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ASSESSING THE FRAUD RISK FACTORS IN THE FINANCIAL STATEMENTS WITH BENFORD'S LAW*

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ABSTRACT

The aim of this study is research potential fraud risk in financial statements by using some financial and nonfinancial parameters. For detection of fraud risk used conformity of financial statements with Benford's law among different groups of companies. Variables to be met by financial statement liability include sectors, risk groups, size of independent audit firms, independent auditing obligation and independent membership of directory board.

To this intent balance sheet and income statements of the companies traded in BIST real sector for the years 2008-2017, taken as data set. Data set were applied Benford analysis for measuring conformity of financial statements with Benford's law. For analyse difference between groups applied T-Test, ANOVA and TUKEY tests. As a result, investigated significant difference between company groups and variables were found to affect the fraud risk in the financial statements. These results have shown impact of different variables on financial statement as a fraud risk factor. It has expected that these factors are effective in the financial statement fraud. Company owners, professsional accountants, auditors and tax authority can use this method for detecting red flags and selecting audit targets.

Keywords: Benford's Law, Fraud Detection, Financial Statement Analysis, Fraud Risk Factors.

JEL Codes: M40, M41, M42.

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BENFORD YASASI İLE FİNANSAL TABLOLARDAKİ HİLE RİSKİNİN BELİRLENMESİ

ÖZ

Bu çalışmanın amacı, bazı finansal ve finansal olmayan parametreler yardımıyla finansal tablolardaki potansiyel hile riskini araştırmaktır. Hile riskinin tespiti için BIST şirketleri içerisinden Benford yasasına uyum kriterine göre kontrol ve risk grupları belirlenmiştir. Hile riskinde etkili olabilecek faktörler olarak; sektör, BIST risk grupları, bağımsız denetim firmalarının büyüklüğü, bağımsız denetim yükümlülüğü ve bağımsız yönetim kurulu üye sayısı olmak üzere beş değişken seçilmiştir.

Bu amaçla BIST reel sektörde işlem gören şirketlerin 2008-2017 yılları için bilanço ve gelir tabloları veri seti olarak alınmıştır. Finansal tabloların Benford yasasına uygunluğunu ölçmek için veri setine Benford analizi uygulanmıştır. T-Testi, ANOVA ve TUKEY testleri gruplar arasındaki farklılıkların analiz edilmesinde kullanılmıştır. Sonuç olarak, şirket grupları arasında hile riski açısından anlamlı farklar belirlenmiş dolayısıyla söz konusu değişkenlerin finansal tablolarda hile riskini etkilediği tespit edilmiştir. Şirket sahipleri, muhasebe meslek mensupları, denetçiler ve vergi otoritesi gibi çevrelerin bu yöntemi kırmızı bayrakları tespit etmek ve denetim hedeflerini seçmek için kullanabileceği değerlendirilmektedir.

Anahtar Sözcükler: Benford Yasası, Hile Denetimi, Finansal Tablolar Analizi, Hile Risk Faktörleri.

JEL Kodları: M40, M41, M42.

1. INTRODUCTION[1]

The truth of financial information has a direct impact on social and economic life (Robinson et al., 2015). Therefore, an economic system that is effective, smoothly functioning capital markets, social and economic dynamics such as fair taxation structure are directly related to the correct and honest transfer of financial information (Moller, 2009; Aaker and Jacobson, 1994; Franco et al., 2011; Watrin et al., 2008). Frauds in the accounting process may cause the other parties to damage and lose by showing the financial statements differently than they actually are. These losses negatively affect all economic aspects from individual to government. For these reasons, accounting audit has been expected to be effective in order to minimize these negativities. The fact that the financial statement data reflects reality, being free of mistakes, prejudices or manipulations is very important for a well-functioning economic system. Accurate financial reports provide efficient resource allocation and effective investment (Conceptual Framework for Financial Reporting 2018). Therefore, the assessment of errors in the financial statements is an important task for investors, analysts, auditors, regulators and researchers. The research questions are that; is it possible to detect correctness of financial data with

[1] This study was produced from a PhD. dissertation titled "Finansal Tablolarda Hile Riskinin Tespiti Üzerine Bir Model Önerisi: BIST Uygulaması".

Benford's Law? And which variables can be effective in determining fraud risk in the financial statements?

As the use of software designed for specific and general audit purposes becomes widespread, audit coverage expands. Nonetheless, according to the ACFE (Association of Certificated Fraud Examiners) 2016 report, it has found that firms lost 5 percent of their annual income due to fraud and the total loss caused by the fraud was $ 6.3 billion. Turkey is in a similar situation privately; according to the GIB (Income Administration Authority) 2017 annual report, Turkey taxpayers examined, which constitutes 1,9 percent of total taxpayers, the tax loss determined per taxpayer 126.000 TRY and base average was declared 10 percent missing in all types of taxes in 2017. According to the estimates, it is emphasized that the ratio of informal economic activities and tax loss to fluctuating course varies between 86.73 percent and 35.37 percent (Erkus and Hakan, 2009: 139). According to the OECD Tax Administration 2013 report, the taxation rate of developed countries is generally over 50 percent. The updated OECD report on 2015 Turkey's data presented as percent of 25. The labour force in Turkey at the same time the population is rather low rate of taxation. Most of field studies shows informal economy size in Turkey has shown as more than percentage of 40 as a high rate similar with developing countries. Because of this negative view Turkey companies selected for this research.

There are number of problems that weaken the effectiveness of auditing. First of all, most of the financial data is kept in the organizations and there are obstacles to access. Controlling financial data is a time-consuming and expensive process. Declared public and publicly available financial data is limited. Various methods have used to gain an idea of the correctness of financial statements. Those are generally based on the analysis of various financial ratios. In spite of this, Benford's law, which is based on the frequency of the figures in the number digits, is another way of finding practice in fraud control, even though there doesn't has financial infrastructure. However, for both methods need generally accepted critical values to able to make significant comparing.

Most of the frauds in the financial world are based on changing the numbers. Detecting the changed numbers in this case also means to reveal the fraud. Benford's law makes it possible that states that the probability of finding numbers in a naturally occurring number of digits is not equal. Nigrini (2000) has stated that the Benford's law became a powerful and valuable tool for the audit of accounting. Benford's law is characterized by being observable only in naturally occurring numbers, not artificially regulated numbers. These numbers are no longer naturally occurring in the case of a random accounting record, and the Benford's law can be effective in determining those (Bhattacharya et al., 2008: 150). This is what makes Benford's law extremely useful in detecting fraudulent financial data. In the

case of fraudulent interference with financial accounts, generated figures will not comply with Benford's law, thus increasing the chances of being perceived by analysis techniques based on this law. However, the fact that a data set does not comply with the Benford's law is not sufficient for fraud detection alone. This provides only some statistical evidence that the data may have been manipulated. Therefore, when interpreting the results of the Benford's law, it is necessary to consider certain limitations (Bhattacharya et al., 2010: 577). Auditors should use analytical procedures to determine the presence of abnormal operations, incidents and trends. The Benford's law provides the expected forms of numerical data and has proposed as a test for the specificity and reliability of accounting data at the transaction level (Nigrini and Miller, 2009: 305). Hundreds of studies in the literature have shown that Benford's law can be applied to accounting data, and it could work well for fraud detection.

This paper contributes to the literature in several ways. First, this study is the first study, which use "BDS" (Benford Digit Score) and "BDS critic values" for determining financial statements compliance with Benford's law and also separated from other studies in terms of use BDS as a detecting method of fraud. BDS critical values as conformity table which is a development about Benford analysis is effective, basic and fast method to detecting fraud. Secondly determined some nonfinancial factors, which are effective on financial statements fraud risk. It also suggests usage of Benford analysis as a comparing method between groups. There are five factors that examined is there any relations or what is the direction of relation between fraud and those nonfinancial factors; sectors which companies traded in, risk groups which authority of stock market classified, audit firm size, independent audit regulation and independent member quantity in directory board. We found that as expected there is difference between sectors about financial statements fraud risk. That has found negative relation between risk groups, audit firm size, independent audit obligation and independent directory member quantity and fraud risk. It has expected that it will be a guide to the researcher about the factors which are effective in the financial statement fraud. At the same time it is presenting a proof that BDS values works effectively for measuring conformity with Benford's law. Company owners, professional accountants, auditors and tax authority can use this method for detecting red flags and selecting audit targets.

The structure of the paper is as follows; section one; background and motivation of study. Section two; review related previous studies. Section three; outlines the conceptual basis for Benford`s law theory. Fourth section; explain the research method and rationale behind the study. Section five; summaries and discusses the results obtained. This is followed by sixth section, which concludes the study and suggests further research.

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2. LITERATURE REVIEW

The application of Benford's law to accounting data was first made by Carslaw (1988). In Carslaw's study, the frequency of second digit (especially zero) appearances in the earnings numbers of New Zealand companies was investigated in accordance with Benford's law. In particular, reported gains have a much higher expected 0 frequency and a lower expected 9 frequencies. It has been stated that this abnormality may be evidence of an alternative income-healing behaviour that firms want to reach. According to the author, such targets are based on the existence of cognitive reference points.

Since then Benford analysis has found a wide range of applications in accounting with a wide variety of methods. The analysis can be applied to any kind of accounting data that has a number of records over a certain size and is expected to occur naturally; generally accounting statements, financial statements, tax declarations and macroeconomic data. Nigrini (1994) conducted a case study on embezzlement by a security chief working in a large housing estate. The first two-digit combinations of fraudulent checks gave a hint to the fraudulent process of deviation from Benford's law. In Hill's (1998) analysis of a 1995 tax bill that has known to be fraudulent in New York, it was determined that the numbers did not follow Benford's law. In Nigrini (1995) study, Benford's analysis of US President Clinton's tax payments, 13-year tax payments have been observed to follow the Benford distribution. Tam Cho and Gaines (2012) test Benford's years of US election campaign spending. In 2011, an analyst of China-based company implemented the Benford first and second digit tests using the data from the last 10 quarters of the income statement, and found that 5 and 8 figures were higher than expected and 4 figures were lower than expected. This situation has come to the conclusion that the 4 figures of Chinese culture originated from the fact that the ominous 5 and 8 figures were regarded as auspicious, and they may have been played with figures (Özdemir, 2014).The summary information of similar studies is given in the Table 1.

Table 1: Benford's Law Applications in the field of Accounting

Author	Year	Variables	Digit Test	Conformity Tets
Carslaw	1988	Net Profit, Ordinary Profit	1.and 2.	Z-statistics
Thomas	1989	Profit-loss, quarterly profits, earnings per share	1.and 2.	Z-statistics
Chiristian and Gupta	1993	Income Tax Returns	First 2	Z-statistics
Nigrini and Mittermaier	1997	Invoices	1. 2. and First 2.	Z-statistics

Niskanen and Keloharju	2000	Net Profit	2.	Z-statistics
Kinnunen and Koskela	2003	Net profit and loss	2.	Z-statistics
Das and Zhang	2003	Earnings per share	2.	Z-statistics
Skousen all	2004	Profit	1. 2. 3. and 4.	Z-statistics
Durtschi	2004	Purchase checks, insurance claims	1.	NA
Çakır	2004	Stock closing	1., 2.and First 2.	MAD test
Quick and Wolz	2005	Financial Statements	First 2	Chi-square, Z-statistics
Tam Cho all	2007	Election Campaign financing	1.	Euclidean distance
Akkaş	2007	Stocks accounts	1., 2. and First 2.	Chi-square
Dorfleitner and Klein	2008	Stock price	2.	Chi-square
Jhonson	2009	Earnings per share	1.	Z-statistics
Jordon all	2009	Sales	2.	Z-statistics
Krakar and Zgela	2009	Swift messages	1. 2. and First 2	Chi-square
Çubukçu	2009	Payment Checks	First 2	Chi-square
Jordon and Clark	2011	Profit	2.	Z-statistics
Archambault	2011	Financial Statements	1.	Chi-square
Rauch	2011	Macroeconomic Data	1.	Chi-square
Henselmann	2012	XBRL Filings	1.	Chi-square, Z-statistics, MAD test
Tilden and Janes	2012	Financial Statements	1.	Z-statistics
Hsieh Hsieh and Lin	2013	Quarterly profits	2.	Z-statistics
Jhonson and Weggenmann	2013	Financial Statements	1.	Z-statistics, MAD test
Boztepe	2013	Budget revenues and expenditures	1.	NA
Yanık and Samancı	2013	General administrative expenses	1., 2., First 2 and First 3	Chi-square
Möller	2014	Financial Statements	2.	z-stat, Chi-square
Uzuner	2014	Financial Statements	1.	Chi-square
Geyer and Drechsler	2014	Long Term Debt	1.	Chi-square,Z-statistics
Gönen and	2014	Stocks trading volume	1., 2.and First 2.	MAD test

Rashan				
Demir	2014	Marketing sales distribution expenses	1., 2.and First 2.	Chi-square
Nigrini	2015	Financial Statements	First 2	MAD test
Amiram all	2015	Financial Statements	1.	FSD score
Nigrini	1992, 1996	Income Tax Returns	1. 2. and First 2.	Chi-square, Z-statistics MAD test
Nigrini	1994, 2000	Payrolls	First 2	Z-statistics; MAD test
Van Ceneghem	2002, 2016	Profit, Financial Statements	2.	Chi-square, z-stat, MAD test

The study also investigates the effects of risk factors in the field. Risk factor 'red flags' that related to fraudulent financial reporting may be grouped in the following three categories (SAS No. 82): (a) Management's characteristics and influence over the control environment, (b) Industry conditions, (c) Operating characteristics and financial stability (Spathis et al., 2002: 515). In addition, there are many variables that can be associated with fraud in financial transactions. For example, the growth rate of the company, the number of independent executives in the management team, the size of the audit firm, the stock market index, audit procedures, audit laws and institutions.

There are limited studies on the factors that affect the risk of fraud in financial statements. Beasley et al. (2000) has found that the types and ratios of fraud differed between the three different sectors. It has been emphasized that having an independent audit committee reduces the risk of fraud. Abbott et al. (2000) have found that the number of members of the board of directors without similar affiliation is inversely related to the fraud risk. Brazel et al. (2006) investigated whether publicly available nonfinancial measures (NFMs), such as the number of retail outlets, warehouse space, or employee head counts, can be used to assess the likelihood of fraud.

3. THEORY AND HYPOTESES

3.1. Benford's Law

The emergence of Benford's law is based on a two-page article published in the American Journal of Mathematics in 1881 on the frequency of numbers on the number of digits by American astronomer and mathematician Simon Newcomb's. Newcomb has shown that the frequency of digits (0-9) is not equal and he shows the possibility of each digit being in different digits of the number (Newcomb, 1881: 39). Accordingly, the frequency of the first digit in the first step decreases from 1 to 9. In step 3, the probabilities are

very close to each other, and from the fourth step onwards the difference becomes unclear (Newcomb, 1881: 40).

Newcomb's model has been almost forgotten for 57 years despite all the excitement and functionality until famous physicist Frank Benford's made similar observations. Benford showed on the table the frequency of each digit in the number of digits taking the average of the distribution results obtained from 20,229 different data sets in the 1938, edition of The Law of Anamorphous Number in the American Philosophical Society (Benford, 1937: 553). From 20 different data sets, on average, 30.6 percent of the total 20,229 data starts with 1. The ratio of those start with 2 is 18.5 percent on average, and this ratio is decreasing by the number grows. Benford (1938) formulated these conclusions in a distribution hypothesis to be called the "Benford Law", a universal law regulating the digits of numbers.

Table 1: Probabilities predicted by Benford's Law

di	P(d1)	P(d2)	P(d3)	P(d4)
0		0.119	0.101	0.100
1	0.301	0.113	0.101	0.100
2	0.176	0.108	0.100	0.100
3	0.124	0.104	0.100	0.100
4	0.096	0.100	0.100	0.100
5	0.079	0.096	0.099	0.099
6	0.066	0.093	0.099	0.099
7	0.057	0.090	0.099	0.990
8	0.051	0.087	0.098	0.099
9	0.045	0.085	0.098	0.099

(Source: Deikman, 2007: 323)

Table 2 shows calculated probabilities of occurring numbers in digits. Benford, the first figures in data sets collected from a variety of fields has shown almost the same distribution. Benford's law is strong enough to raise suspicions about the authenticity of data sets that do not comply with this distinction (Benford, 1957: 551). This rule is also regarded as a universal nature law because it maintains its validity when scale and number base change (Fewster, 2012: 27).

The Benford's law, based on the principle that people cannot produce numbers by chance, is an example of Hill's (1998) experiment. In the course of the theory of probability, one group was asked to write 200 rounds of the results of the coin tour, and the other group was asked to write the estimated

results of the 200 rounds. Although the same face-to-face situation often occurs six times in succession in practice, this scenario has never been seen in the prediction group results (Hill, 1998: 362). In another experiment, 742 students were asked to create random 6-digit numbers, and the numbers were found to be less compatible or incompatible with Benford's law (Nigrini and Mittermaier, 1997: 56). This test also repeated by us. In accounting final examination, students were asked for write randomly six-digit numbers on paper. As a result of the Benford analysis of the data set collected from 343 papers, appears that the data set is incompatible with the Benford's law. If people are asked to generate random numbers, their response will indeed vary significantly from random sequences (Hill, 1988: 967). When people think they are producing a random number, they often reflect on their own experiences and the numbers in their experiences.

Benford's law is a general law concerning naturally occurring numbers that maintain their validity under different circumstances. Pinkham (1961) stated that if there is a law governing digital distributions, it is a premise that this law is constant in terms of scale. So, if the lengths of the world's rivers follow a kind of law, it should be insignificant that these numbers are expressed in miles or kilometres. This means that if all the numbers in a data set appropriate to the Benford's law are multiplied by a non-zero constant, the new set will follow the Benford's law (Nigrini, 2011: 30). If you apply this law to the monetary system, the consequences of the data being denominated in Dollar, Euro, Pound, Peso, Yen or Lira does not change, so there is no need to deal with the exchange rates (Geyer and Williamson, 2004: 232).

3.2. General Formula

The approximate values of the expected frequencies from Benford's observations can be calculated by the logarithmic formulation. The probability of having a significant non-zero number in the first digit of the number calculates as follows (Hill, 1998: 358):

$$P\,(D1 = d1)\log10(1 + 1/d1);\ d1 = \{1,2,3 \ldots 9\} \quad (1)$$

For example the probability that the first digit of a number is 6:

P(D1=6) =log(1+1/6)=0,0669 = %6,69

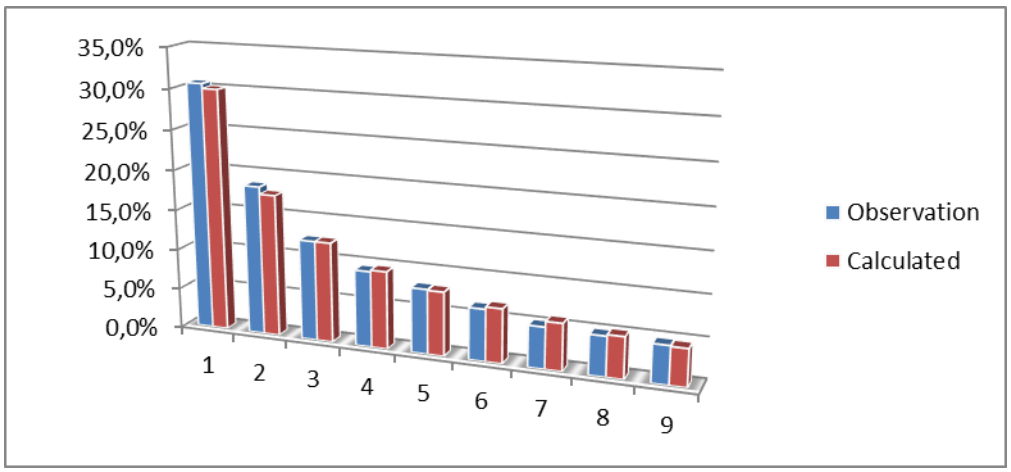

Figure 1: Frequency of The Numbers In The First Digit

(Source: Raimi, 1969: 109)

Figure 1 shows that the expected frequencies calculated by Benford's observations and the logarithmic formula calculations are very close to each other. Likewise, the probability of a digit being in the second digit of the number can be calculated by the following formula:

$$P\ (D2 = d2) = \sum_{d1=1}^{9} \log10(1 + 1/\ d1\ d2)\ ;\ d2 = \{1,2,3\ldots 0\} \qquad (2)$$

P: Probability

D1: First digit

D2: Second Digit

D3: Third Digit

3.4. Benford Analysis

There are five most important tests for the use of the Benford's law. These are; the first digit test, the second digit test, the first two digit test, the first three digit test and the last two digit test. The first and second digit tests are high level conformity tests in the selection of data. The First Two Digits and the First Three Digits tests can be used to select audit targets. The Last Two Digits test is a strong test without detecting the derived digits, it can be used to determine the rounding (Nigrini, 2011: 150). The poor compatibility of data sets with Benford's law may be a signal of an anomaly related to the data. Therefore, if a researcher with four datasets in hand has one set of incompatibility while being compatible with three sets of Benford, the strategy should be to focus on incongruities, because fraud risk will be higher (Nigrini, 2012: 74). Data sets to be tested for compliance with the Benford's law should meet the following requirements (Quick, 2005: 1290). The dataset should define the size of similar occurrences; the data must express the same kind events. The example is all city-based or all-year sales.

The lower or upper limit of the values in the dataset should not exist. The maximum and minimum limits disrupt the distribution. The values in the data set should not be assigned numbers. It is one of the main conditions of the law that the numbers are formed randomly from the natural way (Akbaş, 2007: 196).

Previous studies about fraud show that the risk of fraud between companies which traded different sectors is not equal. Brazel et al. (2006) recorded research results has provided empirical evidence suggesting that nonfinancial factors can be effectively used to assess fraud risk. According to the ACFE 2016 report, banking and financial services, government and public administration and manufacturing industries have represented as the most represented sectors in fraud cases. In the same report less fraudulent sectors have determined as publication and telecommunication sectors. Kroll Global Fraud & Risk Report 2016 has shown similar results. This report recorded that faced with a fraudulent transaction in last sectors are finance: percent 87, professional services percent 84, retail percent 82 and medical percent 80. And average rate of financial fraud has been percent 15 in all fraudulent transactions. The difference between intersectoral financial transactions, the frequency of cash and recording transactions, the variety of financial and administrative obligations, can also influence the quality of financial statements. Because of the above reason, this study proposing the fallowing hypothesis.

Hypothesis 1. There is significant difference between sector groups of companies about fraud risk in financial statements. BIST has classified companies traded in stock market by risk levels, which calculated according to some indicators. Shares in the A, B and C groups shall be determined by the general calculations to be made on a monthly basis for each share of the shares traded in the stock exchange. For the shares to be made in the D group, the market and the platform should be taken into consideration (http://www.borsaistanbul.com/urunler-ve-piyasalar/piyasalar/pay-piyasasi/a-b-c-d-grubu-paylar). We expected the low risk level companies as remarked A, has less fraud risk. Mock and Turner (2005) founded that over two years of audits, number and type of fraud risk factors identified differs across clients, industries, and fraud risk categories. This study is proposing the following hypothesis.

Hypothesis 2. There is negative relation between risk groups of companies from A to D and fraud risk in financial statements. We are expecting the big four audit firms has more pressure and facilities to qualified the audit process. That is why they have international prestige, brand value, corporate governance. Karacaer and Ozek (2010) expressed results of their study, showed a negative and statistically significant relationship between the size of the audit firm and the profit management. There are two theoretical explanations of the relationship between the size of the audit firm and the

quality of audit (Lennox, 1999: 779). One of these explanations is that large audit firms are more inclined to publish accurate and accurate audit reports because they are more famous. According to the alternative hypothesis, the higher the asset levels (wealth) of the auditors, the more likely they are to publish the right audit reports in order to protect their assets against the possibility of a lawsuit (Karacaer and Ozbek, 2010: 62). Francis et al. (1999), for a large sample of NASDAQ firms, determined that the first six large audit firms restricted their profit management behaviors. Bauwhede, Willekens and Gaeremynck (2003) emphasized that there is a significant difference between the first six audit firms and other audit firms in terms of the quality of audit. Butler, Leone and Willenborg (2004), Chen, Lin and Zhou (2005), Chia, Lapsley and Lee (2007), Lennox (2008) Lai (2009), Korpi et al. (2016) in the works, they found that auditing by big audit firms decreasing financial manipulation. This study is proposing the following hypothesis.

Hypothesis 3. There is negative relation between audit firms size and fraud risk in financial statement. The purpose of the independent audit is to increase the level of confidence that target users have in their financial statements. This objective has achieved by the auditor's opinion that the financial statements are prepared in accordance with the financial reporting framework in all material respects. It is about whether or not the financial statements are presented in all material aspects of the financial statements in a fair manner, or if they provide a true and accurate view (Türkiye Denetim Standarları BDS200,4). In the audit progress, it is a necessity for the audit to be performed by an independent auditor based on the information risk. These conditions can be explained for reasons such as the conflict of interest, the complexity of the accounting system and the fact that the information is related to the decisions to be taken (Kepekci, 1996: 9). Yıldız and Baskan (2014) stated that the independent external audit was the third most important method with 16 percent in the ways used in accounting errors and tricks and the independent audit for companies gained importance in determining the errors and tricks in accounting. As in previous researches of ACFE, independent external audit has been identified as the most widely used anti-fraudulent method in the ACFE 2016 report. In the report, approximately 82 percent of the organizations subject to the same survey were subject to independent audit and similarly, 81.1 percent were registered in the Code of Conduct. The existence of anti-fraud controls, as well as the correlation analysis related to lower fraud losses and faster detection, showed that fraud losses were 14.3 percent – 54 percent lower in organizations with controls to combat fraud than those without controls, and 33 percent of tricks. 3 – 50 percent has found to be detected more quickly. This study is proposing the following hypothesis.

Hypothesis 4. There is positive relation between Independent Audit Regulation and fraud risk in financial statements. Corporate governance, in the management and operation of the companies, the protection of the rights of all stakeholders, including shareholders, as well as their traditional structures, which take into account the rights of the community in question, in other words, to obtain and distribute profit to their shareholders, is a management philosophy that aims to regulate the rules of relations (Sehirli, 1999). As an essential element of the corporate governance approach, internationally applicable; four key elements identified as fairness, responsibility, transparency and accountability (Pamukcu, 2011: 135). Meantime, social responsibility and neutrality principles, which are among the basic concepts of accounting, also recommends that the resources are evaluated fairly, regardless of the entity's interest groups (Ozkol et al., 2005: 138). Xie et al. (2003) conclude that board and audit committee activity and their members financial sophistication may be important factors in constraining the propensity of managers to engage in earnings management. Dechow and Dichev (2002), Peasnell et al. (2000) studies based on data for US and UK firms document that corporations with independent boards tend to have less financial manipulations. Jaggi et al. (2009) evaluates there is association between corporate board independence and earnings management in Hong Kong firms. This study is proposing the following hypothesis.

Hypothesis 5. There is negative relation between independent directory board member quantity and fraud risk in financial statements. The effect of the structure of the board of directors on business performance has recently attracted the attention of researchers. In the Corporate Governance Communiqué published by the SPK, it is obligatory to have an independent member within the board of directors. It is also regulated that the number of independent members cannot be less than one third of the total number of members and in each case less than two. The reason for this regulation is transparency and accountability within the scope of corporate governance principles, so a positive relationship can be expected between the number of independent board members and the risk of fraud. Atılgan (2017); Şengür ve Püskül (2011); Özen ve Yılmaz (2016); Demirel (2014) found relations between independent member rate and financial ratios and transparency.

4. METHODOLOGY

4.1. Data Set

The research universe is companies traded at BIST. Based on 2017, the companies traded at BIST have been identified and the same companies have been included in the research universe for 10 years towards the past. In this period in Turkey stock market has averagely 400 companies. Banking

and finance companies excluded from this research in order to have different form of financial statements. In this framework, the number of companies that disclosed their financial data to the public is 347. In this way, all of the research subjects are included. The study attempted to analyse quarterly balance sheets and income statements covering this 347 companies period between 2008 to 2017, were used as data set. However, the universe size and the research period may differ for the five different variables in sections investigated in the study. In the sections where each variable is investigated, data set information is given separately. The data is collected from FINNET database and official web site of Turkey stock market; ww.kap.org.tr.

In order to measure compliance with the Benford's law, T-Test and ANOVA tests have applied to investigate the differences according to BIST risk groups, sectors, before and after independent audit regulation, independent audit firms and independent directory board membership. The TUKEY test has used for multiple comparisons. SPSS 22 program has been used for these tests.

4.2. Research Design

In this section, it was researched whether there is a significant difference in financial statement fraud risk between different groups of companies operating in BIST. The intent of the financial statement fraud risk is that the financial statement data conform to the Benford's law. For this purpose, the data set was subjected to the 1st Digit test, 2nd Digit test and First-2 digit test under the Benford analysis. From the result, BDS (Benford Digit Score) values calculate for each observation. According to BDS critic values table (Table 3) companies classified as compatible or incompatible. BDS is different version of MAD (Mean Absolute Deviation) and calculates by taking average of digit test MAD values.

MAD is calculates as below (Nigrini, 2001: 158):

$$= \frac{\sum_{I=1}^{K} |AP - EP|}{K} \qquad (3)$$

AP: Actual Distribution,

EP: Benford distribution, K: 9 (for first digit test), 90 (for first 2 digit)

BDS calculates as $= \frac{\text{1.Digit MAD+ 2.Digit MAD+ First 2 Digit MAD}}{3}$ (4)

Table 2: BDS Critical Values Table

BDS Value	Result
0,000 - 0,0095	Comformity
0,0095 - 0,0157	Acceptable Comformity
>0,157	Nonconformity

(Source: Ozevin, 2018: 116)

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Companies with a lower BDS value are more compatible, while those with a higher BDS value are considered more incompatible. The compliance of the financial statements of the company with Benford's law is interpreted as the indication of the low fraud risk of the financial statements.

5. RESULTS AND DISCUSSION

5.1. Sector-Based Analysis of Financial Statements

The financial statements of companies operating in the real sector in BIST were subjected to Benford analysis according to the sectorial classification. According to the BIST sector classification, sectors that are at least 10 companies in each sector from the companies operating in the real sector are included in the research. If there are less than 10 companies from a sector group, that sector is left out this research. In this way, the entire research universe consists of 179 companies. This part of the research covers five years of data between 2013-2017. Calculated BDS values are compared with critical values and compliance levels are determined for annual and five-year periods. Sectors included in the analysis consist of companies that can achieve the full data set. The financial sector and holding companies are excluded from the analysis in this section.

Table 3: Compormity-Noncomformity Companies According to Benford Analysis Results

		5 Years (2013-2017)		**Annual (2017)**	
Sectors	Company	Compatible	Incompatible	Compatible	Incompatible
Food	25	18	7	19	6
Clothing	19	13	6	12	7
Chemistry	25	19	6	20	5
Trade	18	9	9	10	8
Metal	14	8	6	10	4
Stone-Soil	23	10	13	14	9
Paper-Publication	14	8	6	10	4
Technology	15	11	4	9	6
Machinery	26	18	8	15	11
Total	179	114	65	119	60

According to Table 4, of the 179 companies whose financial statements for 2017 were analysed, 114 companies were in compliance with Benford's law and 65 were out of compliance. Of the 25 firms in the food sector, 19 were compatible and 6 were incompatible. The most incompatible companies

appears in Trade sector and the least incompatible companies seen in the Chemistry sector. Comparative analysis and significance tests on the sectorial basis were carried out in the next section.

Table 4: Comparing Sector Conformity with Benford's Law

	Sum of Squares	df	Mean square	F	Sig.
Between Groups	,000	8	,000	2,490	,011
Within Groups	,013	1561	,000		
Total	,014	1569			

Table 5 compares the sectors according to conformity to Benford's law. The results of the analysis show that the sectors differed in terms of compliance with the Benford's law.

Table 5: Descriptive Statistics by Sectors

	N	Mean	Std. Dev.	Minimum	Maximum	Multiple Comparsion
Food	230	,0151	,00292	,01	,02	
Clothing	180	,0156	,00317	,01	,03	Metal Goods
Paper-Pabl.	140	,0150	,00269	,01	,02	
Chemistry	200	,0150	,00312	,01	,03	Trade
Stone-Soil	230	,0150	,00290	,01	,03	Trade
Metal Main	120	,0151	,00266	,01	,02	
Metal Goods	230	,0148	,00282	,01	,02	Chemistry, Clothing
Trade	100	,0161	,00294	,01	,02	Chemistry, Metal Goods
Technology	140	,0151	,00309	,01	,03	
Total	1570	,0152	,00295	,01	,03	

Multi-sectorial comparison was conducted by the TUKEY test. When the analysis results are examined, it is seen that there is a statistically significant difference between the clothing sector and the metal goods sector, between the trade sector and the chemical and metal goods sectors, between the chemical and trade sector, between the stone-soil sector and the trade sectors. According to the BDS values, it is seen that the sector which is most compatible with the Benford's law is the metal goods sector with 0.148. The most incompatible sector is the trade sector with an average MAD of 0.0161 (Table 6).

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5.2. Risk Groups Based Analysis of Financial Statements

BIST includes all companies traded on the risk factor classification. Risk classification is done annually. Therefore, this part of the research covers only the data of 2017. The number of companies traded at BIST in 2017 is 413. Since the companies that have not disclosed financial data are also listed in this classification by BIST, the research universe has increased to 413. The entire research universe is included in the research. BIST separate companies for four groups according to their risks factors. As go from A to D, the companies with increasing risk scores are listed with specific calculations. In the second half of 2017, there were 253 companies listed in group A, 76 companies in group B, 35 companies in group C and 49 companies in group D. The Anova test results for the risk groups are shown in Table 7.

Table 6: Anova Test Results by Risk Group

	Sum of Squares	df	Mean square	F	Sig.
Between Groups	,001	3	,000	20,585	,000
Within Groups	,010	1100	,000		
Total	,010	1103			

It can be said that there is a significant difference between the BIST risk groups in terms of compliance with the Benford's law and hence the accuracy of the financial statement because the p-value of the analysis according to Table 7 which shows the results of Anova test is less than 0.05.

Table 7: Descriptive Statistics by Risk Groups

	N	Mean	Std. Dev.	Minimum	Maximum
A	828	,0147	,00288	,01	,03
B	171	,0162	,00350	,01	,03
C	66	,0167	,00294	,01	,02
D	39	,0156	,00297	,01	,02
Total	1104	,0151	,00307	,01	,03

As seen in Table 8, the BDS value of the companies classified as low risk by the BIST were low and the companies classified as high risk were high. It can be said that the BDS score gives parallel results to the BIST classification when making risk estimation.

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Table 8: Multiple Comparison Results by Risk Groups

(I) Risk Group	(J) Risk Group	Mean Dif. (I-J)	Std. Error	Sig.
A	B	-,00158*	,00025	,000
	C	-,00202*	,00038	,000
	D	-,00092	,00049	,239
B	A	,00158*	,00025	,000
	C	-,00045	,00043	,730
	D	,00066	,00053	,606
C	A	,00202*	,00038	,000
	B	,00045	,00043	,730
	D	,00110	,00060	,262
D	A	,00092	,00049	,239
	B	-,00066	,00053	,606
	C	-,00110	,00060	,262

Table 9 shows the results of the TUKEY test, which shows the differences between the risk groups. Accordingly, there is a significant difference between the companies included in the risk group A and the companies included in the groups B and C in terms of financial statements fraud risk. This is a finding that confirms that the companies in Group A in the BIST risk classification differ from those in the other group in terms of financial health.

5.3. Audit Firm Based Analysis of Financial Statements

The purpose here is to investigate whether there is a significant difference in the fraud risk of the financial statements between the companies audited by the Big Four audit firms (Deloitte, EY, KPMG, PwC) and the other audit firms. In order to measure the effect of the audit firm on the financial quality, BIST companies were subject to Benford analysis by separating two groups according to independent audit firms. The first group consists of companies audited by Deloitte, Ernest Young, KPMG and PwC firms known as the Big Four audit firms in the world, and other auditing firms audit the second group. According to the independent audit reports of 2017 and 2016, there are 194 companies that have signed an audit agreement with Big Four audit companies over a two-year period, and 152 companies that have signed agreements with other audit companies.

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Table 9: BDS Values of Companies According to Audit Firm

	Audit Firm	N	Mean	Std. Deviation	T-Test Sig.
	Other	326	,0165465	,00453198	0,024
	Big Four	389	,0156045	,00626821	

As seen in Table 10, the companies audited by the Big Four audit firms have a better score in terms of BDS values indicating the fraud risk of the financial statements. This situation can be interpreted as being branded and international supervisory firms performing more effective audit.

Table 10: BDS Compliance T-Test Results According to Audit Firm

		F	Sig.	t	df	Sig. (2-tailed)	Mean Dif.
	Equal Variances assumed	,019	,891	2,263	713	,024	,00094
	Equal Variances not Assumed			2,326	698,534	,020	,00094

When the financial statements fraud risk was measured according to the size of the audit firm in Table 11, significant differences were found between the companies audited by the big four audit firm and audited by other audit firms.

5.4. Independent Audit Regulation based Analysis of Financial Statements

It has been researched whether there is a significant difference in the accuracy of financial statements before and after the requirement of Independent Audit of companies traded in BIST. Independent audit of the financial statements has been introduced in Turkey since 2013. In this section, the research period is presented as five-year periods before and after the independent audit obligation. In this frame, it was researched whether the financial statements of companies traded in BIST differ from the conformity to Benford's law before and after independent audit. In the pre-audit period taken 2008-2012 years, there are 238 companies that can reach all of the data, whereas the total number of companies that can be reached during the independent audit 2013-2017 period is 347.

Table 11: BDS Values of Before and After Independent Audit Companies

Term	N	BDS	T-Test Sig.
Before Independent Audit (2008-2012)	1,336	0,0111	0,039
After Independent Audit (2013-2017)	1,694	0,0095	

Table 12 compares the BDS values of the companies before and after the independent audit period with the T-test. When the results are examined, it can be seen that the BDS values before and after the independent audit period differ in a statistically significant.

Table- 12: The Effect of Independent Audit on BDS Cohesion T-Test Results

		F	Sig.	t	Df	Sig. (2-tailed)	Mean Dif.
	Equal Variances assumed	4,605	,032	2,063	1568	,039	,00033
	Equal Variances not Assumed			2,063	1525,286	,039	,00033

According to Table 13, the pre-audit period seems to be weaker than Benford's law according to the independent audit period. This can be interpreted as an independent audit having a positive effect on the fraud risk of the financial statements.

5.5. Independent Directory Member Based Analysis of Financial Statements

In this part examined independent directory board membership effects on financial statements accuracy according to Benford's law BDS values. In this section, the research universe is 347 BIST companies whose financial data are available in 2017. BIST companies separated into two groups according to independent directory board membership rate. The median rate of 347 companies was 0,33. According to this company groups separated as which has more than percent 30 independent member rate and which has less than 30 percent independent member rate.

Table- 13: BDS Values of Directory Board Membership

Group	N	BDS	T-Test Sig.
Independent Member >percent30	154	.0153007	0.015
Independent Member <percent30	193	.0157601	

As seen in Table 14, BDS values of more independent member owner companies is lower comparing to less independent member owner companies. According to test result observed that the independent directory board membership have positive effect on the financial statements fraud risk.

6. CONCLUSION

The results of the study can be summarized as follows: As a result of the application of Benford analysis on a sectorial basis, it has been determined that the companies operating in different sectors exhibit significant differences in the level of compliance with Benford's law and therefore the financial statements fraud risk. Among the nine sectors included in the study, has shown the most close conformity results were in the chemical sector and most nonconformity results has occurred in the trade sector. This can be interpreted as the fact that the risk of fraud is lower in the financial statements of the companies operating in the chemical sector and the risk is higher in the companies in the trade sector.

BIST classified the companies according to risk level. Towards low-risk to high-risk as A, B, C, and D groups. It has founded that there was a significant difference between these groups in terms of compliance with the Benford's law in the study. Group A is significantly different from Groups B and C in a positive manner. In other words, companies in the lower risk group are more likely to comply with the Benford's law.

Another result of the study is that found positive correlation between the size of the audit firm and the fraud risk of the financial statements. As a result of the Benford analysis, the financial statements of the companies audited by the Big four audit firms were more consistent than the companies audited by other audit firms.

The financial statements of the periods before and after the independent audit obligation have been determined to be the result of the Benford analysis and the independent audit observer has increased the fraud risk of the financial statements. Compared to the 2008-2012 period, the financial statements for the period 2013-2017 are more compatible with Benford's law.

When examined the correlation between independent directory member quantity and fraud risk of the financial statements, it found that companies which have more independent directory members have closer conformity with Benford's law. It can be said that independent directory membership quantity affected positively the financial statements accuracy.

This study determined some nonfinancial factors, which are effective on financial statements fraud risk. It is expected that it will be a guide to the researcher about determining fraud behaviors and related nonfinancial

factors. It is a finding to be taken into account by auditors, company owners and tax authorities that the risk of fraud in firms of different sectors is different. As a result of the fact that large audit firms reduce the risk of fraud compared to others, the auditor can guide the company managers in selecting the company. According to the results of the analysis, the positive impact of the independent audit practice on the fraud risk of the financial statements may shed light on the new regulations of the relevant authorities. The number of independent management club members is inversely related to the risk of fraud. This information can be valuable for managers and investors. We use BDS values and BDS critic table for measuring conformity with Benford's law and by the same way fraud risk of financial statements. It's a development about Benford analysis which is effective, basic and fast method to detecting fraud. Company owners, professional accountants, auditors and tax authority can use this method for detecting red flags and selecting audit targets. At the same time it is presenting a proof that BDS values works effectively for measuring conformity with Benford's law.

In future research analyses can be repeated for different groups. For example, it is thought that this analysis can give interesting results for public-private companies, profit - non-profit companies. Also the comparison of the companies of different countries with this analytical method can give useful results.

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