A Pragmatic Study of Benford Law in Detecting Earnings Management: Based on Public Limited Companies of the UK

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Posted Date: 27 March 2026

doi: 10.20944/preprints202603.2212.v1

Keywords: Benford law; earnings management; performance matched discretionary accruals

 doi:10.20944/preprints202603.2212.v1

Article

A Pragmatic Study of Benford Law in Detecting Earnings Management: Based on Public Limited Companies of the UK

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Abstract

This paper presents the estimation of the earnings management and analyse the manipulations by implementing Benford's Law. The estimation of the earnings management and detecting the magnitudes of errors in earnings management has been rarely studied in FTSE350 companies context, therefore, This paper estimates the values of earnings management by using performance matched discretionary accruals and analyse the performance of earnings manipulation by adopting Benford's Law. The authors of this paper use Benford's law based on the first digit, second digit and first two digits data as a benchmark and analyse the performance of earnings management. It has been identified that the naturally occurred value of earnings management have very high differences from the data articulated by Benford law. This indicates that there are significant manipulations in the value earnings management. While considering the findings based on frequency of first digits of earnings management, this research annotates that the FTSE350 companies are actively involved in aggressive earnings management using the techniques of income smoothing, Big Bath and Cookie Jar. Conversely, while considering the analysis of frequencies of first two digits of earning management values, this research identifies that FTSE350 companies are actively involved in aggressive earnings management but regarding the techniques used, it does not reflect such consistency that the first digit reflects.

Keywords: Benford law; earnings management; performance matched discretionary accruals

1. Introduction

The interpretation of financial statements is quite significant and sensitive for the users of the financial statements. The quality of financial information has been an increasing concern in financial markets specially those issued by public companies due to the fact that the users of the financial information has to rely on the information those are made publicly available; as a result, the external and internal users of financial statement may adversely be affected (Lo et al, 2017).

Additionally, Fraud detection becomes more challenging and costly in the larger organisations, hence, such organisations deploy the proactive access restrictions, post facto forensic accounting systems. Therefore, the detecting earnings management has become quite crucial action of the larger organisation (McNichols & Wilson, 1988).

The other aspect of this paper is to employ the Benford analysis (Myers et al, 2007; Nigrini, 2015) as a benchmark and compare this with the practices of the organisations listed in FTSE350. The distribution of the data by Benford is a logarithmic distribution which detects the irregularities of the financial data; additionally, this is quite clear and effective model.

This paper calculates the value of the earnings management which are considered as observed data and the data identified by applying Benford Law is considered as expected data; henceforth, the comparison between observed data and expected probability alludes the accuracies and inaccuracies

 doi:10.20944/preprints202603.2212.v1

of the observed data. Authors who have used Benford's law (Saenz & Garcia, 2019; Nigrini, 2005) have shown that the distribution of first digits in financial reports complies with the law in most cases.

However, if there is a falsification of financial statements, then the distribution of the first digits changes. As a result, the likelihood of falsification of financial statements can be verified statistically, and, at least theoretically, the reliability of a specific financial report can be quantified (Zang, 2012).

Aim: Detecting the earnings manipulation by applying Benford's Law.

Objectives:

- To Estimate the value of Earnings Management by using Performance matched discretionary accruals model.
- To detect the earnings management practices and analyse it by applying Benford Law.

1.1. Benford Law

Scholars (Diaconis and Freedman, 1979; Hill, 1995; Berger and Hill, 2015) have agreed the view of Benford (1938) that any naturally occurred dataset has more small leading digits than large leading digits. They further emphasised that Benford has simplified the datasets by rounding the errors to get better fit for the logarithmic law. For this reason, Benford's law is very popular and has given rise to much different research (Berger & Hill, 2015).

In the studies by Carslaw (1988) and Nigrin (2005), they have identified that there were more 0s in the second digit than 9s in a sample of financial data of New Zealand firms. They further claimed the reason of such data manipulation was because managers are more inclined to round up the numbers upward to present the better financial report. Hence, they suggested that Benford's law is quite effective tool for fraud detection. The authors observed the data of the payroll and suggested that if the data are deviated from Benford's data, there persists the fraud and deception.

Nigrini (2015) also used the first and second-digit tests to detect tax evasion. Low-income taxpayers were more likely to fabricate numbers on their tax returns. In similar research, Amiram et al (2015) and Nigrini (2005) showed that digital frequencies are well suited to identifying manipulation in financial statements. Ozevin et al (2005) also used Benford's law to identify wide-scale earnings management in the period around the Enron crisis. Zdraveski & Janeska (2021) showed that Macedonian companies' income statement data fail Benford's law for all fraud observations.

1.2. Earnings Management

The manipulation of the financial information in the accounting practices are key issues in these days. The management themselves involve in such deceitful activities to fulfil their self-interest threat. Earnings management is quite popular idea in the accounting practices, hence, Scott (2015) conclude that there is no easy way to convince this practice. They further suggest that while investigating the accounting in the corporations, the analysts and the auditors have to overlook how the bonuses are being provided to the managers and how those provisions are being made unexpectedly by using accrual aspect of the accounting.

In terms of earnings management, there is no one specific definition; however, the standard understanding is that "Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers" (Healy and Wahlen, 1999, p.365).

The researchers; Watts & Zimmerman (1986), Alali & Romero (2013), in the past have identified various ways of incentives being provided but regarding Healy and Wahlen (1999) has alluded mainly three different types of manipulations as capital markets, the contract written for the managers if they are based on the profitability or sales, the requirements by political or regulatory framework in the accounting practices.

As per the definition of earnings management, "Earnings management is the choice by a manager of accounting policies, or actions affecting earnings, so as to achieve some specific reported

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earnings objective." (Scott, 2015 p.403); this signifies that there can appear mainly two perspectives. The first one is that the practice of earnings manipulation in favour of the management by violating the accounting procedures and the second one is that the control on the reported earnings by practising the real earnings management.

1.2.1. Detection of Earnings Management

In the analysis made by Ozevin et al. (2020) and Kumar & Mitra (2018), it is alluded that the discretionary accruals estimated by using Jones model (1991) is positively associated with return on assets. This method of calculating the value of abnormal accruals is mis specified, to elude this performance related misspecification, Kothari et al. (2005) has added a matched-firm or portfolio technique to reduce the errors in earnings management.

Moreover, discretionary accruals; also known as abnormal accrual or unexpected accruals, are based on manager's discretional power when the accounting values are abnormally manipulated. Some examples of discretionary accruals are allowance for doubtful receivables, worthless receivables, provisions for debt, reorganizational expenditures, impacts in changing accounting values, deferred revenues, accrued expenses, and profit or loss appeared when selling assets. Non-discretionary accruals are known as normal accruals. These accruals are basically related to everyday financial activities of a firm (Kothari, et al., 2005).

The choice of accounting policy actually indicates the involvement of discretionary accruals in the financial statements. The value of discretionary accruals contains severe error because Jones and modified Jones model do not suggest controlling the prior performance of the firms. As argued by Kothari et al. (2005), they input the lag of return on asset in the model that have intercept and control for firm's performance. This helps in mitigating the issues of heteroscedasticity that exists in Jones Model and modified Jones model.

Performance matched discretionary accrual model has added previous year's return on asset (ROA) as a variable in modified Jones model because the latter model does not concentrate on a specific event and correlation issues. Hence, this study uses Kothari et al. (2005) model in estimating the value of abnormal accruals. Thus, the discretionary accruals will be estimated by the residuals of the following cross-sectional model:

$$TAC_{i,t} = \alpha\left(\frac{1}{TA_{i,(t-1)}}\right) + \beta_1\left(\frac{\Delta Rev_{i,t} - \Delta Rec_{i,t}}{TA_{i\,(t-1)}}\right) + \beta_2\left(\frac{PPE_{i,t}}{TA_{i,(t-1)}}\right) + \beta_3(ROA_{i,(t-1)}) + \epsilon_{i,t} \quad \ldots\ldots\ldots\ldots\ldots \text{(i)}$$

1.2.2. Theory and Motivation of Earnings Management

Agency theory explains earnings management behaviour as a consequence of conflicts of interest between managers and shareholders, arising from the separation of ownership and control in public companies. Given that this research focuses on the manipulation of financial data by company managers, particular attention is paid to the application of agency theory in explaining earnings management practices (Amiram et al, 2015).

These conflicts incentivise managers to obscure the true financial position of the firm. This occurs due to costly contracting between managers and shareholders, shareholders' limited ability to fully monitor and understand managerial actions, and challenges in effectively communicating information. In this context, contracting theory, bounded rationality theory, and information asymmetry theory interact to shape earnings management behaviour (Badar et al, 2017).

Collectively, these theoretical perspectives suggest three primary categories of motives that drive earnings management: contracting motives, capital market motives, and third-party motives (Berger and Hill, 2015).

2. Methodology

This section describes about the data availability, research strategies and considers the balance sheet approach of calculating total accrual. This also presents the equation to demonstrate its relationship with discretionary accruals and non-discretionary accruals. Moreover, this section

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selects the performance matched discretionary accruals model to estimate earnings management out of many other models.

2.1. Measuring Total Accruals

This research comprises the data from companies listed in FTSE350 from 2019 to 2024 are used. The data was collected by using the database called FAME.

For data analysis purpose, this paper has made the use of SPSS and Ms-Excel. SPSS was used specially when the value of discretionary accruals was calculated and Ms-excel was used when analysing the observed data with expected data.

Accruals are actually the different between operating cash flows and earnings which have been formed as total accrual. To measure discretionary accruals total accruals and non- discretionary have to be calculated where Total accruals = discretionary accruals + non-discretionary accruals (Kumar et al., 2018).

It has been investigated that total accruals can be calculated from two different approaches which are balance sheet approach and cash flow statement- based approach. Healy (1985) and Jones (1991) have used balance sheet approach, as mentioned in equation (v), to calculate total accruals in which following formula has been used. This can be mentioned as below:

$$TA_t = (\Delta CA_t - \Delta Cash_t - \Delta CL_t + \Delta STDEBT_t - Dep_t) \quad \text{..... (ii)}$$

where,

ΔCA_t = Change in current assets in year t;

$\Delta Cash_t$ = Change in cash in year t;

ΔCL_t = Change in current liability in year t;

$\Delta STDEBT_t$ = Change in current maturities of long term debt and other short term debt included in current liabilities between current year t and previous year t-1;

Dep_t = Depreciation and amortisation expense in year t.

Hence, Accruals and manager's flexibility basically causes the earnings management practices. Numerous researches are being outgrown in this topic as it has unsolvable problems. Researchers are approaching to reduce the fraudulences that are involved in while practising earnings management. Various models have been found to investigate the degree of problems and measures for them (Kumar & Bhattacharya, 2007).

Since the estimation of non-discretionary is significantly unavoidable, the following model has been used to identify the value of non-discretionary accruals which is based on the parameters calculated by using equation (i) & (ii).

$$NDA_{i,t} = \alpha\left(\frac{1}{TA_{i,(t-1)}}\right) + \beta_1\left(\frac{\Delta Rev_{i,t} - \Delta Rec_{i,t}}{TA_{i\,(t-1)}}\right) + \beta_2\left(\frac{PPE_{i,t}}{TA_{i,(t-1)}}\right) + \beta_3(ROA_{i,(t-1)}) \quad \text{..... (iii)}$$

There is the heteroscedasticity issue as per calculation presented in the Table 2.0 in this model due to the fact that the original values of the variables; mentioned in equation (iii), are deflated by the value of total asset at (t-1). In some cases, researchers (Kossovsky, 2021; Bader & Saleh, 2017) admitted that to avoid heteroscedasticity for the model developed by performance matched discretionary accruals; deflating the values by previous year's total assets is appropriate.

Table 2.0

Regression Statistics	
R Square	0.004815361
No of Observation	1750
R Square Value	0.004815361
χ^2_{Calc} = N x R Square	8.426881871
Degree of Freedom (K-1)	3
R Square Critical Value	7.815

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As identified in the Breusch-pagan test in Table 2.0, the X^2_{Calc} = N x R Square > R-squared critical value, the data collected based on the FTSE350 companies are heteroskedastic.

Thirdly, discretionary accruals are computed as

$$DA_{i,t} = TA_{i,t} - NDA_{i,t} \quad \ldots\ldots\ldots \text{(iv)}$$

This study has not considered the particular events of the economies cycle while estimating the value of earnings management. On the other hand, the absolute value of earnings management has been formed to run the regression analysis; this is because the manipulation can be done in both positive and negative ways to meet the contractual obligations (Aguguom & Salawu 2018; Chung et al, 2015). Estimates of the firm specific parameters $\beta_1, \beta_2, \beta_3$ are generated using the performance matched discretionary accruals model in the estimation period.

2.2. Analysis of Observed Data with Expected Data

This paper has considered the expected data which was identified by Benford Law as the bench mark and the observed data which is represented by the values of the earnings management which has been calculated by using performance matched discretionary accruals.

The first digit, second digit and first two digits are used to identify the earnings manipulations. The observed data has been analysed against the data that has been set as the bench mark; expected data identified by using Benford Law.

Empirical studies led Benford (1938) to propose that, in many real-world applications, the first digits D1, the second digits D2, and the first two digits D3 follow the probability distribution below:

$$P(K_1 = k_i) = \log(1 + 1/k_i), \text{ for } (k_i = 1, 2, 3, \ldots\ldots, 9) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(v)}$$

$$P(K_2 = k_i) = \sum_{j=1}^{9} Log\left(1 + \frac{1}{10*j+k_i}\right), \text{ for } (k_i = 1, 2, 3, \ldots\ldots, 9) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(vi)}$$

$$P(K_3 = K_i) = \log(1 + 1/k_i), \text{ for } (k_i = 10, 11, 12, \ldots\ldots, 99) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(vii)}$$

3. Data Analysis

The presentation of the data, the calculations, the analysis based on the data are demonstrated in this section. As per the primary question of the research is 'do the various datasets from Benford law detect the earnings quality?', this research has performed various tests and provided empirical evidences; and the analysis are made based on those evidences and tests.

3.1. Earnings Management (Discretionary Accruals)

Based on the above equation, non-discretionary accruals can be calculated as NDA = TA – DA; & discretionary accruals is considered as

$$DA = TA - NDA \quad \ldots\ldots\ldots\ldots \text{(viii)}$$

The equation to calculate for non-discretionary accruals, as per the Table 6.1, has been identified as follow:

$$NDA = -0.055 - 1.46 * InverseOfTA + 0.005 * ChangeinSalesRecTA - 0.44 * PPETA - 2.75 * ROATA \ldots\ldots\text{(ix)}$$

From the calculation of Earnings management, this is identified that the most of the corporations have practised income decreasing discretionary accruals, which means that the organisations have practised earnings manipulation to lower the profit amount of the companies. This finding is also supported by Dechow & Schrand (2004) who has identified that the corporations have practised income decreasing practices of earnings management. They argue that the companies do take part in such activities due to income smoothing technique. The purpose of income smoothing is to bring stable financial status in the statements.

Income smoothing technique is identified in almost all industries of the organisations while there are better results in financial statements. The evidence from the past researchers Dong et al

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(2021), Essien et al (2016) allude that when the corporations are doing better or gaining more profit, they most likely perform the income decreasing accounting practices.

The other reason also can be because that corporations act just in opposite way as above mentioned when economy is in downturn. The research on earnings management has found that earnings management the corporations practise earnings manipulation as income increasing earnings management in the economic crisis and income decreasing earnings management in economic surge (Berger & Hill, 2015).

The value of earnings management is used in the form of absolute value considering only the magnitude which indeed helps the analysis to be made better. The direction aspect of the discretionary accruals has not been considered while making analysis.

Further, the coefficients are estimated by using Ordinary Least Square method based on the sampled data from FTSE350 index. Hence, non-discretionary accruals are calculated based on the obtained parameters from regressions of the total accruals; by using the linear equation as suggested by performance matched discretionary accruals model. Obviously, discretional accruals are calculated as per the formula:

$$DA = TA – NDA \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(x)}$$

The total accruals has been calculated by incorporating the corporations of FTSE350 companies from year 2019 till 2024.

The Table 4.0 above presents the coefficients to calculate the earnings management based on the performance matched discretionary accruals model. This table presents the negative sign (β2) in respect to property plant and equipment which signals the income decreasing earnings management; this is obvious as depreciation and amortisation factors are used while performing the financial statements.

Table 4.0.

Model			Unstandardized Coefficients
			B
1	(Constant)		-0.055
	1/TA	α	-1.44
	Change in (Sales-Rec)/TA	β1	0.005
	PPE/TA	β2	-0.44
	ROATA	β3	-2.75

The coefficient β1 has positive sign which represents the relationship between Changes in revenue and total accruals, hence, there is positive impact of discretionary accruals. The main idea in this is because the sales have been increased from years to years which represents that the change in revenue is positive which has positive impact in generating profit; most of the time. However, there is impact on increasing and decreasing earnings management as per the increment in account receivable and payable, respectively.

While mentioning the relevance of performance matched discretionary models, this model has been the most effective model. Many researchers have identified that the performance matched discretionary accruals is the most significant by the past research. It is identified that this model is significant at 1% confidence level. The power of the model has been identified as 57% by the researchers, hence, this research has adopted the idea of this model (Carslaw, 1988 and Dong et al, 2021).

After this justified reason which indicates that the performance matched discretionary accruals is the most significant one, this research has embraced the idea of this model and has calculated the

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nondiscretionary accruals. Discretionary accruals, then, has been calculated by reducing non-discretionary accruals from total accruals.

3.2. Analysis of Earnings Management Practices Against the Benford Law

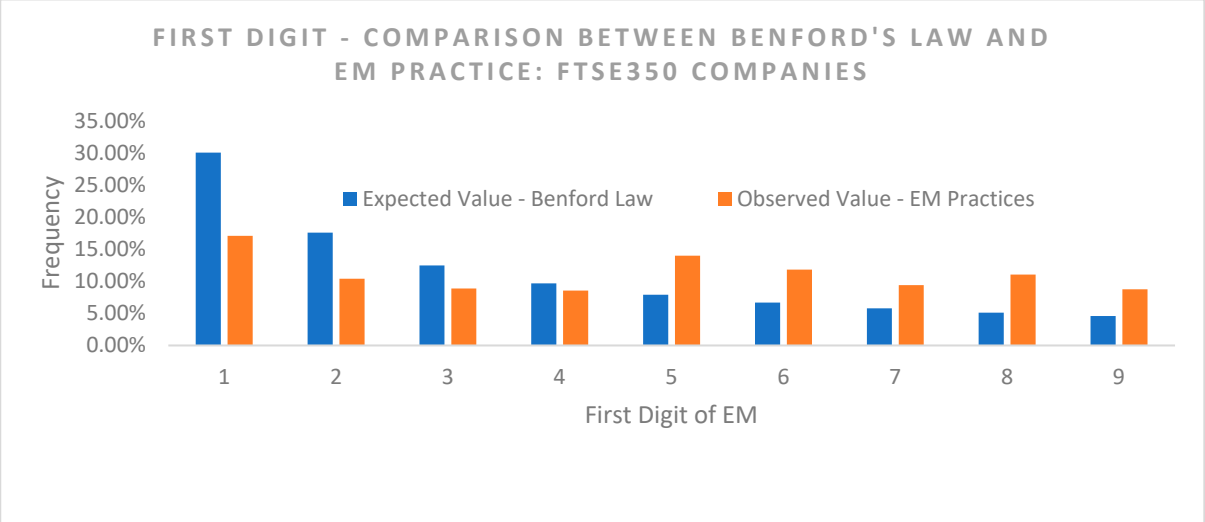
This paper has adopted the model developed by Benford and analyse the earnings management data benchmarking the standard developed by Benford. The first digits, second digits and first two digits of the value of discretionary accruals have been considered in this paper. These digits have been analysed assuming the Benford law's line as perfect benchmark.

3.2.1. An Interpretation of First Digits

Benford's Law is very well and pragmatically developed mathematical theory which demonstrates the frequency distribution of naturally occurred real-life datasets. Hence, the auditors, financial managers and other interested parties used this law to identify the fraudulences and irregularities in the datasets. The assumption is that if there are evidences of significant deviations of the frequencies of the datasets from Benford's Law, this is considered as manipulated which indicates the error or inaccurate reporting (Kossovsky, 2021).

The Table 4.1 identifies that none of the digits from expected data are aligned with observed data. Benford's Law (1983) suggests the relative measurement of the frequency distribution in terms of what number leads in the datasets. He identifies that the numbers of the dataset that starts from digit 1 are nearly 30% while starting from digit 9s are less than 5%. Therefore, this can be concluded that number starting from 1 appears 6.5 times more than the leading numbers that start from 9 in a particular naturally occurred dataset.

Table 4.1



The data of earnings management practices by FTSE350 companies does not align with the data developed by Benford Law; leading first digits from 1 to 9 but the both line graph at Table 4.2 and bar graph at Table 4.1 presents the uniformity in the data pattern which demonstrate that from first digits 1 to 4 the expected data is higher than the observed data. This result is quite opposite of leading first digits from 5 to 9.

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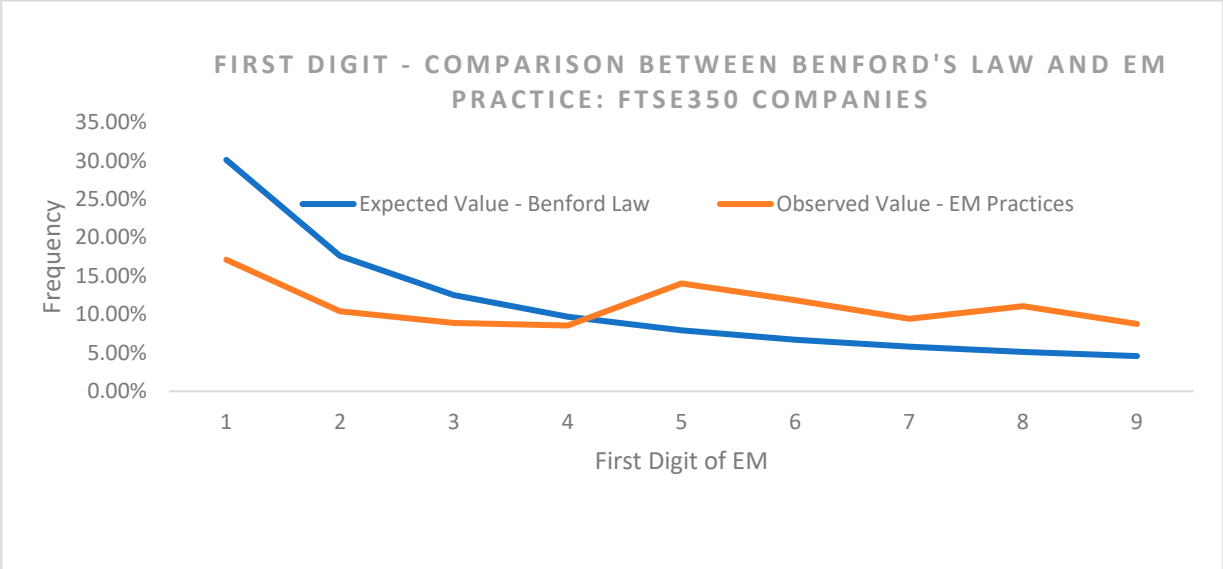
Table 4.2.



The lower value of frequency of first digit data of observed data than expected data links with Big Bath concept of the accounting manipulation while the higher value of the frequency of first digit data of observed data than expected data links with the Cookie Jar concept of accounting manipulation.

This investigative research has also identified the practice of big bath technique while manipulating earnings. The term 'big bath' simply refers to the practice of inflating the profits in subsequent years altering the financial materials in the financial statements. This practice may further worsen the financial results during the accounting period when the business results are bad (Lo & Rogo, 2017).

In the above graphs, towards the smaller digits' side, the frequency of earnings management presents smaller results than the bench mark; this signals that the companies may be practising the income decreasing approach of earnings management when their financial performances are worsening. The findings of this research by Saenz & Garcia (2014) eludes that a huge bath is a process carried out by a corporation when its annual earnings decline is too large to be offset by discretionary goods, where the companies produce further negative results of financial performance which helps them create the reserves; hence, the reserves can be used to make the substantial financial situation favourable.

On the other hand, the bar also presents that aggressive accounting technique has been used to create the Cookie Jar effect. The frequency of first higher digits; from digit 5 to digit 9, of the observed data is larger than the bench mark which suggests that the companies are practicing Cookie Jar technique of earning manipulation. Just contrarily to Big bath techniques, Cookie jar techniques takes place when the organisations keep reserves excessively when the companies are performing better in terms of their profit matters which then can be utilised during lower-profit accounting periods. This is basically to impress that the organisation creates consistent results than is really the case (Scott, 2015).

3.2.2. An Interpretation of Second Digits

This paper argues that the income has been manipulated using big bath techniques when the organisations are declining their financial performance while the income has been manipulated by adopting cookie jar techniques when the organisations have better financial performance. Further, the use of income smoothing techniques is quite obvious in the graph as this presents the gradual declined earnings management from digits 1 to 4 and there is gradual increment from digits 5 to 9.

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Further, the Tables 4.3 and 4.4 presents the bar graphs and number line graph based on the frequencies of expected data; Benford law, and Frequencies of the observed data; Earnings management. As mentioned above, the graph of the expected data has been considered as the bench mark, therefore, this paper identifies that the representation of the data of the financial performance of FTSE350 companies are manipulated. It presents that the companies are aggressively manipulating earnings management. The graphs are not properly aligned which means the data of financial information by the listed companies are falsified.

Table 4.3.

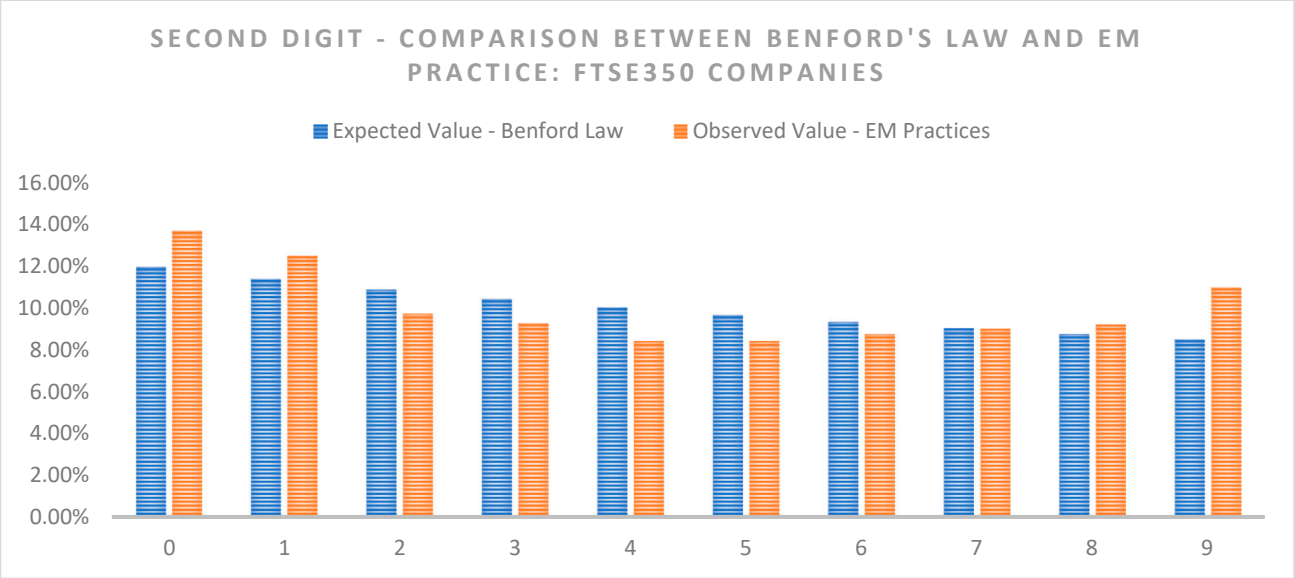
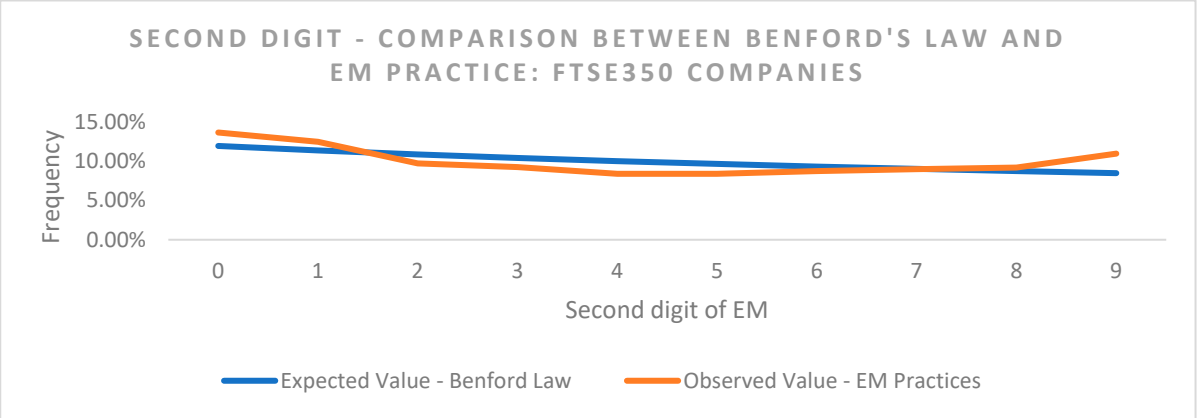


Table 4.4.



The pattern of the graphs of frequencies of first digits does not align with the result of the second digits. The earnings management practices at lower digits and higher digits demonstrates that the companies are practising aggressively upward earnings management while at the digits from 2 to 6; it shows that the companies are presenting downward earnings management when the graphs of discretionary accruals are compare to the expected data.

As per the research by Herteliu et al (2021) the results of the study show a trend for the Romanian companies listed on AeRo market toward rounding up the net income, although the dimensions of these rounding seem to be limited. Considering the second digits of the data, this paper too confirms the practice of both upward and downward manipulations of earnings. However, as compared to first digits and fist two digits, the second leading digits does not present any significant and regular pattern to conclude that the companies are practising any sort of specific trends to discretionary accruals.

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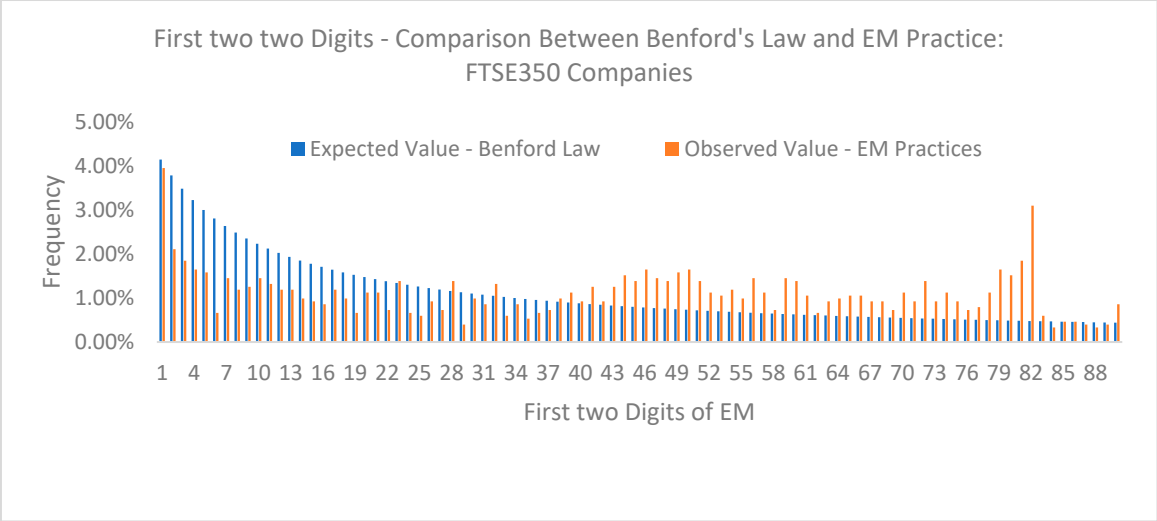
Herteliu et al (2021) further confirm that after applying the Jones model the findings reveals that the signal sent by the cosmetic earnings management identified is confirmed by the existence of discretionary accruals. As this paper confirms that the Listed companies of Bucharest Stock Exchange practices earnings management while making analysis of second digits of the earnings management data, this paper also presents the similar results since there is significance gap between the observed data and expected data.

3.2.3. An Interpretation of First Two Digits

Table 4.5.



This paper at this section has identified the frequency of first two digits which ranged from 10 to 99. The above graph has considered the data identified by the probabilities formulated by Benford Law and the observed data; the frequency of two digits of the earnings management values based on FTSE350 companies. The frequencies of two digits are calculated by adopting Benford principle which has been considered as bench mark in this research.

The graph highlights that the values of frequencies of earnings management from 0 to 49 are lower than the bench mark which support the view that the companies practices the Big Bath techniques of earnings manipulation. Similarly, the values of frequencies of earnings management from 50 to 99 are higher than the bench mark. This support the view that the companies use cookie jar techniques of earnings management when they perform better.

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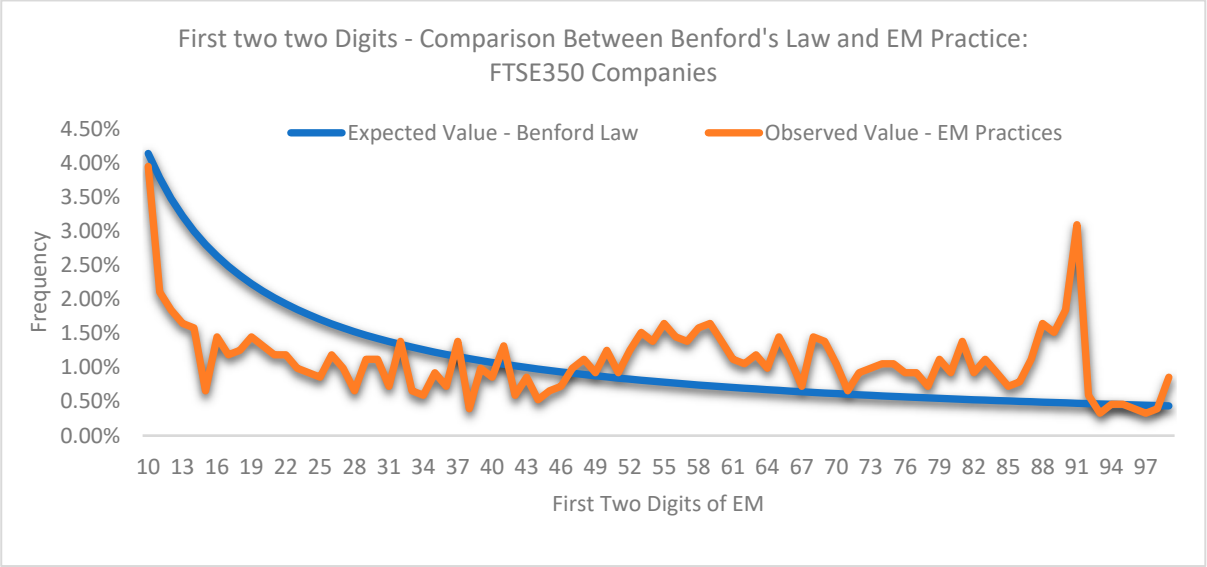
Table 4.6.



This finding aligns with the view of Shuto (2007), Suda and A Shuto (2006) who confirm that cookie jar techniques enable corporations to overestimate expenses in the current period for earnings management. If and when actual expenses results lower than the estimation the managers do, the cookie jar technique can be used to bridge the difference and the company can boost profits to meet predictions.

The first two digits data of the frequency of earnings management oppose the view of income smoothing that was identified from the analysis of the frequency of fist digits data. The Results identified from the analysis of the first digits supports view of income smoothing equally employs accounting techniques to flatten uneven income fluctuations from one accounting period to the next **(**Chia-Hao & Pei-I, 2020)); while, the frequency of first two digits showed an uneven earnings manipulation since the graph presents a lot of fluctuations over the various digits.

Prior studies Hu et al (2022) and Zhang et al (2017) have also conform that corporate managers engage in earnings manipulation either by adopting big bath or cookie jar or other techniques so that the interested parties show their interest to the organisaiton and pay a premium for stock with a stable and predictable earnings trend as opposed to volatility trend pattern of stocks being regarded as riskier for risk-averse investors. This view of the researchers is highly supported by the findings of this paper when the analysis of the frequency of first digit is closely observed. This demonstrates the evenly manipulated earnings which helps the investors make better the financial decisions.

3.2.4. Chi-Square Test

Table 4.7.

Chi Square Test	
First Digit	0.25
Second Digit	0.34
First two digits	0.33

As suggested by Dong et al (2021) the chi-squared test is a statistical test used to determine if there is a significant association between observed and expected frequencies in categorical data, this paper considers the Chi-square Test in addition to other tests as discussed above to further confirm the relationship between the proposed data of the Benford Law and the value of earnings management. This test demonstrates the significant relationship between two variables only if the P-value is less than 0.05.

 doi:10.20944/preprints202603.2212.v1

But the above table presents the chi-square values as 0.25, 0.34 & 0.33 for first digit, second digit and first two digits respectively; where all the P-values are greater than 0.05. Therefore, these results too demonstrates that the observed values have no significant relation with the expected value. This further signifies that the observed value are not naturally occurred value and approves that the FTSE350 companies are largely occupied in practising aggressive accounting.

This finding has supported the view that the deviation of the digits of accounting numbers from Benford's Law is mainly caused by an introduction of frauds, errors or biases, such as earnings management (Essien, 2018; Herteliu et al, 2021).

Our results support the use of Benford's Law as an analytical procedure in an audit engagement because Benford's Law can flag material misstatements in accounting data. Our evidence show that deviations of first digits, second digits and first two digits are positively related to both earnings management.

4. Conclusions

The paper uses the Benford's law to detect the manipulation of the earnings. It has considered the discretionary accrual as a proxy of earnings management. This study has estimated the value of earnings management by adopting the performance matched discretionary accruals. The consideration of total accruals, non-discretionary accruals and discretionary accruals has clarified how the earnings management have been estimated. Moreover, the calculation of totals accrual has adopted the balanced sheet approach.

The Benford's frequency of first digit and two first digits laws have been implemented to detect earnings management. From the data analysis and observation of the graphs, it is investigated that the FTSE350 companies are involved in aggressive earnings management. The smooth decrease of earnings manipulation in the smaller digits and smooth increase of earnings management in higher digits may signal that the companies implemented Big Bath technique when they have poor financial performance and deploy Cookie Jar technique when they have stronger financial performance.

Further, the results identified by analysing the graphs of frequency of first digit clearly denotes the active participation of FTSE350 companies in aggressive earnings management and smoothing earnings management. This also represents the Big Bath and Cookie Jar techniques the companies are adopting in earnings management. on the other hand, when the results of the frequency of two first digits of the earnings management are compared to Benford's Law, it presents that these listed companies are actively engaged in aggressive earnings management but regarding the income smoothing, the results does not support the outcome of the frequency of first digit analysis.

References

1. Aguguom, T. A., & Salawu, R. O. (2018). Earnings quality and firms book value: An empirical evidence from the listed firms in Nigeria. *Journal of Internet Banking and Commerce,* 24(1), 1-22.
2. Alali, F., & Romero, S. (2013). Benford's Law: Analyzing a decade of financial data. *Journal of Emerging Technologies in Accounting,* 10(1), 1-39. https://doi.org/ 10.2308/jeta-50749
3. Amiram, D., Bozanic, Z., & Rouen, E. (2015). Financial statement errors: Evidence from the distributional properties of financial statement numbers. *Review of Accounting Studies,* 20, 1540-1593. https://doi.org/10.1007/s11142-015-9333-z
4. Bader, A. A., & Saleh, M. M. A. (2017). Evidence on the extent of cosmetic earnings and revenues management by Jordanian companies. *International Journal of Economics and Financial Issues,* 7(3), 20-30. https://www.econjournals.com/index. php/ijefi/article/view/4370/pdf
5. Benford, F. (1938). The law of anomalous numbers. *Proceedings of the American Philosophical Society*, 78(4), 551-572. https://www.jstor.org/stable/984802
6. Berger, A., & Hill, T. P. (2015). *An introduction to Benford's law*. New Jersey: Princeton University Press. https://doi.org/10.23943/princeton/9780691163062.001.0001

 doi:10.20944/preprints202603.2212.v1

7. Carslaw, C. A. P. N. (1988). Anomalies in income numbers: Evidence of goal oriented behaviour. *Accounting Review*, 68(2), 321-327. https://www.jstor.org/stable/248109
8. Chia-Hao Lee & Pei-I Chou. (2020) Industry competition, earnings management and leader–follower effects, Applied Economics, 52:4, 388-399.
9. Chung, R., Lee, B. B.-H., Lee, W.-J., & Sohn, B. C. (2015). Do managers withhold good news from labor unions? *Management Science,* 62(1), 46-68.
10. Creswell, J. W., & Creswell, J. D. 2017. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications
11. Dechow, P., & Schrand, C. (2004). *Earnings quality Charlottesville,* Virginia: The Research Foundation of CFA Institute
12. Diaconis, P., & Freedman, D. (1979). On rounding percentages. *Journal of the American Statistical Association,* 74(366a), 359-364. https://doi.org/10.1080/01621459.1979. 10482518
13. Dong, R., Fisman, R., Wang, Y., & Xu, N. (2021). Air pollution, affect, and forecasting bias: Evidence from Chinese financial analysts. Journal of Financial Economics, 139(3), 971-984. Available at: https://doi.org/10.1016/j.jfineco. 2024.12.004
14. Essien, E. A., & Ntiedo, J. U. (2018). The influence of creative accounting on the credibility of accounting reports. *Journal of Financial Reporting and Accounting,* 16(2), 292-310.
15. Healy, P.M. (1985). The effect of bonus schemes on accounting decisions. *Journal of Accounting and Economics,* 7(1-3), 85-107.
16. Herțeliu, C., I. Jianu, I. M. Dragan, S. Apostu, and I. Luchian. 2021. "Testing Benford's Laws (Non) conformity Within Disclosed Companies' Financial Statements Among Hospitality Industry in Romania." Physica A: Statistical Mechanics and its Applications 582: 126221. https://doi.org/10. 1016/j.physa.2021.126221 .
17. Healy, P. M. and J. M. Wahlen. 1999. A review of the earnings management literature and its implications for standard setting. *Accounting Horizons* (December): 365-383.
18. Hill, T. P. (1995). A statistical derivation of the significant-digit law. *Statistical Science,* 10(4), 354-363. https://doi.org/10.1214/ss/1177009869
19. Hu, M., A. Muhammad, and J. Yang. 2022. "Ownership Concentration, Modified Audit Opinion, and Auditor Switch: New Evidence and Method." *The North American Journal of Economics & Finance* 61: 101692. https://doi.org/10.1016/j.najef.2022.101692
20. Jones, J. J. 1991. "Earnings Management During Import Relief Investigations." *Journal of Accounting Research* 29 (2): 193–228. https://doi.org/10.2307/2491047 .
21. Kossovsky, A. E. (2021). On the mistaken use of the chi-square test in Benford's Law. *Stats*, 4(2), 419-453. https://doi.org/10.3390/stats4020027
22. Kothari, S.P., Leone, A.J. and Wasley, C.E. (2005) Performance Matched Discretionary Accrual Measures. Journal of Accounting and Economics, 39, 163-197. http://dx.doi.org/10.1016/j.jacceco.2004.11.002
23. Kumar, K., & Bhattacharya, S. (2007). Detecting the dubious digits: Benford's law in forensic accounting. *Significance*, 4(2), 81-83. https://doi.org/10.1111/j.1740-9713. 2007.00234.x
24. Kumar, S. B., Goyal, V., & Mitra, S. K. (2018). Do Indian firms manage earning numbers? An empirical investigation. Academy of Accounting and Financial Studies Journal, 22(1), 1-7. https://www.abacademies.org/articles/Do-indian-firms-manage -earning-numbers-an-empirical-investigation-1528-2635-22-1-113.pdf
25. Lo, K., Ramos, F. and Rogo, R., 2017. Earnings management and annual report readability. *Journal of accounting and Economics,* 63(1), pp.1-25.
26. McNichols, M. and Wilson, G.P., 1988. Evidence of earnings management from the provision for bad debts. *Journal of accounting research,* pp.1-31.
27. Myers, J.N., Myers, L.A. and Skinner, D.J., 2007. Earnings momentum and earnings management. *Journal of Accounting, Auditing & Finance*, 22(2), pp.249-284.
28. Nigrini, M. J. (2005). An assessment of the change in the incidence of earnings management around the Enron--Andersen episode. *Review of Accounting and Finance,* 4(1), 92-110. https://doi.org/10.1108/eb043420

 doi:10.20944/preprints202603.2212.v1

29. Nigrini, M. J. (2015). Persistent patterns in stock returns, stock volumes, and accounting data in the US capital markets. *Journal of Accounting, Auditing & Finance,* 30(4), 541-557. https://doi.org/10.1108/eb043420
30. Özevin, O., Yücel, R., & Öncü, M. A. (2020). Fraud detecting with Benford's law: An alternative approach with BDS and critic values. *Muhasebe Bilim Dünyası Dergisi*, 22(1), 107-126. https://doi.org/10.31460/mbdd.609957
31. Sáenz González, J. and García-Meca, E., 2014. Does corporate governance influence earnings management in Latin American markets? *Journal of business ethics*, 121, pp. 419-440.
32. Scott, R. William. 2015. *Financial Accounting Theory*. Seventh Edition. Pearson Prentice Hall: Toronto.
33. Shuto, A. 2007. Executive compensation and earnings management: Empirical evidence from Japan. *Journal of Internatinal Accounting, Aauditing and Taxation*. 16(2007): 1-26.
34. Suda, K., and A. Shuto. 2006. Earnings management to meet earnings benchmarks: Evidence from Japan. *Focus on Finance and Accounting Research*. Nova Science Pub Inc. 67-85.
35. Watts R. and Zimmerman J. 1986. *Positive Accounting Theory*, Prentice-Hall, Englewood Cliffs, NJ.
36. Zang, A.Y., 2012. Evidence on the trade-off between real activities manipulation and accrual-based earnings management. *The accounting review*, 87(2), pp.675-703.
37. Zdraveski, D., & Janeska, M. (2021). Application of Benford's law for detecting manipulation in the financial statements in Macedonian companies. Annals of the "Constantin Brancusi" University of Targu Jiu, Economy Series, 6, 4-13. https://www. utgjiu.ro/revista/ec/pdf/2021-06/01_Dejan.pdf
38. Zhang, X., Yang, and Ke, L. (2017) "The evolutionary game simulation on Technology innovation between government and small and medium-sized enterprises," *Science and Technology Management Research*, vol. 37, no. 12, pp. 15–23.