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Application of fuzzy multi-criteria decision making techniques in Fuzzy Ranking of Factors Affecting Earnings Management in Tehran Stock Exchange

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ABSTRACT: The main purpose of this research is to rank factors affecting earnings management using hierarchical analysis technique in fuzzy environment. In this regard, according to the literature of research and review of different sources, the most important criteria and indicators affecting profit management were identified. As a result, 15 important criteria were identified in 4 groups: 1- Structural factors 2- Financial factors 3- External factors 4- Individual factors. Prior to analyzing this information, FAHP technique was used to prioritize factors. The results show that structural factors have the highest priority and most impact on earnings management in Tehran Stock Exchange, while financial factors are in second place and external and individual factors are in the second place respectively.

***Keywords*:** Earnings management, Earnings smoothing, Fuzzy hierarchical analysis technique.

INTRODUCTION

In recent decades, the power of capital markets on the one hand, and the increase in managers' knowledge of accounting methods and guidelines, has led to the emergence of a phenomenon called earnings management (Samie Nik, 2006).

Financial reports are important sources of information for economic decision making that managers, investors, creditors, and other users use to meet their information needs. Since information is not equally distributed to users, there is an asymmetry of information between managers and investors. Information asymmetry is a situation in which managers have more undisclosed information about future operations and different aspects of the firm than investors. This makes managers have the motivation and opportunity to manage profit (Ebrahim Kordler and Hosni Azar Kiani, 2006).

After the emergence of ownership problems to protect the public interest, information had to be secured and the interests of owners and managers merged. For this purpose, various tools were used, such as the creation of a theoretical framework, internal controls, internal and independent auditing, the existence of non-executive directors, the application of long-term remuneration procedures and government legislation. But still, the problems are less complicated, but their complexity has increased.

The reason is perhaps the lack of mechanisms of corporate governance that can, in addition to meeting all of the above criteria, lead to the ultimate goal of the company, namely, enhancing the value of the company. Corporate governance, above all, seeks to protect the interests of shareholders from managing organizations. Corporate governance is an appropriate bridge to bridge the gap between the interests of the individuals (both major shareholders and other shareholders) that drive the company, leading to increased shareholder confidence and reduced company capital costs.

One of the information used for decision makers is profit and loss. Due to the possibility of different interpretations of accounting profit and the existence of different accounting methods, the likelihood of profit management is

increased. One of the main incentives for profit management is to influence the capital market. Various researches have been conducted on the objectives of profit management. Schipper (1989) argues that profit management is a targeted intervention in the financial reporting process of an organization for the purpose of personal gain. Belekui (2004) believes that profit management is a part of accounting. It means creating a purpose and image for the transfer of information using accounting information. Profit smoothing, earnings management, mock accounting and accounting system failures are various aspects of the designed accounting. According to the research of George et al. (1999), investors and corporate executives pay close attention to corporate profit reporting. Management recognizes the importance of profit to the company's stakeholders and considers its rewards the natural consequence of accounting profit. The results of Ball and Brown's (1968) research showed that changes in accounting earnings and equity prices are both relevant and relevant. That is, accounting profit information includes factors that affect stock prices and can be beneficial. Numerous studies (Darrow et al., 1998; Decho & Skins, 2000; Schipper, 1998; Fields et al., 2001; Nelson et al., 2002) have shown remuneration, loan contracts, capital markets, interest smoothing, and political parameters. The most important incentives are profit management. Hayley and Wahlen (1999) believe that profit management is achieved when managers use their judgment and taste in financial reporting to mislead users of financial information. In this case, managers choose methods in the accounting and profit reporting system that do not reflect the true economic situation of the company. From the perspective of George et al. (1999), earnings management takes place both in the domain of financial reporting and accrual accounting and in other management activities and practices. However, most scholars such as Haley (1985), Skiper (1989), and Belkouy (2004) find earnings management to be more feasible within the areas of financial reporting and accrual accounting. Fama and Jensen (1983) and Beattie et al. (2002) believe that public-owned corporations have more incentives to implement profit management because of the theory of representation than private equity firms. The results of Hackerman and Zemjowski's (1979) research show that managers of firms that receive their rewards based on accounting profits use profit-maximizing accounting techniques to show profits.
As mentioned, previous research has studied each particular aspect of the topic and is felt within a holistic approach, so this research is attempted, with a holistic and systematic approach, after identifying the various factors affecting it. Earnings management in companies listed on the Tehran Stock Exchange and finalization of factors are prioritized by FAHP method and executive suggestions are provided.

Theoretical Background and Basis of Research
The concept of profit management

The concept of earnings management has been studied from different angles and each has different definitions. Some of these definitions are:
The first definition was proposed by Schipper (1989), who defined profit management as "the targeted intervention in the process of external financial reporting to achieve personal gain."

(1994) defines earnings manipulation by management in order to obtain some of the expected earnings bias (such as analysts' forecasts, prior management estimates, or reduced earnings dispersion) as earnings management.
Scott (1997) refers to earnings management as a firm's choice of accounting policies to achieve certain managerial goals.

(1993) defines earnings management as the artificial manipulation of earnings by management to achieve the expected level of earnings for some specific decisions (including analysts' forecasts or estimating prior earnings trends to predict future earnings). In their view, the main motivation for earning management is managing investors' perceptions of the business unit.

A more comprehensive definition was provided by Hilli & Wahlen (1999): "Profit management occurs when managers use their personal judgment in financial reporting and manipulate the structure of transactions to change financial reporting. It is either intended to mislead some business owners about the economic performance of the company or to affect the outcome of contracts that are subject to personal gain.
Although these definitions are widely accepted, the practical application of these definitions is a little difficult because management's intentions do not provide objective evidence.

Accounting literature is difficult to provide a clear definition of profit management because the boundaries between profit management and financial fraud are unclear. Financial fraud is the deliberate deletion or manipulation of accounting data that, along with other existing data, will alter the judgment or decision making of the data user.

According to Nardichevo et al. (2001), recent reports by lawmakers such as the US Securities and Exchange Commission indicate that they view earnings management as broader than the definition of financial fraud. The choice of financial reporting methods that are a clear breach of accepted accounting principles falls within the scope of fraud and profit management. It seems that at times it may be possible to select regular methods based on accepted accounting principles.

Profit management. In Iran, too, there has been no clear definition of earnings management by law enforcement officials and the Tehran Stock Exchange.

Focus on profit management

The Role of Financial Reporting The effective transfer of financial information to outsiders is a timely and reliable way (Financial Accounting Standards Board, 1984). To do this, managers are given opportunities to make financial reporting judgments. Managers can Use their knowledge of business activities to improve the effectiveness of financial statements as a means of transmitting information to investors and potential creditors. However, if managers are motivated to mislead financial statement users (in-house and out-of-company) by exercising their accounting choices in financial reporting, profit management is likely to occur.

Profit management in academic research has attracted much attention. Early literature in the area of earnings management has examined the impact of accounting choices on the capital market. The focus of its main focus has been on distinguishing between two competing hypotheses. The mechanistic hypothesis that was prevalent in the accounting literature of the 1960s suggests that users of financial statements do not use information sources other than corporate financial reports, and that investors rely solely on the external values reflected in financial information. Reported by companies, they make their own decisions. The mechanical hypothesis predicts that the relationship between accounting profits and stock prices is purely mechanical. In other words, investors may be systematically misled by accounting choices and practices. The competitor of the mechanical hypothesis is called the efficient market hypothesis. The efficient market hypothesis, the paradigm of mandating financial accounting research in the 1970s, implies that market prices fully reflect all available information.

Early empirical studies using these hypotheses failed to confirm each of the predictions. Previous research has tested the mechanical hypothesis by examining the stock market response to accounting choices that have increased profits but have had no effect on cash flows.

Kaplan Werl (1972) investigated companies that had changed their depreciation method for accelerated financial reporting purposes to a straight line, and found that their firms' cumulative abnormal returns around zero at the time of profit announcement. Their results were inconsistent with the mechanical hypothesis. On the other hand, a number of irregularities in the market such as the January effect (Roosevelt & Kinney, 1976) and the Dushanbe effect (Cross, 1973) were observed which challenged the validity of the market hypothesis. In addition, both the mechanical hypothesis and the efficient market hypothesis have been criticized for the simplicity of the assumptions on which they are based. One criticism is that, contrary to assumptions, investors are not equidistant in their ability to obtain accounting information and process it. (India, 1990). Because of the lack of supporting evidence for any of these hypotheses, it is unclear why companies are resorting to cosmetic accounting changes. In response to this question, Watts Weizmann (1978) formulated their positive theory as an alternative to describing cosmetic accounting changes. Positive theory posits incentives other than capital market-related incentives for corporate earnings management. To do this, positive theory does not violate previous assumptions, but instead employs selection. Different accounting focuses on the company's internal contractual incentives. Accounting variables provide the basis for decisions on allocation of resources, compensation for management services, and non-compliance with debt terms. Therefore, management can influence the results and consequences of these decisions by selecting accounting estimates and procedures. Accordingly, the positive theory is also called "contract theory".

In general, Positive Theory proposes three non-capital-based incentives for cosmetic accounting changes by managers: incentives for remuneration plans, incentives for debt contracts, and incentives for political spending. These incentives stem from the existence of definitive contracts based on numbers and accounting numbers. Therefore, the positivist theory of profit management research shifted from testing capital market incentives to the reasons for firm internal contracts for cosmetic accounting changes.

Research Method

The present study is an applied research in terms of a post-event research design and a descriptive expression method. In order to achieve the stated goals and due to the nature of the issue, a causal-comparative research method is used. In this way, the researcher seeks to discover the relationships between factors and conditions that already existed or occurred by studying the results of them. In other words, the researcher seeks to investigate the possibility of causal relationships by observing and studying the existing results and their context in the hope of finding the cause of the phenomenon or action. The specificity of this type of research is that the information needed to investigate the causes of an accident is collected when the accident has occurred and the researcher has had no involvement in the occurrence. Since the present study involves gathering information to test hypotheses or answer questions about the current situation under study, it is a descriptive (purpose-oriented) and survey (time-based) research.

According to the studies, tens of factors were identified and classified into four main groups. According to the method of work in the hierarchical analysis technique Research question

1. What are the Effective Factors on Profit Management in Tehran Stock Exchange?
2. How big is the impact of each of these factors on the earnings management process?
3. What are the priorities and rankings of the experts influencing profit management?

Statistical Society

Statistical population means all individuals, objects and events that share one or more attributes or characteristics. In this study, the statistical population, according to the type of research, includes the opinions of financial experts present in Tehran Stock Exchange. The reason for choosing Tehran Stock Exchange is that in profit management model it is assumed that corporate management try to achieve or even exceed expected market profit by taking necessary measures and targeted intervention in profit.

How to determine sample size and measure it

According to the statistical population, the statistical sample is as follows:
Experts in the field of research working in the Tehran Stock Exchange due to time and cost constraints selected 20 individuals and completed the research questionnaire (Priority Factor Affecting Questionnaire).

It should be noted that all the questionnaires were completed by face-to-face interview and provided with the necessary explanations about the questionnaire to ensure that the respondents understood the questions in the questionnaire.

Data analysis method

In this research, the hierarchical analysis process method in fuzzy environment is used as one of the multi-criteria decision making methods. The AHP model based on fuzzy numbers was developed in 1983 by two Dutch researchers, Lahorn and Pedrick, for fuzzy hierarchical analysis based on logarithmic least squares method. Factors Affecting Earnings Management and after forming a decision tree, fuzzy hierarchical analysis model was used to prioritize factors affecting earning management. The numbers used in this method are triangular fuzzy numbers (Momeni, 2008, pp. 252-250). The steps for implementing a fuzzy AHP are as follows:
After forming the matrix, the pairwise comparisons are computed for each row of a Sk which is a triangular number:

$$S_k = \sum_{j=1}^{n} M_{kl} \times \left[\sum_{i=1}^{m} M_i \sum_{j=1}^{n} M_j\right]^{-1}$$

Where k represents the number of rows and i and j respectively represent options and indicators. After this step, the magnitude of each Sk should be determined as follows:

$V(M_1 \geq M_2) = 1$ if $m_1 \geq m_2$ otherwise

We also have:

$$hgt(M_1 \cap M_2) = (u_1 - l_2) / ((u_1 - l_2) + (m_2 - m_1))$$

To calculate the weight of the indices in the pairwise comparisons matrix, the following is done:

$$W^{`}(X_i) = \mathrm{Min}(V(S_i \geq S_k)),\ k = 1,2,\dots,n,\ k \neq i$$

So the weight vector of the indices is calculated as follows:

$$W^{`} = [W^{`}(C_1), W^{`}(C_2), \dots\dots W^{`}(C_n)]^T$$

Which is the vector of non-normal fuzzy AHP coefficients. We normalize the weights to obtain the normal vector. Next, we first compare the matrix of paired comparisons, once for indicators, and once for each index. 20 experts were assisted in answering the questionnaire questions and

If the incompatibility rate is less than or equal to 0.1 (IR 0.1) there is compatibility in paired comparisons and can be continued. Otherwise, pairwise comparisons should be revised.
Modeling the variables studied in a conceptual model:

According to the type of the present research on the application of hierarchical analysis process technique in fuzzy environment it is possible to examine the purpose, criteria and sub-criteria in the form of a hierarchical structure. The figure below represents an abstract form of the final research model (factors affecting earnings management).

Research findings

Demographic characteristics of statistical sample

In this section, demographic data of descriptive statistics including gender, age, educational level and work experience of the statistical sample were analyzed descriptively. Is coming

In this research, by searching among reputable scientific sources and using the opinions of experts and experts, four factors: structural, financial, individual and external were identified as the most important factors affecting earnings management in the Tehran Stock Exchange and then each One of these factors was considered as components for them. So that 4 components are related to structural factors, 4 are related to financial factors, 3 are to individual factors, and 4 are to external factors.

In this section, we try to prioritize the identified factors using paired comparisons, distributed among 20 individuals, followed by fuzzy hierarchical analysis.

According to the hierarchy, the decision tree, which is the basis of the hierarchical structure, includes the purpose, the criteria, and the following criteria:

Level 1: The purpose of the research is to prioritize the factors influencing profit management in the Tehran Stock Exchange.

Level 2: The same level of criteria that is divided into four factors: structural, financial, individual and external. Level 3: The following are the criteria in this study that include 15 sub-criteria related to earnings management in Tehran Stock Exchange.

Conclusion

In this research, by searching among reputable scientific sources and utilizing the opinions of experts and experts, four factors: Structural, financial, individual and external were identified as the most important factors affecting earnings management in Tehran Stock Exchange. One of these factors was considered as components for them. So that 4 components are related to structural factors, 4 are related to financial factors, 3 are to individual factors, and 4 are to external factors.

Priority factors affecting earnings management in Tehran Stock Exchange using Fuzzy Analytical Hierarchy Process (FAHP) technique based on research results are:

• First priority: structural factors
• Second priority: financial factors
• Third priority: external factors
• Priority Four: Individual Factors

Based on the results of ranking of effective factors on earnings management by using hierarchical analysis technique in fuzzy environment, structural factors with 0.407 weight are the most important factors in earnings management. External factors can be cited as the third most important factor affecting earnings management and its importance weight is 0.214 and individual factors weighing 0.034 rank fourth.

3. The most important variables related to the above four criteria, from the experts' point of view, are 15 criteria, the priority of each of which is based on the following criteria:

In terms of structural factors, the institutional shareholders were ranked first with a weight of 0.372. The concentration of ownership with a weight of 0.319 was also ranked second, and the size of the company and the type of industry with the weights of 0.155 and 0.154 ranked third and fourth respectively.

A) Structural factors criterion

• Priority One: Institutional Shareholders
• Second priority: Focus on ownership
• Third priority: company size
• Priority Four: Industry Type

In terms of financial factors, the highest rank is related to operating cash with a weight of 0.361 which is the first rank of financial factors affecting earnings management. Financial leverage has the second rank of 0.308 and third is the free cash flow of 0.255. But growth opportunities for the company were identified as the last rank, weighing 0.076.

B) Financial Factors Criterion

• Priority One: Operational Cash
• Second priority: financial leverage
• Third priority: free cash flow
• Priority Four: Growth Opportunities for the Company

The ranking of external factors as the third factor affecting earnings management is the weakness of financial and tax laws with a weight of 0.351 in the 1st position and the weakness of regulatory and control laws with the weight of 0.344 in the 2nd position and the factor of economic pressures with the weight of 0.160. 3 and the fourth rank is related to political pressure weighing 0.144.

D) External Factors Criterion

• Priority 1: Weak fiscal and tax laws
• Second priority: weak oversight and control laws
• Third priority: economic pressures
• Priority Four: Political Pressures

Among the individual factors, cultural values weighed 0.502, and professional and ethical commitment weighed 0.411, and the third was perceived to be unfair.

C) Individual Factors Criterion

• First priority: cultural values
• Second priority: professional and ethical commitment
• Priority 3: Feeling the injustice of the law itself

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