

Accounting Compensation Modeling Using The Analytic Hierarchy Process Supporting The Sarbanes-Oxley Act


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ABSTRACT

The Sarbanes-Oxley Act (SOA) of 2002 included a wide range of reforms for issuers of publicly traded securities, auditors, corporate board members, and lawyers. It was aimed at deterring and punishing corporate and accounting fraud with severe penalties for wrongdoers, and protecting the interests of workers and shareholders. The SOA along with the economic downturn of 2008 and the subsequent passing of the Dodd-Frank Act has focused additional attention to executive compensation especially for CEOs. This paper proposes that the Analytic Hierarchy Process (AHP) may be useful in developing input to compensation contracts in ways that support regulations and the interests of investors and stockholders. AHP is suggested as a framework to explore when considering the factors that can be used to measure the performance of a CEO. Seven reasons for using AHP for this purpose are presented in this report: (1) emphasizes objectivity and consistency, (2) creates an audit trail for compensation agreements, (3) improves understanding between CEOs and compensation committees, (4) supports review and updating CEO compensation contracts, (5) augments CEO selection, (6) supports SOA and Dodd-Frank Act, and (7) may attract investors.

Keywords: Sarbanes-Oxley Act (SOA); Dodd-Frank Act; Analytic Hierarchy Process (AHP)

INTRODUCTION

 ne of the most sweeping reforms to business practices was the Sarbanes-Oxley Act (SOA) of 2002, which was signed into law by George W. Bush and became effective on July 30, 2002 (Zameeruddin, 2002). This act included a wide range of reforms for issuers of publicly traded securities, auditors, corporate board members, and lawyers. It was aimed at deterring and punishing corporate and accounting fraud with severe penalties for wrongdoers, and protecting the interests of workers and shareholders. The Sarbanes-Oxley Act has the following major features: (1) it creates a Public Company Accounting Oversight Board to enforce professional standards, ethics, and competence for the accounting profession, (2) it strengthens the independence of firms that audit public companies, (3) it increases corporate responsibility and usefulness or corporate financial disclosure, (4) it increases penalties for corporate wrongdoing, (5) it protects the objectivity and independence of securities analysts, and (6) it increases Securities and Exchange Commission resources. There is no consensus in the literature with regard to the overall success of SOA (Basu & Dimitrov, 2010). The purpose of this paper is to examine the role of SOA in executive compensation and propose the use of the Analytic Hierarchy Process as a method to identify factors for input into an executive compensation package. To accomplish this purpose, this report identifies the goals of the SOA, reviews the effectiveness of the SOA's claw back provision, presents current issues in executive compensation, provides an overview of the AHP model, and advocates the use of AHP as a starting point for developing executive compensation factors.

GOALS OF THE SOA

One of the six goals for the SOA is to increase corporate penalties for corporate wrongdoing. Section 304 of the Sarbanes Oxley Act of 2002 is known as the "claw back" provision because it authorizes a company to get

back certain executive bonuses and stock profits. The claw back rule provides that any accounting restatement due to the material noncompliance with financial reporting requirements the chief executive officer and the chief financial officer shall reimburse bonuses or other incentive-based or equity-based compensation received from the issuer during the 12-month period following the first public issuance or filing of the document (University of Cincinnati College of Law, 2002). A review of the record of enforcements between July 1, 2002 and June 30, 2006, revealed that over 1,121 publicly traded companies filed a total of 1,786 restatements of which 125 were made for reporting fraud or other accounting errors (List, 2008). This data represents the number of restatements filed since Sarbanes-Oxley went into effect. By December 2007, the SEC had brought Section 304 actions in only five cases. More disturbing is that the SEC itself noted in a press release on May 31, 2007, that this was its “first time” using Section 304 (List, 2008). Only two instances of enforcement of the claw back provision were found in the literature. The SEC recently announced a settled enforcement action in which it obtained a “claw back” of prior compensation and stock sale profits from a CEO pursuant to Sarbanes-Oxley Section 304 in SEC v. McCarthy, No. 1:11-CV-667-CAP (N.D. Ga. March 3, 2011). This case marks the second time the SEC has obtained this type of relief without alleging that the CEO in question personally engaged in any wrongdoing (Carlin, 2011).

SOA EFFECTIVENESS AND ROLE IN EXECUTIVE COMPENSATION

The role of executive compensation and its enforcement under SEC 304 of the SOA raises the issue of how to fairly assess and reward the work of a CEO for a publically traded organization. Although there are a number of theories that describe the underlying precepts of how a compensation model should function there are no testable mathematical models to assess the objectivity and fairness of the methods. One well-researched notion is the “principal/agent” theory which argues that compensation committees of Boards of Directors are principals who negotiate with their agents (CEOs) to establish executive compensation (Bebchuk & Fried, 2004). Under this approach, these principles through their objectivity are able to negotiate cost effective contracts that motivate the CEOs to manage the organization in a way that ultimately increases the wealth of the principals. The focus of this paper is to identify a framework that could be used to develop criteria that could be implemented in a compensation contract that could serve the needs of the organization, its principals, and its CEO in a more transparent and objective methodology. By making the development of these contract assessment factors more objective, the approach supports the SOA by increasing corporate responsibility and disclosure.

CURRENT ISSUES IN EXECUTIVE COMPENSATION

Over the last 10 years, a lot has been written about structuring executive compensation and connecting pay to performance. Because of the economic conditions of 2008, many companies carefully reviewed their structuring of compensation measures for their executives. In 2009 the G-20 Conference echoed the need for effective governance of compensation including oversight and engagement by stockholders. In July 2010, the *Dodd-Frank Wall Street Reform and Consumer Protection Act* (Dodd-Frank Act) became law. Among the investor protection provisions of this law are sections that address executive compensation and corporate governance. These issues were included in the Act because of the widespread perception that executive pay practices contributed to the financial crisis. This view asserts that some executives took excessive risks to realize short-term gains at the expense of long-term shareholder value and financial stability in their organizations. The Dodd-Frank Act requires greater accountability by the board to shareholders about executive compensation. Section 951 of this regulation requires that shareholders of public companies have a non-binding vote on executive pay packages and golden parachutes. The goal of this practice is to encourage compensation policies that connect compensation incentives to a company's financial performance. Under this law, compensation committees are required to be independent of management and have the resources to use the expertise of independent consultants (Pagnattaro & Greene, 2011).

The growing momentum toward executive compensation reform movement brings with it new responsibilities for shareholders. Shareholders of public companies in the United States and of many listed companies in the European Union must be prepared to vote at the annual meeting with an understanding of the pay practices at issue (Pagnattaro & Greene, 2011). With the increased closure of pay arrangements shareholders will need to focus on the relationship between the CEO's paycheck and his or her performance. This paper argues that one approach for assisting the shareholder and compensation committees is through the application of the Analytic Hierarchy Process. The next section provides an overview of AHP.

THE ANALYTIC HIERARCHY PROCESS

The Analytic Hierarchy Process (AHP) is a methodology that aids decision makers who are faced with problems that are composed of conflicting and often subjective criteria (Ishizaka & Labib, 2009). A number of successful applications of this approach have been documented in the literature (Forman & Gass, 2001; Ho, 2008; Kumar & Vaidya, 2006; Liberatore & Nydick, 2008; Omkarprasad & Sushil, 2006). Saaty (1972) is generally regarded as a pioneer in this methodology because of his early publication on the subject.

Saaty (2008) explains the AHP as a method in which priorities are created by decomposing the decision into four steps. First, the problem needs to be defined to determine the type of information that is sought in the process. Second, develop a structure with goal of the decision at the top followed by the objectives. These objectives will range from intermediate levels which identify the criteria to the lowest levels which represent the alternatives. Third, construct sets of pairwise comparisons in which higher level elements are compared directly with elements in the level below it. Fourth, apply the priorities gained from the comparisons to assess importance of lower level elements. After analyzing each element, then combine the weighted values from the level below to obtain its overall priority. This process is continued until the final priorities of the alternatives are obtained. A more detailed list of steps is provided in Table 1.

Table 1: Analytic Hierarchy Process Methodology

Step	Activity
1	Develop a statement of the problem to be solved
2	Expand the statement from Step 1 to include all objectives and the desired outcomes
3	Identify the criteria that would influence the outcomes identified in Step 2
4	Structure the problem to include the goals, criteria, and alternatives developed in the previous steps
5	Compare each element with other elements on its level using the structure developed in Step 4. This step will require $n(n - 1)/2$ comparisons where n is the number of elements under consideration.
6	Calculations are performed to find the maximum eigenvalue, consistency index, consistency ratio, and normalized values for each alternative
7	The calculations performed in Step 6 are repeated until the consistency index and consistency ratio based on the normalized values lie within the desired range

In reviewing the four steps listed above it can be seen that AHP begins with a problem that is decomposed into a hierarchy of criteria so as to be more easily analyzed and compared. The development of this hierarchy enables the decision maker to systematically assess the alternatives by making pair-wise comparisons for each of the chosen criteria. This comparison may use data from the alternatives or subjective judgments as a way to input the information.

AHP transforms the comparisons into numeric values that are further processed and compared. Each factor’s weights allow the assessment of each one of the elements inside the defined hierarchy. This ability to convert empirical data into mathematical models is the main distinctive contribution of the AHP technique when contrasted to other comparing techniques. After all comparisons have been made, and the relative weights between each one of the criteria to be evaluated have been established, the probability of each alternative is calculated. This probability represents the likelihood of an alternative to fulfill the desired goal. The higher this probability is, the greater are its chances to satisfy the final goal of the decision maker (Vargas, 2010). The solution of AHP computations is typically provided through software tailored to complete the calculations. The next section identifies several resources for software that will support the user in applying this approach.

AHP SOFTWARE RESOURCES

Table 1 identified a number of calculations that are required in the last three steps of the AHP process. Fortunately, there are a number of both commercial and free software resources available to carry out these computations specific to the AHP methodology. In the paid area of AHP software, *Expert Choice* is popular choice and is available online. Free software includes the use of *Excel* for completing the calculations as well as toolbox implementations in Matlab (Jun, Xin-sheng, & Li, 2008). The availability of software to perform the calculations for the AHP model supports the application of the approach to a wide variety of problems including the development of

input for executive compensation agreements. Examples of application areas to which AHP has been applied are discussed in the following section.

AHP APPLICATION AREAS

AHP has been used for decision making in a number of areas. Omkarprasad and Sushil (2006) reviewed a total of 150 AHP application papers. Their work provides a reference on AHP and an informative summary. One fact noted by these authors is that AHP is its flexibility to be integrated with different techniques like linear programming, quality function deployment, and fuzzy logic. Consequently users of AHP can obtain the benefits from all the combined methods, and achieve the desired goal in a better way. To gain an appreciation for both the types of problems and areas of application in which AHP has been used the information in Tables 2 and 3 are presented. Table 2 reveals the kinds of problems to which AHP has been applied based on Omkarprasad and Sushil review. Table 3 displays the variety of application areas in which the AHP methodology has been used from Omkarprasad and Sushil’s study.

Table 2: AHP Use by Types of Problems¹

Problem Type	Quantity
Selection	32
Evaluation	26
Cost-Benefit	7
Priority	20
Development	18
Resource allocation	10
Decision making	21
Forecasting	4
Medicine	5

¹ Omkarprasad, V., & Sushil, K. (2006). Analytic hierarchy process: An overview of applications. *European Journal of Operational Research*, 169(1), 1-29.

Table 3: AHP Use by Application Areas¹

Application Area	Quantity
Personnel	26
Social	23
Manufacturing	18
Political	6
Engineering	26
Education	11
Industry	15
Government	13
Other	12

¹ Omkarprasad, V., & Sushil, K. (2006). Analytic hierarchy process: An overview of applications. *European Journal of Operational Research*, 169(1), 1-29.

Ho (2008) found that the AHP can be combined with other techniques, such as mathematical programming (including linear programming (LP), integer linear programming (ILP), mixed integer linear programming (MILP), and goal programming (GP)), Quality Function Deployment (QFD), meta-heuristics, SWOT, and Data Envelopment Analysis (DEA) because of its simplicity and flexibility. Comparatively, the combined AHP and GP and AHP and QFD were the two most commonly used tools that were found to be integrated with AHP. Ho also noted that the integrated AHPs can be applied to a wide variety of fields and problems successfully. The ease in which AHP can be combined with other techniques is another advantage for this methodology.

INPUT TO AHP

Executive compensation generally consists of a combination of four elements: (1) annual base salary, (2) annual incentive or bonus plan generally tied to short-term performance measures, (3) long-term incentives (including restricted stock, stock options, and other long-term performance plans tied to total shareholder return or financial performance), and (4) benefits plan (Deloitte Development, 2012). In general, the base salary constitutes

30% of total compensation, the annual incentive another 20%, the benefits about 10% and long-term incentives for about 40%. As compensation committees sought to achieve pay for performance, one trend was to place more emphasis on performance vested restricted stock for CEOs. Any of these inputs may be used as alternatives in the AHP model. In addition, organizations can develop their input categories or refine the contents of each of these major four elements for use in the AHP model. One newer area for input into executive compensation that could also be included in the AHP methodology is sustainability. Xcel Energy included incentive awards for executives to sustainability performance metrics, including greenhouse gas reduction; Alcoa added sustainability performance in its executive bonus plan in 2010, linking 20 percent of the bonus to nonfinancial metrics, such as carbon dioxide reduction, safety, and diversity (Environmental Leader, 2012).

SEVEN REASONS TO USE AHP FOR CEOS, CORPORATIONS, AND ACCOUNTANTS

The heightened concerns about executive compensation along with the requirements of the Sarbanes-Oxley Act and the Dodd-Frank Act are strong forces that provide a justification for an approach to modeling how CEOs are rewarded for their work. There are number of cogent arguments that can be made to support the use of AHP in this process. Each of the following seven reasons are described in this section: (1) emphasizes objectivity and consistency, (2) creates an audit trail for compensation agreements, (3) improves understanding between CEOs and compensation committees, (4) supports review and updating CEO compensation contracts, (5) augments CEO selection, (6) supports SOA and Dodd-Frank Act, and (7) may attract investors.

Emphasizes Objectivity

The objectivity advantage of the AHP model for executive compensation refers to its clearly defined steps as listed in Table 1. In addition, the results of the calculations in the AHP approach will consistently produce the same results for the same sets of criteria for the same evaluator. Anyone using this process would be required to the same steps with the same calculations. Consequently, the AHP brings with it a fair and objective approach to identify the most important considerations for identifying each organization's and CEO's perceived important factors for executive compensation.

Creates an Audit Trail

The choices and alternatives identified by each organization's compensation committee for CEOs could be readily documented by many implementations of the available AHP software. These factors along with their perceived importance can be reviewed by auditors and shareholders. The audit trail available through the use of AHP software can be useful in reviewing the consequences of the choices in subsequent financial reports. This AHP advantage is in line with Sepe's (2011) recommendation for measures that would help to remove equity-compensation biases include requiring coordination between the compensation committee and the disclosure of evaluation activity and compensation approval in an organization's publicly available reports.

Improves Understanding in Compensation Decisions

An organization's compensation committee can use the AHP methodology to develop its own list of important factors for connecting CEO performance to reward. This committee can compare its list with factors identified by their CEO. By analyzing these two lists, both the committee and the CEO can use the results of the AHP technique to learn about the similarities and differences in the perceived importance of various factors. One of the by-products of the AHP methodology is its potential to improve understanding between senior executives and compensation committees.

Supports Review and Updating of Compensation Contracts

On an annual or quarterly basis, an organization can review its performance data to examine how well its operating results correlates with the factors identified in the CEO compensation agreement as revealed through the AHP methodology. The performance factors created through AHP for the CEO can be compared with the actual performance data for the business. A high correlation may indicate that there is a relationship between the

performance of both the CEO and the organization which is led by the CEO. Lower correlations may provide sufficient incentive to update or re-think the factors used. Consequently, the AHP method can assist in monitoring the relationship between an individual executive performance and the actual results of a company's operations. These results may be used to update new contractual agreements with the same CEO or serve as a learning experience for evaluating a new CEO.

Augments CEO Selection Decisions

Another advantage of the AHP process is its usefulness in the procedure of selecting a CEO. As part of the interview process, the applicant can be asked to apply the AHP method to identify their perceived list of important items for compensation. The resulting list obtained from the CEO-applicant can be compared to a similar list prepared by the hiring committee using the AHP model. Differences between these identified factors can be useful in determining the fit of the applicant with the organization. These differences can also be used as a basis for discussion with each interviewee in subsequent steps of the hiring process. If there are too many differentiators between the list produced by the applicant and the hiring committee, then that individual may be eliminated from further consideration.

Supports SOA Goals and Dodd-Frank Act Requirements

The AHP supports the goals of the SOA and the Dodd-Frank Act for improving disclosure and financial responsibility. The SOA made CFOs along with CEOs explicitly responsible for the integrity of financial reports and, while the Securities and Exchange Commission's (SEC) 2006 proxy statement revisions required that the CFO's compensation be disclosed along with that of the CEO and the next three highest paid executive officers (Balsam, Irani, & Yin, 2012). All of the discussion in this paper in which the CEO was referenced would also apply to other senior executives in the organization.

May Attract Investors

The use and disclosure of the results of the AHP method may also draw investors to an organization. The list of factors perceived as important to the CEO as derived through AHP can provide additional insight into the nature and leadership expectations for an organization that may be of interest to stockholders. The inclusion of these results in a prospectus or financial statement notes may add to the transparency of an organization and thus increase interest by investors. For example, an investor interested in sustainability as a corporate goal may be drawn to an organization in which the CEO is rewarded for improving the company's movement toward this goal. Although there is no evidence that the application and publication of the results of AHP could be useful in attracting investors to an organization, this relationship could be explored in future studies.

CONCLUSION

With the passage of the SOA, the Dodd-Frank Act, and the economic downturn of 2008 interest in executive compensation packages have received extraordinary attention. After reviewing key provisions of these regulations, this report identified the Analytic Hierarchy Process as a methodology that would be useful to apply to determining the inputs for CEO compensation agreements. An overview of AHP along with areas to which this approach has been applied was also discussed. Seven reasons for the adoption of AHP in executive compensation contracts were identified. These reasons included: (1) emphasizes objectivity and consistency, (2) creates an audit trail for compensation agreements, (3) improves understanding between CEOs and compensation committees, (4) supports review and updating CEO compensation contracts, (5) augments CEO selection, (6) supports SOA and Dodd-Frank Act, and (7) may attract investors. This paper demonstrated the potential utility in the application of the AHP in executive compensation agreements. Additional research is needed to determine if the advantages of AHP can be demonstrated through real applications.

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