



WHY CEO EMOTIONAL BIASES AFFECT FIRM ASSETS SPECIFICITY CHOICE BAYESIAN NETWORK METHOD: THE EVIDENCE FROM TUNISIA

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ABSTRACT

The aim of this paper is to explore the determinants of firm investment decision under the manager's psychological characteristic. Previous research investigating the relationship between overconfidence and financial decisions has studied investment, financing decisions and firm values. However, there are only a few exceptions to examine how a managerial emotional bias (optimism, loss aversion and overconfidence) affects firm investment cash flow sensitivity. This stream of research contends whether to firm investment cash flow sensitivity or not depends on how managers perceive of the company's future. We introduce an approach based on bayesian network technique with a series of semi-directive interviews. The originality of this research paper is guaranteed since it traits the behavioral corporate policy choice in emergent markets. In the best of our knowledge this is the first study in the Tunisian context that explores such area of research. Ours results show that investment nature analysis by introducing behavioral dimension enriched organizational financial theory: leader affected by behavioral biases presence prefer asset specificity high level allowing this protect against the takeover operation Russianness.

Keywords: emotional biases; corporate finance; optimism; overconfidence; loss aversion; investment decision; Bayesian network.

JEL Classification Code: G14, G31, G32, D80

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INTRODUCTION

The interaction between investment and financing decisions is arguably the central issue in corporate finance. It is now well-established that a firm's financing choices can affect its investment decisions because taxes, issuance costs, agency conflicts, and information problems associated with debt and equity will affect the firm's cost of capital, drive a wedge between the cost of internal and external funds, and alter managers' incentives to take different types of projects. Investment cash flow sensitivity analysis provided by Organizational financial theory shows that investment depends on internal resources for these three apply to financial reasons : internal funds may be less costly than external funds; managers may tend to overspend internally available funds; and cash flow may simply be correlated with investment opportunities (Myers, 1984; Myers and Majluf, 1984; Graham and Hervey, 2001; Fama and French, 2002; Frank and Goyal, 2007; Bushman et al. 2004; Antoniou et al. 2007; Huang and Ritter, 2009).

All of the above mentioned approaches hold in common one important point, namely, the implicit assumption that financial market participants as well as company managers always act rationally (Azouzi and Jarboui, 2012). However, an extensive and growing literature on human psychology and behavior shows that most people, including investors and managers, are subject to important limits in their cognitive processes and tend to develop behavioral biases that can significantly influence their decisions. The studies act for managers decision making contain distortion of CEO financial decision (Hawkins et al. 2001; Ho and Chang, 2009; Backer et al. 2004; Malmendier et al. 2010; Hackbarth, 2009). Several, empirical studies have found that CEO personal characteristics, particularly the CEO overconfidence may lead to distortions in corporate investment decision and that optimistic managers show significantly higher investment sensitivity to free cash flow, particularly for equity-dependent firms, or for more financing constrained firms (Lin and al., 2005; Malmendier and Tate, 2005; Azouzi and Jarboui, 2012). Malmendier and Tate (2005) found that CEOs who are optimistic regarding their firm's future performance have greater sensitivity to investment cash flow leading to distortions in investment. Also, Lin et al. (2005) show in more financing constrained firms, optimistic managers exhibit higher investment cash flow sensitivity than do non-optimistic managers base on by these studies, on our article examines the possible influence of three closely related emotional biases, which are extensively documented in behavioral research, loss aversion, optimism and overconfidence, on a firm's investment decisions. More specifically, it examines the links between emotional biases and firm assets specificity rate.

The article is structured as follows: Section 2 presents the related literature and the theories which motivate the empirical work and Section 3 discusses the empirical strategies that were adopted. Section 4 discusses the main results and Section 5 presents the concluding remarks.

HYPOTHESIS DEVELOPMENT

The implications of managerial characteristics for corporate decisions have only recently begun to be explored by behavioral finance researchers. Some studies address the issue from the perspective of rational managers interacting with overconfident outside investors. Only recently has a smaller number of analyses emerged focusing the leader cognitive biases themselves and trying to understand how they can affect their investment and financing decisions (Hawkins et al. 2001; Ho and Chang, 2009; Backer et al. 2004 ; Malmendier et al. 2010; Hackbarth, 2009; Azouzi and Jarboui, 2012). Bertrand and Schoar (2003) and Graham et al. (2010) show that a significant fraction of the variation in corporate practices and executive compensation can be explained by manager fixed effects. Malmendier and Tate (2005, 2008) and Malmendier et al. (2007, 2010) formalize the notion of overconfidence and provide empirical evidence of the effects of CEO overconfidence on capital investment and capital structure preferences. We investigate the influence of managerial bias (loss aversion, optimism and overconfidence) about corporate investment specificity choice.

Optimism and Investment Specificity

The role of managerial optimism in a firm's investment and financing decisions has been a subject of an ongoing debate in the corporate finance literature. Following Roll's (1986) pioneering study on the role of managerial optimism in corporate acquisitions, the merits of managers' possible departure from full rationality, and behavioral corporate finance in general, have been examined in a number of theoretical and empirical studies. Malmendier and Tate (2005) find that managers are invested in the project by reason of holding stock options and their desire to preserve their reputation in the labor market. They tend to overestimate the control of the project (specific investment). This implies that an optimistic leader opts for specific investments to develop its human capital and its makes replacement difficult. Hackbarth (2009) argue that optimistic managers have a higher probability to excel in tournaments and thus may get promoted to top executive positions more often, though all managers choose riskier investments (specific investment and long term) when faced by internal competition for leadership.

Fleton and al (2003) justify the presence of firm asset specificity higher level by leader optimistic. This leader optimistic with its firm future investment opportunities increases assets specificity level to limit the likelihood of its replacement. Goel and Thakor (2008) also show that a optimistic CEO's underestimation its firm risk project can offset her risk aversion, leading to improved investment levels by choosing specific investments limiting its replacement. This implies the presence of a positive relationship between CEO optimism and its firm assets specificity. Malmendier et al. (2010) argue that leaders are optimistic able to take risky decision, and find that overconfident CEOs take on more debt. So to avoid the effect of disciplinary mechanisms (do debt) debt leader opts for specific investments. This implies the presence of a positive relationship between assets specificity rate and leader optimism level.

Azouzi and Jarboui (2012) find that the CEO investment decisions behavioral analysis is consistent with the corporate financial theory, the leader affected by behavioral biases adjusts its investment choices based on their ability to assess alternatives (optimism and overconfidence) and risk perception (loss aversion) to create of shareholder value and ensure its place at the head of the management team. This leader optimistic with its firm future investment opportunities increases assets specificity level to limit the threat of a takeover operation (loss of social status or remuneration). This implies the presence of a positive relationship between CEO optimism and its firm assets specificity.

H₁: Optimistic leader accepts level of assets specificity greater than rational leader

Loss Aversion and Investment Specificity

Available literature to suggest that the loss aversion leader plays an important role in explaining their investments choice (Helliari et al. 2005) specifically; leaders seek to avoid the loss risk through their investment choices. They take risks to avoid the probability of making a loss. Kisgen (2006) shows that the level of debt affects the credit rating in a negative way. Nakara (2007) says that the leader opts for investments in research and development (specific) to ensure exclusivity on it and avoids the revocation risk. It tends to invest in new assets or activities which it has a comparative advantage. It will then seek to take root in anticipation of the possible dismissal costs, for example by investing in activities (sectors) where he thinks restore its comparative advantage. Baker et al. (2007) show that a loss in aversion causes CEO to overestimate the firm's risk. This over-estimation the impulse to choose allowing decisions to hedge against the reputation risk loss related to a successful takeover operation (including a high level of asset specificity). Azouzi and Jarboui (2012), also find that CEO loss aversion level is correlated with its preference for assets specificity. This implies a positive correlation between risk of loss and choosing specific investments. Edmans and Gabaix (2011) predict that risk-averse CEOs will be given compensation contracts with greater risk-taking incentives to induce them to accept high-risk positive NPV projects. This CEO loss averse opts for specific investments to limited chances of success of an operation of hostile takeover.

H₂: Loss aversion leader accepts level of assets specificity greater than rational leader

Overconfidence and Investment Specificity

Overconfidence is one of the main behavioral biases brought forward by behavioral finance theory, and its existence has been well documented by anecdotal and academic evidence alike. Many contemporary researchers have developed models to show the overconfidence effect on CEO decision-making (Hawkins et al. 2001; Ho and Chang, (2009); Backer et al. (2004); Malmendier et al. (2010) and Hackbarth, (2009)). Scheinkman and Xiong (2003) find that overconfidence results from an overestimation of the precision of knowledge instead of information. This overestimation

of decision knowledge impulses leader to increase its asset to specific level. It is derived from the controlling conscious choice. Thus leading to a preference of asset specificity high-level is further explained by its overconfidence rate. Backer et al. (2004) show that overconfidence decreases CEO risk perceived level or increase the gain since overstates individual capabilities. Leader, confident in its abilities and personal skills will be encouraged to undertake a rooting policy or manipulate information in order to preserve its investment in specific capital. Graham et al. (2009) point out that business leader is overconfident. They show that overconfident managers have a significant effect on investment policy. The authors show that overconfident managers prefer investment in innovation. This implies positive relationship between CEO overconfidence level and firm assets specificity rate. Hirshleifer et al. (2010) explain investment in innovation by overconfidence leaders. The authors show that overconfidence deprived CEO risk perceived level. This overconfident leader and less risk averse tend to undertake risky investments whose investment innovation. Malmendier et al (2010) also find that CEO overconfidence level is positively correlated with its motivation and involvement in their work. CEO overconfident chooses specific investments such as investment in research and development in order to increase its firm competitiveness and ensure value creation. These investments choice reported in more performance and leader reputation on the labor market.

H₃: overconfidence leader accepts level of assets specificity greater than rational leader

RESEARCH METHOD

Data

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 identify the company (size, industry, ownership structure, debt levels, level of dividend distribution)
- The second part focuses on presenting the level of loss aversion leaders
- Party three deals with the level of optimism of the leader
- Finally, party four seeks to show the level of overconfidence of managers

The questionnaire is addressed to CEO of Tunisian companies. The selected sample consists of 100 managers of industrial and commercial companies listed on the Tunisian stock exchange in 2010 (28 companies) and non-listed companies (82 companies). Our choice of listed companies is justified by the fact that they are supposed to be the most efficient and meet several conditions necessary for the reliability of our study. Limited companies which are usually diffuse shareholders, increasing the importance of role of the board and ownership structure and consequently increase the validity of the assumptions. We decided to exclude financial firms: banks, insurance companies and investment companies for development and portfolio

management... in fact these companies have different characteristics of non-financial businesses and to avoid correlation effects specific to a specific sector. To get a representative sample of our Tunisian market we have added other unlisted companies.

Table- 1. Visited Companies

Initial BVMT sample for 2010	50
Financial firms	(22)
Other non financial firms	120
Insufficient data to emotional intelligence	(40)
Insufficient data to board of directors compositions	(8)
Final sample	100

Variables' Measurement

The objective of this section is to determine the variables' measurement.

Specific Investment

The purpose of this article is to show the impact of emotions on the firms' specific investment cash flow sensitivity. The appropriate measures in the literature to evaluate investment specific are Assets specificity. In our study, we will use the degree of assets intangibility as a proxy of the specific investments. The degree of assets intangibility can be appreciated on many levels. The France Bank and Ministry of Industry in studies devoted to the development of intangible investments in France have used the ratio often intangible / tangible assets. In Tunisia, as in France, the intangible asset accounting record comes from the capitalization of such expenses. However, the unavailability of information legitimizes the use of the amount of intangible assets is presented in the balance sheet although this amount is usually surrounded by doubt as the result of discretionary choices performed by the leaders. Akin to the French context, the measurement of intangible capital in the Tunisian context has the same problems, which leads us to adopt accounting. Based on that discussion and the availability of data of Tunisian companies we offer the following indicator of the degree of activation of intangible expenses:

Asset Specificity Rate (ASR) = intangible assets / asset accounting.

This measured is used by Cazavan-Jeny (2004), Moussu and Thibierge (1997), Thibierge (2001), etc.

The investment decision takes 3 follows:

- i) 1: if asset specificity rate lower than 0.5
- ii) 2: if assets specificity rate equal to 0.5
- iii) 3: if assets specificity rate greater than 0.5

Emotional Bias

The questionnaire focuses on evaluating and scoring of the three emotional biases (risk aversion, optimism and overconfidence). The questions have been inspired from the questionnaires formulated by the Fern Hill and Industrial Alliance companies. The emotional bias takes 2 follows:

- i) 1 if the individual has a high level for each bias
- ii) 0 if not.

Capital Structure Choice

The appropriate measures in the literature to evaluate three methods of financing are:

Internally generated resources (The Cash Flow)

Research within the framework of financial theory of investment; have resorted to many measures of internal resources. Cash flow represents the flow generated by the activity of any business, is one of the most appropriate (Lehn and Paulsen, 1989; Molay, 2006; Naoui et al. 2008; Azouzi and Jarboui, 2012).

$$\text{CF} = \text{Net income} + \text{Depreciation} - \text{Dividend}$$

$$\text{Cash Flow rate (RCF)} = \text{CF} / \text{Total Assets}$$

To show that the leader chosen or not internally generated resources, we can use the change in flow rate. A negative change indicates the use of internal resources.

$$\text{Cash flow rate variation} = \text{RCFN} - \text{RCFN-1} / \text{RCFN-1}$$

Debt Level

We observe a variety of variables that measure the level of debt in the company. Measures such as total debt service ratio have been selected by several authors (Hovakimian et al. 2004). Others have used the debt ratio in the medium and long term (Myers, 2001). The debt ratio in the short term was also used by Titman (1984). As part of our analysis we propose to use the debt ratio as a measure of this variable. It should be noted that this ratio is calculated by:

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

This measure is also used by Koh (2003), Demaria and Dufour (2007), Jarboui and Oliver (2008), Ben Kraiem (2008) and, Sahut and Gharbi (2008). To show that the manager uses debt or not, we can use the change in debt ratio. A positive change indicates the use of debt.

Leverage ratios variation = $LEVN - LEVN-1 / LEVN-1$

Equity Level

This variable is measured by the value of equity in the balance sheet of the company. To show that the leader chosen or not the capital increase, we can use the variation in the percentage of investment. A positive change indicates an increase of capital.

Level of Capital Invested (LCI) = $equity / total\ assets$

Level of Capital Invested Variation = $LCIN - LCIN-1 / LCIN-1$

The financial decision takes 7 follows:

- i) 1 if the manager chooses the internally generated resources: positive variation in the cash flow rate
- ii) 2 if the manager chooses debt: positive variation in the leverage ratio
- iii) 3 if the manager chooses the capital increase: positive variation in the level of invested capital
- iv) 4 if the manager chooses internally generated resources + debt: positive variation in the cash flow rate and debt ratios
- v) 5 if the manager chooses internally generated resources + capital increase: positive variation in the cash flow rate and level of capital invested
- vi) 6 if the manager chooses debt + capital increase: positive variation in the leverage ratio and level of invested capital
- vii) 7 if the manager chooses internally generated resources + debt+ capital increase: positive variation in the cash flow rate, leverage ratio and level of invested capital

Dividend policy

The variable used to measure dividends level is the distribution rate (Rozeff, 1982; Agrawal and Jayaraman, 1994). The advantage of the distribution rate is the information that is in terms of retention of earnings and, therefore, whether the flow (the retention rate is equal to 100 in the payout ratio).

Payout ratio = $Dividend\ per\ share / earnings\ per\ share$

Control Variables

Static trade-off theory (STT) and pecking order theory (POT) is the body of theory of reference that addressed the issue of the financial structure of the firm. The factors that explain the financial structure are mainly at the cost, size, level of risk, growth opportunities, the structure of assets and business (Raj in and Zing ales, 1995; Booth et al. 2001; Molay and Duffer, 2010). We include in our model three control variables that explain the effectiveness of choice of financial structure of the company. These variables are proxies for profitability, firm size and growth opportunities.

Profitability

More profitable firms have, *ceteris paribus*, more internally generated resources to fund new investments. If their managers follow a pecking order, they will be less likely to seek external financing (Fama and French, 2002). Thus, on average, these firms' leverage ratios will be lower. In trade-off models, on the other hand, this relationship is inverted. More profitable firms are less subject to bankruptcy risks, *ceteris paribus*. Hence, their expected bankruptcy costs are reduced and they can make more use of the tax shields provided by debt, thus choosing a position of greater leverage. We will keep the ratio of return on assets ROA to measure this variable:

ROA = Earnings before interest, tax, depreciation divided by total assets, lagged one year period

Firm Size

Studies suggest that the probability of bankruptcy is lower in larger firms and that, therefore, their debt capacity is higher than that of smaller ones, all else equal. On the other hand, fixed transaction costs can make new stock issues unattractive to small corporations, stimulating them to issue debt (Rajin and Zingales, 1995; Hovakimian et al., 2004; Dufour and Molay, 2010). Indeed, most studies have applied total assets or turnover as a measure for firm size (Bujadi and Richardson, 1997).

Future Investment Opportunities

It is argued that future profitable investment opportunities can influence corporate financing decisions in different ways. In the context of the pecking order theory, firms that have many investment opportunities and believe that their stocks (and risky bonds) are undervalued by the market, may choose a capital structure with less debt. If they maintained high debt ratios, they would be forced to distribute precious cash flows generated by their business and could face the need to issue undervalued securities to fund new projects. This could, in turn, induce underinvestment. A more static version of the pecking order model, on the other hand, predicts that firms with more future opportunities will be more levered, *ceteris paribus*, because they need more external financing and issuing debt is preferable to issuing new stock Rajin and Zingales, 1995; Graham, 2000; Booth et al. 2001; Dufour and Molay, 2010; Naomi et al. 2008; Azouzi and Jerboa, 2012). We will keep the Tobin's Q to measure this variable. The Tobin's Q Estimated with the approximation formula proposed by Chung and Pruitt (1994):

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

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.

Board of Directors

To note, theories regarding the board of directors, along with prior empirical researches and various recommendations have suggested that some board characteristics have an influence on the quality of the financial report and on firms' performance.

The Board's Independence

The different characteristics pertaining to the board's independence are measured by the following variable: BIND is defined as the percentage of the board members who are simultaneously independent and non-executives which 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).

BIND = number of outside directors /total board members.

Table-2 presents the characteristics of boards of directors of the 100 Tunisian companies included in our study. Tunisian companies are run by independent boards, medium (seven directors) and not dominated by CEOs.

Table -2. Board of Directors' Characteristics

Variables	Mean	Std	Min	Max	N
Entire Board	7.60	2.56	4	12	100
Outside Directors	2.62	1.11	1	4	100
Affiliated Directors	1.98	0.80	1	3	100
Inside Directors	3.360	1.34	1	5	100
CEO Duality	0.26	0.44	0	1	100

For simplification purposes, the summary of each variable extent range in the model, its name as well as its expected impact on the firm assets specificity choice are depicted in Table-3.

Table-3. Operational definitions of variables

Class :	Phenomena	Mesure	Variables	Predictions		
Endogens variables :						
Assets specificity	Investment Nature	Asset Specificity Rate (ASR) = intangible assets / asset accounting.		AS		
Exogenous variables :						
				weak	average	strong
Optimism	Directors overestimate capacity of their firms	The questionnaire obtained score	OP	+	+	-
Lost aversion	Lossrumination	The questionnaire	LA	+	-	+

	and reputation	obtained score				
overconfidence	Directors overestimate their personal competences	The questionnaire obtained score	OVER	+	+	+
Capital structure choice	Internally generated resources (The Cash Flow)	CF = Net income + Depreciation – Dividend Cash Flow rate (RCF) = CF / Total Assets) Cash flow rate variation = $RCF_N - RCF_{N-1} / RCF_N$	CF	-	+	+
	Debtlevel	Leverage ratios (LEV)= (total debt / total assets) Leverage ratios variation = $LEV_N - LEV_{N-1} / LEV_{N-1}$	LEV	+	-	-
	Equityleve	Level of Capital Invested (LCI) = equity / total assets Level of Capital Invested Variation = $LCI_N - LCI_{N-1} / LCI_{N-1}$	EQ	-	+	+
Dividend Policy	The presence of a dividend policy	Payout ratio = Dividend per share / earnings per share If the payout ratio <0 or > 0: yes: presence of a policy of dividend distribution. If the payout ratio = 0: no, absence of a policy of dividend distribution	DV	-	+	+

Controls variables:

Profitability	Reports on the company's ability to meet its commitment	ROA= Earnings before interest, tax, depreciation divided by total assets, lagged one year period	PF	-	+	+
Firm size	Firms signaled performance	Ln (total assets)	LNSIZE	+	+	+
Future investment opportunities	Indicates the productive capacity of the company	$Q_{it} \cong \frac{MVS_{it} + D_{it}}{A_{it}}$ MVS – market value of common and preferred shares; D – book value of debt, defined as current liabilities plus long-term debt plus inventories	FIO	-	+	+

		minus current assets; A – total assets.				
Board Of Directors	The presence of independent members in the board	Number of outside directors /total board members.	BIND	+	-	-

Bayesian Network Method

The definition of a Bayesian network can be found in many versions, but the basic form (Pearl, 1986) is stated as follows: a Bayesian network is a directed probability graph, connecting the relative variables with arcs, and this kind of connection expresses the conditional dependence between the variables. The formal definition follows:

A Bayesian network is defined as the set of {D, S, P}, where:

- 1) D is a set of variables (or nodes): in our case it consists of investment cash flow sensitivity, optimism, loss aversion, overconfidence, profitability, firm size and future investment opportunities.
- 2) S is a set of conditional probability distributions (CPD). $S = \{p(D / \text{Parents}(D) / D \in D), \text{Parents}(D) \subset D\}$ stands for all the parent nodes for D, $p(D/\text{Parents}(D))$ is the conditional distribution of variable D.
- 3) P is a set of marginal probability distributions. $P = \{p(D) / D \in D\}$ stands for the probability distribution of variable D.

Table- 4.The network variables and their values

Variables	Type
Investment Specific	Discret [1 ; 2 ; 3]
Capital Structure Choice	Discret [1 ; 2 ; 3 ; 4 ;5 ;6 ;7]
Dividend Policy	Discret : YES/NO
Optimism	Discret : YES/NO
Loss Aversion	Discret : YES/NO
Overconfidence	Discret : YES/NO
Profitability	Discret : YES/NO
Firm Size	Discret [1 ; 2 ; 3]
Future Investment Opportunities	Discret : YES/NO
Board Independence	Discret : YES/NO

In the Bayesian network, variables are used to express the events or objects. The problem could be modeled with the behavior of these variables. In general, we first calculate (or determine from expert experience) the probability distribution of each variable and the conditional probability distribution between them. Then from these distributions we can obtain the joint distributions of

these variables. Finally, some deductions can be developed for some variables of interest using some other known variables.

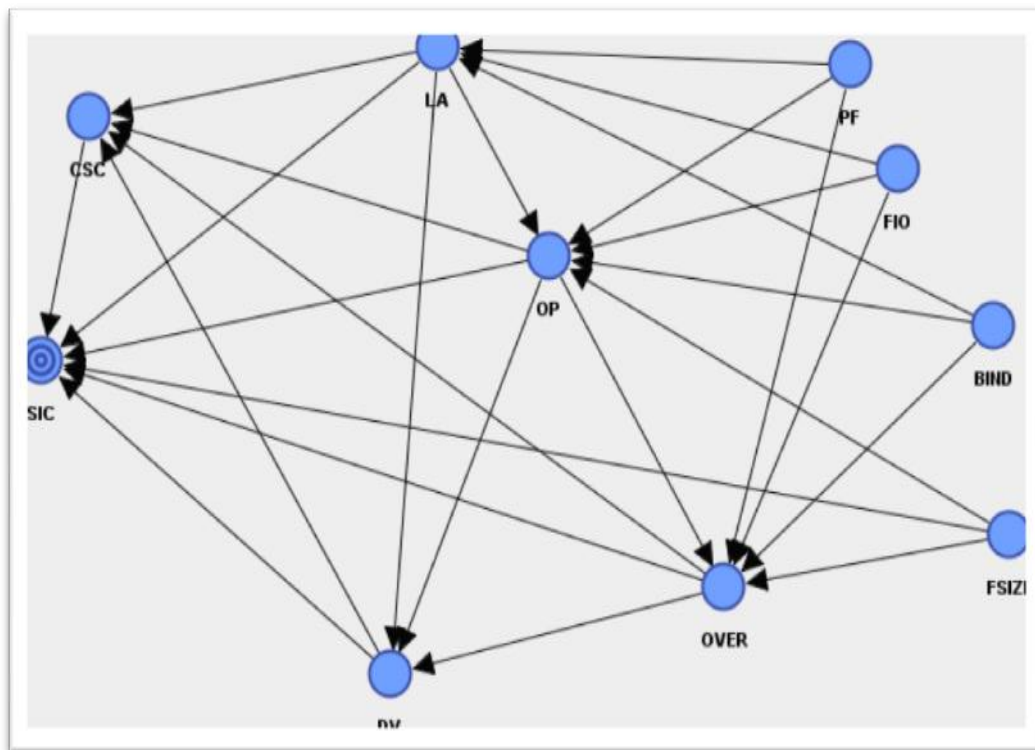
Define network variables and values

The first step in building a Bayesian network expert is to list the variables recursively, starting from the target variable to the causes. In this order we present the variables in the Table-4.

Graphical model

The second step of Bayesian network the construction is to express the relationships between variables. The Bayesian Lab learning of Bayesian network by taking the database is a discrete entry process without sampling data. The Bayesian network constructed is the result for the total database. According to the data that we have received through the questionnaire, we have established relationships following graph (Figure-1). The graphical model if it (Figure-1) explains the assets specificity choice of Tunisian firms. This decisions affected by the CEO emotional bias (optimism, loss aversion, and overconfidence). These emotional biases originate the firms' financial position (capital structure choice, dividend policy, size, growth opportunity, profitability and board independence). In what follows, we describe in detail the various correlations between these variables and their effect on the target variable (assets specificity choice: SIC).

Figure -1. Assets Specificity Choice: Bayesian Network Model



EMPIRICAL RESULTS

The Relationships Discovered Analysis

Table-5 examines the relationship (independence and correlation) between networks variables. The results show the presence of an important and positive relationship (Kullback-Leibler = 0.7796 / weight ratio = 1 / β = 0.6689) between the CEO assets specificity choice and firm size. This result finds firm size positive affect in CEO assets specificity preference. Relationship analysis present important and positive relationship (Kullback-Leibler = 0.7497 / weight ratio = 0.9616/ β = 0.8612) between CEO optimism level and board of directors' independence. This result implies that the optimism leader makes indifferent with institutional presence in the director's board. CEO optimism level is negatively and medium (Kullback-Leibler = 0.4168/ weight ratio = 0.3547 / β = -0.0538) correlated with its firms capital structure choice. Relationship analysis test says that firm capital structure choice is negatively and medium correlated with CEO loss aversion rate (Kullback-Leibler = 0.3606/ weight ratio = 0.4626 / β = -0.0659). CEO optimism level are positively correlated with its firm dividend policy choice (Kullback-Leibler = 0.3070/ weight ratio = 0.3938/ β = 0.5576). Relationship analysis shows the presence of a negative correlation between CEO capital structure choice and its investment specificity preference (Kullback-Leibler = 0.2201/ weight ratio = 0.2823/ β = -0.0557).

CEO overconfidence are a positive impact in its firm assets specificity choice (Kullback-Leibler = 0.1130/ weight ratio = 0.1450/ β = 0.0646). This empirical finding confirms our hypothesis (H_1). Firm dividend policy choice is positively correlated with CEO assets specificity choice (Kullback-Leibler = 0.0917/ weight ratio = 0.1176/ β = 0.0933). Firm assets specificity is negatively affected by its CEO loss aversion level (Kullback-Leibler = 0.0665/ weight ratio = 0.0853/ β = -0.0726). This result is contradictory to our theoretical predictions (H_2). His is explained by the fact that the CEO loss aversion seeks to minimize its firm total risk. It is a gift reticent to prefer risk specific investment. CEO assets specificity preference is positively affected by its optimism level (Kullback-Leibler = 0.0374/ weight ratio = 0.0479/ β = 0.0908). These results affirm the correlation between optimism and assets specificity preference (H_1).

The profitability is negatively correlated with the CEO optimism level (β = -0.0122) and his loss aversion (β = -0.1465), positively correlated with his overconfidence (β = 0.1188). Future investment opportunities is negatively correlated with CEO optimism level (β = -0.0019), positively correlated with his loss aversion (β = 0.0067) and his overconfidence (β = 0.0154). Firm size is positively correlated with CEO optimism level (β = 0.0991) and his overconfidence (β = 0.0067). Board of directors independence is positively correlated with CEO overconfidence level (β = 0.0196) and negatively with his loss aversion rate (β = -0.2954). Finally, the result also show the positive correlation between CEO overconfidence and his optimism level (β = 0.0991). The relationships between the variables in the database are directed at the parent node child node. Each

relationship is composed of three different measures: the Kullback-Leibler, the relative weight and the Pearson correlation (direction of relation). Indeed, the Kullback-Leibler and the relative weight are two measures indicating the strength of relationships and the level correlation between variables, in that while the correlation measure of personal meaning and relationship significance. The relative weight scale is 0 to 1. Thus, Table-5 below shows the relationships analysis results between variables across the network Pearson correlation. Table-5 examines the relationship (independence and correlation) between networks variables.

Table-5. The relationships analysis.

PARENTS NODES	CHILDS NODES	KULLBACK- LEIBLER DIVERGENCE	RELATIVE WEIGHT	PEARSON CORRELATION
FSIZE	SIC	0,7796	1,0000	0,6689
BIND	OP	0,7497	0,9616	0,8612
OP	CSC	0,4168	0,5347	-0,0538**
LA	CSC	0,3606	0,4626	-0,0659**
OP	DV	0,3070	0,3938	0,5576
CSC	SIC	0,2201	0,2823	-0,0557**
OVER	CSC	0,2038	0,2615	0,22611
FSIZE	OP	0,1547	0,1985	0,0991*
OVER	SIC	0,1130	0,1450	0,0646**
DV	CSC	0,1092	0,1401	-0,0111***
PF	OVER	0,0986	0,1265	0,1188*
FIO	OVER	0,0951	0,1219	0,0154***
DV	SIC	0,0917	0,1176	0,0933*
FSIZE	OVER	0,0879	0,1127	0,0667**
OVER	DV	0,0823	0,1056	-0,1464*
BIND	LA	0,0695	0,0892	-0,2954
LA	SIC	0,0665	0,0853	-0,0726*
LA	OP	0,0605	0,0776	-0,2835
LA	DV	0,0524	0,0672	-0,0607**
PF	OP	0,0473	0,0607	-0,0122***
FIO	OP	0,0462	0,0593	-0,0019***
OP	SIC	0,0374	0,0479	0,0908*
BIND	OVER	0,0294	0,0378	0,0196***
PF	LA	0,0197	0,0252	-0,1465*
OP	OVER	0,0150	0,0192	0,0220**
FIO	LA	0,0030	0,0039	0,0067***

Note: Kullback-Leibler close to 1: important correlation between the variables. Relative weight close to 1: important correlation between the variables. Pearson correlation: *, ** and *** at 10%, 5% and 1% levels respectively.

Target Variable Analysis: Investment Specific Choices (SIC)

The target variables analysis shows that 60,8356% of Tunisian is opting to assets specificity high level, 26,7946% choice average assets specificity rate and 12,3698 prefer small assets specificity ratios. The result finds that CEO loss aversion at 57,4613%% optimist at 57,6749%%,

overconfident at 60,4212%, preferred equity at 26,7152%, choice dividend distribution at 72,5446%, operated in firm grater size at 90,1577%, 57,4416% of independence directors board presence, future investment opportunities presence at 55,9080% and 55,7355% profitability decrease involve the presence of assets specificity rate of the order of 60,8356. This result implies that CEO behavioral characteristics' affect his decision. Firm asset specificity higher level is justified by leader emotional profile (optimism, loss aversion and overconfidence).

Table-6. Target variable analysis.

SIC = High (60,8356%)				
Nodes	Binary mutual information	Binary relative importance	Modal value	
F SIZE	0,4725	1,0000	BIG	90,1577%
CSC	0,0086	0,0182	EQ	26,7152%
DV	0,0053	0,0113	YES	72,5446%
LA	0,0034	0,0071	YES	57,4613%
OVER	0,0020	0,0041	YES	60,4212%
OP	0,0009	0,0019	YES	57,6749%
BIND	0,0001	0,0002	YES	57,4416%
PF	0,0000	0,0001	NO	55,7355%
FIO	0,0000	0,0000	YES	55,9080%
SIC = AVERAGE (26,7946%)				
Nodes	Binary mutual information	Binary relative importance	Modal value	
F SIZE	0,3678	1,0000	AVERAGE	81,4369%
CSC	0,0035	0,0095	EQ	23,5235%
OP	0,0033	0,0091	YES	61,8363%
DV	0,0013	0,0034	YES	66,1437%
BIND	0,0010	0,0027	YES	60,0379%
LA	0,0009	0,0024	YES	62,9387%
OVER	0,0001	0,0003	YES	57,3973%
PF	0,0000	0,0000	NO	56,3354%
FIO	0,0000	0,0000	YES	56,2470%
SIC = SMALL (12,3698%)				
Nodes	Binary mutual information	Binary relative importance	Modal value	
F SIZE	0,1212	1,0000	SMALL	50,1556%
OP	0,0146	0,1204	NO	62,5506%
CSC	0,0141	0,1161	EQ	35,6986%
DV	0,0036	0,0294	YES	60,5512%
BIND	0,0032	0,0260	NO	51,7522%
OVER	0,0027	0,0221	YES	50,3251%
LA	0,0022	0,0180	YES	67,2346%
PF	0,0000	0,0001	NO	56,5746%
FIO	0,0000	0,0000	YES	55,9174%

Note: Mutual information: This is the amount of information given by a variable on the target value. Relative importance: The importance of this variable with respect to the target value. Modal value: The average values of the explanatory variable for each the target value.

This leader optimistic and/ or over confident with its firm future investment opportunities increases assets specificity level to limit the likelihood of its replacement (loss aversion). CEO assets specificity average level of the order of 26.7946 is explained by CEO optimist at 61, 8363%, loss aversion at 62, 9387%, overconfident at 60,4212%, average firm size at 81,4369%, equity preference at 23,5235%, dividend distribution at 66,1437%, firm directors board independence at

60,0379%, firm low profitability at 56,3354% and high future investment opportunities presence at 56,2470%. Finally, target variable analysis show that CEO assets specificity small level at 12.3698 is positively correlated with leader pessimism at 62, 5506%, greater loss aversion level at 50, 3251%, overconfidence rate at 50,3251, firm equity choice at 35,6986%, dividend distribution at 60,5512%, firm directors board dependent at 51,7522%, firm low profitability at 56,5746% and high future investment opportunities presence at 55,9174%.

To analyze the CEO assets specificity choice, we must choose the variable assets specificity rate as a target variable in the Bayesian network. Then we can use the function that generates the analysis report of the target CEO assets specificity level. In this report, the relationship between assets specificity level and the other variables are measured by binary mutual information and the binary relative importance. The mutual information of two random variables is a score measuring the statistical dependence of these variables. It is measured in bits (Table-6).

Average Target Maximizing Analysis

Thus, the target dynamic profile capability software (Bayesia Lab) to query about an a posteriori maximization of the target average. This test shows the case to maximize the target variable value. Table-7 presents the dynamic profile of the assets specificity choice (SIC).

Table -7. Target maximizing analysis.

SIC = SMALL			
Nodes	Optimal modality	Probability	Joint Probability
<i>A priori</i>		12,3698%	100,0000%
FSIZE	SMALL	56,4014%	11,0000%
CSC	CF	75,7951%	0,7560%
OVER	NO	100,0000%	0,4815%
SIC = AVERAGE			
Nodes	Optimal modality	Probability	Joint Probability
<i>A priori</i>		26,7946%	100,0000%
FSIZE	AVERAGE	75,2436%	29,0000%
CSC	CF	95,5416%	2,6756%
DV	YES	100,0000%	2,4967%
SIC = High			
Nodes	Optimal modality	Probability	Joint Probability
<i>A priori</i>		60,8356%	100,0000%
FSIZE	BIG	91,4134%	60,0000%
CSC	CF	100,0000%	4,8491%

Note: Optimal modality: modality is maximizing the target value. Probability: the prior probability of each variable. Joint probability: the probability that the target variable takes the value n given that the explanatory variable takes the value p. For example, the probability of choosing big level of assets specifics by firm big size is 60.000%.

The target maximizing analysis show that 100% CEO overconfidence level decrease, 75,7951% internally generated resource choice and 56,4014% firm size small is correlated positively with CEO greater preference of low assets specificity rate at 12,3698. This result implies positive relationship between CEO overconfidence level and firm assets specificity rate. Leader, confident in its abilities and personal skills will be encouraged to undertake a rooting policy or manipulate information in order to preserve its investment in specific capital. The 75,2436% increase in firm size average rate, 95,5416% increase CEO preference for internally generated resource and 100% increase firm dividend distribution choice is correlated with 26,7946% increase CEO assets specificity average rate. Finally target dynamic profile analysis show that CEO increased preferences for specific investment of the order of 60,8356% is positively correlated with 91,4134 % firm size increased and 100% CEO internally generated resource increased.

CONCLUSION

This research examines the determinants of firms' specific investment choice introducing a behavioral perspective. Theoretical analysis presented implications of managerial characteristics (emotional biases) to explain his preference for assets specificity level. Thus, the optimism of the leader over the problem of managerial opportunism is described by the agency theory in specific projects. Leader optimistic interest in bringing is to the maximization of shareholder wealth and to know in order to optimize the flow of funds. Investment nature analysis by introducing behavioral dimension enriched organizational financial theory: leader affected by behavioral biases presence prefer asset specificity high level allowing this protect against the take over operation Russianness.

Empirical analysis presents survey CEO large private companies in Tunisia. Data analyses revealed CEO emotional biases importance in explaining his assets specificity level. Indeed, empirical relationship analysis between optimism and firm assets specificity level shows behavioral dimension role in the explanation. CEO optimism level is positively correlated with a preference for specific investment. Optimistic CEO's underestimation its firm risk project can offset her risk aversion, leading to improved investment levels by choosing specific investments limiting its replacement. We also note that CEO loss aversion level is positively correlated with firm assets specificity rate. Loss aversion causes CEO to overestimate its firm total risk. This over-estimation the impulse to choose allowing decisions to hedge against the reputation risk loss related to a successful takeover operation (including a high level of asset specificity). Thus, the existence of overconfidence leaders can destroy investment decisions either investment specificity high level presence. Finally, the CEO investment decisions behavioral analysis is consistent with the corporate financial theory, the leader affected by behavioral biases adjusts its investment choices based on their ability to assess alternatives (optimism and overconfidence) and risk perception (loss aversion) to create of shareholder value and ensure its place at the head of the management team. This leader optimistic with its firm future investment opportunities increases assets specificity level to limit the threat of a takeover operation (loss of social status or remuneration).

REFERENCES

- Agrawal A., and Jayaraman N. (1994)** The Dividend Policies of All- Equity Firms, a Direct Test of the Free Cash Flow Theory. *Managerial and Decision Economics*, vol. 15, No. 2, pp. 139-148.
- Antoniou, A., Guney, Y. and Paudyal, K. (2007)** The Determinants of Capital Structure: Capital Market Oriented Versus Bank Oriented Institutions, *Journal of Financial and Quantitative Analysis*, pp. 43.
- Azouzi M.A. and Jarboui A. (2012)** CEO Emotional Bias and Investment Decision, Bayesian Network Method. *Management Science Letters*. Vol. 2, No. 4, pp. 1259–1278, February 2012.
- Baker M., Ruback, R.S., &Wurgler J. (2004)** Behavioral Corporate Finance: A Survey. *SSRN*, **àparaître (2005)** In B. Eckbo (Ed.), *Handbook of Corporate Finance: Empirical Corporate Finance*.SSRN_ID740946.
- Baker, M, Richard S. R, &Wurgler, J. (2007)** Behavioral Corporate Finance. *The Handbook of Corporate Finance*, Vol. 1, pp. 145-186.
- Ben Kraiem, R. (2008)** The influence of institutional investors on opportunistic earnings management, *International Journal of Accounting Auditing and Performance Evaluation*, Vol. 5, No. 1, pp. 89-106.
- Bertrand, M. and Schoar M. (2003)** Enjoying the Quiet Life? Corporate Governance and Managerial Preferences, *Journal of Political Economy*, Vol. 111, No. 5, pp. 1043-1075.
- Booth, L., Aivazian, V., Demircuc-Kunt, A. and Maksimovic V. (2001)** Capital Structure in Developing Countries, *Journal of Finance*, Vol. 56, pp. 87-130.
- Bujadi, M. L. and Richardson, A. J. (1997)** A Citation Trail Review of the Uses of Firm Size in , *Accounting Research, Journal of Accounting literature*, Vol. 16, pp. 1-27.
- Bushman, R., Piotroski, J., and Smith, A. (2004)** What Determines Corporate Transparency?, *Journal of Accounting Research*, Vol. 42, pp. 207–252.
- Cazavan-Jeny, A. (2004)** Le ratio market-to-book et la reconnaissance des immatériels- une étude du marché français. *ComptabilitéContrôle Audit*, Vol. 10, No. 2.
- Chtourou, S. Bédard, J. and Couteau, L. (2001)** corporate governance and earning management. Working Paper, Laval University, (2001).
- Demaria, S., & Dufour, D. (2007)** Les choix d’options comptables lors de la transition aux normes AS/IFRS : quel rôle pour la prudence ? *Comptabilité-Contrôle- Audit*, n° 195, pp. 195-218.
- Dufour, D. and Molay, E. (2010)** La Structure Financière des PME Françaises: Une Analyse Sectorielle sur Données de Panel, Manuscrit auteur, publié dans *Crises et nouvelles problématique de la valeur*, Nice, hal-00479529, version 1.
- Edmans, A. and GabaixX. (2011)** The effect of risk on the CEO market, *Review of Financial Studies*, Forthcoming.
- Fama, E. F. and French, K. R. (2002)** Testing Tradeoff and Pecking Order Predictions about Dividends and Debt, *Review of Financial Studies*, Vol. 15, pp. 1-33.

- Fama, E. F. and French, K. R. (2002)** Testing Tradeoff and Pecking Order Predictions about Dividends and Debt, *Review of Financial Studies*, Vol. 15, pp. 1-33.
- Fama, E.F. and Jensen, M.C (1983)** Separation of ownership and control, *Journal of Law and Economics*, Vol. 26, No. 2, pp. 301-325.
- Felton J., Gibson B. and Sanbonmatsu D. (2003)** Preference for Risk in Investing as a Function of Trait Optimism and Gender. *The Journal of Behavioral Finance*. Vol. 4, No. 1, pp. 33-40.
- Forker, J. J. (1992)** corporate governance and disclosure quality. *Accounting and Business Research*, Vol. 22.
- Frank, M., and Goyal, V. (2007)** Trade-off and Pecking Order Theories of Debt, Working Paper, Tuck School of Business at Dartmouth.
- Goel, AM., and Thakor AV. (2008)** Overconfidence, CEO selection, and corporate governance, *Journal of Finance*, forthcoming.
- Graham, J. R. (2000)** How Big Are the Tax Benefits of Debt, *Journal of Finance*, Vol. 55, pp. 1901-1940.
- Graham, J. R., Harvey, C. R., and Puri, M. (2010)** Managerial Attitudes and Corporate Actions, Working Paper.
- Graham, J., Campbell, H., &Puri, M. (2009)** Managerial Attitudes and Corporate Actions. Working Paper, Duke University, SSRN_ID1716966.
- Hackbarth, D. (2009)** Determinants of corporate borrowing: A behavioral perspective. *Journal of Corporate Finance*, Vol. 15, pp. 389–411.
- Haniffa, R., & Cooke, T. (2000, 28-30 August).** Culture, corporate governance and disclosure in Malaysian corporations. Asian AAA World conference, Singapore.
- Hawkins S.A., Hoch, S.J., & Meyers-Levy, J. (2001)** Low-involvement learning: Repetition and coherence in familiarity and belief. *Journal of Consumer Psychology*, Vol. 11, pp. 1-11.
- Helliar, C., Power, D. and Sinclair, C. (2005)** Managerial "Irrationality" in Financial Decision Making, *Managerial Finance*, Vol. 31, No. 4, pp. 1-11.
- Hirshleifer D. A., Teoh S.H., et Low A. (2010)** Are Overconfident CEOs Better Innovators?, SSRN Working Paper. Electronic copy available at: <http://ssrn.com>.
- Ho, C. R. and Chang, Y. (2009)** CEO Overconfidence and Corporate Financial Distress, retrieved August 15, 2009, from <<http://ssrn.com/abstract=1659440>>.
- Hovakimian, A., Hovakimian, G., &Tehrani, H. (2004)** Determinants of target capital structure:The case of dual debt and equity issues. *Journal of Financial Economics*, Vol. 71, pp. 517-540.
- Huang, R. and Ritter J. R. (2009)** Testing Theories of Capital Structure and Estimating the Speed of Adjustment, *Journal of Financial and Quantitative Analysis*, Vol. 44, pp. 237-271.
- Jarboui, A., &Olivero, B. (2008)** Le couple Risque/ Horizon temporel des investissements est-il gouverné par les institutionnels et les actionnaires dominants ?, *Banque et Marchés*, n° 93, Mars-Avril, pp. 20-34.
- Kisgen, D.R. (2006)** Credit Ratings and Capital Structure, *Journal of Finance*, Vol. 61, No. 3, pp. 1035–1072.

- Koh, P.S. (2003)** On the association between institutional ownership and aggressive corporate earnings management in Australia. *The British Accounting Review*, Vol. 35, pp. 105-128.
- Lehn, K., & Poulsen, A.B. (1989)** Free Cash Flow and Stockholder Gains in Going Private Transactions. *Journal of Finance*, Vol. 44, pp. 771-787.
- Lin, Y., Hu, S. & Chen, M. (2005)** Managerial optimism and corporate investment: Some empirical evidence from Taiwan. *Pacific-Basin Finance Journal*, Vol. 13, No. 5, pp. 523-546.
- Malmendier, U. and Tate, G. (2005)** CEO Overconfidence and Corporate Investment, *Journal of Finance*, Vol. 60, No. 6, pp. 2661-2700.
- Malmendier, U. and Tate, G. (2008)** Who Makes Acquisitions? CEO Overconfidence and the Market's Reaction, *Journal of Financial Economics*, Vol. 89, pp. 20-43.
- Malmendier, U., Tate, G. and Yan, J. (2007)** Corporate Financial Policies with Overconfident Managers, Working Paper, UC Berkeley.
- Malmendier, U., Tate, G., & Yan, J. (2010)** Managerial beliefs and corporate financial policies. Working Paper n°105, UC Berkeley and UC Los Angeles, Faculty.fuqua.duke.edu.
- Molay E. (2006)** Un test de la théorie de financement hiérarchique sur données de panel françaises, document de travail, université de Nice IAE, pp. 1- 24.
- Moussu C., & Thibierge C. (1997)** Politique financière, opportunité d'investissement et actifs immatériels en Europe : théorie et étude empirique. *Banque et marchés* n°30, September- October, pp. 6-21
- Myers, S. and Majluf, N. (1984)** Corporate Financing and Investment Decisions when Firms Have Information Those Investors Do Not Have, *Journal of Financial Economics*, Vol. 13, pp. 187-221.
- Myers, S. C. (1984)** The Capital Structure Puzzle, *the Journal of Finance*, Vol. 39, No. 3.
- Myers, S.C. (2001)** Capital structure. *Journal of Economic Perspectives*, Vol. 15, pp. 81-102.
- Nakara W. (2007)** Stratégie d'investissement en R & D, structure de gouvernance et performance des entreprises innovantes : Proposition d'un modèle conceptuel, XVIème Conférence Internationale De Management Stratégique, Montréal 6-9 Juin (2007).
- Naoui K., Elgaied M., & Bayoudh F. (2008)** Financement Interne et Investissement : Asymétrie d'Information vs Discrétion Managériale. <http://ssrn.com/abstract=1118416>.
- Pearl J. (1986)** Fusion, propagation, and structuring in belief networks. *Journal of Artificial Intelligence*, Vol. 29, pp. 241,288.
- Rajan R., & Zingales L. (1998)** Power in a theory of the firm. *Quarterly Journal of Economics*, Vol. 133, No. 2, pp. 387-432.
- Roll, R. (1986)** the hubris hypothesis of corporate takeovers. *Journal of Business*, Vol. 59, pp. 197–216.
- Rozeff MS. (1982)** Growth, Beta and Agency Costs as Determinants of Dividend Payout Ratio. *Journal of Financial Research*, vol. 5, No. 3, pp. 249-259.
- Sahut J.M., & Gharbi O. (2008)** Investisseurs institutionnels et valeur de la firme, papier de travail, Université de Poitiers et Université Paul Cézanne hal-00645361, pp. 1-28.
- Scheinkman J. and Xiong W. (2003)** Overconfidence and speculative bubbles, *Journal of Political Economy* Vol. 111, pp. 1183-1219.

Thibierge, C. (2001) Actifs immatériels, valorisation boursière et contrainte d'endettement : étude empirique sur les marchés français et espagnol. Congrès international de l'Association Française de Finance, Namur, 28-30, <http://www.fundp.ac.be/eco/affi2001/main.html>.

Titman, S. (1984) The effect of capital Structure on a firm's liquidation decision. Journal of Financial Economics, Vol. 13, pp. 137-151.

Wright, D. W. (1996) Evidence on the relation between corporate governance characteristics and the quality of financial reporting. Working Paper, University of Michigan.