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Examining Financial Reporting Fraud in Sudan's Telecom Industry: Sudatel Telecommunication as a Case Study

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Abstract: *The pervasive issue of financial statement fraud undermines economic stability and investor confidence, particularly in fragile economies like Sudan. This research examines the prevalence of financial reporting fraud within Sudan's telecom industry, focusing on Sudatel Telecommunication Group Company as a case study. Utilizing Benford's Law, a statistical tool widely recognized for detecting anomalies in numerical datasets, the research analyses financial statements spanning 2006 to 2023. The results reveal that key accounts including operating revenues, operating expenses, marketing and selling expenses, general and administrative expenses, exchange difference on translate, and cash and bank balances - are largely conform to Benford's Law for both the first and second digits. This suggests a general alignment with expected numerical patterns, indicating a lower likelihood of systemic manipulation or fraud in these areas. Conversely, specific financial categories including property, plant and equipment, intangible assets, trade and other receivables, foreign currency translation reserve, revaluation reserve, loans and borrowings, and trade payables and accruals - showed significant deviations from Benford's Law for the first digits. Moreover, these same seven accounts - except intangible assets - displayed similar patterns of non-conformity for both the first and second digits, suggesting possible inconsistencies in valuation or reporting practices.*

Keywords: Fraud, Financial Reporting, Benford Law, Sudan

1. Introduction

Although corruption is widespread throughout the world, it has a greater negative impact on fragile economies like Sudan, the international community views Sudan as being extremely corrupt, and all available data and country reports show that corruption is widespread, and endemic at all levels of society in Sudan (Elamin, 2019). Out of 84 nations, Sudan was ranked last and occupied the lowest spot, sharing it with Sao Tome, the Democratic Republic of the Congo, and Equatorial Guinea (Hamid et al., 2018).

Sudan suffers from high rates of corruption, ranking 168 out of 180 countries in the Transparency International's 2021 Corruption Perceptions Index (Transparency International, 2022). The Republic of Sudan acknowledged the existence of corruption offenses that take advantage of employment (Wikipedia, 2023). According to Sudan's Open Budget Survey 2019 report, the country scored two percent on transparency, zero percent on public participation, and thirty-three percent on budget oversight (The International Budget Partnership, 2019).

Sudan is also not implementing IFRS, which limits the quality of its financial reporting (Sekerez et al., 2022). Furthermore, Sudan suffers from inadequate auditing and accounting professions, poor reporting and disclosure standards, accounting information that is either not readily available, irrelevant, or unrealistic, and the use of false and insignificant accounting information in internal and external decision making (Elhussein, 2012).

Financial statement fraud is defined as a deliberate action or negligence in the form of a willful act or omission that led to material errors in the financial statements (Manurung and Hadian, 2013). Although there are minor variations in its definition, fraud in financial statements is defined by the Association of Certified Fraud Examiners as the willful, intentional, misstatement or omission of material facts or accounting data that is misleading when considered with all information provided available, would cause the reader to change his judgment or decision (Zhou and Kapoor, 2011).

Today, there are many ways to detect financial statement fraud, and Benford's Law is one of the most crucial ones. Benford's law uses digital processes to enable forensic accountants to find fraud, manipulation, and other mistakes that may be existent in accounting data (Gorenc, 2019). According to Johnson and Weggenmann (2013), significant discrepancies between the actual data and Benford's Law could be a sign of fraud, coincidence, or error. Benford's Law applies to data sets that grow exponentially, but it also seems to apply in many situations where an exponential growth pattern is not immediately apparent (Singleton, 2011).

Financial statement fraud in Sudan remains a critical concern, with significant implications for the financial integrity of companies and institutions. Forensic accounting has emerged as a vital tool in addressing financial misstatements in Sudan. Ismael and Babiker (2017) highlight that forensic accountant enhance the reliability of financial reports by applying investigative skills to detect fraud; Their research emphasizes that forensic accounting improves transparency and safeguards corporate financial reports, protecting stakeholders from fraud. In addition to forensic methods, Saeed and Hagras (2019) propose a fraud detection system using Fuzzy Logic, which is particularly relevant in Sudan where traditional fraud detection methods are lacking; Their model offers real-time, transparent analysis of financial transactions, reducing fraud in the Sudanese banking sector by identifying suspicious patterns automatically. Meanwhile, forensic investigations are also pivotal in commercial banking. A study by Mabior and Wanyama (2024) on South Sudanese banks highlights those advanced forensic techniques combined with robust internal controls are essential in mitigating fraud. Moreover, Sudanese accountants support the adoption of International Financial Reporting Standards (IFRS) as a means to reduce fraud by improving financial transparency, although skepticism remains about its practical implementation due to local regulatory and business culture constraints (Spasić et al., 2021). Fraudulent financial practices in Sudan often stem from systemic issues such as corruption, inadequate legal frameworks, and weak internal controls. To combat these challenges, Sudanese companies must adopt international best practices in forensic accounting and fraud prevention. One critical step involves establishing whistleblower protection programs to encourage employees to report unethical practices without fear of retaliation. Moreover, implementing technologies such as blockchain can enhance transparency by creating tamper-proof records of financial transactions. Collaborating with international anti-fraud organizations could also provide Sudan with the expertise and resources needed to tackle sophisticated fraud schemes.

The serious corruption problem in Sudan is the motivation behind this research, which uses Benford's law to determine whether there is fraud in the financial statements of telecom

companies in Sudan. The research utilizes Benford's law to the financial statements of Sudatel Telecommunication company operating in Sudan for the years 2006 through 2023 and determine whether financial reporting fraud is existing there. The problem of this research is driven by the severe issue of corruption in Sudan, as evidenced by its low ranking of 168 out of 180 countries in Transparency International's 2021 Corruption Perceptions Index. This is further exacerbated by the exploitation of the employment situation and a lack of transparency, public participation, and budget oversight. Additionally, the country's failure to implement IFRS limits the quality of financial reporting and deficiencies in the auditing and accounting professions, poor reporting and disclosure standards, and the use of unrealistic and false accounting information contribute to the problem. These issues have significant negative impacts on internal and external decision making in Sudan.

2. Research Methods

Data Sources

Secondary quantitative data from Sudatel Telecommunication Group Company financial statements from 2006 to 2023 is used in the research. Furthermore, secondary data from previous studies, articles, books, and so forth is used in the research.

Bedford's Law

By the end of the nineteenth century, Newcomb-Benford's Law had been empirically discovered. It all started in 1881, with the discovery of an American astronomer and mathematician. While browsing through heavily used logarithmic tables in the library, Simon Newcomb noticed that the front pages were much more eroded than the last ones, leading him to the conclusion that digits beginning with the number 1 were much more common than digits beginning with the number 2 and so on. As a result, he concluded that the probability of any digit (N) being the first of any number equals log10 (N +1) - log10 (N). And the probability of any digit (N) being the second digit is P(d)=k=1∑9 log10(1+10k+d1) (Da Silva, 2013).

According to Benford's law, the likelihood of a digit appearing in different places in a number decreases logarithmically as the digit value increases (Gorenc, 2019). Benford's Law states that in a genuine data set of numbers, the numeral 1 will be the leading digit 30.1% of the time; the numeral 2 will be the leading digit 17.6% of the time; and each subsequent numeral, 3 through 9, will be the leading digit with decreasing frequency (Collins, 2017).

Benford's law is used by many researches on fraud such as: Renaldo et al., 2021; Durtschi et al., 2004; Mustafa, 2019; Grammatikos and Papanikolaou, 2020; Diekmann & Jann, 2010.

Testing Benford Conformity

Kolmogorov-Smirnov Test

The Kolmogorov-Smirnov (K-S) test evaluates whether the observed data conforms to the expected distribution outlined by Benford's Law. It operates by comparing the cumulative distribution function (CDF) of the observed data with the theoretical CDF of Benford's expected values.

The test calculates the maximum absolute difference (D) between these two distributions, expressed as:

$$D = \max|F_n(x) - F(x)|$$

Where:
$F_n(x)$: The cumulative distribution of the observed data.
F(x): The cumulative distribution of Benfords' expected values.
The critical value for D depends on the sample size (N) and the chosen significance level (α = 0.05) with a standard constant of 1.36. The formula for the critical value is:

$$D_{crit} = \frac{1.36}{\sqrt{N}}$$

If D is less than or equal to D_{crit}, the null hypothesis that the data conforms to Benford's Law is accepted. Conversely, if $D > D_{crit}$, the null hypothesis is rejected, indicating potential non-conformity and raising concerns about the integrity of the data.

In this research, the K-S test was applied to assess both the first- and second-digit distributions in Sudatel's financial statements. The results showed the extent of conformity of the observed data to Benford's expectations, providing insights into potential irregularities or compliance.

Chi2 Test
The Chi-Square (χ^2) test is employed to determine the goodness of fit between the observed frequencies of digits and the expected frequencies as predicted by Benford's Law. This test evaluates whether discrepancies between observed and expected values are statistically significant. The Chi-Square statistic is calculated using the following formula:

$$x^2 = n\sum_{i=1}^{9} \frac{(O_i - P_i)^2}{P_i} \quad for\ the\ first\ digit$$

And

$$x^2 = n\sum_{i=0}^{9} \frac{(O_i - P_i)^2}{P_i} \quad for\ the\ second\ digit$$

Where:
O_i: The observed frequency for each digit.
P_i: The expected frequency for each digit as per Benford's Law.

The degrees of freedom for the test are determined by the number of categories minus 1. The critical value for Chi-Square statistic is obtained from Chi-Square distribution tables based on the chosen significance level (α=0.05) and degree of freedom.

If the calculated value is less than the critical value, the null hypothesis, that the data conforms to Benford's Law, is accepted. Otherwise, the null hypothesis is rejected, suggesting potential irregularities or deviations in the data.

In this research, the Chi-Square test was applied to the first- and second-digit distributions across Sudatel's financial statements. The results provided a statistical measure of compliance, aiding in the identification of potential anomalies or manipulation.

3. Data Analysis and Results

Benford's Law was applied to assess the integrity of Sudatel Telecommunication Group's financial statements from 2006 to 2023, focusing on the conformity of first- and second-digit distributions to expected frequencies. To perform the analysis, the Chi-Square and Kolmogorov-Smirnov tests were used. The Chi-Square test assessed the fit between observed and expected distributions, while the K-S test measured the maximum cumulative difference between them. Various accounts were analyzed to identify potential anomalies that may suggest errors or manipulation.

Table 1: First Digit Results

Item	Benford (O-E) ^2/E	Chi Square (P-Value)	Evidence of Fraud	Kolmogrov Smirnov	Evidence of Fraud
Operating Revenues	11.44	0.180	No Evidence	32.7%	No Evidence
Operating Expenses	7.40	0.497	No Evidence	63.9%	No Evidence
Marketing and Selling Expenses	8.20	0.414	No Evidence	58.9%	No Evidence
General and Administrative Expenses	4.48	0.812	No Evidence	60.0%	No Evidence
Exchange Difference on Translate	2.79	0.947	No Evidence	88.6%	No Evidence
Property, Plant and Equipment	118.00	0.000	Possibility of Fraud	0.0%	Possibility of Fraud
Intangible Assets	25.70	0.001	Possibility of Fraud	26.1%	No Evidence
Trade and Other Receivables	42.20	0.000	Possibility of Fraud	0.01%	Possibility of Fraud
Cash and Bank Balances	8.07	0.427	No Evidence	36.5%	No Evidence
Foreign Currency Translation Reserve	37.39	0.000	Possibility of Fraud	0.11%	Possibility of Fraud
Revaluation Reserve	39.67	0.000	Possibility of Fraud	15.6%	Possibility of Fraud
Loans and Borrowings	41.98	0.000	Possibility of Fraud	1.8%	Possibility of Fraud
Trade Payables and Accruals	51.13	0.000	Possibility of Fraud	0.3%	Possibility of Fraud

Table (1) above presents the results of chi-square and K-S tests for the first digit. The results revealed that there is a possibility of fraud in seven items including property, plant and equipment, intangible assets, trade and other receivables, foreign currency translation reserve, revaluation reserve, loans and borrowings, and trade payables and accruals.

Table (2) below presents the results of chi-square and K-S tests for the second digit. Only two items were found to possibly be fraudulent, these items are foreign currency translation reserve and revaluation reserve.

Table 2: Second Digit Results

Item	Benford (O-E) ^2/E	Chi Square (P-Value)	Evidence of Fraud	Kolmogrov Smirnov	Evidence of Fraud
Operating Revenues	15.06	0.089	No Evidence	62.6%	No Evidence
Operating Expenses	4.07	0.654	No Evidence	79.3%	No Evidence
Marketing and Selling Expenses	7.52	0.536	No Evidence	59.8%	No Evidence
General and Administrative Expenses	7.06	0.613	No Evidence	86.4%	No Evidence
Exchange Difference on Translate	11.00	0.262	No Evidence	87.0%	No Evidence
Property, Plant and Equipment	9.62	0.382	No Evidence	56.5%	No Evidence
Intangible Assets	11.79	0.225	No Evidence	61.0%	No Evidence
Trade and Other Receivables	1.51	0.997	No Evidence	85.8%	No Evidence
Cash and Bank Balances	2.72	0.974	No Evidence	70.3%	No Evidence
Foreign Currency Translation Reserve	23.45	0.005	Possibility of Fraud	11.5%	Possibility of Fraud
Revaluation Reserve	157.18	0.000	Possibility of Fraud	0.2%	Possibility of Fraud
Loans and Borrowings	16.14	0.064	No Evidence	17.8%	No Evidence
Trade Payables and Accruals	7.39	0.596	No Evidence	40.4%	No Evidence

The previous results reveal that key accounts including operating revenues, operating expenses, marketing and selling expenses, general and administrative expenses, exchange difference on translate, and cash and bank balances - are largely conform to Benford's Law for both the first and second digits. This suggests a general alignment with expected numerical patterns, indicating a lower likelihood of systemic manipulation or fraud in these areas.

Conversely, specific financial categories including property, plant and equipment, intangible assets, trade and other receivables, foreign currency translation reserve, revaluation reserve, loans and borrowings, and trade payables and accruals - showed significant deviations from Benford's Law for the first digits. These deviations were supported by p-values below the threshold of 0.05 in both the Chi-Square and Kolmogorov-Smirnov tests. For instance, the p-value for property, plant, and equipment was less than 0.0001, strongly indicating that the first digits do not conform to expected distributions. These findings point to potential anomalies that warrant further investigation, as they may signal irregularities such as misstatements or intentional manipulation in financial reporting.

Moreover, the same seven above mentioned accounts – except intangible assets - displayed similar patterns of non-conformity for both the first and second digits, suggesting possible inconsistencies in valuation or reporting practices. These areas represent critical components of the financial statements and their misrepresentation could significantly impact the perceived financial health and stability of the entities involved.

4. Conclusion

This research examined the financial reporting practices of Sudatel Telecommunication Group using Benford's Law as the primary forensic tool, complemented by statistical methods like the Chi-Square test and Kolmogorov-Smirnov test. The results provide a mixed assessment of

compliance with Benford's Law across different financial variables, highlighting areas of conformity and potential irregularities. The findings point to potential anomalies that warrant further investigation, as they may signal irregularities such as misstatements or intentional manipulation in financial reporting.

Benford's Law proved to be a valuable tool for preliminary fraud detection, offering insights into irregularities that warrant further investigation. However, the limitations of the method, such as its dependency on large and unaltered datasets, were also evident. This emphasizes the need for complementing Benford's Law with other statistical and forensic tools, such as the Kolmogorov-Smirnov test, to enhance the reliability of fraud detection. To address the identified issues, the adoption of international standards like IFRS, coupled with investments in forensic accounting technologies and continuous auditing systems, is essential. These measures would enhance the credibility of financial statements and align Sudan's practices with global benchmarks. Strengthening regulatory frameworks and fostering a culture of transparency within telecom companies can significantly reduce opportunities for financial fraud. Furthermore, collaborations with international organizations and experts in anti-fraud initiatives could provide the necessary resources and knowledge to mitigate fraudulent practices effectively.

This research underscores the need for a multi-faceted approach to fraud detection in Sudan's telecom sector. While Benford's Law offers valuable insights, its findings should be supplemented with qualitative assessments and advanced forensic tools to ensure a comprehensive evaluation. The implications of this research extend beyond the telecom sector, serving as a call to action for other industries in Sudan to prioritize financial integrity. Future studies should consider expanding the scope to include a wider range of sectors and incorporating advanced machine learning techniques for fraud detection. By doing so, Sudanese companies can enhance their global competitiveness and contribute to the overall economic stability of the country.

In conclusion, combating financial reporting fraud in Sudan's telecom industry is not just a necessity for organizational sustainability but also a critical step toward fostering economic development and restoring public trust. This research provides a foundation for further research and practical interventions, paving the way for a more transparent and accountable corporate environment in Sudan.

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