Towards the implementation of corporate governance best practices for Tunisian listed firms: an empirical approach using the artificial neuronal networks

Wided Khiari* and Azhaar Lajmi

Department of Finance and Accounting,
Higher Institute of Management, Tunisia
Email: khiariwided@yahoo.fr
Email: azhaar_lajmi@yahoo.fr
*Corresponding author

Abstract: The object of this study is to propose a code allowing the assessment of some corporate governance best practices for Tunisian listed firms. This code is based on the most reputable set of codes of good governance practices worldwide and on the point of view of a sample of Tunisian experts. This code is presented as a potential tool that measures the quality of some corporate governance characteristics, such as board of directors and its committees, transparency and information policy, directors' compensation and entrenchment, and ownership structure. Using a questionnaire distributed to a sample of Tunisian experts (about 102 experts) and referring to a new approach based on the artificial neural networks, this study allowed us first, to identify the importance given by the experts to a number of criteria in assessing corporate governance of Tunisian listed firms, and second, to create consensus among experts on the values that should take the different criteria in order to achieve good governance.

Keywords: corporate governance; referential; neuronal connections; Tunisian firms; best practices.

Reference to this paper should be made as follows: Khiari, W. and Lajmi, A. (2018) 'Towards the implementation of corporate governance best practices for Tunisian listed firms: an empirical approach using the artificial neuronal networks', *African J. Accounting, Auditing and Finance*, Vol. 6, No. 1, pp.21–42.

Biographical notes: Wided Khiari is an Assistant Professor in Finance in the Higher Institute of Management of Tunis (HIMT) where she teaches courses in corporate finance, financial mathematics and ethics and finance. She holds a PhD in Finance from the HIMT. Prior to joining HIMT, she was a Teaching Assistant in the University of Jendouba in Tunisia. She has an active research interest in corporate governance, liquidity and systemic risk.

Azhaar Lajmi is an Assistant Professor in Accounting in the Higher Institute of Management of Tunis (HIMT) where she teaches courses in financial accounting, managerial accounting and auditing. She holds a PhD in Accounting from the HIMT where she was also a Teaching Assistant. Her research fields focus on corporate governance, audit quality and information asymmetry.

1 Introduction

The topic of corporate governance has been growing because of unpleasant and damaging events known by major firms in the world and the disastrous effects in international financial markets. These problems emerge in most cases in the misappropriation of accounting information and overvalued stocks that misled shareholders.

Indeed, leaders with extensive flexibility in the management of firms and expertise that shareholders did not hold, are aware of the actual situation of the firm they can therefore benefit for their own interest and disclose biased information to firm's partners. For this purpose, the governance still appears to support the accounting changes, namely transparency and quality of key information for successful business management.

It is in this context that we have begun to see, in recent years around the world, the emergence of codes or guides of 'good practices' in governance. Usually drawn up by institutional investors, corporations, associations of directors, stock exchanges or national and international organisations, these guides generally reflect recommendations on corporate governance. These standards of good governance practices are intended primarily for chief executive officer (CEO), for whom the process of decision making is intrinsically linked to the governance system adopted, and are organised around five themes. The first one revolves around the protection of shareholders' rights. Secondly we have the equitable treatment of shareholders - especially minorities-, followed by the role of stakeholders in corporate governance through cooperation in order to create wealth and jobs, and ensure the sustainability of financially strong companies. Fourthly there is the standard of information transparency and communication and last but not least, the importance of the role of the board.

In this normative perspective, corporate governance is required to introduce guidelines in the form of principles. In this sense, guidelines were proposed by the Organisation for Economic Cooperation and Development (OECD) (1999) as part of the work dedicated to corporate governance. They aim to evaluate and improve the legal, institutional and regulatory framework at the national level, to organise and regulate power in the firm and to make proposals for an efficient system. These guidelines are based on the idea that there is no single model of corporate governance, but there are some common elements identified that contribute to good corporate governance.

This research has awakened our interest because of the importance of the economic stakes for companies in the emerging countries, especially in Tunisia, since the corporate governance quality is the cornerstone of financial information quality disclosure. Moreover, it should be noted that emerging markets are characterised by low levels of disclosure and low protection of minority shareholders' rights (Dakhlaoui et al., 2017). Besides, in emerging markets, especially in Tunisia, financial reporting is not regulated and IFRS standards are generally not adopted.

In this sense, the Tunisian context seemed to be an appropriate field for such research. Indeed, the central interest of the Tunisian regulatory institutions in reinforcing the rules of good governance has prompted us to study this subject in such context. In Tunisia, the legislation introduced through Act No. 2005-96 of 18 October 2005 related to the strengthening of the security of financial relations measures concerning in particular the directors' board independence and auditors' independence. In addition, such studies are rare in emerging markets, especially in Tunisia.

The purpose of this work is to extend this line of past studies focus on the implementation of recommendations of good corporate governance principles in Tunisia, using a new approach based on neural networks. These recommendations are derived from a questionnaire that was sent to the Tunisian experts to decide on what determines good corporate governance in Tunisia.

This idea comes from the fact that Tunisian firms do not have good practice guides and positioning of these firms in relation to these standards requires a reference document so we can determine the degree of implementation of our firms to standards of good practice. This approach allows, in some way, to assess the quality of corporate governance based on the opinions of Tunisian experts. Indeed, the majority of studies that has attempted to measure the quality of governance in Tunisia are based either on foreign codes (Hajri, 2008) (which may not correspond to the reality of Tunisian firms) or on econometric approaches based on performance (Bottasso and Sembenelli, 2002; El Mir and Khanchel, 2004; Zelenyuk and Zheka, 2006; Khiari et al., 2007; Khanchel El Mehdi, 2007; Ben Rejeb and Frioui, 2012). These approaches offer certainly means of relative assessment of the quality of corporate governance based on the market, but do not take into account the degree of compliance with standards of good corporate governance.

2 Literature review

2.1 Corporate governance best practices: emergence of corporate governance codes

Corporate governance has emerged at the international level in the context of repeated serious fraud and financial scandals in countries with developed capital economies such as the USA, UK and Italy (Matei and Drumasu, 2015). According to the previous literature (Albu et al., 2013), the first time that corporate governance was mentioned was in the 70s, following the Watergate scandal. More recently, the Enron affair in 2001 has created a real crisis of confidence at the international level which has been detrimental to the smooth functioning of the markets. This led to the disappearance of one of the big five auditor, the Andersen group.

Therefore, it has become essential, following the scandalous affairs that have upset the countries' economy, to restore confidence to stakeholders by implementing fundamental reforms in corporate governance. To this end, regulatory institutions are increasingly adopting financial security laws. They essentially allow the development of good governance rules and improve the quality of financial information and also the external audit quality. Among these laws, we cited the Sarbanes-Oxley act (SOX) in the USA in 2002, the financial Security Act in France in 2003, the Lippens code in Belgium in 2005, the financial Security Act in Tunisia in 2005 (Lajmi and Gana, 2013).

Governance's theories based on efficiency paradigm are based on a specific model of value creation (Bouaicha, 2015). This model allows organisation to achieve its objective thus allowing its survival. Thus, governance mechanisms allow for an improvement of the organisation efficiency by creating maximum value.

After the 1997's financial crisis, corporate governance practices have become an increasingly important issue by many countries and especially in transition economies. In fact, many corporate governance codes have been introduced as part of stock exchange rules. Also, many researchers tried to help regulators and policy makers to improve corporate governance practices by providing them with useful information on the relationship between corporate governance practices and firm performance.

Many researchers argued that corporate governance plays an important role in controlling the firm's operations (Fama, 1980; Fama and Jensen, 1983). The others show that insufficient application of corporate governance principles can be considered as one of the important factors leading to crises.

Managers, owners and directors became conscientious that having a good corporate governance structure can have many benefits. It helps to increase share price and makes it easier to obtain capital. International investors will not seriously consider investing in a company that does not subscribe to good corporate governance principles like transparency, independent directors, separate audit committee….

A good corporate governance system allows avoiding interest conflicts between majority and minority shareholders, managers and shareholders, and also shareholders and stakeholders. Also, it influences positively the economic activities of the company by lowering capital cost and enables all the stakeholders to have access to the information about the company. These outcomes reflect in the stock prices [Gurbuz and Ergincan, (2004), p.1; Akdogan and Boyacioglu, 2014].

Many organisations have been encouraging governments and firms to adopt and implement corporate codes of conduct and good corporate governance principles like the OECD, the US Commerce and State Departments, the World Bank and the International Finance Corporation.

Many researchers show that corporate governance practices have many benefits for companies, countries and institutions. In fact Claessens et al. (2003) note that poor corporate governance can cause low company performance and can be also the origin of macroeconomic crises. Contrary, good corporate governance can have a lot of benefits related to business performance, easy access to low capital financial sources, efficient sources using, good image for company and country, providing security to investors, providing internal auditing to company and prevention of interest conflict.

In this same line of research, Dakhlaoui et al. (2017) report that corporate governance can increase performance and reduce cost of capital. Furthermore, according to these authors, corporate governance reduces information asymmetry and corrects uninformed investors' perception of the current and future performance of the company. Then, the financial information is used by the agent to convince the principal with its managerial competence. So, a high quality of financial information improves the firm's value (Zimmerman, 2012),

Furthermore, according to Tinker et al. (2005), corporate governance provides innovation, mystification, or creative participation for diverse populations with diverse interests.

Also, to provide assurance for shareholders, a system of corporate governance and accountability was built. It's a system of concentric rings. The first outer ring is the director's board which is responsible for determining the corporation's policies, reviewing its operations and ensuring the implementation of these policies in a fair and integral way. Then, follow the independent audit committee and directors board (Abraham and Briloff, 2002). It is necessary to add that audit committee has a vital role in corporate governance.

In developing countries good corporate governance still has shortcomings while it has benefits on financial performance in developed countries and is structured well and has good implications. As compared with developed countries, social, economic environments and traditional management understandings hinder to reach the good corporate governance practices in developing countries (Saldanlı, 2012).

Many reports published on corporate governance principles, and each one is related to a different aspect of corporate governance. The Cadbury report (Cadbury Committee, 1992) published the findings of the committee on financial aspects of corporate governance. The Greenbury report (Greenbury et al., 1995) discusses directors' remuneration. Hampel (1988) Report presents different sections on the principles of corporate governance like the role of directors, directors' remuneration, the role of shareholders, accountability and audit.

Many transition economies have used the OECD's (1999) principles of corporate governance as a benchmark for the establishment of their corporate governance codes. OECD has also published a survey of corporate governance developments in OECD countries and several studies on corporate governance in Asia, the most notable being its white paper on corporate governance in Asia (OECD, 2003).

Also Clarke (2000) criticised corporate governance structures in Asia and focused on the Asian financial crisis, which was partially caused by poor corporate governance practices. Solomon et al. (2002a) developed a conceptual framework for corporate governance in Korea. They also examined some empirical evidence on the evolving role of institutional investors (Solomon et al., 2002b). Several studies of various aspects of corporate governance have been done for China. Dahya et al. (2003) examined the usefulness of the supervisory board report. Chen (2004) takes a critical view of the corporate governance policies of China's state-owned enterprises. Tam (2000) also looks at state-owned firms and attempts to outline a new corporate governance model that is appropriate for China's economic and social conditions.

2.2 The regulatory framework for corporate governance in Tunisia

Until 2008, there was no code of best practices for Tunisian firms. Indeed, until that year, the Tunisian legislature did not establish a code of good practice, but it implemented the code of commercial companies (CCC), which is the regulatory framework for Tunisian firms. There was also the implementation of the accounting system of Tunisian firms, which determines the standards that Tunisian firms must follow to establish their financial statements and financial reporting.

The commercial companies code provides recommendations concerning some aspects of governance of the Tunisian firm. The regulatory framework to which we refer to is in the CCC (2000), as amended by the Act of July 2005.

This code defines the regulatory framework for the control and management of Tunisian companies. The following elements are covered: the board of directors and its various aspects (such as board size and composition, tenure and age limit for directors, the extent and limits of their power, and the duality), the opportunity for Tunisian public firms to implement a dual system of governance (management and monitoring entity), the audit committee and finally the disclosure.

Reading the CCC in Tunisia shows a total lack of ownership structure as an important mechanism of corporate governance. Indeed, this code does not specify the optimal percentage to be held by each investor type in Tunisian firms.

However, the study of the ownership structure of Tunisian firms (Zéghal et al., 2006) shows that the majority of shareholders hold at least 20% of the share capital of the firm. These are classified into namely four categories: state, institutions, foreign investors, and the founding families of firms.

Also, regarding compensation and nominating committees, CCC has not imposed Tunisian firms to set up such committees as the remuneration and appointment of members of the board and auditors within the remit of the general meeting of shareholders.

In addition, the CCC did not plan obligations regarding the age of the directors and the management team which has resulted in the lack of objectivity in decision-making. The CCC is also characterised by the scarcity of information relating to criteria such as qualifications and executive compensation, transparency and so on. Given all these limitations and shortcomings as demonstrated by the Commercial Companies Code, it becomes necessary to establish a code of practices to promote a culture of corporate governance in Tunisia.

Thus, in 2008 Tunisia launched an action plan aimed at establishing the fundamental principles of corporate governance. Tunisian code of corporate governance (TCCG) or named as 2008 Code was first issue in the year 2000 as a milestone in corporate governance reform in Tunisia. The main purpose of this project is to identify the best ways to promote good management practices and good corporate governance.

The code of good governance practices of Tunisian firms present major recommendations for the management and control of firms and includes national and international standards recognised as necessary for the proper conduct and responsible entrepreneurship. The main pillars of corporate governance explained by the guide and shared by many other guides around the world are: internal audit, fiscal transparency, ethics and social responsibility, the role of managers, relations between employees and employers, the board of directors, shareholder rights and privileges of managers.

However, even if this guide is intended as a first attempt to harmonise good governance practices among all stakeholders, its content remains, in our view, very broad as it might miss a lot of details that are likely to hinder its empirical and practical significance as the only referential of governance in Tunisia.

It is within this framework that fits the primary objective of this study. We try to propose, based on the advice of a fairly representative number of Tunisian experts, an assessment of certain governance practices for listed Tunisian firms.

3 Data and methods: towards the implementation of corporate governance best practices for Tunisian listed firms, an empirical approach using the neuronal connections method

3.1 Research methodology

The establishment of a repository to evaluate the governance practices of Tunisian listed firms took place in the following steps. Initially, we referred to a set of codes of good governance practices most reputable worldwide (including Rapports Viénot I, 1995; Rapports Viénot II, 1999; Rapport Bouton, 2002; Institut Montaigne, 2003) to establish a first list of criteria, fairly exhaustive, which will be structured around our referential.

The content of this list has been exposed for a second time, to a number of Tunisian experts (university professors, financial analysts and accounting experts) to be adapted as much as possible to the context of Tunisian listed firms.

In a final step, this list is subject to a questionnaire that we sent to a larger sample of Tunisian experts (about 102 experts). Here, the criteria (or items) are structured around ten headings (dimensions) and include:

- functioning and composition of the board
- composition of Monitoring board
- functioning and composition of the audit committee
- functioning and composition of the compensation committee
- functioning and composition of the nomination committee
- mandatory of the auditor
- means of information dedicated to shareholders
- executive compensation
- composition and characteristics of ownership structure
- manager entrenchment.

In the first part of the questionnaire, respondents were asked to vote on a Likert scale of five points ranging from 'not at all important' to 'very important', the importance they attach to each criterion retained and to share their recommendations on targets to be taken each of these criteria (in terms of percentages, numbers or intervals as appropriate) to strengthen and implement good governance.

In the second part, the experts were asked to make a second rating, this time more aggregated, since it concerns the relative importance they attach to each of the previous ten dimensions in the assessment of governance. Here, they are required to leave 100 points between them according to the importance they attach to each of them.

This double notation gave us means to identify for each criterion its weight or its contribution to the relative importance in the dimension to which it is attached. Strictly speaking, in terms of method we selected for each dimension a neural network that connects the importance of the scores recorded for different criteria (input layer), with the overall importance of the score recorded for the item to which they are attached (output layer). The importance of each calculated criterion refers to the importance of the predictive power of the latter in the corresponding neural network.

3.2 Results and discussions

3.2.1 Calculated importance of governance criteria: the application of neuronal approach

The purpose of this section is to propose a new approach based on the logic of artificial neuronal networks to evaluate the importance given by the experts in different criteria retained the assessment of corporate governance for Tunisian listed firms.

Historically, neuronal network is a tool based on artificial intelligence. It is used in many fields, especially in applied sciences (biology, physics, etc). The field of finance has not escaped this rule, since for some time now we have been witnessing the frequent use of this tool in the detection of ailing firms, portfolio management, forecasting financial time series, exchange rate and asset valuation (Montagno et al., 2002).

Statistically, a neuronal network can estimate a large number of statistical models without requiring you to imagine in advance certain relationships between the dependent and independent variables. In fact, the form of the relationship is determined during the learning process. If a linear relationship between the dependent and independent variables is appropriate, the results of the neuronal network should closely approximate those of the linear regression model. If a nonlinear relationship is more suitable, the neuronal network automatically approaches the structure of the 'correct' model.

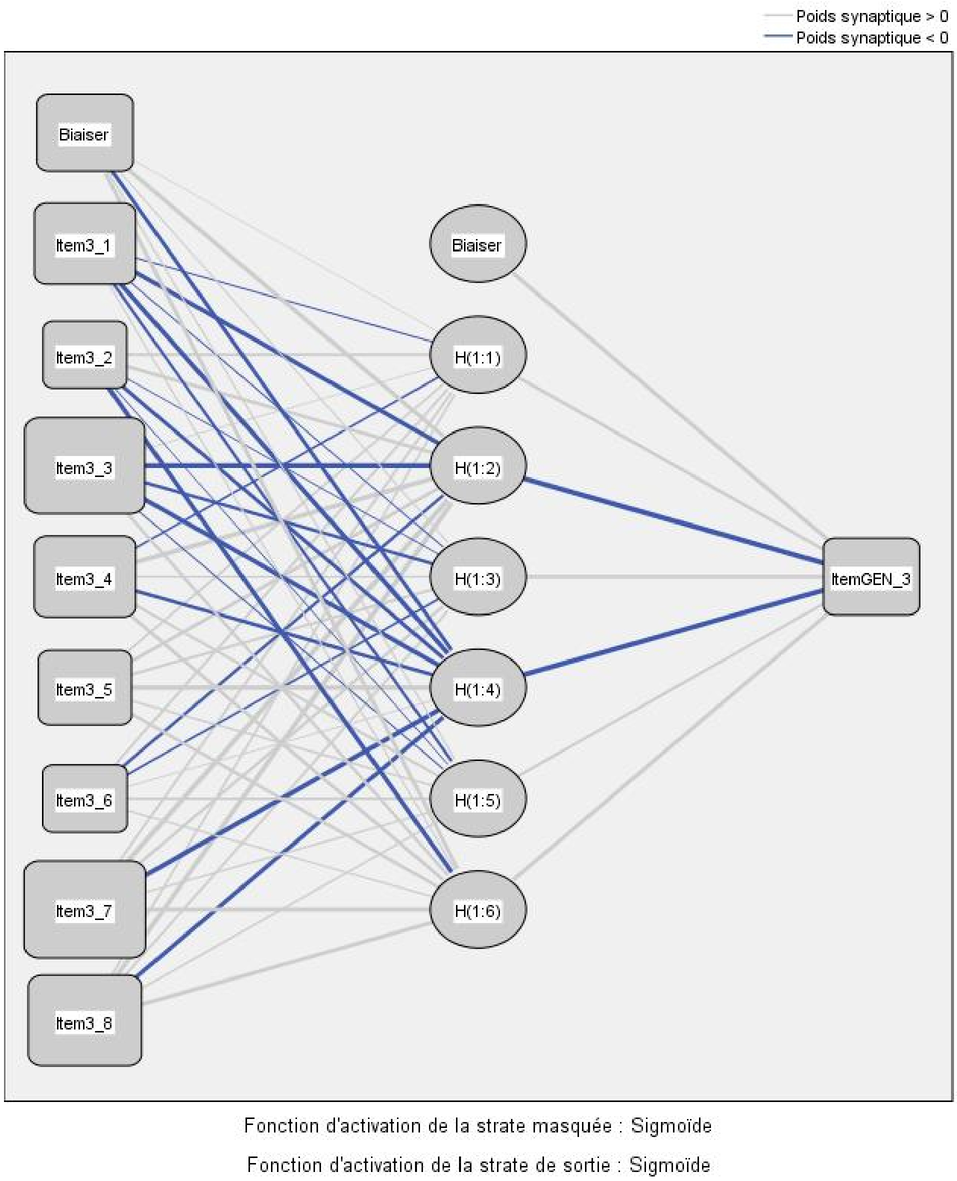
Thus, the basic structure of a neuronal network is defined by a structure made up of elementary systematic systems called neuron, arranged in separate layers and interconnected with each other, so that each neuron of a layer is related to all the neurons of the previous layer and the next layer and through which information will flow.

The application of neuronal networks in our case is illustrated, for example, for the 'functioning and composition of the audit committee' in Figure 1.

The network structure shows the three layers (strata) below:

- *The input layer* contains the independent variables representing items of different criteria. These items are in number of 8, denoted item3_1, item3_2, ..., item3_8, respectively indicate the existence of an audit committee, the number of members in the audit committee, the number of external board members, the number of meetings of audit committees per year, participation of the chairman and/or CEO in committee meetings, membership of the committee at one of BIG 4, presentation of a report to the board and the existence of rules and procedures for the audit committee.
- *The hidden layer* contains unobservable units or nodes. The value of each hidden unit is a function of the independent variables, the exact form of the function depends, in part, on the type of network and to any other part, specifications controlled by the user.
- *The output layer* contains a single neuron (indicated by ITEMGEN_3). It is in our case, the relative importance given to the functioning and composition of the general audit committee. The exact form of the function depends, in part, on the type of network and to any other part, specifications controlled by the user.

Figure 1 Neural network associated with the importance of governance criteria relating to the 'functioning and composition of the audit committee' (see online version for colours)



The hidden layer contains nodes (units) unobservable network. Each hidden unit is a function of the weighted sum of inputs. This function is called the activation function,[1] while the weights are known as synaptic weights.[2] These are determined by the estimation algorithm according to the restraint activation function specification.

Each node is characterised by a small local memory and defined based on four key concepts:

- The connections which connect it to other neurons, called the synaptic weights, allow accepting input signals in order to determine then, the effect of the signal determined by the neuron i to neuron j.
- The potential of the neuron j expressing its internal state, known as the function or combination of aggregation, which is generally equal to the sum of the weights of its inputs ($x_1, x_2, \ldots, x_n$) by their synaptic coefficients ($w_1, w_2, \ldots, w_n$), to which it adds a constant term known as bias or activation threshold[3]:

$$P_j = \sum_{i=1}^{n} w_{ij} x_i + b_j$$

It should be noted that the bias b_j is an external parameter of the neuron j, so it can be considered an input node, associating to it the signal x_0 relative to the unit value weighted according w_{0j}. Moreover, this term can be incorporated into the potential equation that will be expressed as follow:

$$P_j = \sum_{i=0}^{n} w_{ij} x_i$$

- A transfer or activation function ϕ which must be applied to each neuron in order to facilitate determining its activation.
- An activation y_j, equivalent to the output neuron that is equal to the potential of the activation function P_j, expressed as follows:

$$y_j = \varphi(P_j) = \varphi\left(\sum_{i=1}^{n} w_{ij} x_i + b_j\right)$$

Following this, this output value will be issued by the neuron to other neurons or outwardly.

It is clear that each neuron acts as a transfer function such that it receives as input a linear combination of the neurons outputs of the preceding layer and delivers the transformed of this combination by its activation function.

In our case, we used a logistic sigmoid function to specify the activation function. This function takes the following form: $\varphi(x) = \frac{1}{1+\exp(-x)}$, and has the advantage of having a linear behaviour near 0 (when the synaptic weights are small), not linear at the ends, allowing to model linear and nonlinear phenomena.

The synaptic weights for this network are shown in Table 1, which expresses the way in which the overall rating of the importance of the topic is associated with criteria of different notations attached thereto. Formally, this expression is as follows:

$$\mathrm{NOT\_GEN\_3} = \varphi\left[\sum_{j=1}^{6} w_j^1 H(1{:}j) + \mathrm{bias}_1\right] \text{ with } H(1{:}j) = \varphi\left[\sum_{k=1}^{8} w_k^0 \mathrm{Item3\_k} + \mathrm{bias}_0\right]$$

Table 1 Synaptic weights associated with the network

Parameters estimation								
Predictor		*Estimated*						
		Hidden layer 1						*Output layer*
		H(1:1)	*H(1:2)*	*H(1:3)*	*H(1:4)*	*H(1:5)*	*H(1:6)*	*NOTE_GEN_3*
Input layer	(Bias)	0.001	1.575	0.170	–1.099	0.235	1.166	
	Item3_1	–0.159	–1.611	–0.121	–2.058	–0.579	0.204	
	Item3_2	0.563	0.804	–0.064	–1.004	–0.036	–1.641	
	Item3_3	0.097	–3.938	–0.669	–1.753	–0.144	0.642	
	Item3_4	–0.360	1.950	0.282	–0.963	0.528	0.928	
	Item3_5	0.381	0.872	0.451	2.713	0.355	0.703	
	Item3_6	0.431	–0.620	–.372	0.098	0.439	0.278	
	Item3_7	0.416	2.959	0.605	–2.082	0.306	1.328	
	Item3_8	0.372	2.450	0.381	–1.503	0.355	1.216	
Output layer	(Bias)							1.294
	H(1:1)							0.802
	H(1:2)							–4.412
	H(1:3)							0.978
	H(1:4)							–2.943
	H(1:5)							0.573
	H(1:6)							1.226

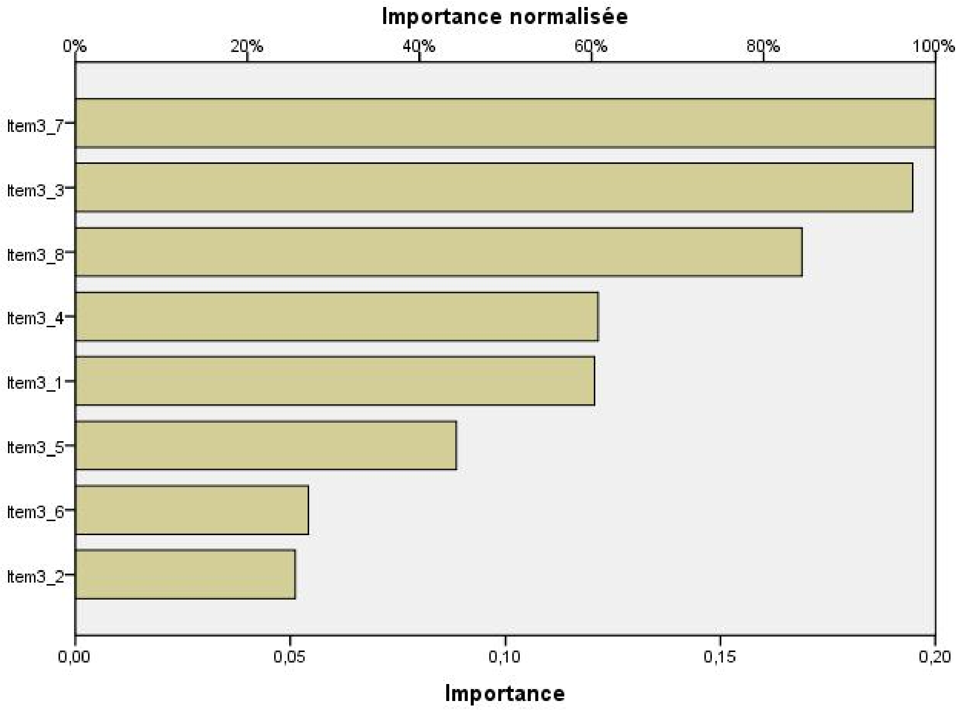
Table 2 Importance of governance criteria relating to the 'functioning and composition of the audit committee'

Importance of independent variable		
	Importance	*Normalised importance*
Item3_1 Existence of an audit committee	0.121	60.3%
Item3_2 number of members in the audit committee	0.051	25.5%
Item3_3 number of outsiders in the committee	0.195	97.3%
Item3_4 number of meetings per year	0.122	60.8%
Item3_5 participation of the CEO in the audit meetings	0.089	44.3%
Item3_6 membership of the committee at one of BIG4	0.054	27.1%
Item3_7 Presenting a report to the board of directors	0.200	100.0%
Item3_8 The existence of inside rules of procedure for the audit committee	0.169	84.5%

The importance of an independent variable measures the change in the value of the network predicted by the model for different values of the independent variable. Normalised importance is simply the importance of values divided by the highest importance values and expressed as percentages. In our case, the calculation of the importance of independent variables related to the audit committee gave the following results:

The importance diagram is simply a bar graph the values importance table, sorted in descending order of importance value. From the results obtained, it appears that the variables related to the submission of a report to the board, the number of outside board members, the existence of rules and procedures for the audit committee, the number of annual meetings of the audit committee and the existence of an audit committee have the greatest impact on the rating of overall importance of the topic.

Figure 2 Importance of governance criteria relating to the 'functioning and composition of the audit committee' (see online version for colours)



This work was performed for the remaining items of the questionnaire, and has identified the importance of criteria for different retained governance categories (or dimensions).

3.2.2 Towards the target values of the criteria of good governance for Tunisian listed firms: consensual approach among experts

The purpose of this section is to build consensus among experts on the values that should record the different criteria in the light of good governance.

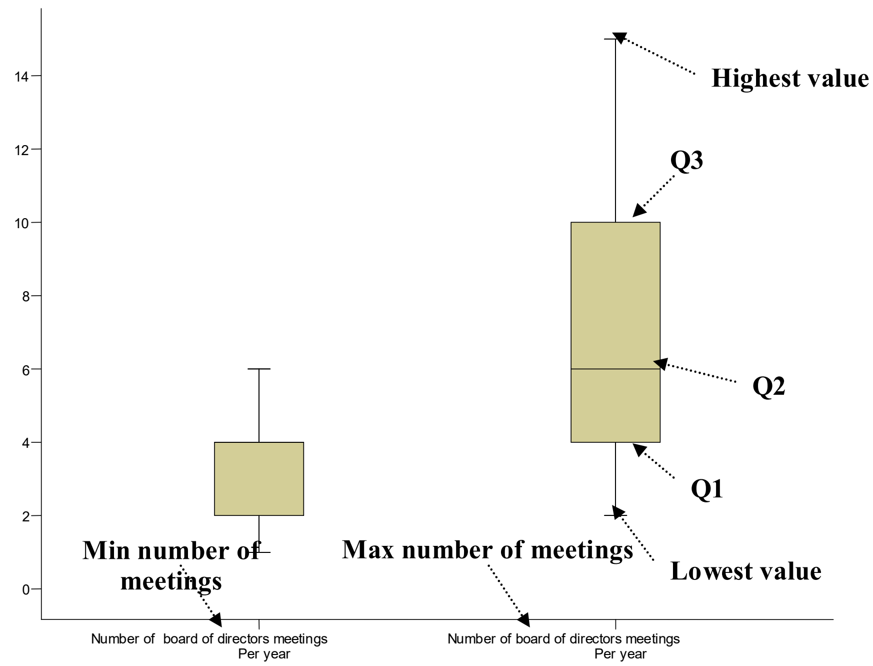
The approach used is essentially random and based on the exploitation of the 'box plots' to graphically identify areas of consensus (limiting areas of central tendency) from the statistical characteristics of the minimums and maximums thresholds distributions provided by experts for each criterion.

The box plot is a popular representation of the dispersion of a set of data because it's simple and synthetic. It consists of placing the values of some quintiles on a horizontal or vertical scale. It allows to instantly seeing some of the characteristics of central tendency, dispersion and shape of variables.

It also allows to compare two populations and detect 'outliers', that is individual to exclude from the analysis to not distort the overall results. It takes the form of a split into two segments and extended externally by two segments that are perpendicular to their rectangle.

The application of this method allowed us to determine, for each criterion, the thresholds that have the most consensus among Tunisian experts in corporate governance. The area of consensus adopted corresponds to the values that tend to be between the medians of the distributions of minimum and maximum thresholds. The following figure shows an example of a box plots relating to the number of meetings of the board.

Figure 3 Example of box plots relating to the number of meetings of the board (see online version for colours)



The horizontal axis shows the different categories for each criterion in the questionnaire. For example, respondents were asked to give their recommendations for fixing the minimum and the maximum number of meetings of the Directors' Board.

Thus, for each category, we get a box mustache on which states:

- The value of the first quartile Q1, designating 25% of the population.
- The value of the second quartile Q2, 50 designating the population.
- The value of the third quartile or the median, indicating 75% of the population.
- The minimum value recorded during the data collection.
- The maximum value recorded during the data collection.

- Values called aberrant, atypical or extreme that lie beyond the box plots. They are often represented by markers (stars, squares, etc.).

For example, regarding the number of meetings of the board, for 25% of respondents, the minimum optimal number of meetings per year varies between two and three, whereas for 75% of respondents, this number is equal to four. However, regarding the maximum number, 25% suggests a maximum optimal number that varies between four and five, while 50% of respondents suggested a number of meetings between five and six. Moreover, 25% of respondents recommended a maximum number between ten and 11.

To identify the optimal values suggested by experts for each criteria of the grid, we will retain the recommended values by the majority of respondents (i.e., the highest percentage of respondents). For example, we will retain, for the optimal number of meetings a minimum value equal to four meetings per year and a maximum value which varies between five and six times a year. The same work was done for the rest of the grid criteria, which allows to identify the targets of the recommendations of experts in governance for Tunisian listed firms.[4]

4 Conclusions

The aim of this study is to provide, based on the advice of a fairly representative sample of Tunisian experts, an evaluation guide of certain governance practices for Tunisian listed firms.

This repository is a potential instrument for measuring the quality of some aspects of the governance of these firms, including the functioning and composition of the board and its committees, transparency and information policy, compensation and entrenchment of the manager, and finally the characteristics and composition of the shareholding structure.

The implementation of this repository (standard) is based on the reading of a set of codes of good governance practices well-known to the world. This reading e, allowed us to establish a first fairly comprehensive list, of the criteria which will be structured around the repository. The contents of this list have been exposed, a second time, to a number of Tunisian experts in order to adapt it as much as possible to the context of Tunisian listed firms. In a final step, this list is subject to a questionnaire that we sent to a larger sample of Tunisian experts (about 102 experts).

In the first part of the questionnaire, respondents were asked to adjudicate on the importance they attach to each criterion and to share their recommendations for targets to be taken by each of these criteria to enhance and achieve good governance.

In the second part, the experts were asked to make a second rating, this time more aggregated, since it concerns the relative importance they attach to each of the previous ten dimensions in the assessment of governance and to distribute 100 points between them according to the relative importance they attach to each of them.

This work allowed us to, both, assess the importance given by experts to the various criteria used in assessing the governance of listed Tunisian firms, and to create consensus among experts on values that should record the different criteria in order to achieve good governance.

References

Abraham, J. and Briloff, E. (2002) 'Accountancy and society: a covenant desecrated', *CPA Journal*, Vol. 72, No. 12, pp.11–12.

Akdogan, Y.E. and Boyacioglu, M.A. (2014) 'The effect of corporate governance on firm performance: a case of Turkey', *International Journal of Critical Accounting*, Vol. 6, No. 2, pp.187–210.

Albu, N., Durica, A., Grigore, N., Grigoras, D., Mateescu, R. and Ichim, A. (2013) 'Corporate governance in Romania. Perceptions and perspectives', *Accounting, Expertise and Business Audit Magazine*, Vol. 2, pp.36-42.

Ben Rejeb, W. and Frioui, M. (2012) 'The impact of good corporate governance practices on stakeholder's satisfaction in Tunisian listed companies', *International Journal of Business and Management Studies*, Vol. 4, No. 2, pp.201–213.

Bottasso, A. And Sembenelli, A. (2002) 'Does ownership affect firms' efficiency? Panel data evidence on Italy', *Empirical Economics*, Vol. 29, No. 4, pp.769–786.

Bouaicha, R. (2015) 'Internal governance mechanisms and the external audit quality: theoretical review of the relational issues', *African Journal Accounting and Finance*, Vol. 4, No. 1, pp.53–73.

Cadbury Committee (1992) *The Financial Aspects of Corporate Governance*, Professional Publishing Ltd, London.

Chen, J.J. (2004) 'Corporatisation of China's state-owned enterprises and corporate governance', *Corporate Ownership and Control*, Vol. 1, No. 2,pp.82–93.

Claessens, C.A.M.F., Djankov, S., Fang, J. and Lang, L. (2003) 'The benefits and costs of internal markets: evidence from East Asia's financial crisis', in Fan, J.P.H., Hanazaki, M. and Teranishi, J. (Eds.): *Designing Financial Systems in East Asia and Japan – Toward a Twenty-First Century Paradigm*, pp.204–224, Routlegde, London.

Clarke, T. (2000) 'Haemorrhaging tigers: the power of international financial markets and the weaknesses of Asian modes of corporate governance', *Corporate Governance*, Vol. 8, No. 2, pp.101–116.

Code des Sociétés Commerciales (2000) *Loi 2000-93 du 3 novembre 2000 portant promulgation du code des sociétés commerciales*, JORT n° 89 du 7 novembre.

Code des sociétés commerciales (2005) *Loi 2005-65 du 27 Juillet 2005 portant promulgation du code des sociétés commerciales*, JORT n° 61 du 2 Aout.

Dahya, J., Karbhari, Y., Xiao, J. and Yang, M. (2003) 'The usefulness of the supervisory board report in China', *Corporate Governance*, Vol. 11, No. 4, pp.308–321.

Dakhlaoui, M., Lajmi, A. and Gana, R.M. (2017) 'Financial information quality and cost of equity capital: evidence from Tunisia', *Journal of Applied Economics and Business Research*, Vol. 7, No. 1, pp.38–58.

El Mir, A. and Khanchel, I. (2004) 'De l'efficience de la gouvernance', paper presented at the *13th Conference of AIMS*,24 June, Normandie, Vallée de Seine.

Fama, E.F. (1980) 'Agency problems and the theory of the firm', *Journal of Political Economy*, Vol. 88, No. 2, pp.288–307.

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.

Greenbury, R., Angus, M., Chapman, D., Henderson, D., Lees, D., Lindey, G., Melville-Ross, T., Simon, D., Vallance, I. and Walther, R. (1995) *Directors' Remuneration: Report of a Study Group Chaired*, by Sir Richard Greenbury, July 17, Gee Publishing Ltd., London, Greenbury Report [online] http:// www.ecgi.org/codes/code.php?code_id=131.

Guide de bonnes pratiques en gouvernance d'entreprise (2008) Tunisie, Institut Arabe des Chefs d'Entreprise (IACE).

Gurbuz, A.O. and Ergincan, Y. (2004) *Kurumsal Yönetim: Türkiye'deki Durumu ve Geliştirilmesine Yönelik Öneriler*, Literatür Yayınları, 1. Baskı, İstanbul.

Hajri, J. (2008) *Qualité de gouvernance et performance des entreprises tunisiennes cotées*, PhD in Management Sciences, December, University of Tunis.

Hampel, R. (1998) *Committee on Corporate Governance. Preliminary Report,*. Gee Publishing Ltd., London.

Institut Montaigne (2003) *Mieux gouverner l'entreprise* [online] http://www.institutmontaigne.org (accessed March 2003).

Khanchel El mehdi, I. (2007) 'Empirical evidence on corporate governance and corporate performance in Tunisia', *Corporate Governance: An international Review*, Vol. 15, No. 6, pp.1429–1441.

Khiari, W., Omri, A. and Karaa, A. (2007) 'Corporate governance and efficiency: an indexing approach using the stochastic frontier analysis. Corporate governance', *The International Journal of Business in Society*, Vol. 7, No. 2, pp.148–161.

Lajmi, A. and Gana, M.R. (2013) 'Audit committee and external audit quality: substitution or complementarity? Empirical evidence on Euronext brussels', *International Journal of Financial Management Research and Development*, Vol. 3, No. 2, pp.22–38.

Matei, A. and Drumasu, C. (2015) 'Corporate governance and public sector entities', *Economics and Finance*, Vol. 26, pp.495–504.

Montagno, R., Sexton, R.S. and Smith. B.N. (2002) 'Using neural networks for identifying organizational improvement strategies', *European Journal of Operational Research*, Vol. 142, No. 2, pp.382–395

Organisation for Economic Cooperation and Development (OECD) (1999) *Principles of Corporate Governance*, OECD, May, Paris.

Organisation for Economic Cooperation and Development (OECD) (2003) *White Paper on Corporate Governance in Asia*, OECD, Paris.

Rapport Bouton (2002) *Pour un meilleur gouvernement des entreprises cotées*, Rapport groupe de travail conjoint AGREF/AFEP – MEDEF.Rapport.

Rapports Vienot I (1995) *Le conseil d'administration des sociétés cotées*, AFFP-CNFP.

Rapports Vienot II (1999) *Rapport du comité sur le gouvernement d'entreprise*, AFEPMEDAEF.

Saldanlı, A. (2012) 'Kurumsal Yönetim Endeks Performansının Analizi', *Ekonomik ve Sosyal Araştırmalar Dergisi*, Vol. 8, No. 8, pp.137–154

Solomon, J., Solomon, A. and Park, C. (2002a) 'A conceptual framework for corporate governance reform in South Korea', *Corporate Governance*, Vol. 10, No. 1, pp.29–46.

Solomon, J., Solomon, A. and Park, C. (2002b) 'The evolving role of institutional investors in South Korean corporate governance: some empirical evidence', *Corporate Governance*, Vol. 10, No. 3, pp.211–224.

Tam, O.K. (2000) 'Models of corporate governance for Chinese companies', *Corporate Governance*, Vol. 8, No. 1, pp.52–64.

Tinker, T., Lehman, C.R. and Merino, B. (2005) 'Corporate governance', *Advances in Public Interest Accounting*, JAI Press, NY, 328 pages.

Zéghal, D.M., Marrakchi, S. and Makni, Y. (2006) 'Impact de la structure de propriété et de l'endettement sur les caractéristiques du conseil d'administration: étude empirique dans le contexte d'un pays émergent', paper presented at the *27ème Congrès de l'Association Francophone de Comptabilité*, May, Tunisia.

Zelenyuk, V. and Zheka, V. (2006) 'Corporate governance and firm's efficiency: the case of transitional country', *Ukrain Journal of Productivity Analysis*, Vol. 25, Nos. 1–2, pp.143–157.

Zimmerman, J.L. (2012) *Myth: External Financial Reporting Quality has a 1st Order Effect on Firm Value*, pp.12–23, University of Rochester – Simon School, Working Paper.

Notes

1 The activation function 'binds' the weighted sums of the units in a layer with the values of the units in the previous layer.

2 The connections are the synaptic weights connecting the nodes to each other.

3 This is an independent term, called polarisation or bias, which can be considered in the model or not. This term adds a component to determine, it is in a position to compensate for the difference between the average value of the outputs of the network (on all training or learning points) and the average value of the target values, thus playing a stabiliser role for the network.

4 Corporate governance target recommendations of Tunisian experts are presented in the Appendix (see Table A.1)

Appendix

Table A.1 Results of the questionnaire: corporate governance recommendations for Tunisian listed firms in terms of target values and calculated importance

Criteria	*Recommendations*	*Importance*	*Normalised importance*
	The board of directors		
Number of meetings of the board of directors per year	Min: four meetings Max: five to six meetings	0.062	39.3%
Board size (number of members in the board))	Min: five members Max: 12–14 members	0.019	12.2%
Number of independents (who don't have any direct or indirect interest relationship with the firm)	Min: one Max: three	0.083	52.7%
Number of foreign administrators	Min: one Max: three	0.044	27.6%
Number of administrators having a relationship with a bank (exerçant une fonction ou un mandat d'administrateur dans une banque)	Min: one to two Max three to four	0.092	58.2%
Le nombre d'administrateurs liés à client/fournisseur Number of administrators having a relationship with a customer or supplier (exerçant une fonction ou un mandat dans une entreprise client ou fournisseur)	Min: zero Max: one	0.037	23.3%
Mean age of administrators	Min: 50 years old Max: 60 years old	0.023	14.5%
The recruitment of directors: how to recruit directors	by appointment	0.078	49.3%
Number of executive directors	Min: one Max: two	0.079	50.0%
Number of administrators holding more than 5% of the capital	Min: one Max: two	0.017	11.1%
Annual evaluation of the composition and the functioning of the board	Are you with the evaluation? Yes | x | No |	0.033	21.1%
Administrator mandate	Min: three Max: four	0.015	9.7%
The remaining term of office of administrators		0.072	45.4%

Table A.1 Results of the questionnaire: corporate governance recommendations for Tunisian listed firms in terms of target values and calculated importance (continued)

The skills of administrators:			
• *level of education*		0.038	23.9%
• *professional experience*	Min: ten years Max: 20 years	0.023	14.9%
Duality: the combination of functions between Chairman and the CEO	Are you with the duality? Yes [ ] No [x]	0.071	44.9%
The presence of CEO in meetings of the board (whether members or not)	Are you with the presence of the CEO? Yes [x] No [ ]	0.055	34.9%
Existence of inside rules of procedure	Are you with the existence of the inside rules? Yes [x] No [ ]	0.158	100.0%
	The monitoring board		
Existence of a monitoring board	*Do you support the existence of this board?* *Yes* [*x*] *No* [ ]	0.088	9.6%
Members number in the monitoring board	Min: three Max: between five and six members	0.912	100.0%
	The Audit Committee		
Existence of an audit committee	Are you with the existence of an AC? Yes [x] No [ ]	0.121	60.3%
Number of members in the audit committee	Min: three Max: five	0.051	25.5%
Number of outsiders in the committee	Min: two Max: three	0.195	97.3%
Number of meetings per year	Min: two to three meetings per year Max four meetings per year	0.122	60.8%
Participation of the CEO in the audit meetings	Are you with the participation of the CEO? Yes [x] No [ ]	0.089	44.3%
Membership of the committee at one of BIG 4	Are you with the membership of the committee at one of BIG 4? Yes [x] No [ ]	0.054	27.1%

Table A.1 Results of the questionnaire: corporate governance recommendations for Tunisian listed firms in terms of target values and calculated importance (continued)

Presenting a report to the board of directors	Are you with the presentation of a report? Yes [x] No [ ]	0.200	100.0%
Existence of inside rules of procedure for the audit committee	Are you with the existence of the inside rules? Yes [x] No [ ]	0.169	84.5%
	The compensation committee		
Existence of a compensation committee	Are you with the existence of a CC ? Yes [x] No [ ]	0.046	8.6%
Number of members in the compensation committee	Min: three Max: five	0.081	15.0%
Number of outsiders in the compensation committee	Min: one Max: two	0.149	27.5%
Number of meetings of the committee per year	Min: one Max: three	0.541	100.0%
Participation of the CEO in the meetings of the compensation committee	Are you with the participation of the CEO? Yes [x] No [ ]	0.182	33.6%
	The nomination committee		
Existence of a nomination committee	Are you with the existence of a NC ? Yes [x] No [ ]	0.137	51.2%
Number of members in the nomination committee	Min: three Max: six	0.268	100.0%
Number of outsiders in the committee	Min: one Max: two to three members	0.204	76.0%
Number of committee meetings per year	Min: one meeting per year Max: two to three meetings per year	0.218	81.2%
Participation of the CEO in the committee meetings	Are you with the participation of the CEO? Yes [x] No [ ]	0.173	64.6%
	The statutory auditor		
Existence of a statutory auditor	Are you with the existence of a SA? Yes [x] No [ ]	0.742	100.0%

Table A.1 Results of the questionnaire: corporate governance recommendations for Tunisian listed firms in terms of target values and calculated importance (continued)

The mandate of statutory auditor	Min: three mandates Max: five mandates	0.258	34.8%
	Manager Remuneration		
Manager remuneration	Min: between 2,000D and 3,000D Max: between 5,000D and 7,000D	0.078	8.5%
Determining policy of compensation		0.922	100.0%
	Information means to shareholders		
Existence of a website	Are you with the existence of a website? Yes | x | No |	0.111	81.4%
Existence of the following information on the website:	Are you with the existence of that information?		
• agenda of the key dates	Yes | x | No |	0.023	16.9%
• press releases	Yes | x | No |	0.038	28.2%
• annual reports over three years	Yes | x | No |	0.109	80.4%
• stock market information	Yes | x | No |	0.104	76.3%
• information about the general assembly	Yes | x | No |	0.062	45.9%
• presentations to financial analysts	Yes | x | No |	0.079	58.2%
Publication of detailed quarterly results	Are you with the publication of quarterly results? Yes | x | No |	0.054	39.4%
Publication of detailed interim results	Are you with the publication of interim results? Yes | x | No |	0.048	35.1%
Publication of the report of the general assembly	Are you for the publication of report ? Yes | x | No |	0.097	71.4%
The delayed publication of quarterly results	Max: between 20 and 40 days	0.042	30.6%
The delayed publication of interim results	Max between 20 and 40 days	0.098	72.1%

Table A.1 Results of the questionnaire: corporate governance recommendations for Tunisian listed firms in terms of target values and calculated importance (continued)

The delayed publication of annual results	Max: between 20 and 40 days	0.136	100.0%
	Ownership structure		
Percentage held by institutional	Min: 30% Max: 40%	0.148	60.5%
Percentage held by administrators	Min: 5% Max: 40%	0.104	42.5%
Percentage held by foreign investors	Min: 30% Max: 40%	0.019	7.8%
Managerial ownership	Min: 5% Max: 20%	0.051	21.1%
The percentage held by the state	Min: 5% Max: 25%	0.110	44.9%
The percentage held by families	Min: 5% Max: 35%	0.166	67.9%
The percentage held by major shareholders (holding more than 5% of capital)	Min: 20% Max: 45%	0.244	100.0%
The percentage held by employees	Min: 5% Max: 15%	0.159	65.0%
	Manager entrenchment		
Manager tenure	Min: five ans Max: 15 ans		