



## Detecting Corporate Financial Fraud using Beneish M-Score Model

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### ABSTRACT

Detecting financial fraud is an important issue and ignoring this issue may cause financial and non-financial losses to individuals and organizations. The aim of this study is to test the ability of Beneish M-Score Model for detecting financial fraud among companies listed on Tehran stock exchange. The research sample consists of 137 companies listed on Tehran Stock Exchange for a period of 11 years (2005-2015). Logistic regression analysis is used to test the research hypothesis at the level of 5% error. The results show that the accuracy of Beneish M-score model for detecting fraudulent financial reporting is 66/03 percent. In general, based on the logistic regression analysis, despite the existence of valid theoretical foundations, it seems that it is not possible to detect financial fraud of companies listed on Tehran stock exchange using Beneish M-score model. In other words, based on financial information of companies listed on Tehran Stock Exchange, Beniesh model is not a suitable model for detecting fraud and we need to develop a new model to detect fraud in financial reports

### Keywords:

Financial Fraud, Beneish M-score model, Detecting Fraud.



## 1. Introduction

The growing recurrence of fraud and corruption in recent years, especially in large companies, made financial fraud a major concern for countries around the world. Fraud is not a new issue, since this phenomenon happened in different forms since the 1960s. It's interesting to know that due to the hidden and clever aspects of fraud, it also occurs in companies with efficient management. Only in the United States and the United Kingdom, the amount of reported fraud is estimated at billions of dollars, although it is estimated that these reports may account for only 10% of total fraud. Evidently, this is only part of the consequences of fraud and misconduct, and such issues as breaking down on the credit of the company and the capital market, which leads to the reduction of investment, have not been taken into consideration (Hasas Yeganeh et al., 2010).

Fraud increases business costs, creates distrust, and results in system failure and loss of performance in organizations. It also has a negative effect on the encouragement, honesty and integrity of the managers and staff who oversee and control the implementation of the law. Fraud not only can impose financial losses, but also decrease the credibility and customer confidence in the system, and in general, it can be a huge disadvantage to investment in the community. According to Section 24 of the Iranian Auditing Standards, fraud can be defined as any deliberate or deceptive action by one or more directors, employees or third parties for an undue advantage or illegality. Wallace (1995) believes that fraud is a pre-designed program to deceive others, which can be done by providing fictitious documents.

Companies can manipulate their financial statements by managing earnings through arbitrary buying or selling, or by fraud. Nonetheless, companies that have been struggling to curtail their financial reserves or manage their earnings later, doing fraud to offset their shortcomings. But, the discovery of management fraud through routine auditing processes is not an easy task, because there is not much to know about management fraud features. On the other hand, many auditors do not have enough experience to detect fraud, and managers are still trying to deceive the auditors. Summers and Sweeney (1998) found that auditors can increase the likelihood of success in detecting fraud in financial reporting by paying more attention to internal exchanges. An accurate estimate

of the likelihood of fraud will increase the ability to identify and prevent it. As a result, it supports the auditors against the claims, and it also reduces the heavy costs, which affects the entire community. In recent years, a variety of laws and regulations related to the detection, prevention, and reporting of fraud have been drafted in the world, and the editorial organizations are following the standards that integrate the attempts to detect fraud (Daghmechi, 2015).

To detect fraud, investigating the accuracy of financial information in each organization and organization database is essential. This review and analysis can help us to discover the patterns of fraud. Of course, it should be taken into account that it is not easy to discover patterns of fraud. In this regard, a hypothesis has been developed to identify the risk of fraud in companies listed on Tehran Stock Exchange. This study investigates the ability of Beneish M-Score Model for detecting the fraudulent financial reports of companies listed on Tehran Stock Exchange. Therefore, the research question is whether the Beneish M-Score Model can detect fraud in the financial statements of companies listed on Tehran Stock Exchange or not?

This study contributes to the literature by examining the ability of Beneish M-Score Model to detect fraud in financial statements of Iranian companies for the first time.

In next sections, the relevant literature and conceptual framework to develop research hypotheses are discussed. Then, the research methodology including research population and sample selection are explained. The research results are analyzed in next section and finally the conclusions of study and suggestions for future researches are discussed in final section.

## 2. Literature Review

According to paragraph 4 of section 24 of the Iranian Auditing Standards, fraud is any deliberate or deceptive acts of one or more of the managers, employees or third parties for the purpose of obtaining an undue or illegal advantage. In fact, fraud involves the incentive to commit fraud and the use of an opportunity to commit it. According to paragraph 6 of section 24 of the Iranian Auditing Standards, fraudulent financial reporting involves deliberately distorting or eliminating sums or disclosures of

financial statements in order to deceive users of financial statements.

To prevent and detect fraud, it is imperative that auditors have a thorough understanding of possible factors affecting fraud. Of course, the existence of such factors does not necessarily mean fraud, but increases the auditor's sensitivity to the possibility of fraud. Generally, some factors stem from motivations of individuals and some other factors due to the environmental and organizational conditions of organizations. Economic incentives in the form of benefits or financial needs are the most common incentive for fraud. Some people also involve fraud due to psychological motivations such as gaining power or social status. In the public sector, evidence suggests that political motives are the main driver of fraud in government accounts. Alberche et al. (2004) investigated fraudulent financial reporting in terms of four dominant management theories. They identified eight factors affecting fraud: inflation, moral corruption, inappropriate executive motives, inadequate market expectations, major creditors' pressure, established rules, opportunistic behavior of audit firms and past failures.

In Iran, the issue of fraud has been investigated comparable to other financial issues. For example, Sheikh (2004) examined the importance of potential fraud factors using factor analysis techniques and points to the existence of more harmful symptoms than weaknesses in accounting systems and internal controls. Also, Safarzadeh (2010) concluded that his research pattern has the ability to detect fraud in financial reporting, and this proposed model can be used by different groups of users such as auditors, tax authorities, banking system, etc. Maham et al. (2012) identified a pattern consisting of a combination of 14 financial indicators and 5 non-financial indicators related to financial fraud among listed companies on Tehran Stock Exchange. The results showed that all direct relations were significant. The score obtained by companies according to the presented model regarding the risk of financial fraud was 35%. Etemadi and Zalghe (2013) concluded that the proposed model in their research has a role to play in the discovery of fraudulent financial statements and can be used by investors, public accountants and internal auditors, tax authorities and government institutions and the banking system. Beneish's model has not been studied in Iran so far, but the issue of fraud detection in other

countries has been well considered and analyzed, including the results of Kaminsky et al. (2002), who concluded that it is not statistically significant difference between the financial ratios of companies that have falsified financial reporting with other companies, and thus it is empirically proven that the analysis of financial ratios has limited ability in the detection of fraud financial statements.

In recent years, researchers found that Beneish's model can detect fraud in financial statements of other countries (Ugochukwu et al., 2013). Ugochukwu et al. (2013) found that the use of the Beneish's model, along with Audit Standard No. 99, significantly contributed to the deterrence and fraud detection and help auditors in Nigeria. Moreover, this model can effectively be used as a way to prevent the rise of fraud among organizations and companies in Nigeria. Tarjo and Nurul Herawati (2015) found that the M-score Beneish model, along with data mining, has the ability to detect fraud. Recently, Repousis (2016) used the Beneish model to detect fraud in Greek companies with the aim of examining the eight variables of the Beneish model to identify fraud or manipulation of corporate financial statements. The results showed that the indicators used in the M-Score Model have a confidence level of 99% and are reliable for fraud detection.

Mehta and Bhavani (2017) have used the forensic tools to detect fraud in financial statements of Toshiba Corporation of Japan during 2008 till 2014. This study compared the results of three tools; the Beneish Model, the Altman Z-score model and Benford's Law. They conclude that although all three tools are useful for indicating red flags of fraud, none of them could pin point the exact area or location of the fraud. In fact, many researches have been conducted regarding fraud detection which indicates the importance of fraud and its discovery in financial statements. But in Iran, the model of Beneish and the ability of this model to detect fraud have not been considered. Therefore, in order to investigate the ability of this model to detect fraud in the financial statements of listed companies on Tehran Stock Exchange, the research hypothesis is as follow:

*Research hypothesis: It is possible to detect fraud of companies listed on Tehran Stock Exchange using M-score Beneish model.*

### 3. Methodology

The present research is a post-event research type because past information is used to test hypotheses. Logistic regression models are used to analyze the data using Eviews software.

In order to analyze the data, the test of normality and Probit analysis are used and for analyzing the research hypothesis, the regression presumptions are studied and then the multivariate regression model is used. The research population is all companies listed on Tehran stock exchange and research sample includes 137 companies from different industries. The M-score Beneish model which is used in this research is as follow:

$$M = -4.840 + 0.920DSRI + 0.528GMI + 0.0404AQI + 0.892SGI + 0.115DEPI - 0.172SGAI + 4.679TATA - 0.327LVGI$$

Where:

M = Beneish M-score index

DSRI = Sale index

GMI = Margin of safety index

AQI= Assets quality index

SGI = Sales growth index

DEPI = Depreciation index

SGAI = Sales and administrative costs index

TATA = Income index

LVGI = Leverage index

## 4. Results

### 4.1. Descriptive Statistics of Variables

Table 1 shows the descriptive statistics of research hypotheses.

**Table 1. Descriptive Statistics of Research Variables**

Variables	mean	median	max	min	SD
DSRI	7.469	7.055	13.440	-18.484	7.925
GMI	1.202	0.881	14.727	-4.883	5.663
AQI	1.016	1.000	7.859	0.150	2.294
SGI	1.434	1.136	3.272	-1.464	1.930
DEPI	3.111	2.846	2.022	0.001	0.546
SGAI	1.190	1.006	8.586	-4.362	5.168
TATA	0.088	0.605	6.078	-0.676	2.214
LVGI	1.024	1.005	4.270	0.096	0.301

Source: Compiled by author

In the descriptive statistics, the mean is the main indicator which represents the balance point and the distribution center, and is a good indicator of the centrality of the data. For example, the average value for a variable (GMI) is 1.202, which indicates that most data is centered on this point. Median is another central indicator that shows the status of the sample. As you can see, the median of TATA is equal to 0.605, which indicates half of the data is less than this number and the other half more than this number. Among the variables, TATA and DSRI have the lowest and highest average levels, respectively, with the values of 0.888 and 7.469. Also, the lowest and the highest levels of median with the values of 0.605 and 7.055 belong to these two variables.

## 4.2. Testing Research Hypotheses

### 4.2.1. Review the Assumptions of Regression

For analyzing data, assumptions of multivariable regression model are examined through normality test, multicollinearity test and variance homogeneity test which confirm the assumptions of the classical model. First, for the purpose of testing the normality of the data, the Jarque-Bera test is used. According to the results of this test, the Jarque statistic with a probability of 0.00 indicates that data is normal. Also, Brosh-GadFerry test is used to detect heterogeneity of variance. The results of this test show that the variances are heterogeneous. The Brosh-GadFerry test is also used to test the multicollinearity between variables. If the probability value is more than 5%, then the assumption zero of the test for multicollinearity is rejected and, conversely, if the probability of the statistics is less than 5%, multicollinearity is not rejected. Due to the result which is greater than 5% and is 0.168, there is no multicollinearity.

### 4.2.2. Results of Testing Research Hypotheses

For testing research model, F-statistics analysis and for testing coefficient of regression model, t-statistic analyses are used. Moreover, the adjusted R<sup>2</sup> is used to test the relationship between dependent and independent variables. The results of testing hypotheses (multiple regression analyses) are presented in table 2.

**Table 2. The results of data analysis for testing research hypothesis**

variables	Coefficient	Std. Error	t-statistic	P-value
c	3.39	1.00	3.38	0.00
DSRI	0.08	0.01	5.99	0.00
GMI	0.51	0.14	3.49	0.00
AQI	0.86	0.24	3.56	0.00
SGI	0.46	0.14	3.27	0.00
DEPI	0.11	0.01	-6.78	0.00
SGAI	0.61	0.42	1.44	0.14
TATA	1.23	0.57	2.14	0.14
LVGI	-0.13	0.13	-1.00	0.31
Log-likelihood: -19.1943 LR Statistic: 112.4578 Prob: 0.00				

Source: Compiled by author

Table 2 shows the results of the Probit model according to logistic regression. The most important statistics used for the evaluation of the fitted model are the maximum LR statistics, the associated error level and the statistical value Log-likelihood resulting from the application of the model. The maximum truth stature is equal to 112.45 with zero error level, which reflects the rejection of the H0 hypothesis (the model's non-significance assumption) and the reliability of the model. Also, another criterion used for evaluation is the log-likelihood statistic and the negative value of the statistic and the bigger magnitude indicate that the model is appropriate. The value obtained for this model is -19, which shows that the model is meaningful and reliable.

Moreover, if the probability of occurrence is more than 0.5, then the company's reporting would be fraudulent and otherwise unconscionable reporting would be considered. To further emphasize, Logit Regression Modelling is only used to determine the effective factors for determining fraudulent or uncritical reporting. Therefore, the percentage of fraudulent reporting and non-fraudulent reporting are 20.67% and 80.16%, respectively. Therefore, in general, it can be stated that the overall breakdown of the model in the detection of fraudulent reporting or non-fraudulent reporting is 66.33%. In general, the results of the prediction method in the logistic regression model indicate that, despite the existence of valid and credible theoretical bases, according to the declared coefficients for fraudulent reporting by companies based on the M-score model, this criterion regarding the degree of fraudulent reporting and the

degree of non-fraudulent reporting, this model is not a suitable criterion for detecting fraudulent reporting in companies listed on the Tehran Stock Exchange.

## 5. Discussion and Conclusions

Since the process of distortion by the company's management is deliberately organized, it is not easy to detect fraudulent practices through routine auditing processes. Therefore, developing criteria and compiling signs for fraud detection is one of the most important and significant issues. In recent years, a variety of laws and regulations related to the detection, prevention, and reporting of fraud have been developed through relevant organizations in the world. In this regard, the M-score Beneish model has been developed which has been widely used in the fraudulent financial analysis process. Accordingly, the main objective of this research is to investigate the ability of M-score Beneish model to detect fraud in financial statements of companies listed on Tehran Stock Exchange. The population is all companies listed on Tehran Stock Exchange and the sample is 137 companies during 2005 to 2015.

According to the research hypothesis, the research model was tested based on the logistic regression method. The results show that according to the logistic model, the percentage of accuracy of fraudulent and non-fraudulent financial reporting detection is 20.67% and 80.16%, respectively. Therefore, in general, it can be argued that despite the existence of valid and credible theoretical bases M-score Beneish model is not a suitable model to detect fraud in Tehran Stock

Exchange. According to the declared coefficients, it seems that this criterion, considering the amount of fraudulent reporting separation and the degree of non-fraudulent reporting, is not a suitable criterion for detecting fraudulent reporting among listed companies on Tehran Stock Exchange. This result is not consistent with Tarjo and Nurul Herawati (2015) and also with Repousis (2016) results. As they found that Beneish model is a suitable model to detect fraud.

Due to this fact that the model's efficiency in the detection of fraud in financial statements is undeniable, the inability of the model is further rooted in the ineffectiveness and transparency of the Tehran Stock Exchange and its lack of development, as well as the unfamiliarity of most Tehran Stock Exchange investors and activists with such specialized concepts that somehow it causes the model to be ineffective and effective. Therefore, with the fundamental changes in the structure of Tehran Stock Exchange, as well as the empowerment of investors through educational programs and activities, can help Tehran Stock Exchange to grow and foster this financial market consistent with the developed and advanced stock exchanges in the world.

One of the limitations in conducting this research is the failure to consider the effects of inflation and the change in price levels, the limited time domain, and the non-separation of various industries. Considering the results, it can be argued that the results of this research could be encouraging to allow further research into designing a reliable model for evaluating and detecting fraud in financial statements of companies in Iran.

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