

Determinants in Ratios of Executive and Non-Executive Directors in Board Composition

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Abstract

The composition of directors and executives has been the subject of much recent discussion, with concern being expressed about corporate governance and management effectiveness. However the majority of research on this subject is limited to an analysis of the impact of the governance mechanism on management. This article intends to analyze other factors that influence the governance mechanism. As an investigation of the board composition and determining factors for directors and executives, this article applies fuzzy synthetic decision method to evaluate four major US corporations. The result provides a theoretical approach to compose an optimal ratio distribution of board directors.

Keywords: board structure; corporate governance; fuzzy synthetic decision



I Introduction

Recent corporate debacles such as the accounting scandals and the drastic deflation of market values in the U.S. and around the world have reinvigorated the importance of the corporate directorate issue (Forbes and Milliken, 1999). By law, shareholders own corporations and, ideally, corporate managers should be working on behalf of shareholders to allocate business resources to their optimum use. Corporate law in the United States requires that the business of publicly traded corporations be conducted under the direction of a board of directors (Eisenberg, 1976). The board's role is to ensure that shareholder returns are forthcoming. Boards of directors play an important role in the governance structure of large organizations (Fama and Jensen, 1983). Corporate governance refers to the 'integrated set of internal and external controls' (Baysinger and Hoskisson, 1990) and incentive arrangements that are used to harmonize the interests of the principals (owners or shareholders) with the interests of the designated agents, the managers (Berle and Means, 1932; Williamson, 1984). The board of directors act as the formal link between the shareholders of the firm and the managers entrusted with running the organization (Monks and Minow, 1995). Hence, boards can be described as the 'apex of the firm's decision and control system' (Fama and Jensen, 1983), which plays a key role in monitoring and controlling managers (Dalton, Daily, Johnson and Ellstrand, 1999).

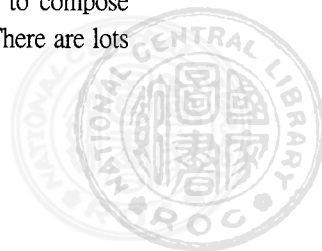
However, as economies grow, and business units become even larger, shareholder control seems to diminish: Ownership has become more dispersed and few shareholders have sufficient stakes to individually influence the choice of boards of directors or chief executive officers. Today, the purpose of the vast majority of corporate share ownership is for investment, it is not for achieving operating control of a company.

Economists view the board as an important element in the governance structure of the large corporation (Fama & Jensen, 1983). Agency theorists (Jensen & Meckling, 1976) have proposed that the relationship between managers and stockholders can be understood in principal-agent terms: managers are the agents in control of assets owned collectively by stockholders and receive compensation for their performance in managing the assets of a firm. The firms' board of directors is viewed as an entity charged with monitoring the managers' performance to ensure that they achieve their fiduciary duties of maximizing shareholder wealth. Agency theorists view the board as a potentially effective element of corporate governance and internal control. However, agency theorists do not make any explicit arguments about the proportion of outsiders on a board or what will ensure neutrality; instead, the objectivity of outside directors is linked to their expertise and governed by their external reputations. Legal scholars and corporate reformers, on the other hand, have argued that to be an effective governing body, a board should have a majority of outside members (Eisenberg, 1975; Nussbaum & Dobrynski, 1987). Thus, developing a shared vision for the future of the company, enhancing quality relationships and establishing clear and open communication between board members are considered as particularly important indicators of a high-performing board (Coulson-Thomas, 1991; Willcocks, 1994; Renton, 1999; Westphal, 1999; Carpenter and Westphal, 2001).

Outside directors are only one mechanism for achieving effective corporate governance. In an effort to investigate an optimal ratio on corporate boards, we use Fuzzy Synthetic Decision (FSD) method to test four American corporations. In so doing, we hope to be able to propose a theoretical framework holds with regards to board composition.

II Factors Influence Board Structure

The separation of ownership and control first discussed by Berle and Means (1932) creates many situations in which the interests of managers and owners may not coincide. The primary monitoring mechanism available to organizational owners is the board of directors which is charged with insuring that CEOs and top management carry out their duties that are in the best interests of owners. It becomes more important to owners how to compose effective corporate boards and what would be the rational ratio of Non-executive directors in boards. There are lots factors influence corporate boards.



Statutory Regulations

Countries have different regulations, for example, America legislates that corporations must set up compensation committees, director nomination committees and auditor committees each of which is independent and acts on behalf of the shareholders, whereas corporate governance in Japan focuses on harmony between employer and employee. Consequently, board structures will be designed to meet the needs of local regulatory demands.

Ownership Structure

Ownership structures vary considerably across developed economies. American and British corporations spread ownership widely among dispersed individual and institutional investors. However, Japanese corporations centralize ownership to a core "inside" group that can influence policy. These distinct approaches will impact board structures differently.

Capital Market Development

Capital markets vary widely and support corporations differently throughout the world. The dissimilar monitor on corporations is to make up for functions of board directors, in a result, this will influence board structure.

Corporation Culture

A country's culture is often reflected in its corporate culture. For example, Japanese view society as being composed of various inside and outside groups. Similarly, Japanese corporations are viewed and view themselves as separate social units in which outsiders are excluded. Therefore, they stress social duty within the unit and no need of outsider directors.

Strategic Management Involvement

The roles boards of director play in strategic management will impact the board's structure. In a monitoring role, outside directors are seen as providing more independent, shareholder-interested monitoring; on the contrary, in a controlling role, boards of directors have power in the decision process that CEOs and top management carry out their duties in the best interests of owners.

Decision Making Process

Some corporations prefer collectivism and others favor individualism. Japanese corporations advocate a collective decision making process which emphasizes the importance of executive directors, but American corporations count on professional skills to make decision and stress more importance of non-executive directors.

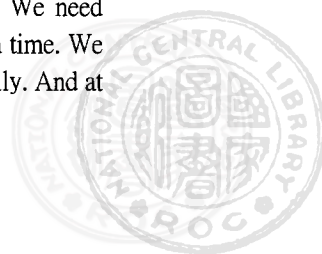
Innovation and Risk Management

Studies of non-executive director ratios and firm innovation activities have produced negative correlation. However, executive directors can access corporation's variety of information, they can precisely judge value of innovation. Obviously, corporations need to structure different board structure to face challenges in different industries and risk.

Company Size and Development Stage

A family enterprise has small company size, they need collectivism decision process; speedy developing enterprise has big company size which needs rational board structure to implement functions effectiveness.

The basic problem of decision making is to choose the best in a set of competing alternatives that are evaluated under conflicting criteria. Most of us have difficulty examining even a few ideas at a time. We need instead to organize our problems in complex structure which allow us to think about them one or two at a time. We need simplicity and complexity. We need an approach that is conceptually simple so that we can use it easily. And at



the same time, we need an approach that is robust enough to handle real world decisions and complexities. The Analytic Hierarchy Process is such a problem-solving framework. It is a systematic procedure for representing the elements of any problem. It organizes rationally by breaking down a problem into its smaller constituent parts and then calls for simple pairwise comparison judgments to develop priorities in each hierarchy.

III Research Model

There are so many factors influencing board structure. The problem is how to set up the best one in a set of competing alternatives that are evaluated under conflicting criteria. Taking the board composition of four leading companies in USA as study object, this research found out the factor of board structure by factor analysis, adopted AHP (Satty, 1990) to decide the weight distribution of board structure composing factors, and set up a fuzzy structure appraisal model adaptable to board composing system by fuzzy synthetic decision approach.

3.1 Analytic Hierarchy Process (AHP)

Saaty (1977) introduced the analytic hierarchy process (AHP) which provides us with a comprehensive framework for solving complex problems. It enables us, at the same time, to cope with the intuitive, the rational, and the irrational, when we make multicriteria and multifactor decisions. We can use the AHP to integrate perceptions and purposes into an overall synthesis. The AHP does not require that judgments be consistent or even transitive. The degree of consistency (or inconsistency) of the judgments is revealed at the end of the AHP process. The AHP is a systematic procedure for representing the elements of any problem. It organizes the basic rationality of the problem by breaking it down into its smaller constituent parts and then calls for simple pairwise comparison judgments to develop priorities in each hierarchy.

There are three principles which one can recognize in problem solving. They are the principles of decomposition, comparative judgments, and synthesis of priorities. The decomposition principle calls for structuring the hierarchy to capture the basic elements of the problem. (See figure 1.) The principle of comparative judgments calls for setting up a matrix to carry out pairwise comparisons of the relative importance of the elements in the second level with respect to the overall objective of the first level. Priorities are synthesized from the second level down by multiplying local priorities by the priority of their corresponding criterion in the level above, and adding them for each element in a level according to the criteria it affects. The AHP contains an intrinsic measure of inconsistency for each matrix and for the whole hierarchy. Knowledge of inconsistency enables one to determine those judgments which need reassessment.

In order to set up the appraisal factors for analytic level construction, this research designed the first questionnaire to make investigation. A 7-point Likert scale with values ranging from 1 (smallest) to 7 (largest) was used. The second questionnaire (AHP questionnaire) is designed according to the structure. The various factors under each level in the questionnaire are made pair comparison by 1 (objectives i and j are equally important) to 9 (objectives i is absolutely more important than j) scale ratings the examinee should tick the rating of each pair comparison of factors.

Data were collected in a survey of staff in sample companies. A total of 200 first questionnaires were distributed and 103 usable questionnaires were used in the analysis, representing a valid response rate is 51.5%. The second questionnaire investigation was carried out to those who had sent back the first questionnaire and 98 copies were returned. After consistency check, 87 copies were valid questionnaires, the valid response rate is 88.77%.



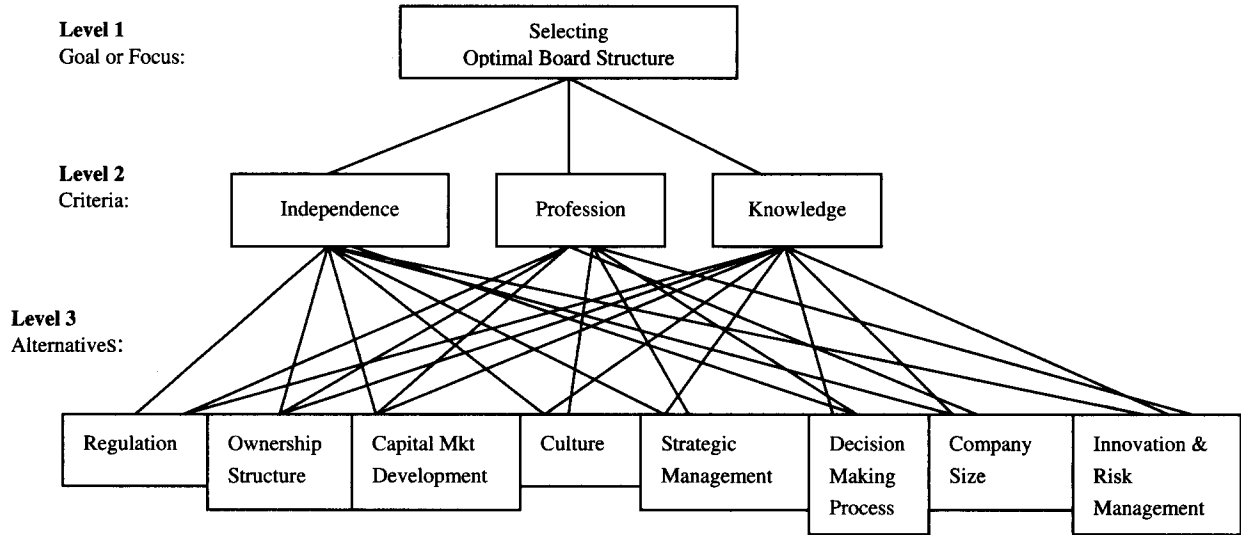


Figure 1 Factors effecting board structure thru AHP

3.2 Fuzzy Synthetic Decision (FSD)

Fuzziness was introduced, based on Zadeh's fuzzy set and possibility theory (Zadeh, 1965, 1978), into the classical data models in order to represent and manipulate uncertainty and/or imprecise information. Fuzzy sets are collections of elements for which boundaries are not clearly defined. However, there are many elements of universe that are not clearly in or out of the set. The fuzzy set solution allows these boundaries to be hazy and assigns memberships in the set between zero and one. The FSD is an effective fuzzy method and is applied in variety. It has been extended to multi-level model and multi-operation model from initial model.

Initial Model

Supposing domain $U = \{u_1, u_2, \dots, u_n\}$ is a set of appraisal indexes or appraisal factors, $V = \{v_1, v_2, \dots, v_m\}$ is a set of appraisal grades, every appraisal object can obtain a fuzzy relation matrix \tilde{R} from U to V .

$$\tilde{R} = (r_{ij})_{n \times m} = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1m} \\ r_{21} & r_{22} & \dots & r_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n1} & r_{n2} & \dots & r_{nm} \end{bmatrix}, \text{ where } r_{ij} \text{ is the membership degree } (i=1,2,\dots,n, j=1,2,\dots,m) \text{ that the}$$

appraisal object is appraised as v_j on consideration of factor u_i .

From U to V has a fuzzy relation vector R , $R(U) = (r_{i1}, r_{i2}, \dots, r_{im})$ is called single factor judgment which is sub-collection of V . and $r_{ij} (0 \leq r_{ij} \leq 1; i = 1, 2, \dots, n; j = 1, 2, \dots, m)$ is degree of v_j . We define $R = (r_{ij})$ as exchange matrix. When weighted distribution- A and exchange matrix- R are known, we can start operation and process evaluation. We will get the initial model of fuzzy synthetic decision:

$$A \circ R = B (b_1, b_2, \dots, b_m) \quad (1.1)$$

$$b_j = \bigvee_{i=1}^n (a_i \wedge r_{ij}) \quad , \quad 0 \leq b_j \leq 1 \quad (1.2)$$

Multi-level Model



Thru dividing factor set layer by layer, we can extend above mentioned model into multi-layer fuzzy synthetic decision model. The process could be started at the bottom level and move upward. When we first divide factor set $U = \{u_1, u_2, \dots, u_n\}$, we will get two-layer FSD model. The operation is:

$$\underset{\sim}{B}_{\text{fuzzy}} = A \circ R = A \circ \begin{bmatrix} A_1 \circ R_1 \\ \sim \\ A_2 \circ R_2 \\ \sim \\ M \\ \sim \\ A_n \circ R_n \\ \sim \end{bmatrix} \quad (1.3)$$

$\underset{\sim}{A}$ is weight distribution of $U/P = \{U_1, U_2, \dots, U_n\}$; A_i is weight distribution of $U_i = \{u_{i1}, u_{i2}, \dots, u_{ik}\}$, and R and R_i are exchange matrix for U/P and U_i respectively. $\underset{\sim}{B}_{\text{fuzzy}}$ is evaluation result for both U/P and U .

(See figure 2.)

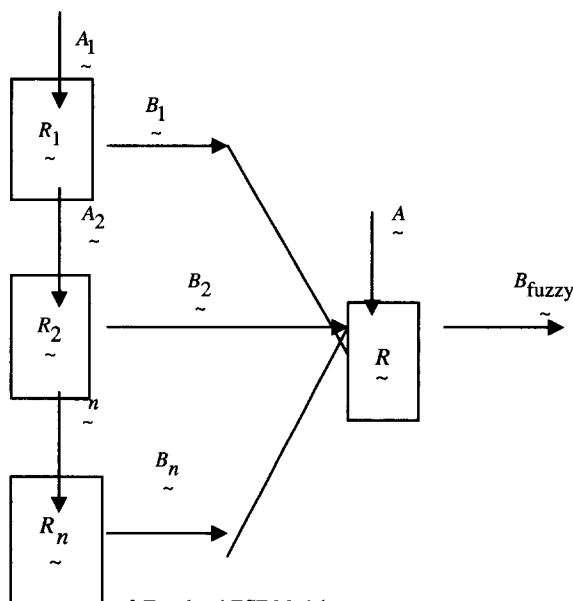


Figure 2 Two-level FCE Model

If we make divide from U/P , we can get three-layer or more layers FSD model.

Multi-operation Model

We can extend the initial model to multi-operation FSD model which extends operation \wedge (min) and \vee (max) in initial model to generalized fuzzy operation “and” operation \bullet_* , “or” operation \bullet_+ which uses operation \bullet_* and \bullet_+ to substitute operation \wedge and \vee . We can get multi-operation model as follows:

$$A \circ R = B(b_1 b_2 \wedge b_m)$$

$$b_j = \left(a_1 \bullet_* r_{1j} \right) \bullet_+ \left(a_2 \bullet_* r_{2j} \right) \bullet_+ \wedge \bullet_+ \left(a_n \bullet_* r_{nj} \right) \quad (1.4)$$

$$j = 1, 2, \dots, m$$

Define as Model $M \begin{pmatrix} \bullet_* & \bullet_+ \\ * & * \end{pmatrix}$.



This multi-operation model has infinite numbers but there are only five models proposed now. (See Table 1.)

Table 1 Operation Types

Type	$M(\wedge, \vee)$	$M(\bullet, \vee)$	$M(\bullet, \oplus)$	$M(\wedge, \oplus)$	$M(\bullet^k, \wedge)$
Operation b_j	$b_j = \max[\min(a_1, r_{1j}), \min(a_2, r_{2j}), \Lambda, \min(a_n, r_{nj})]$	$b_j = \max[a_1 r_{1j}, a_2 r_{2j} \Lambda, a_n r_{nj}]$	$b_j = [1, \sum_{i=1}^n a_i, r_{ij}]$	$b_j = \min \sum_{i=1}^n \min(a_i, r_{ij})$	$b_j = \min [r_{1j}^{a_1}, r_{2j}^{a_2}, \Lambda, r_{nj}^{a_n}]$
Symbol					
\bullet $*$	$\bullet \rightarrow \wedge$ $a \wedge \beta = \min(\alpha, \beta)$	$\bullet \rightarrow \bullet$ $\alpha \cdot \beta = \alpha \times \beta$	$\bullet \rightarrow \bullet$ $\alpha \cdot \beta = \alpha \times \beta$	$\bullet \rightarrow \wedge$ $a \wedge \beta = \min(\alpha, \beta)$	$\bullet \rightarrow \bullet^k$ $a^{\bullet^k} \beta = \beta^a$
$+$ $*$	$+$ $\bullet \rightarrow \vee$ $a \vee \beta = \max(\alpha, \beta)$	$\bullet \rightarrow \vee$ $a \vee \beta = \max(\alpha, \beta)$	$+$ $\bullet \rightarrow \oplus$ $\alpha \oplus \beta = \min(1, \alpha + \beta)$	$+$ $\bullet \rightarrow \oplus$ $\alpha \oplus \beta = \min(1, \alpha + \beta)$	$+$ $\bullet \rightarrow \wedge$ $a \wedge \beta = \min(\alpha, \beta)$

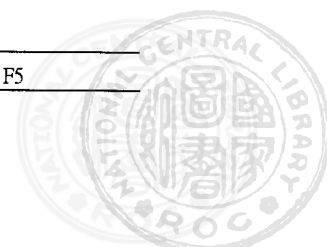
IV Case Study

We used the above mentioned method to research four leading American companies: BP, PLC, Intel, AT&T and UTC. For factor analysis, the principal component method with varimax rotation and eigenvalue greater than 1 and factor loadings greater than 0.5 were used. We, first, determined influential factors and appraisal factors. From all the factors influencing the boards of directors, we extracted five factors $U = \{u_1, u_2, u_3, u_4, u_5\} = \{\text{government regulation, ownership structure, strategic decision involvement, type of decision making, and company size and developing stage}\}$ which means $n = 5$. Appraisal factors $V = \{\text{smallest, smaller, small, normal, large, larger, largest}\}$, $m = 7$ which respected board composition model $D = \{\text{board directors are all executives, board directors are majority of executives, board directors have more executives than non-executives, board directors have equal executives and non-executives, board directors have less executives than non-executives, board directors are majority of non-executives, board directors are all non-executives}\}$. The results are shown in Table 2. After factor analysis, the analytic hierarchy structure can be set up.

According to the second questionnaire investigation, the data of every questionnaire is used to set up the pair comparison matrix, then input into AHP to analyze. The eigenvalue and eigenvector of every pair comparison matrix should be work out. By AHP calculation, the weights of various factors in each, which is the weight set $\lambda = (0.25 \ 0.21 \ 0.18 \ 0.16 \ 0.20)$ of fuzzy synthetic decision, can be found out. In Table 3, the appraisal matrix $B = (r_{ij})_{5 \times 7}$ is put together with weight set to the decision making sets. We selected a model of board composition d_k which respects to the ratio a . According to results analyzed by fuzzy synthetic decision method, our findings support a realistic board composition (See Table 4).

Table 2 Results of factor analysis

Extracted factors	F1	F2	F3	F4	F5
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Eigenvalue	4.7638	2.5866	1.4567	1.1322	1.7723
Cumulative Variance Explained	25.07%	63.03%	63.15%	75.20%	74.05%
Cronbach $\alpha=0.76$					

Table 3 Board composition

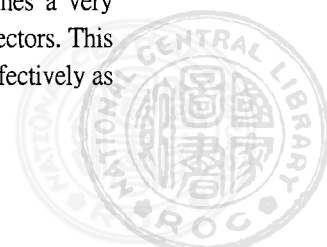
Company	Fuzzy appraisal vector	Synthetic appraisal Vector	Model	Ratio of Non-executives
BP PLC	$\begin{Bmatrix} 0 & 0.03 & 0.07 & 0.10 & 0.25 & 0.30 & 0.25 \\ 0 & 0.02 & 0.07 & 0.17 & 0.28 & 0.25 & 0.21 \\ 0.01 & 0.05 & 0.11 & 0.16 & 0.30 & 0.24 & 0.13 \\ 0.01 & 0.03 & 0.07 & 0.11 & 0.33 & 0.27 & 0.18 \\ 0.04 & 0.07 & 0.12 & 0.17 & 0.28 & 0.27 & 0.05 \end{Bmatrix}$	(0.011 0.038 0.085 0.141 0.284 0.265 0.167)	d_5 Non-executives larger than executives	$\left(\frac{2}{3}, \frac{2}{4} \right)$
Intel	$\begin{Bmatrix} 0 & 0.03 & 0.07 & 0.10 & 0.25 & 0.30 & 0.25 \\ 0.01 & 0.05 & 0.12 & 0.25 & 0.31 & 0.17 & 0.09 \\ 0.06 & 0.06 & 0.13 & 0.26 & 0.31 & 0.15 & 0.07 \\ 0.02 & 0.05 & 0.09 & 0.25 & 0.30 & 0.18 & 0.11 \\ 0.05 & 0.09 & 0.15 & 0.22 & 0.31 & 0.17 & 0.05 \end{Bmatrix}$	(0.018 0.055 0.110 0.207 0.294 0.192 0.121)	d_5 Non-executives larger than executives	$\left(\frac{8}{12}, \frac{2}{3} \right)$
AT&T	$\begin{Bmatrix} 0 & 0.03 & 0.07 & 0.10 & 0.25 & 0.30 & 0.25 \\ 0 & 0.03 & 0.08 & 0.12 & 0.27 & 0.30 & 0.20 \\ 0.03 & 0.06 & 0.10 & 0.15 & 0.26 & 0.30 & 0.10 \\ 0.02 & 0.03 & 0.05 & 0.10 & 0.28 & 0.32 & 0.20 \\ 0.04 & 0.08 & 0.13 & 0.15 & 0.25 & 0.30 & 0.05 \end{Bmatrix}$	(0.017 0.045 0.086 0.121 0.260 0.302 0.165)	d_6 Non-executives are majority.	$\left(\frac{3}{4}, \frac{5}{6} \right)$
UTC	$\begin{Bmatrix} 0 & 0.03 & 0.07 & 0.10 & 0.25 & 0.30 & 0.25 \\ 0.01 & 0.03 & 0.07 & 0.13 & 0.19 & 0.28 & 0.29 \\ 0.02 & 0.06 & 0.08 & 0.15 & 0.23 & 0.28 & 0.20 \\ 0.02 & 0.04 & 0.07 & 0.11 & 0.22 & 0.29 & 0.24 \\ 0.02 & 0.07 & 0.11 & 0.15 & 0.24 & 0.26 & 0.15 \end{Bmatrix}$	(0.012 0.046 0.078 0.126 0.227 0.281 0.228)	d_6 Non-executives are majority.	$\left(\frac{5}{6} \right)$

Table 4 Board structure (2004)

Company	BP PLC	Intel	AT&T	UTC
Number of executive directors	6	2	1	1
Number of non-executive directors	12	9	9	11
Total number of directors	18	11	10	12
Ratio of Executives	33%	18%	10%	8%
Ratio of Non-executives	67%	82%	90%	92%

V Conclusion

Today, service as a corporate officer or director is more daunting a task than at any other time in business history. Ultimately, the performance of any board is a function of the character of the individuals that comprise the board. No structural remedy can overcome poor judgment or apathy. At the same time, no amount of individual character can overcome accountability without responsibility. Besides, given the increasing number of financial scandals in the USA (Enron, Tyco, Global Crossing, WorldCom, Xerox, etc.), it seems timely to consider what should really be expected of non-executive directors. Therefore, composing an effective board becomes a very important issue to corporations. There is far too little research that discusses the composition of board directors. This study aims to provide evaluation method of board structure. Firms may need to utilize their board more effectively as a monitoring mechanism. Future research should investigate this area in more depth.



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董事會組成結構之探討 — 以美國四大公司為例

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摘 要

董事會既扮演股東大會的代理人，又擔任經理層的委託人，在公司治理結構中具有十分重要的地位，已經成為公司治理結構的核心。企業董事會的構成直接決定著董事會職能的有效發揮，因此選擇合理的董事會構成模式，不僅能夠有效地維護股東的利益，而且對企業的長遠發展具有重要的策略意義。本文在對董事會構成模式及其影響因素分析的基礎上，運用模糊數學理論和層級分析法，提出了選擇董事會構成模式和確定董事會構成的大概比例之模糊綜合評判方法，為企業合理組織董事會提供一理論基礎思考的方向。

關鍵詞：董事會結構；公司治理；模糊綜合評判

