention, but, not necessarily, to authentic behavior (Girandola and Michelik, 2008).

Obviously, the agency problem which reins principal-agent relationship disappears in the firm where ownership is wholly concentrated. Following the argumentation that higher ownership concentration leads to enhanced manager control and reduce, consequently, the agency costs, could suppose to discover a negative relationship between ownership concentration and firm's investment decision escalation in moments of weaker performance. However, in our study we hypothesize that a highly concentrated ownership which is associated with a high monitoring and disciplinary persuasive actions might be also a justification of the firm's investment decision escalation in moments of weaker performance. Thus, we aim to test the following hypothesis:

***H1:** The presence of block holders is positively associated with investment decision escalation during crises.*

Board independence and escalatory behavior in investment decision

The board of directors has long been considered as a significant corporate governance mechanism for converge the interests of both managers and stakeholders in the firm. Thus, the fundamental task of board of directors in corporate governance has consequently been recognized and, lately, has gained large position.

To attain the "best" corporate governance approach, researchers recommend to focusing on strength internal control and risk management. As a result, they allow all monitoring effort to the board of directors (Cadbury, 1992; Gwilliam and Marnet, 2010). Thus, concludes that effective boards are one of the main efficiency sign of corporate governance.

The participation of the outsider non-executive director is central facing to succeeding high-profile corporate scandals known in earlier decade. The importance of this participation is wholly inquiring, especially, when bias is showed as negatively features on the quality of board's performance and decision-making.

Mainly, the key role of the board is the control and guide of the firm's risk-management policy. As known that executive's excessive risk-taking behavior is the most important causes of the many financial crises. In many firms, board fails to found adequately risk strategies and, efficiency, control CEO's risk-taking behavior. Thus, the author concludes that board of directors' under performance affect strongly the extent to which companies are susceptible to the financial crisis.

The expertise of directors is an important determinant for firm performance in crisis periods. Thus, the presences of outsider financial experts have a positive relationship with firm performance. Authors' findings support views that outsider financial experts offer a better perceptive of financial information which is necessary for efficient board monitoring and guiding mission. This interpretation deals with parallel studies that highlights the key advising role played by outsider experts directors (Agrawal and Knoeber, 2001; Adams and Ferreira, 2007).

In this paper we aim to investigate the great role that plays the board independence in improving investment decision escalation. We suggest that, referring to the persuasive communication theory, the presence of outside directors has a disciplinary persuasive influence on executive which arise for him the commitment feeling. Thus, manager seeks to escalate his investment decision while it's a failure course of action. Therefore, we search to test the following hypothesis:

H2: *The presence of outside directors is positively associated with investment decision escalation during crises.*

Remuneration system and escalatory behavior in investment decision:

The CEO's remuneration system is a governance mechanism. By relating managers 'remuneration with firm performance, the shareholders can guarantee that executives make decisions that rise firm-value. Though, the managers are loss-averse agents, so, they could leave risky choicesto less risky ones. Generally, when shareholders desire to stimulate the manager to take more risk, they may implement appropriate incentives.

Sawers *et al.* (2006) study the effects of stock options on executive behavior. Unexpectedly, the authors find that executives remunerated with stock options are smaller risk taking than managers remunerated with fixed incentives.

Generally, executives are more risk-taking in the loss perspective than the gain perspective (Sawers *et al.*, 2006). These results show that when managers have an important wealth they become less risk-taking. Authors interpret this finding according to behavioral agency model. They affirm that the relationship between the decision-making process and the wealth incentives remuneration system identifies managerial risk-taking.

Moreover, Sawers *et al.* (2006) test whether managers' risk-taking behavior is affected by the CEO's perceptions of the stock options value. They argue that the CEO's risk-taking behavior is wholly affected by its subjective estimation of stock options. The CEO's behavior favors the risk-taking when he overestimates the stock options value and disfavours the risk-taking when he underestimates the stock options value.

Dodonova and Khoroshilov (2006) show remuneration with stock option constitute the accurate incentive for the short term CEO's loss-averse behavior. However in the long-term, the inefficient CEO's loss-averse behaviour results from the over manager's compensation with stock options. Thus, executives endowed by high pay-to-performance incentives are risk-averse because seeking risk will exposes them to large losses. Therefore, Dodonova and Khoroshilov (2006) resume that

shareholders should incorporate supplementary options in managerial compensation for companies where they desire to preserve high levels of pay-to-performance sensitivity.

Reed (2007) also shows that important stock-option remuneration encourages high CEO's risk behavior. So, the author's model announces that CEO's remuneration using stock options increases the probability of executive's risk-taking behaviour especially on the total poor performing investments. Consequently, Reed (2007) proposes substitute remuneration incentives which may link CEO's compensation more explicitly to shareholders' wealth.

De Meza and Webb (2007) show that remuneration system should recompense success and not discipline failure. Thus, author's model recommends the use of carrots rather than sticks when CEO's risk aversion behavior is low and reference income is in progress.

The incentive system, which adopts stock options, rewards performance, but generally do not punish failure. The challenge here is that how finding the correct equilibrium between encouraging executives to take more risk while simultaneously discouraging them to taking too much risk.

In this paper we aim to seek the real role that plays CEO's remuneration system in improving investment decision escalation. Therefore, we intend to test the following hypothesis:

H3: *The presence of performance-based incentive remuneration system is negatively associated with investment decision escalation during crises;*

CEO's commitment bias and investment decision escalation

It is said that "a trapped administrator is one who remains inflexible to change in the face of negatives consequences" (Fox and Staw, 1979). Thus, researchers show that "decision makers may even stick with their bad decision for more than rationally required" (Brockner *et al.*, 1986). In this phase, "projects take a life of their own, thereby eating up more resources and delivering no real value", (Warne and Hart, 1996; Keil *et al.*, 2000; Hall, 2003). Several studies reveals that decisions makers continue to invest in their initial course of action even after receiving considerable negative information concerning its availability (Chee-Wee *et al.*, 2006; Van Putten *et al.*, 2009, 2010; March, 2010).

Meyer and Allen (1991) propose that commitment as a psychological attachment may take the following three forms: affective, normative and continuance types of commitment. These forms may also be seen as bases of commitment, motives engendering attachment (Becker 1992).

Strong commitment depends on the existing of several factors, which are: The context of freedom in which the action was carried out, the public nature of the action, the explicit nature of the action, the irrevocability of the action, the repetition of the action, the consequences of the action, the cost of the action, the reasons for the action (absence of external reasons: promises of a reward, threats of punishment).

According to the circumstances, individuals will feel more or less bound by the act they were encouraged into doing. We can consequently understand why Kiesler (1971) chose to define commitment as the link between individuals and their actions.

H4: *A high level of commitment bias will have positive influence on the investment decision escalation.*

CEO's risk profile and the investment decision escalation

The analysis of the psychology of the manager provides an important number of advanced that contribute to explain his behavior on investment decision.

In the behavioural finance literature it is documented that managers are more sensitive to losses than to gains. This feature stems from prospect theory and was predictable by Kahneman and Tversky (1979) among others. Thus, deciders who present myopic loss aversion are less motivated to invest a greater amount of their wealth into risky assets if they evaluate their investments more frequently.

Samuelson and Zeckhauser (1988) propose in the same setting the bias of statu-quo. This bias determines the decision of the investor to maintain the initial investment choice because of the importance of efforts and costs committed in the stage of the hold of position on this choice. He considers these committed costs and efforts like a point of reference. Every time that he is going to change his position on a fund, he is going to commit some similar costs. Of this fact (Mangot, 2005) shows that the agent has a tendency to let the unaltered things because this strategy is considered arbitrarily as the strategy of reference.

Daniel *et al.* (1998) and Mangot (2005) analyze the bias of conservatism or attribution. According to these authors, the decider keeps his position on his initial choice while granting an important weight on the news that comes to confirm this first choice that to those that come to invalidate it. This bias of attribution maybe in part attached to the phenomenon of cognitive dissonance.

In this setting, Samuelson and Zeckhauser (1988), note that when the decider receives a flow of information to contradictory consequences, he hung a process of selection of information. This process consists to overweight those that go in the sense of the confirmation and to avoid those that come to contradict it. He adopts a strategy aiming to stabilize him psychologically. This strategy is called a confirmation bias.

Thus, in the same order of ideas, we hypothesize in this paper that the CEO's risk profile influences his investment decision. So, a very defensive risk profile is associated positively with the investment decision escalation.

H5: A CEO's defensive risk profile (as opposed to dynamic risk profile) will have positive influence on the investment decision escalation.

CEO's cognitive dissonance and investment decision escalation

Cognitive dissonance is a psychology term defining the internal stress and tension that an individual experiences when he make a decision with negative result. Whether conscious or subconscious, the simultaneous existence of elements of knowledge that come contrarily in one way or another, encourages individual to commit an effort in order to fit them better.

The majority of researches on commitment escalation cite cognitive dissonance as a feature that contributes to the escalatory behavior. In prior Staw's test (1976) with research allocations, individual showing the highest level of escalation were he searches to eliminate the cognitive dissonance that he experiences as result of knowing that their initial allocations were unsuccessful.

Staw (1976) investigates that individual's stress and tension lead him to rationalize his original choice by escalating his commitment in his second allocations as a manner to minimize this dissonance.

As an associated concept, cognitive inertia refers to a resistance on a course of action when decider feel that its original decision made was unsuccessful. However, the desire to remain

consistent in the eyes of the public to whom he announced his commitment in this decision causes the individual escalatory behavior.

Goetzmann and Peles (1997) conducted an empirical study that helps to explain the convex relationship between funds investment inflows and past performance on mutual funds using the dimension of cognitive dissonance. They confirm that an uncommonly high frequency of underperforming funds consistent with investor inertia. Furthermore, authors test differential reaction of investment dollars to past performance. They show an unusual response to poor performance.

This study was conducted using a questionnaire distributed to investors in mutual funds in order to identify their views on the performance of their funds. Authors affirm that they seek to adjust their views on the effectiveness of past investment decisions. They tend, therefore, to assess the performance of their funds at the end to give an ex-post justification of their choices and reduce thus the psychological costs they incur. Therefore, these investors keep their positions in the underperforming fund by over estimating its performance.

Bellando and Tran-Dieu (2008) suggest a theoretical explanation of the asymmetrical relationship between the fund relative profitability and its attractiveness increasing based on the cognitive dissonance theory contributions. Authors explain the investment strategy adopted by investors in the poor performing funds by the cognitive cost of cognitive dissonance. They conclude that the cognitive cost produced by the relationship of inconsistency between two mental states compel the investor to liquidate his position in the fund to poor profitability. Thus, these funds are not subject to significant exits.

Most of studies which given in the framework of the cognitive dissonance theory was interested in the relationship between activation and cognitive performance. Thus the notion of activation is deduced from the classical observation of the functioning of the nervous system: activation level varies from minimum to maximum when going from sleep to wakefulness, then the lookout and finally emotion. Thus stress is related generally to a strong rise in the level of arousal (Jones and Hardy, 1989).

Thus our hypothesis is consistent with the view of Chamson André who express that when we do not live as we think, we begin to feel as we live. Hypothesis aims to validate the predictable relationship between manager cognitive dissonance and his escalatory behavior.

***H6:** A high level of cognitive dissonance will have positive influence on the investment decision escalation*

Financial strength's indicator and investment decision escalation

The profitability is traditionally evoked by researches as an important heuristic for the decision making. These researches, generally based on the theory of rational choice, respect the formula of Helmut Schmidt that says "today's profits are tomorrow's investments".

Ippolito (1992) studied the impact of the relative profitability on the nets inflows in funds in the United States. The author verifies a linear and meaningful relationship between these two variables. To the same title, Berk and Green (2004) consider that the increasing slope of the relationship between the relative profitability and the nets inflows in the fund provides a perfect informative signal on the quality of the fund. For this reasons deciders choose to invest further in funds to superior profitability.

A number of studies are conducted, lately, while based on the limited rationality hypothesis, aims, on the contrary, to prove a no linear relationship between the past profitability and the investment decision.

Among these works, the survey conducted by Sirri and Tufano (1998) shows, using the different measures of the fund profitability, that for the most funds, the profitability explains positively and meaningfully the inflows in these funds. For funds to moderate profitability the relationship is statistically weak, whereas, for those the underperforming the result shows that these funds don't know any meaningful outflows. Huang and al. (2005) verify an asymmetric relationship between the nets inflows in funds and their relative profitability. These authors verify, that underperforming funds know, for the same reason as those most performing, meaningful inflows.

Thus, contrary to the traditional financial theory we have the following hypotheses:

H7: company strong financial indicators (Z score) will have a positive influence on the investment decision level.

Firm's leverage and investment decision escalation

In corporate finance, the role of liabilities on investment decisions has drawn keen attention. In the first time, the Modigliani-Miller Theorem (MM Theorem) showed that in a perfect market, the level of liabilities does not affect corporate investment behavior. They noted that there is no relationship between fund procurement and the debt ratio. However, as regards the negative effects of liabilities on corporate management, it is noted, that liabilities can influence corporate investment behavior through the following two channels. Firstly, as important liabilities increase bankruptcy risks, corporate managers tend to go in for the limitation of borrowings and/or reducing investments which potentially increase the prospect of underinvestment. Secondly, higher debts level produce larger interest payment weight, which reduces liquidity, thus, debt has a negative impact on the investment level.

Arikawa *et al.* (2003) adopt the method of estimation used by Lang *et al.* (1996) and show that the main bank system in Japan facilitated to amplify the disciplinary role of liabilities, principally for low-growth companies. In this setting, Muramatsu (2002), based on the theory of Jensen (1986), asserts that the disciplinary role of liabilities or monitoring by main banks was not significant. Thus, author concludes that overinvestment happened in Japan during the bubble period.

Thus, previous studies have verified the role of liabilities on investment and its effect in restraining overinvestment and facilitating underinvestment. These studies suggest that liabilities limit overinvestment but probably cause underinvestment.

In this paper we hypothesize that the importance of the dept level constraints managers to escalate their investment decision by its disciplinary effect.

H8: A high dept level is negatively associated with investment decision escalation.

R&D intensity and investment decision escalation

To investigate the relationship between investment decision escalation and R&D intensity we refer to the notion of entrenchment in terms of manager-specific investments evoked by Jensen and Meckling (1976), and Jensen (1986). Entrenchment is caused by an excessive investment in assets corresponding to managers' skills. These investments enable managers to increase their own return. The degree of entrenchment is described by how specific firm's assets characterize managers' talents.

For these objective managers make too many investments specific to their own skills. The cause is simply that they are investing shareholders' wealth rather than their own. By using shareholders' funds to make manager-specific investments, managers bind shareholders to themselves.

In this paper we hypothesize that manager who decide to invest an important sum in specific assets become strongly attached to his decision and choose consequently to escalate his initial investment choice.

H9: A high R&D intensity is positively associated with investment decision escalation.

Methodology

Data sample selection

Our empirical study is based on quantitative research. We use a questionnaire as a method of data collection. Our questionnaire consists of four main parts, based on treated areas in theory:

- The first part aims to collect some company's information from firm's statute and financial annual statement: Ownership structure, board composition, CEO's remuneration system, operating profit, total assets, current liabilities, long-term debt, current assets, earnings before interest and tax, R&D expense, sales,
- The second part focuses on determination of the level of CEO's commitment bias.
- The third part focuses on determination of the rate of CEO's cognitive dissonance.
- Part four aims to knowing the nature of CEO's risk profile and the CEO's age and tenure.

The questionnaire is addressed to managers in 220 non-financial Tunisian companies during the revolution period(2010-2011 fiscal year), 28 are listed companies and 192 are non-listed companies chosen from the list of firms implanted in the region of Tunis and S fax provided by "Agency of promotion of industry" in these region (table 1). All financial firms were eliminated to the fact that this sector is regulated and have particular governance system and characteristics. Firms with insufficient data regarding about CEO's cognitive are also excluded.

Table 1: Visited companies

	Total	Number
Initial BVMT sample		50
Financial firms		(22)
	28	
Other non financial firms		270
	298	
Insufficient data to emotional biases		78
Final sample	220	

The selected sample correspond to firm managers or CEO's representing ranging in age from 30 to 70 (table 2). In some firms questionnaires have been distributed by the method of door to door to been delivered to the concerned person, few among them have been mailed and most of them have been contacted via two accounting firm with which we have a great relationship.

It is worth noting that more than five hundred questionnaires had been distributed, we have received only two hundred ninety eight which is a less responses number than expected (return rate = 60%). Many from the primary selected sample have refused to respond to our question (specially mailed ones) on the ground of several reasons, such: they are too busy; generally they do not pay attention to the researches questionnaires and they return them to their assistants or

other staff for a response; and; they, usually, perceive these kind of questionnaires as a sort of "control" (specially non-listed firm) which aim to expropriate key data about their firm and their private information.

Table 2: Profile of subjects

	Total	Percentage
Firm's Activity		
Agriculture and crafts	16	7
Industry	128	58
Commerce and Service	76	35
CEO's tenure		
<5 years	33	15
5–10 years	125	57
> 10 years	62	28
CEO's Age		
<46	146	66
≥46	74	34
Total	220	100

Variables' measurement

On this context we aim to determine the endogens and exogenesis variables' measurement.

Escalatory behavior: The investment decision escalation (dependant variable)

The purpose of this paper is to provide evidence as to whether manager consider the monitoring and incentive effect of corporate governance, the cognitive and firm's financial features in his escalatory behavior (investment decision) while he notes a high level of commitment bias. The appropriate measure in the literature to evaluate investment decision escalation is the investment level which uses the indicators of overinvestment and underinvestment.

In this paper, we will use two indicators of investment level which are: overinvestment (low future investment opportunities and free cash flow) or underinvestment (low free cash flow and Future investment opportunities).

○ The free cash flow ratio as conceptualized by Jensen (1986) is measured as operating income before depreciation interest expense and taxes, as well as dividends paid (Lehn and Poulsen, 1989; Gul and Tsui, 1998; Jaggi and Gul, 1999) divided by book value of total assets to account for effects related to size (Lang *et al.*, 1991).

Free cash flow rate (FCFR) = Operating profit / total assets

○ Future investment opportunities are measured by Tobin's Q (Skinner, 1993). Tobin's Q is defined as the ratio of market value of a firm to the replacement value of its assets (Lindenberg and Ross, 1981; Griliches, 1981; Cockburn and Griliches, 1988; Megna and Klock, 1993; Skinner, 1993). In our work, we will employ an approximation of Tobin's Q, considered as follows (Chung and Pruitt, 1994):

$$Q_{it} = \frac{MVS_{it} + D_{it}}{A_{it}}$$

MVS: market value of common and preferred shares;

D: book value of debt, defined as current liabilities plus long-term debt plus inventories minus current assets;

A: total assets.

Based on these indicators, investment level is as follows:

1 if manager decides overinvestment: low future investment opportunities and free cash flow

0 if the manager decides underinvestment: low free cash flow and future investment opportunities.

Ownership concentration

In our study, we will adopt the measure chosen by Shabou (2000) adapted to Tunisian context. This variable is dichotomous, it is set to 1 (value 0) when the percentage held by the block holder is greater (less) than 50%. The companies where the shareholders hold at least 50% of the capital were qualified as heavily concentrated.

Board independence

In this setting we choose to operate the boards independence by the following variable: BIND which is defined as the percentage of the directors members who are simultaneously independent and non-executives, it is equal to the number of outside directors divided by the total board members (Chtourou *et al.*, 2001; Wright, 1996; Forker, 1992; Haniffa and Cooke, 2000, Azouzi and Jarboui, 2012; Hamza and Jarboui, 2012).

$BIND = \text{number of outside directors} / \text{total board members}$.

Based on this ratio, BIND is as follows:

1 if outsider's directors represent more than 50% in the board;

0 if insiders' directors represent more than 50% in the board.

Remuneration system

The remuneration incentives are usually measured using delta and/orvega. Delta is the sensitivity of CEO portfolio wealth to a 1% change in stock price. However, vega is the sensitivity of CEO portfolio wealth to a 0.01 change in the standard deviation of stock return. Numerous studies are using these measures, we cite for example, Knopf *et al.* (2002), Rajgopal and Shevlin (2002), Coles *et al.* (2006) and Core and Guay (2002).

Although, to proceed easily we decide to calculate this variable as dichotomous; it take 1 when the manager's remuneration system is based on firm's performance; and, 0 when it is fixe.

CEO's commitment bias

To measure the CEO's commitment bias, we takes the same steps than the most of studies have used an adaptation of the original questionnaire elaborated by Meyer and Allen (1991) to evaluate organizational commitment (*Organizational Commitment Scale*). This instrument is chosen because of its validity and its multidimensional character shown by several researches (Meyer and *al.*, 2002, Hamza and Jarboui, 2012).The commitment bias takes 2 follows:

2 if the manager has a high level for this bias

1 if not

CEO's risk profile

To determinate the nature of the CEO's risk profile, we refers to the questionnaire elaborated by Centea organization which is intended exclusively to characterize individual investor's risk profile (Hamza and Jarboui, 2012).

The risk profile takes 2 follows:

2 if the manager has a dynamic risk profile

1 if the manager has a defensive risk profile

CEO's cognitive dissonance

There are three main approaches to measuring cognitive dissonance:

An experimental approach (Festinger and Carlsmith, 1959; Simon *et al.*, 1995), a quantitative approach established by the founder of the theory of cognitive dissonance (Festinger 1957) and questionnaire as proceeding by Goetzmann and Peles (1997).

To determinate the level of the CEO's cognitive dissonance we decide to proceed using questionnaire. The cognitive dissonance takes 2 follows:

2 if the manager's cognitive dissonance level is high;

1 if the manager's cognitive dissonance level is low.

Financial strength indicators

There are many measures of financial strength indicator. In this paper we operate using the Altman's five ratios, which designate three levels of financial strength: strong, moderate, and weak.

Altman (1968) used multivariate linear discriminant analysis (MDA) to determine a cut-off value that enabled him to predict with 95% precision the criteria indicating which companies were in financial distress or vice versa.

The Z score calculated using five of Altman's ratios are as follows.

$$Z \text{ score} = 1.2 \text{ WC/TA} + 1.4 \text{ RE/TA} + 3.3 \text{ EBIT/TA} + 0.6 \text{ MV/BV} + 1.0 \text{ Sales/TA}$$

Z score = financial condition of the company (strong, moderate and weak)

WC/TA = working capital/total asset

RE/TA = retained earnings/total asset

EBIT/TA = earnings before interest and tax /total asset

MV/TA = market value of share/book value of debt

Sales/TA = sales/total asset

Based on the Z score, Altman distinguish companies as strong, moderate and weak. In this paper, financial strength representing the independent variable measured by Altman's Z score takes the values follows:

1= weak,

2= moderate; and

3= strong.

Firm's leverage

We observe a number of variables that measure the level of debt. Measures like total debt services ratio has been adopted by several researchers (Hovakimian *et al.*, 2004). While others have envisaged the debt ratio in the medium and long term (Myers, 2001). Titman (1984) has used the debt ratio in the short term.

In this setting we recommend to use the debt ratio as a measure of this variable measured by:

$$\text{Leverage ratios (LEV)} = (\text{total debt} / \text{total assets})$$

This measure is also proposed by Koh (2003), Demaria and Dufour (2007), Jarbouï and Olivero (2008), Ben Kraïem (2008), Sahut and Gharbi (2008), Azouzi and Jarbouï (2012); and Hamza and Jarbouï (2012).

Based on this ratio, firm's leverage is as follows:

1 if dept level > 50%;
0 if not

R&D intensity

We use the research and development (R&D) intensity as a proxy for firm specific assets. As Francis and Smith (1995), Cho (1988), Abdullah *et al.* (2002), and Hamza and Jarboui (2012), we evaluate R&D intensity variable by the ratio of a firm's R&D expense divided by total assets.

The R&D intensity takes 2 follows:

1 if this ratio > 50%;
0 if not

Methods

The employed method is a probabilistic graphical model called Bayesian network. This methodology is inserted on the artificial intelligence explanatory method.

The basic definition of a Bayesian network is given by (Pearl, 1986) who is declared that a Bayesian network is an explicit probability graph, which joins the estimated variables with arcs. This type of association articulates the conditional relationship between the variables. The formal description of Bayesian network is expressed as the set of {D, S, P}, where.

➤ D is a designation of variables or "nodes": in our case it refers to Firm's investment decision escalation, CEO's commitment level, CEO's risk profile, CEO's cognitive dissonance, Firm board of director's independency, Firm ownership concentration, CEO's remuneration system, Firm financial strength indicators, Firm's leverage rate, and, Firm's R&D intensity.

➤ S is a designation of "conditional probability distributions" (CPD). $S = \{p(D / \text{Parents}(D)) / D \in D\}$, $\text{Parents}(D) \subset D$ means that for all the parent nodes for D, $p(D / \text{Parents}(D))$ is the conditional distribution of variable D. Firm's investment decision escalation.

➤ P is design the "marginal probability distributions". $P = \{p(D) / D \in D\}$ refers to the probability distribution of variable D.

In the Bayesian network method, the problematic may be modelled with the actions of all variables. In general, three levels in modelling process are applied: initially we approximate the probability distribution of each variable and the conditional probability distribution between them. Secondly, basing on these estimations we can acquire the combined distributions of these variables. Finally, we can exercise some deductions for some variables in the objective to use some other important variables.

Result analysis

Definition of network variables and values

The initial step in constructing a Bayesian network model is to list all variables respectively, classified from the target variable to the causes. The variables definition is presented in the table below:

Table 4: The network variables' definition and mesures

Variables	Type
Investment decision escalation	Discret : YES/NO
Commitment level	Discret : YES/NO
Risk profit	Discret [1 ; 2]
Cognitive dissonance	Discret [1 ; 2]
Board independency	Discret : YES/NO
Ownership concentration	Discret : YES/NO
Remuneration system	Discret : fixed/based on performance
Financial strong indicators	Discret [1 ; 2 ; 3]
Leverage rate	Discret : YES/NO
R&D intensity	Discret : YES/NO

Results analysis and discussion

Graphical model

The second step in constructing a Bayesian network model is to test the relationships between variables. The Bayesian network constructed using the Bayesia Lab program is the result of the total variables database. The graphical relationship established between variables attaching to the data that we have obtained through the questionnaire, is shown in this figure.

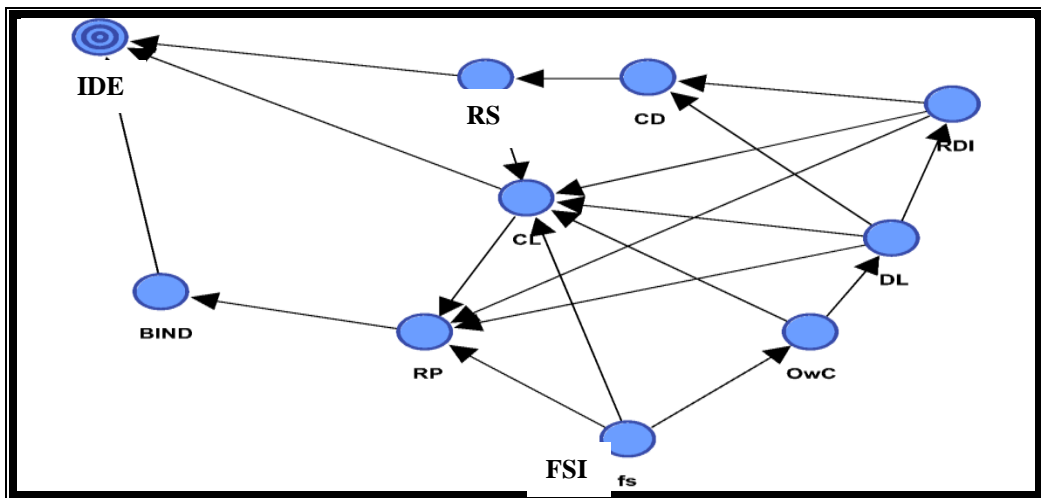


Figure 1: Firm’s investment decision escalation determinants: Bayesian network

Analysis of the discovered relationships

The relationships between the variables in the parent node and child node are measured using three indicators: the Kullback-Leibler, the relative weight and the Pearson correlation. The Kullback-Leibler and the relative weight are two indicators that show the concreteness of relationships and the importance of correlation between variables. Whereas the Pearson correlation, which progresses from 0 to 1; indicates the significance of variables relationship. Thus, the table 4 shows the relationships analysis between variables across the Bayesian network.

Table 5: The relationships analysis

Parents nodes	Childs nodes	Kullback-leibler divergence ^(a)	Relative weight ^(b)	Pearson correlation ^(c)
BIND	IDE	1,0000	1,0000	0,5412
RS	IDE	0,1022	0,2951	-0,0784*
CL	IDE	0,0894	0,2713	0,0379**
FSI	CL	0,3918	0,9659	-0,0191***
OwC	CL	0,3625	0,6585	0,0309**
DL	CL	0,3598	0,6278	0,0323**
RDI	CL	0,3198	0,5012	0,0189**
RS	CL	0,2632	0,3538	-0,0714*
DL	RP	0,3034	0,4500	-0,0015***
FSI	RP	0,3006	0,3684	0,0489**
CL	RP	0,1667	0,3274	-0,0018***
RDI	RP	0,1174	0,3209	0,0503**
RDI	CD	0,0380	0,1886	-0,0634*
DL	CD	0,0254	0,1022	-0,0137**
OwC	DL	0,0565	0,2124	0,1364
FSI	OwC	0,0093	0,0773	0,0474**
RP	BIND	0,0361	0,1546	0,1069
CD	RS	0,0113	0,0813	0,0596*
DL	RDI	0,0258	0,1098	-0,0879*

Notes: (a) Kullback-Leibler close to 1: important correlation between the variables

(b) Relative weight close to 1: important correlation between the variables.

(c) Pearson correlation:*, **, ***, respectively at 10%, 5%, and 1%.

Concerning the influence of governance mechanisms on the investment decision escalation, analysis advanced in table 6 shows the presence of strong (Kullback-Leibler = 1/ relative weight = 1), positive and insignificant ($\beta = 0, 5412$) effect of board independence; and, weak (Kullback-Leibler = 0,1022 / relative weight= 0,2951),negative and significant ($\beta = -0,0784^*$) effect of remuneration system. This evidence confirms predictions of the theory of persuasion and the theory of commitment.

Furthermore there is an indirect influence of governance mechanisms on the investment decision escalation. Ownership concentration has a moderate (Kullback-Leibler = 0.3625/ relative weight= 0.6585), positive and significant ($\beta = 0, 0309$) effect on CEO's commitment level. Also, remuneration system has a weak (Kullback-Leibler = 0.2632/ relative weight= 0.3538), negative and significant ($\beta = - 0, 0714$) effect of CEO's commitment level.

Consequently, persuasive communication (governance mechanisms), by its monitoring effect, is viewed as important cause of escalatory behavior. This inefficient role of these mechanisms can be justified by the negative influence of discipline and incentive on changing individual behavior (Girandola and Michelik, 2008). This finding of the failure of persuasion force in behavior changing, improves several studies showing the gap that can exist between ideas and actions. Moreover, Fox and Staw (1979) affirm that decider escalates if he makes the initial decisions in a liberty context, so he being personally responsible for this act, so, he will be subject of organizational pressure of being responsible for the consequences. Furthermore authors indicate that job insecurity and reputation increase the commitment to an initial chosen decision.

Concerning the influence of CEO's cognitive characteristics on the investment decision escalation, analysis advanced in table 6 shows the presence of weak (Kullback-Leibler = 0, 0894 / relative weight= 0, 2713), positive and significant ($\beta = 0, 0379^{**}$) effect of commitment level.

Furthermore there is an indirect influence of CEO's cognitive characteristics on the investment decision escalation. Commitment has a weak (Kullback-Leibler = 0.1667/ relative weight= 0.3274), negative and significant ($\beta = -0, 0018$) effect on CEO's risk profile. Also, CEO's cognitive dissonance has a weak (Kullback-Leibler = 0.0113/ relative weight= 0.0813), positive and significant ($\beta = 0, 0596$) effect on remuneration system.

This evidence confirms predictions of the theory of commitment and numerous empirical studies obviously show the importance of managerial personal responsibilities on reducing the escalation of commitment (Lange, 1993). Whereas, Matthias (2007) recommends a lot of procedures and actions such: Overcoming perception threshold, reducing selective perception, limiting Self-Justification, reducing unquestioned decision scope, declining sunk cost-effect, and, limiting optimism.

As Kiesler's definition; commitment is the link between an individual and its actions. So, commitment implies that only acts are binding: commitment leads to the perseveration of key behavior and the generation of new behaviors going in the same direction.

Concerning the influence of firms' features, analysis advanced in table 6 shows the presence of indirect influence on the investment decision escalation. Firstly, there is a strong (Kullback-Leibler = 0,3918 / relative weight= 0,9659),negative and significant ($\beta = -0,0191^{***}$) effect of financial strength indicator on CEO's commitment level; weak (Kullback-Leibler = 0,3006 / relative weight= 0,3684),positive and significant ($\beta = 0,0489^{**}$) effect of this variable on CEO's risk profile; and; weak (Kullback-Leibler = 0,0093 / relative weight= 0,0773),positive and significant ($\beta = 0,0474^{**}$) effect of financial strength indicator on ownership concentration.

Secondly, the dept level has a significant effect on commitment level (Kullback-Leibler = 0,3598 / relative weight= 0,6278/ $\beta = 0,0323^{**}$); on CEO's risk profile (Kullback-Leibler = 0,3034 / relative weight= 0,4500/ $\beta = -0,0015^{***}$); on R&D intensity (Kullback-Leibler = 0,0258 / relative weight= 0,1098/ $\beta = -0,0879^{**}$); and; on CEO's cognitive dissonance (Kullback-Leibler = 0,0254 / relative weight= 0,1022/ $\beta = -0,0137^{***}$).

Finally, the R&D intensity has a significant effect on commitment level (Kullback-Leibler = 0,3198 / relative weight= 0,5012/ $\beta = 0,0189^{**}$); on CEO's risk profile (Kullback-Leibler = 0,1174 / relative weight= 0,3209/ $\beta = -0,0503^{**}$); and; on CEO's cognitive dissonance (Kullback-Leibler = 0,0380 / relative weight= 0,1886/ $\beta = -0,0634^{*}$).

This result is consistent with the findings of Bellando and Tran-Dieu (2008), and Goetzmann and Peles (1997) whose shown that inflows in fund is not conditioned by a firm's financial condition.

With respect to the task enjoyment question, managers receiving the lower Z score will report higher levels of enjoyment than those receiving the higher Z score. This follows the earlier literature on cognitive dissonance (Aronson, 1992, 1994; Festinger, 1957).

According to the theory of cognitive dissonance, an individual registers dissonance when her behavior is inconsistent with her cognitions. Generally, it may be easier to change one's cognitions than changing one's actions. Based on the logic above, managers receiving the low Z score are be in a situation of dissonance shown in the conflict between the cognitions "I exerted effort to earn a large sum of money," and "I received the low Z score". Integrating the cognition

“I’m not good at this task” diminishes the difference between CEO’s expected utility and their low Z score received. Incorporating the last cognition means that managers receiving the low Z score will be pessimistic in their abilities, so reducing the dissonance resulted from having exerted effort only to obtain a low return to their effort.

In this stage, investors may integrate cognitions associated to her ability to reduce dissonance, thereby committing additional effort to rationalize initial effort they exerted in the first choice.

Analysis of the firm’s investment decision escalation (IDE)

To analyze the firm’s investment decision escalation, we express, firstly, the investment decision variable as a target in the Bayesian network. Secondly, we use the function that produces the analysis report of the target firm’s investment decision escalation. According to this report, the correlation between firm’s investment decision escalation and other variables are approximated by binary mutual information and the binary relative importance.

Table 7: Target variable analysis

IDE = YES (72, 7213%)				
Nodes	Binary mutual information ^(a)	Binary relative importance ^(b)		Modal value ^(c)
BIND	0,2010	1,0000	Yes	86,2862%
RS	0,0046	0,0229	Performance based	72,9211%
RP	0,0023	0,0116	Dynamic	76,3115%
CL	0,0010	0,0051	Yes	75,6350%
FSI	0,0000	0,0001	Weak	77,7927%
CD	0,0000	0,0001	High	73,5219%
RDI	0,0000	0,0000	Yes	56,9311%
DL	0,0000	0,0000	Yes	83,7002%
OwC	0,0000	0,0000	Yes	74,5991%
IDE = NO (27, 2787%)				
Nodes	Binary mutual information ^(a)	Binary relative importance ^(b)		Modal value ^(c)
BIND	0,2010	1,0000	No	68,6909%
RS	0,0046	0,0229	Performance based	80,5420%
RP	0,0023	0,0116	Dynamic	70,7183%
CL	0,0010	0,0051	Yes	71,9305%
FSI	0,0000	0,0001	Weak	77,5529%
CD	0,0000	0,0001	High	73,9414%
RDI	0,0000	0,0000	Yes	56,5172%
DL	0,0000	0,0000	Yes	83,4663%
OwC	0,0000	0,0000	Yes	74,4024%

Notes: (a) Mutual information: is the amount of information given by a variable on the target value. It is calculated in bits.

(b) Relative importance: presents the importance of a variable with respect to the target value.

(c) Modal value: is the average value of the explanatory variable for each target value

The target variable analysis « investment decision escalation » show that 72.7213% (27.2787%) of Tunisian companies decide to over invest (under invest) in the post revolution period (2010-2011).

Moreover, results show, for each value of the target, the list of nodes that have a probabilistic dependence with the target, sorted by descending order according to their relative contribution to the knowing of the target value.

In the case of over investment the most important nodes in term of informational relative contribution is, consecutively, the presence of outside directors (Binary relative importance=1.000), the remuneration system based on performance (Binary relative importance=0.0229), the CEO’s dynamic risk profile (Binary relative importance=0.0116), and, the high CEO’s commitment level (Binary relative importance=0.0051).

While, in the case of under investment the most important nodes in term of informational relative contribution is, consecutively, the absence of outside directors (Binary relative importance=1.000), the remuneration system based on performance (Binary relative importance=0.0229), the CEO’s dynamic risk profile (Binary relative importance=0.0116), and, the high CEO’s commitment level (Binary relative importance=0.0051).

Additionally, the profile for each value of the target is described by the modal value of each influencing nodes. These profiles are compared with the a priori modal values of the nodes i.e. when the target variable is unobserved.

In the case of over investment the most important modal value is given by the node of the presence of outside directors (modal value =86.2862%), the CEO’s dynamic risk profile has a great influence on the target profile (modal value =76.3115%), the high CEO’s commitment level describe mainly the target profile (modal value =75.6350%), finally, the remuneration system based on performance describe well the target profile (modal value =72.9211%).

While, in the case of under investment the most important modal value is given by the node of the remuneration system based on performance (modal value =80.5420%), the high CEO’s commitment level has a great influence on the target profile (modal value =71.9305%), the CEO’s dynamic risk profile describe mainly the target profile the target profile (modal value =70.7183%), finally, the node of the presence of outside directors (modal value =68. 6909%).

The resemblance of contribution of same variables (BIND, RS, RP and CL) can be discussed referring to the socio political environment. Subsequent the historical revolution in January 2011; Tunisia has experiencing an exceptional wave of political, social and economic transition. Consequently, the country knows a period of extreme transformation which has created new challenges and, particularly, new investment conjuncture.

The investment conjuncture has been further influenced by the unfavourable immediate shock of the revolution in addition to a protracted epoch of uncertainty and instability as managers and financial experts are studying and testing the boundaries of new-found financial politics.

Maximization of the target average (IDE)

The target dynamic profile capability software is a test enhanced by Bayesia Lab program to provide the percentage of explanatory variable to maximize the target variable value. Table 6 presents the dynamic profile of the Firm’s investment decision escalation (IDE)

Table 8: Target dynamic profile analysis

IDE = YES			
Nodes	Optimal modality	Probability	Joint Probability
<i>A priori</i>		72,7213%	100,0000%
BIND	YES	88,0196%	71,2892%
RS	FIXE	92,0078%	17,8308%
CL	NO	100,0000%	3,5801%
IDE = NO			
Nodes	Optimal modality	Probability	Joint Probability
<i>A priori</i>		27,2787%	100,0000%

BIND	NO	65,2646%	28,7108%
CL	NO	75,8423%	7,2817%
RS	FIXE	100,0000%	1,4181%

The target dynamic profile analysis presented in table 3 show two following results
 First, with the 72, 7213% augmentation in overinvestment it is associated an augmentation of the effect of board independence with 88, 0196%; the increase in the effect of remuneration system with 92, 0078% and the completely absence of commitment level 100, 0000%.

Secondly, with the 27, 2787% augmentation in underinvestment its associated an augmentation of the effect of board dependence with 65, 2646%, the increase in the effect of no commitment with 75,8423% and the totally effect of fixed remuneration system 100,0000%.

Conclusion

This research examines the determinants of firms' investment decision escalation employing a CEO's social psychological aspect which is: commitment bias introduced simultaneously with other CEO's cognitive characteristics, such governance mechanisms, and, firm's financial features. For this goal we have implement a survey conducted around some executives of large private companies in Tunisia in the post revolution period.

Actually, the collected data analysis has confirmed the theoretical analysis which indicates that escalation of commitment is the tendency of decision makers to maintain to invest time, money, or effort into a failure decision or unproductive course of action. The expression "throwing good money after bad" because they have "too much invested to quit" captures the real meaning of this frequent decision-making error. Escalation of commitment has managerial consequences. The presence of CEO's high commitment bias ignores the possibility of crisis communication inside the firm. Many organizations have experienced large losses, because the manager was determined to justify his original choice by continuing to commit resources to a non profitable decision. March, declare it in this way: "Now that I have made my decision, I need to find good reasons for it".

Furthermore, the empirical analysis of the relationship between governance mechanisms and CEO's escalatory behavior in investment decision show an inefficient role of these mechanisms in monitoring and incanting managers to deviate a committed executive from this biased behavior.

Indeed, we can said that the main lesson of this study for Tunisian companies is to incorporate the commitment aspect in the governance mechanism conception by introducing the binding communication in order to align both the CEO's and shareholders' interest.

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