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The Use of Beneish Model in Forensic Accounting: Evidence from Turkey[1]

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Abstract
As the world economy is becoming much more globalized than before, financial market participants face new serious risks in the business environment. Forensic accounting has emerged as an increasingly important area for dealing with corporate frauds. The last two decades have witnessed high-profile corporate accounting scandals. The economic globalization and rapid technological change have mitigated the efficiency of traditional methods in the detection of accounting frauds occurred in the business environment. Forensic accounting has grabbed great attention in the recent years. Forensic accountants have played prominent roles in the detection of financial statement frauds. Forensic accounting includes a wide range of services such as investigation and litigation. Many fraud detection methods have been developed in the recent years. Beneish Model is one of them. This paper aims to analyze the usefulness of Beneish Model in the forensic accounting practices. Logistic regression analysis is used to examine the empirical variables. Based on a sample that includes 174 firms from 2005 to 2017, it has been concluded that Beneish Model aids effectively in the analyzing of quantitative characteristics of falsified financial statements.

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1. Introduction

In the business environment, firms are expected to disclose accurate and reliable financial information. Financial market participants can only make rational and accurate investment decisions when firms report accurate and reliable accounting information. Money and capital markets' efficiency heavily depends on the quality of accounting information reported by firms. Accounting manipulation is one of the most discussed topics in today's business environment. Some firms deliberately disclose inaccurate accounting information for various reasons. Owojori and Asaolu (2009) support the assertion that corporate frauds are very sophisticated in the modern business environment and traditional fraud investigators fail to combat against these corporate frauds. This gave rise to the demand for fraud investigators that possess forensic accounting skills. The widespread global corporate frauds are among the major obstacles to capital and money markets' development. Public trust in financial statements and investor confidence have been eroded as a result of accounting frauds that adversely affect financial markets. Generally speaking firms commit accounting fraud to affect stock price, inflate corporate earnings or mitigate tax burden. It is also worth mentioning that accounting frauds may cause serious economic losses.

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Although forensic accounting is a very new area, in the recent years, forensic accounting practices have played a prominent role in the detection and prevention of accounting frauds. Many auditing firms have founded forensic accounting department to satisfy demands coming from firms that suffer from accounting fraud. Legal systems in developed economies heavily need forensic accounting practices to expose accounting frauds. Gray (2008) states that forensic accounting professionals are considered a combination of an auditor and fraud investigator and forensic accountants utilize special talents in auditing, finance, accounting, law and criminology to analyze and assess evidence of fraud. Kranacher et al. (2008) claim that due to political, social and legal events, the interrelationship among forensic accounting, auditing, criminology and law is massively changing over the last decades. Forensic examination report plays a vital role in the court's decision. Forensic accounting appears to grab more attention of financial market participants as forensic accountants play an effective role in detecting financial statement frauds.

Financial statement ratios, multivariate statistical models and data mining techniques are widely used by forensic accountants to uncover financial statement frauds. Past research studies demonstrate that each model has its advantages and disadvantages. Beneish Model is one of the most used quantitative models in the forensic accounting investigations. Beneish Model provides massive benefits to the forensic accountants, since it helps forensic accountants fully examine the financial statements disclosed by the firms and analyze the changes in amounts of financial statements accounts from period to period. The variables used in the Beneish Model are derived from the firms' balance sheet and profit and loss statement accounts. According to Beneish Model, asset quality index, total accruals to total assets, sales growth index, depreciation index, gross margin index, days' sales in receivables index, sales, general and administrative expenses index and leverage index have significant potential to detect falsified financial statements (Beneish,1999). Beneish Model constructed using financial statement ratios can be used for the publicly traded firms. In the developed countries, there are many research studies that assess the validity of Beneish Model in detecting financial statement fraud, yet there are few studies that analyze the validity of Beneish Model for developing countries.

The rest of this study is structured as follow. Section 1 discusses the current developments of forensic accounting. Section 2 reviews past literature and develops research hypotheses. Section 3 provides research methodology. Section 4 presents the empirical results. The last section reveals suggestions for the future studies and concludes the paper.

2. Current Developments in Forensic Accounting

Global business history includes not only business successes that inspire people but also numerous financial statement frauds that cost billions of US dollars per year and adversely affected the lives of people. Financial markets have played a key role in financing firms. In the financial markets, all firms should follow regulations and standards set by the government agencies. Government authorities, creditors, stockholders and investors expect that firms' financial statements accurately reflect true financial position and performance.

The financial statement misstatements, intentional or unintentional, have adverse impacts on firms' operations and even collapse the firms. The last decades have witnessed global corporate frauds that significantly decreased financial efficiency and public trust. Vinten (2002) states that the governments around the world have introduced new measures that can deter corporate frauds effectively to restore public trust and investor confidence. The term 'forensic accounting' has emerged in order to deal with corporate fraud that increasingly becomes much more complex as a result of a high level of competitive business climate and advanced information technology.

According to the American Institute of Certified Public Accountants (AICPA), ''forensic accounting services are the application of fraud investigation skills and specialized knowledge possessed by certified public accountants to gather, analyze and assess evidential matters and to report and communicate empirical findings in the justice courts''. Gramling et al. (2012)

claim that forensic accounting is regarded as one of the specialty fields of the accounting science and can be defined as the extension of auditing that primarily concentrates on well-established investigation of situations where corporate frauds have already been detected or corporate frauds are highly doubted. Forensic accounting has successfully evolved to meet the changing needs of firms that have suffered from corporate fraud.

The legal proceeding is one of the primary components of corporate fraud investigations. As dynamics of business world rapidly change, justice systems of countries make great efforts to adopt new procedures that can be effective in dealing with corporate frauds. In the legal proceedings, forensic accountants are tasked with analyzing accounting documents and determining whether or not accounting fraud was committed by the firm. Forensic accounting practices are divided into three following areas as follows;

a. Investigative Auditing
b. Litigation Support
c. Criminal Investigation

Investigative auditing has become one of the primary tools of the forensic accounting in the global business climate. The auditing of financial statements and investigation process are the important elements of the investigative auditing. Investigative auditors primarily deal with the alleged accounting fraud that may occur within business organizations. Firms operating in industry where financial statement fraud risk is high employ investigative auditors. Investigative auditors are expected to have deep knowledge not only in financial statement audit but also in investigation process. Investigative auditors are expected to be ready to conduct interview with potential witnesses and testify as an expert witness in a legal case, if needed. The evidences gathered by investigative auditors are an important part of the investigative process. If investigative auditors effectively and accurately analyze the collected evidence, the likelihood of success of investigative process will significantly increase.

Forensic accountants are tasked in the litigation process. During the litigation process, forensic accountants contribute to the translation or decoding the complicated accounting transactions. Forensic accountants can provide invaluable technical evidence by translating and decoding accounting transactions (Çabuk and Yücel, 2012). The documents, evidence and reports submitted by forensic accountants help lawyers better shape their claims and defense. Thus, the contributions of the forensic accountant are of great importance for improving the quality and accuracy of the court's decisions. Additionally, forensic accountants should have sufficient knowledge about legal concepts of financial statement fraud in order to effectively perform litigation support. In today's business climate, forensic accountants perform litigation support in the following areas;

a. Detection of the tax evasion, and creative accounting practices
b. Supporting anti-money laundering activities
c. Giving an opinion on the firms' financial position and health
d. Estimation of possible firm loss
e. The evaluation of firms' liquidation process
f. Determining the fundamental reasons of firms' bankruptcy

Firms tend to commit financial statement fraud so as to prevent reporting corporate loss and hide any problems of financial distressed conditions (Dechow et al., 1996; Burgstahler and Dichev, 1997). In many high-profile white-collar crime cases such as Parmalat, Enron and Madoff Ponzi Scheme, forensic accountants have significantly contributed to the criminal investigation process. In the criminal investigations, the major goal is to determine whether criminal acts have been occurred. Police departments in many developed countries trust forensic accounting applications in order to effectively carry out criminal investigation associated with accounting frauds. In the business environment, the criminal actions can be closely associated with the bribery, money laundering, financial statements frauds, tax frauds and bankruptcy frauds. Insurance firms, banks and other firms need the skills of forensic accountants in the event of a suspected fraudulent acts. In the criminal investigation of corporate

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fraud, forensic accountants determine whether corporate fraud has been perpetrated by someone and legally collect evidence against suspected fraudsters and communicate the findings to the justice courts. Forensic accountants can also identify damages of the fraudulent activity and discover weaknesses of internal control system in the criminal investigation.

As being one of the newest areas of accounting science, forensic accounting has a strong relationship with law, auditing and criminology. Forensic accounting practices are significantly affected by the law system. Most of forensic accounting techniques are developed during investigative auditing processes. Forensic accountants having a deep understanding of criminology can profile the fraudsters in the investigation process. Fraud triangle is viewed as the most important contribution of criminology to the forensic accounting.

As the dynamics of the business world and information technology have changed considerably, financial information manipulation has become more complex than ever before. As a result, legal system and firms strongly need the practices of forensic accounting in order to detect complex accounting fraud.

3. Literature Review and Research Hypotheses

This section is devoted to the research hypotheses and existing literature on the financial statement fraud employing Beneish M-Score that is proposed by Messod Beneish in 1999. Beneish (1999) analyzed the financial statements data of 64 fraud firms and 2332 non-fraud firms by using the probit regression method. The results of the empirical analysis show that firms that committed financial statement fraud have low asset quality and gross margin ratio and are highly leveraged. Beneish (1999) also found that there is a systematic association between the likelihood of financial statement fraud and accounting variables. Beneish (1999) concluded that the established model is very useful in the detection of financial statement frauds.

Franceschetti and Koschtial (2013) employed Beneish Model to uncover financial statement frauds. Based on a sample of thirty bankrupt and thirty non-bankrupt firms, they found that sales growth index, gross margin index, asset quality index, days' sales in receivable index and total accruals to total assets contribute to the detection of financial statement fraud committed by bankrupt firms. Curtis and Thalassinos (2005) utilize Beneish Model to examine the financial statements of firms listed on Athens Stock Exchange. They posit that Beneish Model yields more accurate results when return on equity and Altman's Z score accompany Beneish Model.

Groove and Cook (2004) test the usefulness of Beneish Model in detecting financial statement frauds. In their study, Beneish Model is used in the high-profile fraud cases such as Qwest, Enron, Global Crossing and WorldCom. They found that the ratios of Beneish Model worked well in the detection of financial statement frauds that occurred in Qwest, Enron, Global Crossing and WorldCom. Additionally, they state that forensic accountants should use Beneish Model together with traditional vertical, horizontal and ratio analysis in order to effectively detect financial statement frauds.

Dechow et al. (2011) analyze the major characteristics of 676 firms that committed financial statement fraud by extending Beneish Model. They claim that abnormal growth in receivables and revenues can signal financial statement fraud and the firm's financial and non-financial performance indicators get worse during the period when the firm manipulates financial statements.

Repousis (2016) empirically investigated the effectiveness of Beneish Model in detecting financial statement fraud by using a sample that includes 25,468 firms operating in Greece. The empirical results showed that sales growth index, depreciation index, gross margin index, asset quality index, total accruals to total assets, days' sales in receivables index, leverage index, sales, general and administrative expenses index are statistically significant. Additionally, the results of this study prove that Beneish Model enables forensic accountants to comprehensively analyze the alleged financial statement fraud.

Er and Varıcı (2013) use Beneish model to identify fraudulent financial statements disclosed by the firms listed on Borsa İstanbul. The data analyzed in this study is collected from thirty-nine manufacturing firms' financial statements published in 2010. They employed a logistic regression model to discriminate between manipulator firms and non-manipulator firms and found that days' sales in receivable index, depreciation index, asset quality index, and total accruals to total assets play more prominent role than other ratios in the detection of financial statement frauds.

Orellana et al. (2017) apply Beneish Model to a Spanish food firm, Pescanova, that went bankrupt in 2013. The period analyzed in the study is of four years. They conclude that Pescanova manipulated the days' sales in receivable index (DSRI) and total accruals to total assets (TATA) before its bankruptcy. They claim that the empirical results strongly demonstrate the validity of Beneish Model for Pescanova case.

Küçüksözen ve Küçükkocaoğlu (2004) use Beneish Model to uncover fraudulent financial statements prepared by firms listed on Borsa İstanbul between the time period of 1992-2002. They concluded that four of Beneish ratios, days' sales in receivable index, depreciation index, asset quality index and gross margin index, can help in discriminating between manipulator and non-manipulator firms. Aghghaleh et al. (2016) investigate whether Beneish Model has any relations with the detection of financial statements frauds committed by firms operating in Malaysia. They found that Beneish Model is effective in detecting fraud firms with an accuracy rate of 73%.

Spathis (2002) created a model that effectively detects fraudulent financial reporting. He stated that a low stock turnover ratio, low return on assets and low Z-score increase the likelihood of financial statement fraud. He claimed that analysis of financial statements is an important tool for detecting accounting fraud using a sample that consists of seventy-six firms operating in Greece. Skousen et al. (2009) investigated the validity of fraud triangle theory in detecting financial statement fraud. By using financial statements of 86 fraud firms, they conclude that rapid asset growth, liquidity problems and debt financing increase the probability of financial statement fraud.

Tahmina and Naima (2016) analyze the accounting data of 102 firms operating in Bangladesh between the years of 2010 and 2013 by using Beneish Model. They state that days' sales in receivable index (DSRI), asset quality index (AQI) and total accruals to total assets (TATA) differ significantly between manipulator firms and non-manipulator firms. They also found that overstating intangible assets, artificially inflating earnings and capitalizing expenditures can signal financial statement frauds.

In the development of research hypotheses, previous studies are meticulously analyzed. This paper expects that accounting variables used in Beneish Model enable forensic accountants to effectively detect financial statement fraud. Hence, the following hypotheses are analyzed in the present study.

H1: Days' sales in receivable index (DSRI) has a significant impact on the predictability of financial statement fraud.

H2: Gross margin index (GMI) has a significant impact on the predictability of financial statement fraud.

H3: Asset quality index (AQI) has a significant impact on the predictability of financial statement fraud.

H4: Sales growth index (SGI) has a significant impact on the predictability of financial statement fraud.

H5: Depreciation index (DEPI) has a significant impact on the predictability of financial statement fraud.

H6: Sales, general and administrative expenses index (SGAI) has a significant impact on the predictability of financial statement fraud.

H7: Leverage index (LEVI) has a significant impact on the predictability of financial statement fraud.

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H8: Total accruals to total assets (TATA) has a significant impact on the predictability of financial statement fraud.

4. Research Methodology and Data

The objective of this section is to explain the research method and design and measurement of variables. The explanation of the research method employed in the data analysis provides a better understanding of the empirical results, see Table 1.

Table 1. Variables used in Beneish Model

Days' sales in receivable index (DSRI)	(Net Receivables$_t$ / Sales$_t$) / (Net Receivables$_{t-1}$ / Sales$_{t-1}$)
Gross margin index (GMI)	[(Sales$_{t-1}$ – Cost of Goods Sold$_{t-1}$) / Sales$_{t-1}$] / [(Sales$_t$ – Cost of Goods Sold$_t$) / Sales$_t$])
Asset quality index (AQI)	[1 - (Current Assets$_t$ + Property$_t$+Plant$_t$+Equipment$_t$ + Securities$_t$) / Total Assets$_t$] / [1 - (Current Assets$_{t-1}$ + Property$_{t-1}$+Plant$_{t-1}$+Equipment$_{t-1}$ + Securities$_{t-1}$) / Total Assets$_{t-1}$)]
Sales growth index (SGI)	(Sales$_t$ / Sales$_{t-1}$)
Depreciation index (DEPI)	[(Depreciation$_{t-1}$/(Property$_{t-1}$+Plant$_{t-1}$+Equipment$_{t-1}$+Depreciation$_{t-1}$)]/ [(Depreciation$_t$ / (Property$_t$+Plant$_t$+Equipment$_t$ + Depreciation$_t$)]
Sales, general and administrative expenses index (SGAI)	(Sales, General and Administrative Expenses$_t$ / Sales$_t$) / (Sales, General and Administrative Expenses$_{t-1}$ / Sales$_{t-1}$)
Leverage index (LEVI)	[(Current Liabilities$_t$ + Total Long Term Debt$_t$) / Total Assets$_t$] / [(Current Liabilities$_{t-1}$ + Total Long Term Debt$_{t-1}$) / Total Assets$_{t-1}$]
Total accruals to total assets (TATA)	(Current Assets$_t$ – Cash$_t$ – Taxes Payable$_t$ –Depreciation$_t$ - Amortization$_t$)/ (Total Assets$_t$)

Beneish Model, devised by Messod Beneish, is one of the contemporary methods that aim to detect accounting frauds. Beneish Model enables forensic accountants to comprehensively analyze firms' financial statements accounts. The variables employed in the Beneish Model are derived from income statement accounts and balance sheet accounts. Forensic accountants use Beneish Model so as to get M-scores of firms. Firms are divided into two groups as fraud firms and non-fraud firms based on the M-scores. The M-score of greater than -1.78 indicates that the firm is likely to commit financial statement fraud.

According to Beneish Model, the following variables have important potential to detect financial statement frauds committed by firms; days' sales in receivables index, gross margin index, asset quality index, sales growth index, depreciation index, sales, general and administrative expenses index, leverage index and total accruals to total assets. Surely, all eight variables are not individually important, but these variables collectively create a model that effectively detects financial statement fraud. Beneish Model is primarily used for firms listed on stock exchanges. The Beneish Model is as follows.

M- Score = -4,840 + (0.920 × DSRI) + (0.528 × GMI) + (0,404 × AQI) + (0,892 × SGI) + (0,115 × DEPI) + (-0,172 × SGAI) + (4,679 × TATA) + (-0,327 × LEVI)

Firms that committed financial statement fraud are identified from the weekly bulletins released by the Capital Markets of Board (CMB). Data used in the empirical analysis is derived from Public Disclosure Platform and daily bulletins released by Borsa İstanbul. The accounting data of 87 fraud firms and 87 non-fraud firms from the years 2005 to 2017 is collected.

Table 2 presents sector classification of sample firms. Table 2 indicates that firms operating in manufacturing industry has the highest percentage share in the sample and firms operating in food, beverage and tobacco industry has the lowest percentage share in the sample. The final sample consists of 174 firms. Eighty- seven firms that committed financial statement fraud and eighty-seven firms that did not commit financial statement fraud are considered in the data analysis. Fraud firms are matched with non-fraud firms based on sector and asset size.

It is worth mentioning that financial firms are excluded from the empirical analysis since they have largely different balance sheet structures.

Table 2. Sector Classification of Sample Firms

Sectors	Fraud Firms	Non-Fraud Firms
Manufacturing Industry	46	46
Wholesale and Retail Trade	15	15
Technology	10	10
Tourism	7	7
Textile	5	5
Food, Beverage and Tobacco	4	4
Total	87	87

5. Empirical Results

In this section, the results of empirical analysis are reported. The descriptive statistics of variables used in the study enable us to better understand the empirical results. Table 3 reports the mean values, standard deviation and independent sample t-tests for fraud and non-fraud firms. An independent sample t-test is carried out to compare means of fraud firms and non-fraud firms. Thanks to independent sample t-test, the dominating variables which indicate whether or not a firm commits financial statement fraud can be identified.

Table 3. Descriptive Statistics and T-Tests

	Fraud Firms		Non-Fraud Firms			
	Mean	Standard Deviation	Mean	Standard Deviation	t-test	Sig. (two-tailed)
DSRI	1.270	0.789	0.985	0.407	2.979	0.0033
GMI	1.517	0.851	0.917	0.126	6.477	0.0000
AQI	1.074	0.394	0.649	0.568	5.720	0.0000
SGI	1.152	0.490	0.888	0.342	4.105	0.0001
DEPI	1.234	0.713	0.775	0.282	5.552	0.0000
SGAI	0.857	0.180	0.887	0.171	-1.097	0.2742
LEVI	1.129	0.251	0.918	0.152	6.673	0.0000
TATA	0.029	0.027	0.024	0.024	1.270	0.2056

The t-test for days' sales in receivable index is statistically significant ($t=2.979$, $p<0.003$), implying that days' sales in receivable index of fraud firms is higher than that of non-fraud firms. It can be inferred that disproportionate increase in the days' sales in receivables index may imply that the firm management artificially overstates corporate earnings. Days' sales in receivables index is used to analyze the relationship between receivables and sales revenues. The amount of sales and receivables are expected to follow a stable trend. Hypothesis 1 that days' sales in receivable index has a significant impact on the predictability of financial statement fraud is accepted.

The results of univariate test indicate that there is a statistically significant difference in the means of fraud firms and non-fraud firms for gross margin index ($t= 6.477$, $p<0.000$). Gross margin index is used to determine if there is a deterioration in firms' gross margin. When the firm's gross margin index is greater than 1, it can be concluded that the firm's gross margin has weakened. The deterioration of gross margin index can signal potential financial statement fraud. This result supports the assumption of Beneish (1999). Hypothesis 2 that gross margin index has a significant impact on the predictability of financial statement fraud is accepted.

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Pairwise comparison indicates that firms with high asset quality index are more likely to commit financial statement fraud than firms with low asset quality index (t= 5.720, p< 0.000). This result shows that the higher asset quality index, the greater probability the firm commits financial statement fraud. Asset quality index is utilized to analyze the asset realization risk's change. An increase in asset quality index may be caused by additional expenses which are capitalized to mitigate total expenses. Hypothesis 3 that asset quality index has a significant impact on the predictability of financial statement fraud is accepted.

The results of t-test show that there is a statistically significant difference in the means of fraud firms and non-fraud firms for sales growth index (t= 4.105, p<0.000). High sales growth can lead expectations many of which are not sustainable for the firms' management. High sales growth does not solely imply financial statement fraud yet firms with high sales growth are more likely to commit financial statement fraud since their financial position and performance may put great pressure on firms' management to succeed corporate earning targets. Hypothesis 4 that sales growth index has a significant impact on the predictability of financial statement fraud is accepted.

The t-test for depreciation index is statistically significant (t= 5.552, p<0.000), suggesting that depreciation index of fraud firms is higher than that of non-fraud firms. Depreciation index greater than 1 reveals that the firm's assets are depreciated at a slower rate than previous year. This result indicates that fraud firms revise the useful life of their assets upwards or adopt a new depreciation method that boosts corporate earnings. Hypothesis 5 that depreciation index has a significant impact on the predictability of financial statement fraud is accepted.

There may be a positive relationship between sales, general and administrative expenses index and likelihood of financial statement fraud. Sales, general and administrative expenses index greater than 1 may signal deteriorating sales and administrative efficiency that may induce the firm's management to commit financial statement fraud. With regard to sales, general and administrative expenses index, though the mean value for fraud firms is 0.857 and 0.887 for non-fraud firms, a statistically significant difference cannot be observed (t=-1.097, p<0.2742). Hypothesis 6 that sales, general and administrative expenses index has a significant impact on the predictability of financial statement fraud is rejected.

The result of t-test indicates that leverage index is statistically significant (t=6.673, p<0.000), reflecting that leverage index of fraud firms is higher than that of non-fraud firms. This result supports the assertion that the higher leverage index can make firms more prone to financial statement fraud. Leverage index greater than 1 indicates an increase in the use of debt financing. Leverage index enables forensic accountants to analyze the trends in total debt to total assets. Hypothesis 7 that leverage index has a significant impact on the predictability of financial statement fraud is accepted.

The result of t-test indicates that total accruals to total assets does not vary significantly between fraud firms and non-fraud firms (t= 1.270, p<0.2056). Total accruals to total assets evaluates the extent to which the firm's management apply discretionary accounting policies to change corporate earnings. High level of accruals may increase the likelihood of corporate earnings manipulation. Hypothesis 8 that total accruals to total assets has a significant impact on the predictability of financial statement fraud is rejected.

This paper aims to analyze Beneish Model at the aggregate level. Logistic regression analysis is used to analyze the interaction effects of ratios of Beneish Model. Logistic regression model is selected to establish a model that can effectively predict fraud firms, since dependent variable is dichotomous, that violates the assumptions of linear regression analysis. There are eight independent variables and one dichotomous variable. Dichotomous variable is coded 1 if the firm does not commit financial statement fraud, coded 0 otherwise.

Results from logistic regression analysis are reported in table 4. The result of logistic regression analysis indicates that there is a statistically significant relationship between dependent variables and independent variable (χ^2= 122.54, p< 0.000). The strength of

association between dependent variable and independent variables is adjusted r-squared=50.80%, indicating a moderate positive relationship. Additionally, the result of Hosmer-Lemeshow test reveals that the empirical model fits the sample data well.

Table 4. The Results of Logistic Regression Analysis

Variables	Coefficient	Standard Error	Sig.(p-value)
Constant	14.583	2.938	0.000
DSRI	-1.162	0.496	0.019
GMI	-2.846	1.380	0.039
AQI	-1.770	0.491	0.000
SGI	-1.329	0.600	0.027
DEPI	-1.447	0.599	0.016
SGAI	1.011	1.343	0.452
LEVI	-6.453	1.508	0.000
TATA	-19.313	9.068	0.033

Adjusted R^2: 50.80%; χ^2 : 122.54 ***; Hosmer-Lemeshow test: 0.573; *** p<0.001

Coefficient on sales, general and administrative expenses index is not statistically significant. Possibly, this ratio is mainly related with earnings management, not financial statement fraud. According to the results of logistic regression analysis, coefficients on sales growth index, depreciation index, gross margin index, asset quality index, total accruals to total assets, days' sales in receivables index and leverage index are statistically significant. As can be seen in table 4, the most dominating ratios in the logit model are TATA (-19.313), LEVI (-6.453) and GMI (-2.846). Based on the results of logistic regression analysis, the model equation is as follows.

$$M= (Constant\times 14.583) + (-1.162\times DSRI) + (-2.846\times GMI) + (-1.770 \times AQI) + (-1.329\times SGI) + (-1.447\times DEPI) + (1.011\times SGAI) + (-6.453\times LEVI) + (-19.313\times TATA)$$

Table 5 reports the classification results of the logit model. Classification table is an important tool that evaluates the predictive ability of the logit model. The logit model inaccurately classifies only nine out of 87 fraud firms and sixteen out of 87 non-fraud firms. According to the classification results, the logit model correctly classifies 85.63 % of cases. The classification results suggest that Beneish Model has superior performance in the detection of firms that committed financial statement fraud.

Table 5. Classification Results

Observed	Fraud Firms	Non-Fraud Firms	Percentage Correct Classifiction
Fraud Firms	78	16	82.97
Non-Fraud Firms	9	71	88.75
Overall Percentage			85.63

6. Concluding Remarks

Over the last two decades, financial statement frauds have had massive effects on Turkish economy. Several methods have been developed to uncover and prevent financial statement frauds. The methods used in the forensic accounting science make key contributions to the detection of financial statement fraud. Past experiences gained in the previous fraud cases have played a critical role in the development of forensic accounting methods. Rapidly changing global economic environment leads to the introduction of the new forensic accounting methods. Past experiences have proved that Beneish Model is one of the most effective methods in the detection of fraudulent financial statements. After Enron fraud case, Beneish Model has

grabbed more attention for its accuracy and easily applicability in detecting financial statements fraud.

The objective of the present study is to measure the performance of Beneish Model in the detection of financial statement fraud committed by firms listed on Borsa İstanbul. A data set of 174 firms listed on Borsa İstanbul is analyzed during the twelve-year period of 2005-2017. The results of univariate analysis show that days' sales in receivable index (DSRI), gross margin index (GMI), asset quality index (AQI), sales growth index (SGI), depreciation index (DEPI) and leverage index (LEVI) have a significant impact on the predictability of financial statement frauds. The results of logistics regression analysis prove that Beneish Model has a strong ability to predict financial statement fraud. The logit model correctly classifies 85.63 of all cases. The results of logistic regression analysis indicate that firms with high days' sales in receivable index (DSRI), gross margin index (GMI), asset quality index (AQI), sales growth index (SGI), depreciation index (DEPI), sales, general and administrative expenses index (SGAI) and leverage index (LEVI) are more likely to falsify financial statements. Taken together, the results of empirical analysis support the findings of Beneish (1999). Financial market participants should be cautioned, not all accounting irregularity is a signal for financial statement fraud.

Detecting financial statement fraud is hugely difficult for forensic accountants, especially if the firm's management is involved. If the forensic accountants follow a well-established investigation process, high-complex corporate frauds can be easily detected. Forensic accountants provide invaluable technical evidence and communicate the findings of investigation process to the law court. Forensic accountants significantly contribute to the bringing fraudsters to justice. It is worth mentioning that forensic accountants should be familiar with legal procedures and issues to properly carry out these services. Future studies can perform a cross-country analysis using publicly available information to measure the efficiency of Beneish Model.

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