Benford´s Law: Usefulness in detecting fraud/errors in audited financial statements

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Abstract

Corporate scandals and failures due to fraud have resulted in significant financial losses to shareholders. Recently, there has been an increase in the occurrence of such events both globally and within South Africa. More importantly, these events have occurred in companies where satisfactory audit opinions have been issued. As a result, concerns regarding the integrity and reliability of Independent Audit opinions underpins the need for this study.

Therefore, the purpose of this study was to identify a suitable tool for detecting fraud or error in financial statements. Benford's Law, the tool used, claims that digits in numeric data are distributed according to expected frequencies (Nigrini & Mittermaier, 1997). A quantitative analysis of a sample of known and suspected incidences of fraudulent financial reporting was analysed. First, second and first-two digit Benford's tests were performed and the Mean Absolute Deviation (MAD), Kolmogorov–Smirnov statistic (KS) and Z-Statistic were used for assessing conformance. Inconsistencies and limitations were identified in the results of the KS and Z-Statistics as well as the usefulness of first-two digit test. Overall, the MAD statistic confirmed that suspected and fraudulent financial data does not conform to Benford's Law for all companies when applying the first and second digit tests.

Keywords

Corporate governance, fraud, Benford's law, auditor

List of abbreviations

African Bank	African Phoenix Investments Limited
Capitec	Capitec Bank Holdings Limited
DF	Distortion Factor Model
Freedom Property	Freedom Property Fund Limited
JSE	Johannesburg Stock Exchange
KS	Kolmogorov–Smirnov statistic
MAD	Mean Absolute Deviation
NEPI	NEPI Rockcastle Plc
SENS	Stock Exchange News Service (SENS)
Steinhoff	Steinhoff International Holdings N.V.
Tongaat	Tongaat Hulett Limited

Declaration

I declare this research project is my own work. It is submitted as partial fulfilment of the requirements for the degree of Masters in Business Administration to the Gordon Institute of Business Science, University of Pretoria. It has not been submitted for any degree or examination in any other university. I further declare that I have received the necessary authorisation and consent to carry out this research.

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1. INTRODUCTION TO THE RESEARCH PROBLEM

1.1. Introduction

The recent increase in the occurrence corporate scandals and collapses, both globally and within South Africa, have raised concerns regarding the reliability of audited financial statements and the quality of the accounting and auditing profession. As a result, this research seeks to identify a tool for detecting fraud or error in financial statement data. There has been extensive research conducted relating to the use and application of Benford's Law for identifying anomalies in data. This chapter seeks to provide greater insight into the origin and current status of the problem as well as why it is important to research the topic further from both an academic and business perspective.

1.2. Background to the problem

Changers in business structures (from owner managed to multiple shareholders and stakeholders) together with the complexity of accounting standards has justified the existence of assurance in the form of audits since 1200 (Fang, Huang, & Wang, 2017; Watts & Zimmerman, 1983). Independent assurance on the quality of accounting records is foundational to ensuring that the records are a true reflection (fair presentation) of the company's performance (Hribar, Kravet, & Wilson, 2014). It is reasonable to conclude that multiple stakeholders (individual shareholders, institutional investors, funders, credit and loan providers, customers etc.) of a company can place reliance on the credibility of the financial records where external auditors have provided an opinion on the fair presentation thereof.

The company and ultimately the shareholders bear the costs associated with the external audit process. Therefore, the monitoring of a firm's performance to reduce agency costs borne by shareholders (due to opportunistic behaviour by managers, errors and bias) is only effective where auditors are independent (Tepalagul & Lin, 2015; Versoin, 1983b). This is to protect the quality and reliability of their work performed (Tepalagul & Lin, 2015; Versoin, 1983b).

In addition to the need for independent assurance by external auditors, there has been an evolution in the development of codes for good corporate governance (Cuomo, Mallin, & Zattoni, 2016). Corporate governance is defined as "a set of

mechanisms and institutions which are intended to provide efficient monitoring and control over a firm's strategy and operation" (Aluchna & Idowu, 2017, p. 1). The purpose of corporate governance "is to help build an environment of trust, transparency and accountability necessary for fostering long-term investment, financial stability and business integrity, thereby supporting stronger growth and more inclusive societies" (OECD, 2015, p. 7). Therefore, corporate governance is concerned with how organisations are directed/administered.

The first country to issue a code of good governance in 1978 was the United States was followed by Hong Kong in 1989 according to Aguilera & Cuervo-Cazurra (2009). A study which focussed on a Review and Research Agenda relating to Corporate Governance Codes up to 2014 (Cuomo et al., 2016) noted that there has been a significant increase in corporate governance codes/guidelines since the United Kingdom's Cadbury Code was issued in 1992. In a period of 22 years (from 1992 to 2014) there was an increase in Transactional codes (those issued by Transactional Institutions such as Pan-European, Commonwealth, etc.) by 21 codes (Cuomo et al., 2016). More significantly the author found that National codes (those issued by countries) had increased to 345 which comprised of 91 first codes and 254 revisions (Cuomo et al., 2016).

Despite ongoing changes to Auditing Standards, Accounting Standards and corporate governance codes, corporate scandals and/or failures have continued to emerge in companies in America (namely Enron, HealthSouth and WorldCom), Europe (namely Parmalat, Vivendi Universal and Royal Ahold), United Kingdom (the Maxwell saga), Korea (Daewoo) and South Africa (namely Regal Bank and Leisurenet) to name a few (Abdo & Fisher, 2007; Soltani, 2014).

Internationally, there have been more recent concerns regarding corporate governance failures and external audit independence and quality (Marriage, 2018a; Olearchyk, 2018). In addition, the risk of occupational fraud within companies continues to realise despite increased focus of enterprise risk management and internal controls (Association of Certified Fraud Examiners, 2018; Starykh & Boettrich, 2019). The Report to the Nations for 2018 on occupational fraud and abuse highlighted that there was a total loss in excess of $7 billion from 125 countries

relating to 23 industry categories based on 2 690 cases of fraud (Association of Certified Fraud Examiners, 2018).

Locally, South Africa was traditionally ranked very high in terms of the quality of its auditing and reporting standards by the World Economic Forum (Schwab, 2016). In the Global Competitiveness Index for 2016-2017, South Africa was ranked first out of 138 countries (Schwab, 2016). In the subsequent year, South Africa has dropped significantly in its rankings to 30 out of 137 countries (Schwab, 2017) following issues regarding the quality of work performed by KPMG at the South African Revenue Services and a Gupta related entity (Cotterill, 2018a).

More significantly, Steinhoff International Holdings N.V. (hereafter referred to as Steinhoff) issued an announcement in December 2017, on the Johannesburg Stock Exchange's (JSE's) Stock Exchange News Service (SENS) stating that there were accounting irregularities which required further investigation as well as the resignation of the Chief Executive Officer (Steinhoff International Holdings N . V., 2017). In just over one month following the announcement, the market value of Steinhoff declined by $10bn towards the end of January 2018 flagging it as "one of South Africa's biggest ever accounting scandals" (Cotterill, 2018b, para. 1). The market value declined by 80% following the announcement that reliance can no longer be placed on its Financial Statements for 2015 and 2016, despite having been signed off as unqualified (present fairly in all material respects) by Deloitte (Marriage, 2017; Steinhoff International Holdings Ltd, 2015; Steinhoff International Holdings N . V., 2016; Steinhoff International Holdings N .V., 2018). However, Steinhoff is amongst other corporate failures and scandals in South Africa such as African Bank and more recently VBS Mutual Bank and Tongaat Hulett Limited.

On 31 May 2019, Tongaat Hulett Limited issued a SENS stating that their "review has revealed certain past practices which are of significant concern to the Board and the Company's auditors" (Tongaat Hullet Limited, 2019, para. 4). Specific reference was made to historic practices which "appear to have resulted in financial statements that did not reflect Tongaat Hulett's underlying business performance accurately" (Tongaat Hullet Limited, 2019, para. 4) and are subject to an ongoing independent forensic investigation.

The recent accumulation of corporate scandals and failures, both locally and internationally, has raised concerns regarding the effectiveness of corporate governance systems, the quality of work performed and independence of external auditors as a key assurance provider, as well as the role of regulators in overseeing and holding external auditors accountable (Cotterill, 2018a; Marriage, 2018b, 2018a).

1.3. The problem

"Financial reporting fraud and other forms of financial reporting misconduct are a significant threat to the existence and efficiency of capital markets" (Amiram et al., 2018, p. 732). Financial losses to the company and shareholders (as is evidenced by Steinhoff) follow corporate governance scandals and failures (Cotterill, 2018a; Marriage, 2018b, 2018a; Soltani, 2014). Significant reliance is placed on audited financial statements by multiple stakeholders. However, there is an increase in corporate failures and scandals relating to fraudulent accounting resulting in significant losses to shareholders and other providers of capital (Cotterill, 2018a; Marriage, 2018b, 2018a; Soltani, 2014).

It is therefore important to understand from a research perspective whether or not a statistical or mathematical tool exists to detect misstatement (fraud or error) in a company's financial records.

1.4. The business and academic (theoretical) need

From a business perspective, declines in stock market valuations (due to diminishing investor confidence) and other downside economic effects (e.g. slowdowns in economic growth) in developed countries are due to a number of causes (Claessens & Yurtoglu, 2013). These include "corporate collapses (like Enron), undue profit boosting (by WorldCom), managerial corporate looting (by Tyco), audit fraud (by Arthur Andersen), and inflated reports of stock performance (by supposedly independent investment analysts)" (Claessens & Yurtoglu, 2013, p. 15). The increase in corporate scandals and failures following satisfactory external audit opinions regarding the going concern of the company and the quality of its financial statements raises questions regarding the credibility and reliability of the external audit process and may have a negative impact on investor confidence (Amiram et al., 2018; Cotterill, 2018a; Marriage, 2018b, 2018a; Soltani, 2014).

From an academic perspective, extensive research has been conducted relating to the use and application of Benford's Law. Benford´s Law claims that the frequency of digits (e.g. the first digit ranging from one to nine) in numeric data are not equally distributed as the digit one occurs more frequently than number nine (Benford, 1938). As stated in an analysis by Nigrini (2012) of the extent of published and unpublished papers on Benford´s Law, the cumulative totals in have increased exponentially. In 1976 there were 37 papers, in 2000 there were 200 papers and in 2011 there were 750 papers which were estimated to be about 1500 papers by 2015.

Whilst existing research has been extensive, limited research has been conducted using data reported in annual financial statements to test for conformity with Benford's Law globally and particularly in the South African context (Amiram, Bozanic, & Rouen, 2015; Saville, 2006). Where research was conducted by Saville (2006) relating to South African listed companies, the quality of the research methodology and design was criticised with recommendations on areas for improvement (Nigrini, 2012).

1.5. The research objective

The objective of this research is to determine whether or not Benford´s Law is a suitable tool for investors and other interested stakeholders to use in order to detect misstatements due to fraud in the financial data of companies which are listed on the Johannesburg Stock Exchange. This will, from a business perspective, provide an additional layer of assurance as to the credibility of the reported numbers to contribute to mitigating risks of fraud and misconduct which threaten the effectiveness of financial markets.

From an academic perspective, the objective of this research is to contribute to closing the gap in existing research with regard to the application of Benford's Law in relation to firm-year financial data (Amiram et al., 2015; Nigrini, 2012). In particular, this research seeks to test the validity of Benford's Law in identifying anomalies in the fraudulent financial accounting data of companies.

1.6. Scope of the research

Saville (2006) used Benford's Law in order to detect errors and fraud in data relating to companies listed on the Johannesburg Stock Exchange by analysing conformance for sample data of companies classified as either errant or compliant. The scope of the research is an adaptation of work performed by Saville (2006) taking into consideration recent literature on determining the extent to which data should conform to Benford's Law, criticism of the work performed and recommendations to improve analyses relating to financial reporting conformance to the law. The scope will be limited to companies listed on the Johannesburg Stock Exchange where there are known and suspected incidents of misstatements (fraud or error) in audited financial records.

1.7. Summary

The credibility and reliability of audited financial records is paramount to ensuring that capital markets are effective and to protect the interest of multiple stakeholder. In the chapter that follows, the literature review considers the possible causes of corporate failures, the role of independent oversight structures (e.g. the board) and independent assurance providers (external auditors) in preventing/detecting fraud, the prevalence of fraudulent financial reporting and the various detection methods. This formed the basis for identifying Benford's Law as a simplistic tool for identifying fraud and error. Benford's Law is explained in detail followed by empirical evidence supporting the validity and usefulness thereof in order to develop research hypotheses (in Chapter 3) for further testing.

Chapter 4, which considers the research methodology and design required to test conformance with the tool, is expanded upon with specific reference been made to the population, sample size and the statistical tests required to test the extent of conformance to the law.

The results of the statistical tests identified to reject or not reject the hypotheses are reported in Chapter 5 and interpreted in Chapter 6 followed by an overall conclusion in Chapter 7.

2. LITERATURE REVIEW

2.1. Introduction

The literature review begins by providing an overview of corporate failures that have occurred globally as well as the possible causes thereof. This chapter seeks to determine whether or not a simplistic tool exists for detecting fraud or errors in financial reporting that can be used by multiple stakeholders. This was done by reviewing the role of independent oversight and assurance in detecting fraudulent financial reporting, explaining the definitions and prevalence of fraud and errors in financial reporting. Benford's Law was identified as the theory/tool for detecting fraud and errors in financial reporting due to its simplicity. The founding principles of Benford's Law were explained and empirical evidence was obtained regarding its application in identifying anomalies in data as well as the challenges in applying it in order to critique the validity thereof. Thereafter, the review focussed on the usefulness of Benford's Law in the detection of fraud and errors in financial reporting based on existing literature.

2.2. Overview of corporate failures and possible causes

Motivated by the need to understand the main causes of financial corporate failures, Soltani (2014) conducted an analysis of high profile corporate failures/scandals in both America (Enron, WorldCom and HealthSouth) and Europe (Parmalat, Royal Ahold and Vivendi Universal). The author noted that majority of existing research focussed on American companies relating to "fraudulent financial reporting, earnings management, auditing issues and management misconduct" (Soltani, 2014). In his research he developed a theoretical framework which broadened the perspectives on corporate issues (Soltani, 2014). The theoretical framework and subsequent analysis of corporate failures identified the following core areas which were major causes of such failures:

1. "Corporate ethical climate and management misconduct
2. Tone at the top and executive leadership
3. Environmental factors including bubble economy and market pressure
4. Accountability, control mechanisms, auditing and corporate governance
5. Executive personal interest, compensation package and bonus
6. Fraud, fraudulent reporting and earnings management (Soltani, 2014, p. 253)"

The core areas identified by Soltani (2014) are valuable in broadening the perspectives with regard to the major causes of such failures, however, in the narrowest sense Agency Theory (refer to 2.3.1) and its role in the development of Corporate Governance standards best describes the root cause (Cuomo et al., 2016).

Whilst there may be correlations between the major causes identified by Soltani (2014), this research focusses primarily on fraud detection in the context of financial reporting. The research begins with understanding:

- The need and role of independent oversight (corporate governance) and assurance providers (auditors), and
- Fraud and Benford's Law as a possible tool for detecting fraud.

2.3. The role of independent oversight and assurance over financial reporting

The need for independent oversight and assurance over financial reporting is established by agency theory (Jensen & Meckling, 1976). Independent oversight and independent assurance are key mechanisms to ensure accurate financial reporting. Agency theory, independent oversight and independent assurance are further explained in the subsections that follow.

2.3.1. Agency theory

Agency theory has been recognised as the dominant theory used to understand and explain agency problems that exist in the contractual relationship between managers and owners of a firm (Chen, 2015; Cuevas-Rodríguez, Gomez-Mejia, & Wiseman, 2012; Cuomo et al., 2016; Jensen & Meckling, 1976; Kang, Anderson, Eom, & Kang, 2017; Versoin, 1983a). The theory rests on the foundation that agency costs are incurred by the principal (outside equity and debt holders) where there are conflicts between the interests of the agent (management) and the principal (Jensen & Meckling, 1976).

Agency theory best explains the root cause as to why corporate scandals and failures have occurred and has been foundational to the development corporate governance systems globally (Cuomo et al., 2016). Agency theory therefore validates the need for independent oversight and assurance to (1) reduce agency costs and (2) ultimately improve profitability and overall firm performance.

In instances where corporate scandals and corporate failures arise as a result of fraud, error and misconduct, further costs in the form of an erosion of value (as is evidenced by Steinhoff) are incurred.

2.3.2. Independent oversight of management

The board is the ultimate custodian of corporate governance (Institute of Directors in Southern Africa, 2009; Institute of Directors Southern Africa, 2016). Corporate governance is defined as "a set of mechanisms and institutions which are intended to provide efficient monitoring and control over a firm's strategy and operation" (Aluchna & Idowu, 2017, p. 1). In essence, corporate governance is concerned with how organisations are directed/administered.

Independent oversight of management, performed by board and audit committee structures, has been synonymous with "the presence of outside directors, who are non-management members of the board" (Uribe-Bohorquez, Martínez-Ferrero, & García-Sánchez, 2018, p. 30) in order to reduce agency costs.

Existing voluntary codes, legislation and research have placed significant emphasis on the oversight responsibilities of the board of directors and audit committee members (Institute of Directors Southern Africa, 2009; Zhou, Owusu-Ansah, & Maggina, 2018). This has been upheld by Agency Theory which proposes that "a better-governed firm should have better performance and higher valuation due to lower agency costs" (Zhou et al., 2018, p. 20). In a study conducted by Huang, Lin, Chiu, & Yen (2017) which identified risk factors that contribute to financial statement fraud, insufficient board oversight was ranked fourth out of fifteen factors ahead of the internal control environment which was ranked tenth.

Therefore, independent oversight structures play a key role in fraud prevention and detection.

2.3.3. Independent assurance providers

According to Watts & Zimmerman (1983), the existence of assurance in the form of audits can be traced back to the year 1200 when business corporations were developed. Whilst they were initially conducted by directors or shareholders, the use

of external professional auditors became more common in the United Kingdom and the United States from the latter half of the nineteenth century and the twentieth century respectively (Watts & Zimmerman, 1983) .

Globally, external auditors have been the primary resources for providing independent assurance to users (typically non-experts in accounting) of the financial statements (Jensen & Meckling, 1976; Watts & Zimmerman, 1983). The need for external audits has always been to provide independent assurance on the quality of the reported accounting records (Hribar, Kravet, & Wilson, 2014). Independent assurance is required in order to ensure that the accounting records are a true reflection of an organisation's performance and to provide stakeholders with relevant information to evaluate the value of the firm and forecast its future performance (Hribar, Kravet, & Wilson, 2014). In addition, Fang, Huang, & Wang (2017) contended that accounting is complex, imperfect in practice and prone to errors (unintentional misapplications of accounting standards) and bias (intentional misapplications of accounting standards). As a result, accounting requires professional knowledge and substantial judgement (Fang et al., 2017).

Therefore, it stands to reason that shareholders, investors, providers of credit, government regulators and other stakeholders place significant reliance on the report of the independent auditors with regard to the accuracy of the financial information and its ability to operate as a going concern. However, the collapse of Enron in 2002 and the subsequent demise of its external auditors, Anderson (one of the then "Big 5" multinational auditing and consulting firms) validated the concerns regarding conflicts that exist between owners and managers. In addition, it 'sparked significant concerns regarding the independence of external auditors and the quality of their work (Arnold & de Lange, 2004; Cullinan, 2004; Tepalagul & Lin, 2015; Unerman & O'Dwyer, 2004). Subsequent to these scandals and others (e.g. Parmalat, Ahold, and Comroad) as well as the global financial crisis in 2008, there has been an increase in doubt regarding the purpose of traditional audits in ensuring the credibility of financial information and questions as to whether or not existing regulations require improvement (Aschauer & Quick, 2018).

In response to the collapse of major corporations (Enron and WorldCom), the United States promulgated the Sarbanes-Oxley Act of 2002 "which prohibits the auditor from

providing most non-audit services to its clients; imposing a 1-year cooling-off period for former auditors landing jobs at their clients; and requiring audit partners to rotate every 5 years" (Tepalagul & Lin, 2015, pp. 101–102). Similarly, section 92 of the South African Companies Act No. 71 of 2008 requires that the designated audit partner to be rotated every 5 years which is supported by King III (Institute of Directors in Southern Africa, 2009).

With regard to auditor independence and audit quality, a literature review in this regard was published by Tepalagul & Lin (2015) based on articles published from 1976 to 2013 in nine prominent journals. The literature review focused on four key threats to independence and resultant audit quality, namely (1) Client importance (e.g. the importance of the client with regard to the size of the audit fees relative to other client portfolio fees), (2) Auditors performing non-audit services, (3) Lengthy audit tenures, and (4) Client affiliation with the audit firm (e.g. in the form of future employment opportunities for the auditor). The results were mixed as to whether or not these four are threats to independence and the quality of audit opinions.

Majority of recent research has however, focussed on audit tenure, mandatory audit firm rotation and the provision of non-audit services by external auditors with regard to the quality of audits as threats to the independence of auditors in isolation (Aschauer & Quick, 2018; Ball, Tyler, & Wells, 2015; Chan, Chen, Janakiraman, & Radhakrishnan, 2012; Corbella, Florio, Gotti, & Mastrolia, 2015; Daniels & Booker, 2011; Tepalagul & Lin, 2015; Wilson, McNellis, & Latham, 2018).

Research on a simultaneous combination of such threats and their impact on audit independence and audit quality is lacking particularly where corporate failures, fraud and scandals have been preceded by years of unqualified audit opinions.

2.4. Fraudulent financial reporting

As explained by Amiram et al. (2018), various researchers and legislation have provided definitions regarding fraud and in particular financial reporting fraud which share common elements. These combined elements include "(i) there must be a misrepresentation in the form of a misstatement, misreporting, or omission; (ii) that misrepresentation must be material; (iii) the person making the misrepresentation must have done so with some fault in the sense that the material misrepresentation

was committed negligently, recklessly, or with knowledge of its falsity; and, (iv) in private suits, the misrepresentation is causally related to a loss suffered by the plaintiff" (Amiram et al., 2018, p. 733).

NERA Economic Consulting has issued a report entitled "Recent Trends in Securities Class Action Litigation: 2018 Full-Year Review" by Starykh & Boettrich (2019) which highlighted that during 2018 there were 214 securities class action filings relating to fraud and misconduct (legal or regulatory violations) in the United States of America. More specifically, the filings related to accounting issues, missed earnings guidance, misled future performance, regulatory issues, the environment and merger-integration issues. The aggregated total of NERA-defined investor losses (which is a measure of the total size of the case) excluding General Electric of $290 billion, amounted to $258 billion (Starykh & Boettrich, 2019).

A multidisciplinary review of literature pertaining to fraud and misconduct relating to financial reporting was conducted by Amiram et al. (2018). The authors claimed that, "Many of the most infamous cases of corporate misconduct involve accounting misrepresentations" (Amiram et al., 2018, p. 746) citing Enron, WorldCom and Lehman Brothers as past examples.

2.5. Detection of fraud or error

The need to detect fraud in financial statement data has resulted in extensive research on methods or tools for detecting fraud. Abbasi, Albrecht, Vance, & Hansen (2012) acknowledged that whilst there was prior research which occasionally utilised internal data in order to detect financial fraud, this is neither practical nor easily accessible for most stakeholders. Consequently, in reviewing prior research relating to the detection of financial fraud, their study focussed on research which used external data (publicly available data such as financial statements). The literature review summarised the results of 14 studies over a 15 year period (commencing in 1995) where financial statement data was used to detect fraud, however the author concluded that the results were inadequate as majority (64%) achieved less than a 70% fraud detection rate (Abbasi et al., 2012).

Benford's Law was identified as a useful and effective mathematical tool for identifying anomalies in data (Cho & Gaines, 2007). It is also considered to be easy

to explain and understand even where the user does not have formal training in mathematics due to its simplicity (Cho & Gaines, 2007). The section that follows, provides more details regarding this mathematical phenomenon as well as empiracle evidence supporting its validity.

2.6. Benford's Law

2.6.1. An overview of Benford's Law

Simon Newcomb first observed in 1881 that the first pages of the logarithmic tables wore out more frequently than the last pages (Newcomb, 1881). This led to the formulation of the statistical principle that numbers which begin with the digit one will occur more frequently (30,1% probability of occurrence) than the numbers that begin with the digit nine occurring the least frequently (4,6% probability of occurrence) thus diminishing in their frequency from the number one up to the number nine (Newcomb, 1881). Based on this observation the digits of numbers are not equally distributed.

According to Saville (2006), the claims made by Newcomb in explaining the distribution of the first digits in natural numbers went unnoticed until 1938 when Frank Benford published his research on "The Law of Anomalous Numbers" which is more commonly known as Benford's Law.

Frank Benford made the same observation as Simon Newcomb when he stated "that the pages of a much used table of common logarithms show evidences of a selective use of the natural numbers" (Benford, 1938, p. 551) and that pages with "the low numbers 1 and 2 are apt to be more stained and frayed by use than those of the higher numbers 8 and 9" (Benford, 1938, p. 551).

Frank Benford's research involved deriving a statistical law explaining the frequency in which digits are distributed and involved collecting and analysing a variety of data types from multiple fields of study such as population numbers, numbers recorded in the Readers Digest, the areas of rivers, street addresses, atomic weight and death rates etc. (Benford, 1938). From the 20 different groups of data collected, 20 229 observations/records were analysed to determine the frequency of occurrence in which random natural numbers from one to nine appeared as first digits (Benford,

1938). Based on his research the following formulas are used to explain the expected frequencies derived by Benford's Law (Nigrini, 2012, p. 5) for the first digit, second digit and first-two digits.

a. *First expected digit frequency*

The probability (Prob) that the first/leading digit (D_1), excluding negatives, represents a number from 1 to 9 (d_1) is derived by equation 1 below.

$$\text{Prob}(D_1 = d_1) = \log\left(1 + \frac{1}{d_1}\right) \quad \text{where } d_1 \in \{1,2,\dots,9\} \qquad (1)$$

Therefore, where $d_1 = 1$,

then the Prob (D_1) = log (1+1/1)

= log (2)

= 0.30103

b. *Second expected digit frequency*

The probability (Prob) that the second digit (D_2), excluding negatives, represents a number from 0 to 9 (d_2) is derived by equation 2 below.

$$\text{Prob}(D_2 = d_2) = \sum_{d_1=1}^{9} \log\left(1+\frac{1}{d_1 d_2}\right) \quad \text{where } d_2 \in \{0,1,\dots,9\} \qquad (2)$$

Therefore, where $d_2 = 1$,

then the Prob (D_2) = log (1+1/11) + log (1+1/21) + log (1+1/31) + log (1+1/41) + log (1+1/51) + log (1+1/61) + log (1+1/71) + log (1+1/81) + log (1+1/91)

= 0.11389

c. *First-two expected digit frequency*

The probability (Prob) that the first-two digits (D_1 D_2), excluding negatives, represents a number from 10 to 99 (d_1 d_2) is derived by equation 3 below.

$$\text{Prob}(D_1 D_2 = d_1 d_2) = \log\left(1 + \frac{1}{d_1 d_2}\right) \quad \text{where } d_1 d_2 \in \{10,11,\dots,99\} \qquad (3)$$

Therefore, where $d_1\ d_2 = 11$,

then the Prob (D_1) = log (1+1/11)

= log (12/11)

= 0.03779

Following Benford's Law for the first, second and first-two digits, Hill (1995) derived a general significant digit law as follows (equation 4):

$$\text{Prob}\ (D_1 = d_1 \ldots D_k = d_k) = \log\left[1 + \left(\frac{1}{\sum_{i=1}^{k} X\ 10^{k-i}}\right)\right] \quad (4)$$

Where $d_1 \in \{1,2 \ldots,9\}\ and\ \mathrm{dk}_k \in \{0,1, \ldots,9\}, j = 2, \ldots k$

Expected digital frequencies for the first, second, third and fourth digit positions in numbers are included in Table 2. The second, third and fourth digit frequencies become more uniform (Nigrini, 1996).

Table 1. Benford's Law: Expected digital frequencies

BENFORD'S LAW: EXPECTED DIGITIAL FREQUENCIES				
Digit	**Position in Number**			
	1st	**2nd**	**3rd**	**4th**
0		.11968	.10178	.10018
1	.30103	.11389	.10138	.10014
2	.17609	.10882	.10097	.10010
3	.12494	.10433	.10057	.10006
4	.09691	.10031	.10018	.10002
5	.07918	.09668	.09979	.09998
6	.06695	.09337	.09940	.09994
7	.05799	.09035	.09902	.09990
8	.05115	.08757	.09864	.09986
9	.04576	.08500	.09827	.09982
Note: The number 147 has three digits, with a 1 as the first digit, 4 as the second digit, and a 7 as the third digit. The tables indicates that under Benford's Law the expected proportion of numbers with a first digit 1 is 0.30103 and the expected proportion of numbers with a third digit 7 is 0.09902.				

Note: Reprinted from *A Taxpayer Compliance Application of Benford's Law. Journal of the American Taxation Association, 18(1), 72–91.* Retrieved from

http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=6148128&site=ehost-live

2.6.2. Empirical evidence testing the validity of Benford's Law

Extensive research has been conducted to test the validity of Benford's Law in order to identify anomalies in numeric data following Frank Benford's research in 1938. The research has focused on Benford's Law's usefulness to multiple stakeholder's interests or applications including external auditors, accountants, tax authorities and forensic investigators amongst others as explained in this section.

In 1988, Charles Carslaw postulated that where managers are incentivised to achieve performance goals, there will be pressure to meet the goals "by ensuring that the first digits is at least as large as that of the users' expectations" (Carslaw, 1988, p. 322). Therefore, the expectation was that numbers relating to income would be rounded upwards marginally above the reference point resulting zero's exceeding the probability of their expected distribution and nine's falling below their expected distribution of second digits (Carslaw, 1988; Nigrini & Mittermaier, 1997). By way of example, income of R5 900 000 would be rounded upwards to R6 000 000. Charles Carslaw's research focussed on the frequency of first and second digits reported as ordinary income and net income in the annual financial statements of 220 New Zealand listed companies during the period 1 January 1981 to 31 December 1985 (Carslaw, 1988). The results of the tests on income figures of 220 New Zealand listed companies during the sample period confirmed the abnormality in the distribution of second digits (Carslaw, 1988). More recently, empirical evidence confirmed that earnings management was prevalent in majority of Taiwan listed companies (Lin, Lin, Yeh, & Wang, 2018). In addition, their research focussed on the extent to which the board of director as Fat Cats (i.e. they also have the ability to increase their own income) influence earnings management compared to those who aren't Fat Cats (Lin, Lin, Yeh, & Wang, 2018). The study discovered that "Fat Cat firms exert more earnings management than other firms" (Lin et al., 2018, p. 166) which was "due to poor corporate governance efficacy" (Lin et al., 2018, p. 166).

Hill (1995) was able to validate a theorem for significant digits which stated that leading digits will conform to Benford's Law where the distributions are randomly selected and related samples selected are random.

Research by Nigrini (1996) analysed the frequency of digits relating to taxpayers declarations of interest received and interest paid deductions on the Individual Tax Model Files in order to establish a link to tax evasion. In addition to using Benford's Law to determine whether or not the actual frequency deviated from the expected frequency, a Distortion Factor Model (DF) was developed to estimate the extent to which digits were manipulated. Nigrini (1996) concluded that Unplanned Tax Evasion (during the preparation of the tax return) could be detected using DF model. Nigrini & Mittermaier (1997) demonstrated using various digital analyses tests (first digit, second digit, first-two digit, duplicate numbers, rounding, and last-two digit) that Benford's Law is a useful tool to assist external auditors with performing analytical procedures during planning and completion phases of the audit.

Cho & Gaines (2007) cautioned that it is not possible for all numbers to conform to Benford's Law particularly in accounting relating to sales transactions which involve identical transactions (e.g. constant price) of popular items in high volumes. Durtschi, Hillison, & Pacini (2004) considered the effectiveness of using Benford's Law in assisting with detecting fraud relating to accounting data, particularly from an auditors perspective. They concluded "that Benford's analysis, when used correctly, is a useful tool for identifying suspect accounts for further analysis using Benford's Law correctly" (Durtschi et al., 2004, p. 31). In addition, a key contribution made by Durtschi, Hillison, & Pacini (2004) was in providing guidelines as to when Benford's analysis is likely to be useful or not as explained in Table 2.

Table 2. When Benford analysis is or is not likely useful

WHEN BENFORD ANALYSIS IS OR IS NOT LIKELY USEFUL	
When Benford Analysis Is Likely Useful	**Examples**
Sets of numbers that result from mathematical combination of numbers - Result comes from two distributions	Accounts receivable (number sold * price), Accounts payable (number bought * price)
Transaction-level data - No need to sample	Disbursements, sales, expenses

WHEN BENFORD ANALYSIS IS OR IS NOT LIKELY USEFUL	
On large data sets - The more observations, the better	Full year's transactions
Accounts that appear to conform - When the mean of a set of numbers is greater than the median and the skewness is positive	Most sets of accounting numbers
When Benford Analysis Is Likely Useful	**Examples**
Data set is comprised of assigned numbers	Check numbers, invoice numbers, zip codes
Numbers that are influenced by human thought	Prices set at psychological thresholds ($1.99), ATM withdrawals
Accounts with a large number of firm-specific numbers	An account specifically set up to record $100 refunds
Accounts with a built in minimum or maximum	Set of assets that must meet a threshold to be recorded
Where no transaction is recorded	Thefts, kickbacks, contract rigging

Note: Reprinted from *The Effective Use of Benford's Law to Assist in Detecting Fraud in Accounting Data. Journal of Forensic Accounting, 5, 17-34.* Retrieved from https://doi.org/DOI:

More recent research (Amiram et al., 2015; Barney & Schulzke, 2015; Druică, Oancea, & Vâlsan, 2018; Lin et al., 2018; Nigrini, 2017) has identified challenges and key considerations highlighted over the years relating to the application of Benford's Law with regard to the following:

1. The results yield false positives (i.e. false claims of fraudulent results),
2. The identification of appropriate digit tests for measuring conformity,
3. The various statistical tests available to test the significance or extent of conformance, and
4. The relationship between the number of observations analysed and the extent to which non-conformity is considered significant.

These challenges and key considerations are expanded upon in the subsections that follow.

2.6.2.1. False positives

Cleary & Thibodeau (2005) highlighted that there are costs associated with digital analysis using Benford's Law in the form of Type I errors (false positives). Effectively a Type I error occurs where the results of a test "indicate fraud where none actually exists" (Barney & Schulzke, 2015, p. A66). Inversely, a Type II error will occur where the results indicate that no fraud was conducted whilst it actually exists.

In the context of auditors using Benford's Law, Cleary & Thibodeau (2005) concluded that Type I errors can be better controlled where digital analysis using Benford's Law is used on a test-by-test basis rather than a digit-by-digit basis as explained in section 2.6.2.2 and 2.6.2.3.

2.6.2.2. Digit tests

Various one-digit (first, second, third, fourth, last digit) and two digit (first-two digits, last-two digits) Benford-based tests exist (Druică et al., 2018; Nigrini, 1996, 2017). As is evident from Table 2, the frequencies in which the digits occur become more uniform from the second and third digit test onward (Nigrini, 2012, 2017). Where numbers are rounded in financial statements, the last-digit test becomes problematic (Nigrini, 2017). Cleary & Thibodeau (2005) recommend using both first and first-two digit tests where data set is large but caution that there is a greater probability of a Type I error but also a greater probability of identifying valid fraudulent accounting entries. Nigrini (2017) argues that the first digit test adds no value when the first-two digit test is used for auditing and sampling. As large volumes of transactional data require analysis, anomalies in single first digit could include false positives and therefore identifying anomalies in the first-two digits will reduce the risk of a Type 1 error (Cleary & Thibodeau, 2005; Nigrini, 2017).

2.6.2.3. Statistical tests

Various statistical tests exists for measuring the extent to which digital analysis conforms to Benford's Law. Cleary & Thibodeau (2005) recommended that auditors start the analysis on a test-by-test basis using the Chi-squared test for

testing the Null Hypothesis and if there are possible fraud indicators then consider using the digit-by-digit analysis. However, Nigrini (2012) highlights that assessing conformity with Benford's Law remains a challenge despite the existence of multiple statistical methods. This is due to "the fact that we are usually dealing with large data sets where even small and unimportant deviations from the expected pattern are statistically significant" (Nigrini, 2012, p. 149). Therefore, sample sizes has an impact on the validity of the test results which will be discussed in section 2.6.2.4.

Research by Druică et al. (2018) highlighted difficulties and challenges with regard to determining conformity with Benford's Law by evaluating six Null Hypothesis Significant Tests (goodness-of-fit tests) and two additional tests as follows:

- Null Hypothesis Significant Tests
    - Pearson Chi-square statistic,
    - Kolmogorov-Smirnov (KS) statistic,
    - the Euclidean distance d statistic,
    - Chebyshev distance m statistic,
    - the Joenssen's J_{p^2} statistic, and
    - Joint Digit Test T2 statistic.
- Additional tests
    - Mean Absolute Deviation (MAD), and
    - Excess-MAD

The results of the research using the abovementioned tests were mixed ranged "from marginal conformity to marginal non-conformity to Benford" (Druică et al., 2018, p. 81). Similarly, misleading results were noted relating to the Null Hypothesis Significant Tests where there were large number of records/observations in the data set and the deviations where small.

2.6.2.4. Number of records/observations

The number of records/observations forming part of sample has an impact on the selection of an appropriate statistical test (Nigrini, 2012). The Z-Statistic, which evaluates each digit at a time, was used in research conducted by Carslaw (1988) and Lin et al. (2018), however Nigrini (2012) explained that where the

number of records/observations is large, small deviations skew the results as being significant from a statistical perspective.

By contrast, only small deviations are accepted using the Chi-squared test and the Kolmogorov-Smirnov (KS) statistic which considers the number of records/observations (N) when testing a data set's conformity on a test-by-test basis (Nigrini, 2012). The critical value used by the KS statistic is calculated based on the N as explained in section 4.6.2. Based on existing research, the critical value was "more sensitive to deviations as N increased, and near perfection was required for data sets of 25 000 records or more" (Nigrini, 2012, p. 158). The issues and limitations relating to the impact of the number of records/observations previously explained are, however, eliminated by the Mean Absolute Deviation (MAD) test as it does not take it into consideration (Nigrini, 2012).

Although various literature reviewed made reference to the terms referring to large samples or large data sets, such terms are not clearly defined (Cleary & Thibodeau, 2005; Druică et al., 2018; Nigrini, 2017). Despite Nigrini (2012) proposing a general rule of 1000 observations for good conformity, 3000 for close conformity, and a minimum of 300 for the first-two digit tests to be included in the data set, the following was noted:

- There is no evidence supporting how these sample sizes were derived other than reference being made to the chi-square test for the 1000 minimum.
- Reference is made to using the first digit test on small samples within the context of the 300 minimum proposed for first-two digit tests.
- The author does not preclude the option of running the tests on data sets of less than 1000, but highlights the risk of a Type 1 error where large deviations as a result of the smaller sample are not accepted.

2.6.3. Application of Benford's Law in detecting financial reporting fraud or error

An analysis of Enron's earnings reports for 2001 and 2002 by Nigrini (2005) using Benford's Law detected small manipulations in earnings management. Nigrini (2012) has published a book entitled "Benford's Law: Applications for Forensic Accounting, Auditing, and Fraud Detection" which includes an analysis of financial statement data (balance sheet, income statement, statement of cash flows, and statement of retained earnings) for companies who traditionally have provided quality financial reports and those that had reporting issues. Both the first digit and first-two digit tests for the companies (Procter & Gamble, Johnson & Johnson, IBM and ExxonMobil) which reported high-quality results generally conformed to Benford's Law. Similar results were noted for the companies (General Motors, American International Group, Lehman Brothers and Nortel Neworks) which had reporting issues relating to the first digit test whilst the first-two digit tests resulted in non-conformity. The conclusions drawn in assessing conformity were based on the results of the Mean Absolute Deviation (MAD) test. Therefore, according to the author, this "suggests that accounting fraud cannot be detected solely by an analysis of the first and first-two digits and the second-order test" (Nigrini, 2012, p. 233).

According to Saville (2006) there is extensive research internationally regarding the validity and usefulness of Benford's Law with the exception of analysing financial statements relating to South African listed companies. The research by Saville (2006) focused on testing conformity to Benford's Law using companies listed on the Johannesburg Stock Exchange which were classified as either 'errant' or 'complaint.' The results indicated that 100% of the 'errant' companies and only 18% of the 'compliant 'companies did not conform to Benford's Law. The author concluded that Benford's Law provides a tool in detecting error and fraud for "auditors, shareholders, financial analysts, investment managers, private investors and other users of publicly reported accounting data such as revenue services" (Saville, 2006, p. 352). Nigrini (2012), however, stated that caution should be exercised when relying on the results of the work performed by Saville (2006) due to concerns relating to the numbers used as well as the criteria for testing conformity. Overall he concluded that additional research is needed in the area.

According to Amiram et al. (2015), there is a gap in existing research with regard to the application of Benford's Law relating to the population of numbers reported in the annual financial statements of firms. Amiram et al. (2015) tested conformance with Benford's Law by developing a measurement instrument (based on the mean absolute deviation statistic and the Kolmogorov–Smirnov statistic) which they called the Financial Statement Divergence Score (FSD Score).

In addition, Amiram et al. (2015)'s research also demonstrated that:

- There was a divergence from Benford's Law where errors were applied to the financial statement line items, and
- In instances where firms restated their results, the divergence from Benford's Law was less than the previous un-restated financial statements.

Overall there appears to be limited literature on analysing fraud and error using Benford's Law relating to financial statements. Elements such as net income, ordinary income and earnings per share (Carslaw, 1988; Lin et al., 2018) have been analysed individually but not on a consolidated level such as the income statement and balance sheet with the exception of Amiram et al. (2015). In addition, there is limited research exists on testing the validity of Benford's Law relating to known instances of fraudulent financial data.

2.7. Summary and conclusion

The literature review introduced the role and importance of independent oversight (board and audit committee) and assurance (external auditors) structures in detecting fraud and error in financial reporting. However, despite the ongoing introduction of and enhancements to legislation and voluntary codes relating to good corporate governance, corporate failures and scandals, as a result of fraudulent financial reporting, continues to emerge. Benford's Law was identified as a simplistic tool/theory in principle to identify anomalies in data for multiple stakeholders.

However, a number of challenges relating to the risk of excessive false positives (when used by auditors), the type of digit and statistical test selected, and the number of records/observations were identified. Despite the perceived limitations and proposed challenges, there is value in further analysing the value of Benford's Law

at a financial statement level due to the existing gap in knowledge and in order to identify anomalies (fraud or error) in the data analysed.

In the chapter that follows, research hypotheses are identified for further testing based on the Literature review.

3. RESEARCH HYPOTHESES

The objective of this research is to determine whether or not Benford´s Law will be suitable to detect fraud where known cases or suspected cases of fraudulent financial reporting exist relating to companies which are listed on the Johannesburg Stock Exchange.

The null hypotheses constructed in existing research has, in general, tested that all digits, empirical distributions, or results conform, comply or follow Benford´s Law (Amiram et al., 2015; Durtschi et al., 2004; Hassler & Hosseinkouchack, 2019; Nigrini & Miller, 2009).

The research hypotheses tested will be constructed for both Misstated Audited Financial Statements and Suspected Misstated Audited Financial Statements, where misstated relates to fraudulent or erroneous (restated financial records).

Hypothesis 1: Misstated Audited Financial Statements

The following hypotheses will be analysed:

- $H1_0$: Misstated Audited Financial Statements (MAFS) conform to Benford's Law (BL) (i.e. fairly present)
    - H_0: MAFS = BL
- $H1_1$: Misstated Audited Financial Statements (MAFS) do not conform to Benford's Law (BL) (i.e. do not fairly present)
    - H_1: MAFS ≠ BL

Hypothesis 2: Suspected Misstated Audited Financial Statements

The following hypotheses will be analysed:

- $H2_0$: Suspected Misstated Audited Financial Statements (SMAFS) conform to Benford's Law (BL) (i.e. fairly present)
    - H_0: SMAFS = BL
- $H2_1$: Suspected Misstated Audited Financial Statements (SMAFS) do not conform to Benford's Law (BL) (i.e. do not fairly present)
    - H_1: SMAFS ≠ BL

4. RESEARCH METHODOLOGY

4.1. Introduction

This section provides an explanation regarding the choice of the methodology used, the key considerations used in identifying the population and selecting the sample, and the appropriate statistical tools used to analyse the goodness-of-fit and extent/degree of conformance with Benford's Law. Thereafter, the approach used for gathering and analysing the data is expanded upon.

4.2. Choice of methodology

The overarching research question to address the research problem was to determine whether or not a statistical or mathematical tool exists to detect fraud or error in a company's audited financial statements where fraudulent accounting has occurred or is suspected to have occurred. The objective of conducting such research was to provide a suitable tool for investors and other interested stakeholders to use. Therefore, a pragmatic research philosophy position was adopted based on the research question, research objectives and hypotheses deduced from the literature review in order to mathematically test the theory of Benford´s Law (Muijs, 2011; Saunders & Lewis, 2012). This is consistent with similar research conducted on the validity and usefulness of Benford's Law (Amiram et al., 2015).

The mathematical phenomenon known as Benford's Law was used as the dominant theory for detecting anomalies (e.g. fraud or error) in data. Therefore, a deductive approach was followed to test the theory based on the hypotheses developed (Amiram et al., 2015; Saunders & Lewis, 2012). A quantitative data collection technique was considered to be relevant for the study as it required multiple methods for collecting and analysing longitudinal secondary data in order to test the hypotheses (Amiram et al., 2015; Muijs, 2011).

4.3. Population

Historical financial reporting data of companies listed on the Johannesburg Stock Exchange (JSE) in South Africa was considered to be either fairly presented or misstated (due to fraud or error). Whilst the company's external auditors have provided an opinion on the fair presentation of financial statements annually, there have been companies who have reported fraud (Steinhoff, Tongaat Hulett),

suspected financial anomalies or which have collapsed (African Bank) subsequent to receiving unqualified (satisfactory) audit reports. Therefore, it was not be possible split the data into two data sets (e.g. fairly present and not fairly presented/misstated) as it was not possible to accurately define companies falling into each data set.

In order to determine whether or not Benford´s Law provided a useful tool for detecting fraud and error, the population was defined as companies listed on the Johannesburg Stock Exchange who have reported financial results which are fraudulent or suspected to be fraudulent. Therefore, the completeness of the population is not known.

4.4. Unit of analysis

The unit of analysis studied was a company listed on the Johannesburg Stock Exchange, which was consistent with similar research analysing the usefulness of Benford's Law in detecting fraud or error in financial data (Amiram et al., 2015; Saville, 2006).

4.5. Sampling method and size

Existing research did not prescribe the sampling method, the size of sample and the number of records/observations required for assessing conformance to Benford's Law (Benford, 1938; Newcomb, 1881; Nigrini, 1996; Saville, 2006) particularly with regard to financial statement data.

Saville (2006) split the sample into two sample sets whereby companies were classified as errant and compliant. The first (errant) sample included companies which were "commonly suspected or known to have committed accounting fraud or produced erroneous data, and their shares were either suspended or delisted during the reference period as a consequence" (Saville, 2006, p. 346). The sample of errant companies was obtained from "a group of ten investment brokers and managers representing five different financial services firms who dealt in listed companies over the reference period" (Saville, 2006, p. 353). The second (compliant) sample consisted of companies which were "ranked by Ernest and Young (2002), as having the top reporting standards amongst listed companies on the JSE" (Saville, 2006, p. 346) and was used as a control group. Whilst the criteria for selecting the first (errant) sample appears to be sound, it is questionable with regard to the criteria for

classifying the second sample data sets as there is no causal relationship between the quality of the information contained in the integrated report and the quality of the financial statement data. Nigrini (2012) raised a similar concern and in addition argued that even the companies classified as errant contained a company that did not represent the group as the fraud related to non-disclosure of personal information and not fraudulent reporting.

Based on the above and challenges noted in defining the population in section 4.3, it was not considered appropriate to include a control group of compliant companies in the sample as there is no certainty that the financial data reported is not fraudulent and therefore may not be characteristic of the population.

As the quantity of the population comprising of companies which produced misstated financial results due to fraud and error is unknown, a representative (probability) sampling technique is not appropriate. The rationale being that each company listed on the Johannesburg Stock Exchange did not have an equal opportunity of being selected (Vinet & Zhedanov, 2010). Therefore, a judgemental sampling technique (non-probability) was used as the total population is not known (Vinet & Zhedanov, 2010). The sample data related to companies where, either or in combination thereof:

- External auditors have not issued a modified opinion in the form of a qualified, adverse or disclaimer of an opinion (International Federation of Accountants (IFAC), 2015),
- Fraud/misstatement has been confirmed/suspected and reported publicly, or
- The shares have been delisted on the stock exchange as a result of fraudulent financial reporting.

IRESS (previously McGregor BFA) and OSIRIS was reviewed for selecting the sample together with media reports where appropriate. The period for selecting the sample related to the events reported from 2016 to 2018, with the exception of African Bank which related to 2014, in order to identify recent events. However, the analysis of data was for a ten year period (subject to the specific company's date of incorporation) to provide multiple firm year reporting results for analysis.

In terms of the size of the sample and period of analysis, Saville (2006) analysed a single year's Income Statement data for a sample of 17 errant companies and 17 compliant companies resulting in 1020 observations. Nigrini (2012) stated that the research done by Saville (2006) should be redone using two large samples instead and therefore, this was considered the minimum sample size required for this study.

The first sample selected for testing Hypothesis 1 of this study comprised of four companies where fraudulent financial reporting is known resulting in a total of 1130 observations from two to ten years of data which was then applied to various tests. The second sample selected for testing Hypothesis 2 comprised of two companies where fraudulent financial reporting is suspected resulting in a total of 203 observations from two to five years of data which was then applied to various tests. Details of the companies selected and number of observations is presented in Table ***5***.

4.6. Measurement instrument

Benford's Law was used to determine the frequency in distribution of the first digit, second digit and first-two digits of financial (accounting) data using equations 1 to 3 in Chapter 2.

In order to measure conformance to Benford´s Law, much research has been conducted to determine the goodness-of-fit and the degree/extent to which digital analysis conforms to the law using various statistical tests (Amiram et al., 2015; Lin, Lin, Yeh, & Wang, 2018). In other words, the acceptable deviation from the expected frequencies. Cleary & Thibodeau (2005) differentiated the statistical tests available into two categories of tests for determining the goodness-of-fit and the degree/extent of conformance, namely digit-by-digit and test-by-test which is discussed in section 2.6.2.1 to 2.6.2.4.

More specifically, research by Druică, Oancea, & Vâlsan (2018) made use of "a real-life example to illustrate a few of the challenges and difficulties routinely encountered in the process of trying to determine conformity to Benford´s Law" (Druică et al., 2018, p. 77). Druică et al. (2018) used aggregated bank account balances data over a 16 year period which they argued "naturally conformed" (Druică et al., 2018, p. 77) to Benford´s Law and evaluated the results of eight different tests for conformance

with the law. There were six Null Hypothesis Significance Tests and two additional tests based on the methodology used by Barney & Schulzke (2016). The following were evaluated by Druică et al. (2018):

- The six Null Hypothesis Significance Tests, also referred to as the goodness-of-fit tests for conformance with Benford´s Law included (1) the Pearson Chi-square statistic, (2) the Kolmogorov-Smirnov (KS) statistic, (3) the Euclidean distance d statistic, (4) the Chebyshev distance m statistic, (5) the Joenssen's J_{p^2} statistic, and (6) the Joint Digit Test T2 statistic. These tests provided "the basis for accepting or rejecting the Null Hypothesis for a given level of significance" (Druică et al., 2018, p. 78). A key criticism of the Null Hypothesis Significance Tests is that the results are misleading when the number of records in the data set (observations) are large as only small deviations from Benford's Law are acceptable (Barney & Schulzke, 2015; Druică et al., 2018; Nigrini, 2012).
- The two additional tests included the Mean Absolute Deviation (MAD) and the Excess-MAD which, in contrast to the Null Hypothesis Significance Tests, measure the extent of conformity with Benford's Law (Druică et al., 2018). However, Nigrini (2012) has developed a set of values in for drawing conclusions regarding conformance with Benford´s Law. According to Amiram et al. (2015), the Mean Absolute Deviation, in contrast with the Null Hypothesis Significance Tests, is more useful with the number of records in the data set (observations) are large.

The results of their research was mixed and ranged "from marginal conformity to marginal non-conformity to Benford" (Druică et al., 2018, p. 81), however the data set did not relate to audited financial records. Various research has thus cautioned against the use of Null Hypothesis Significance Tests in detecting fraud and in audit sampling (Barney & Schulzke, 2015; Druică et al., 2018; Nigrini, 2017).

Research conducted by Amiram et al. (2015) demonstrated that financial statements conformed to Benford´s Law where they did not contain errors and that through the use of simulations to manipulate the data they were able to demonstrate a high probability of non-conformance in such instances. Their research used "two statistics when measuring conformity to Benford's Law—the Kolmogorov–Smirnov (KS) statistic and the Mean Absolute Deviation (MAD) statistic" (Amiram et al., 2015, p.

1548). Therefore, these are the measurement instruments used in this study to measure conformance on a test-by-test basis together with the Z-Statistic for measuring conformance on a digit-by-digit basis and are explained in the subsections follow.

4.6.1. Z-Statistic

This statistical tests evaluates each digit at a time for testing conformance with Benford's Law (Nigrini, 2012). The Z-Statistic formula is as follows (Nigrini, 2012):

$$Z = \frac{|AP - EP| - \left(\frac{1}{2N}\right)}{\sqrt{\frac{EP(1-EP)}{N}}} \quad (5)$$

Where,

- AP is the actual proportion
- EP is the expected proportion,
- N is the number of records, and
- 1/2N < AP-EP else 0

At a 5% significance level, z-statistics > 1.96 are statistically significant.

4.6.2. Kolmogorov–Smirnov (KS) statistic

This is defined as "the maximum deviation of the cumulative differences between the empirical distribution of leading digits in annual financial statements and their theoretical Benford distribution" (Amiram et al., 2015, p. 1575). The KS statistic formula is as follows:

$$KS = Max(|AD_1 - ED_1|, |(AD_1 + AD_2) - (ED_1 + ED_2)|, \dots, |(AD_1 + AD_2 + \cdots + AD_9) - (ED_1 + ED_2 + \cdots + ED_9)| \quad (6)$$

Where,

- AD (actual distribution) is the empirical frequency of the number, and
- ED (expected distribution) is the theoretical frequency expected by Benford's distribution.

The critical (test) value for testing conformance is $1.36/\sqrt{P}$

Where,

- 1.36 is the constant for a significance level of 0.05, and
- P is the number of records

4.6.3. Mean Absolute Deviation (MAD) statistic

This is defined as the "sum of the absolute difference between the empirical distribution of leading digits in annual financial statements and their theoretical Benford distribution, divided by the number of leading digits" (Amiram et al., 2015, p. 1575). The MAD statistic formula is as follows:

$$MAD = \left(\sum_{i=1}^{K} |AD - ED|\right)/K \quad (7)$$

Where,

- K is the number of leading digits being analysed,
- AD (actual distribution) is the empirical frequency of the number, and
- ED (expected distribution) is the theoretical frequency expected by Benford's distribution.

Mark Nigrini has published book entitled "Benford's Law: Applications for Forensic Accounting, Auditing, and Fraud Detection" whereby he developed a set of critical values for determining conformance with Benford's Law when using the MAD statistic which will be used in this study (Nigrini, 2012, p. 160).

4.7. Data gathering process

The data gathering process involved two phases. The first phased involved the collection of data for the purpose of identifying the sample for the two hypotheses whilst the second phase involved the collection of financial data for the purpose of analysing the data.

4.7.1. Phase 1

For the first phase, two different samples were selected as follows:

Misstated/fraudulent financial statements sample (sample one for Hypothesis 1)

The Audit Status for the year 2018, 2017 and 2016 was extracted for all JSE companies from OSIRES. The years were filtered using the criteria "Blanks", "No option" and "Unaudited" relevant to the year. The Integrated/Annual Reports or Annual Financial Statements for the respective companies were viewed on the company's websites to confirm or dispute the Audit Opinion data extracted from IRESS based on the Independent Auditor's Report. Where there were no Annual/Integrated Reports or Annual Financial Statements posted on the respective Company's website, the SENS announcements were reviewed to ascertain the reasons thereof. Thereafter, a conclusion was made as to whether or not to include each Company in the sample of Companies with fraudulent or misstated accounting records together with commentary which justified the decision. There were 69 audit opinion statuses as either blank, “No opinion” or “Unaudited” out of 888 (296 companies X 3 years) expected audit opinion status during the period 2016 to 2018. Of the 69, there were 63 false positives and six company financials years (which related to three companies) where there was a blank opinion due to fraud/misstatement reported.

A list of companies which announced a “Termination Company and/or JSE initiated” event from 2016 to 17 October 2018 was reviewed. All eight companies were excluded from the sample as the events were not as a result of fraudulent/misstated financial reporting.

Suspected misstatement/fraudulent financial statements (sample two for Hypothesis 2)

The webpage of Viceroy Research Group (www.viceroyresearch.org) was reviewed to identify any reports of fraudulent or misstated financial data reported relating to JSE companies. There were three JSE listed companies identified where reports were issued relating to suspected fraudulent report. Two were included for testing the second Hypothesis and the other one was subsequently confirmed to be fraudulent financial reporting and included in the sample for testing the first Hypothesis.

4.7.2. Phase 2

For the second phase, this research required the use of secondary data which was publicly available. Financial data relating to audited financial statements (e.g. Statement of Financial Performance and Statement of Financial Position) for the sample of companies selected for analysis was collected from a commercial database known as IRESS (previously McGregor BFA) and was accessible through the Gordon Institute of Business Science.

The data collected was utilised quantitatively for digital analysis and statistical testing to determine both the frequency of occurrence relevant to the expected frequency of occurrence based on Benford's Law and the degree or extent of conformance respectively. The data gathering process was consistent with similar studies (Amiram et al., 2015; Saville, 2006)

4.8. Data analysis approach

The approach used to analyse the data collected included the following 3 steps:

Step 1: Sanitising the data collected

Financial data relating to the Statement of Financial Performance (Income Statement) and the Statement of Financial Position (Balance Sheet) for the sample selected was sanitised before the digits were extracted for further analysis (Nigrini, 2012) as follows:

- Totals and subtotals were removed as they don't provide any new information and cannot be manipulated.
- Zero's as first digits were excluded as they don't form part of the expected frequency of first digits (refer to Table 1).
- Percentages and other calculated numbers (e.g. earnings per share etc.) were omitted as they are quotients of two other numbers.

Whilst Amiram et al. (2015) included cash flow statements in their analysis, the results indicated that it was least likely to contain errors as opposed to the Income Statement which was most likely. Nigrini (2012) also included the Cash Flow Statements and in addition included the notes to the financial statements. However, the Cash Flow statement have been excluded from

this study as there are a number of duplicate entries which will result in double counting. This study analysed the data of the Income Statement and Balance Sheet individually and combined

Step 2: Application of Benford's Law (Digit analysis)

The absolute values of the first digits, second digits and first-two digits were extracted using equations 1 to 3 (Benford's Law) in Chapter 2. Thereafter, the frequency of distribution of each digit for each test relative to the expected distribution was calculated and depicted graphically in order to provide a high level descriptive analysis of the data.

Step 3: Testing for conformance to Benford's Law (Digit-by-digit and Test-by-test)

Based on the results of step 2, three statistical tests for conformance with Benford's Law (MAD) statistic were performed in order to measure the goodness-of-fit and extent/degree to which the actual data conforms to Benford's Law. The Z-Statistic was the digit-by-digit statistical test used to measure conformance on an individual digit level rather than for concluding on an overall level (Nigrini, 2012). The Kolmogorov–Smirnov (KS) statistic and the Mean Absolute Deviation (MAD) were the test-by-test statistical tests used for assessing overall conformance for both research hypotheses.

A summary of the overall approach followed in this study for the first, second and first-two digit tests is included in Table 3. The table makes reference to the period of analysis (single and group year) and the financial data (Income Statement, Balance Sheet or combined/consolidated) to which the digit and statistical tests were applied. The analysis of the first-two digits based on a single year's data was not included in the data analysis approach. This was due to the small number of observations in the data relative to the large number of first-two digit combinations (ninety in total). Similarly, the analysis of the first-two digit test was only performed on the Combined (Balance Sheet and Income Statement) data for grouped (multiple) years as it had the largest number of observations. In addition to the statistical tests conducted, the latest integrated report/annual financial statements (prior to identifying the fraud/misstatement) were reviewed to summarise key audit matters reported by external auditors in order to provide context to the findings.

Table 3. Summary of data analysis approach

Analysis period	Digit/(s)	Financial Data	Digit analysis	Digit-by-digit	Test-by-test	
				Z-Statistic	MAD	KS
Single year (Year 1, Year 2, …..Year 10)	First	Balance Sheet	Yes	Yes	Yes	Yes
		Income statement	Yes	Yes	Yes	Yes
		Combined	Yes	Yes	Yes	Yes
	Second	Balance Sheet	Yes	Yes	Yes	Yes
		Income statement	Yes	Yes	Yes	Yes
		Combined	Yes	Yes	Yes	Yes
	First-two	Balance Sheet	**No**	**No**	**No**	**No**
		Income statement	**No**	**No**	**No**	**No**
		Combined	**No**	**No**	**No**	**No**
Group years • Years 1-5 • Years 6-10 • Years 1-10 Except where less than 5 years	First	Balance Sheet	Yes	Yes	Yes	Yes
		Income statement	Yes	Yes	Yes	Yes
		Combined	Yes	Yes	Yes	Yes
	Second	Balance Sheet	Yes	Yes	Yes	Yes
		Income statement	Yes	Yes	Yes	Yes
		Combined	Yes	Yes	Yes	Yes
	First-two	Balance Sheet	**No**	**No**	**No**	**No**
		Income statement	**No**	**No**	**No**	**No**
		Combined	Yes	Yes	Yes	Yes

4.9. Quality controls

The financial data was gathered from a commercial database and was secondary data in nature. It was considered reliable as the analysis of the data can be easily replicated to produce the same result. Secondary data was considered to be the most appropriate measure for ensuring the validity of the results and thereby strengthening the quality of research.

4.10. Research limitations

The research contained various limitations. Firstly, the reliability of opinions provided by external auditors is a key limitation relating to the research and a key driver for

conducting the research as was evidenced by Steinhoff (Steinhoff International Holdings N .V., 2018). External auditors only provide an opinion on the fair presentation (i.e. there are no material misstatements) of financial statements (Steinhoff International Holdings Ltd, 2015; Steinhoff International Holdings N . V., 2016). Therefore, fraudulent and erroneous results which were not material would not have a negative impact on the audit opinion. In addition, there have been instances where fraud has been detected subsequent to favourable opinions been issued and relating to prior periods where favourable opinions were issued. Therefore, the research methodology and design is limited to known (reported) or suspected instances for fraud and error and cannot be validated against a control group of companies where there is no fraudulent or erroneous reporting.

As the completeness regarding the actual population of fraudulent and erroneous financial records is not known, inferences cannot be drawn from the sampled data to a population.

The extent to which the results of the digital analysis do not conform to Benford's Law is generally not a direct indicator of fraudulent reporting. The only exception being where the analysis is conducted on known instances of fraud. More detailed testing of individual account data would be required and is not the focus of this study because the data is not publicly available. In addition, the use of Benford's Law to detect fraud at a financial statement level should be used with caution (Druică et al., 2018).

Lastly, there is limited research relating to the application of Benford's Law at a financial statement level. In addition, where there are existing studies for assessing conformance, differences exist in the research methodology used particularly relating to the sample sizes, the digit and statistical tests, and the data analysed. This creates a further limitation with regard to discussing and comparing the findings of this study with that of other studies. However, it does reiterate the need for additional research at a financial statement data level.

5. RESULTS

5.1. Introduction

This section presents the results of the analysis conducted in accordance with the research methodology explained in Chapter 4 to test the two hypotheses presented in Chapter 3. The results and related findings will be discussed in detail in Chapter 6.

This section begins with providing details regarding the sample of companies listed on the Johannesburg Stock Exchange selected for analysis and the related observations. Thereafter, the results for each of the two hypotheses are presented per company analysed. The results per company include a graphical descriptive analysis of the data based on the actual versus expected frequency of the relevant digit test distributions followed by statistical tests performed for assessing conformance with Benford's Law. Lastly, a summary of the key audit matters reported by external auditors in the latest integrated report/annual financial statements (prior to identifying the misstatement) is presented.

5.2. Sample selected and observations

The list of companies included in the sample per hypotheses and rationale for including them in the sample is presented in Table 4. The details of the number observations per company sampled per data set (Balance Sheet, Income Statement and Combined) are presented in Table 5.

Table 4. Sample selected

Company and share code	Rationale for including in the sample
H1: Misstated Audited Financial Statements Hypothesis	
Steinhoff International Holdings N.V. (SNH)	Reliance can no longer be placed on its Financial Statements for 2015 and 2016 (Steinhoff International Holdings Ltd, 2015; Steinhoff International Holdings N . V., 2016; Steinhoff International Holdings N .V., 2018). A report providing an overview of the Forensic Investigation results highlighted confirmed that profits and assets were inflated as well as fictitious and/or irregular transactions

Company and share code	Rationale for including in the sample
	and income was created (Steinhoff International Holdings N.V., 2019).
Tongaat Hulett Limited (TON)	On 31 May 2019, Tongaat Hulett Limited issued a SENS stating that their "review has revealed certain past practices which are of significant concern to the Board and the Company's auditors" (Tongaat Hullet Limited, 2019, para. 4). Specific reference was made to historic practices which "appear to have resulted in financial statements that did not reflect Tongaat Hulett's underlying business performance accurately" (Tongaat Hullet Limited, 2019, para. 4) and are subject to an ongoing independent forensic investigation.
Freedom Property Fund Limited (FDP)	No financials since 2016. SENS issued on 27 Jan 2017 confirmed fraudulent financial reporting requiring restatement of 2015 results
African Phoenix Investments Limited (AXL) (Previously African Bank Investments Limited)	The SENS issued on 11 August 2014, stated that the shares were suspended on the JSE following the bank been placed under curatorship by the South African Reserve Bank.
H2: Suspected Misstated Audited Financial Statements Hypothesis	
Capitec Bank Holdings Limited (CPI)	A report issued by Viceroy Research Group on 30 January 2017 alleged that the loan book is overstated and that impairments required would result in a net-liability position (Viceroy Research Group, 2017).
NEPI Rockcastle Plc (NRP)	A report issued by Viceroy Research Group on 28 November 2018 alleged that there were a number of inconsistencies in the financial data reported and that the profits in a Romanian organisation was overstated (Viceroy Research Group, 2018).

Table 5. Number of observations analysed per company per data set

Company Sampled	Year									
	10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
H1: Misstated Audited Financial Statements Hypothesis										
Steinhoff International Holdings N.V.*	38	36	41	40	41	40	41	41	40	41
	196					203				
	399									
Tongaat Hulett Limited*	35	34	35	35	35	35	36	35	35	35
	174					176				
	350									
African Phoenix Investments Limited (AXL)*	36	35	36	36	36	36	27	27	31	32
	179					153				
	332									
Freedom Property Fund Limited (FDP)*									26	23
									49	
H2: Suspected Misstated Audited Financial Statements Hypothesis										
Capitec Bank Holdings Limited (CPI)*						31	31	30	30	29
						151				
NEPI Rockcastle Plc (NRP)*									26	26
									52	
* The first row records the observations per single year analysed. The second row shows the observations for the first five and last five group years (where applicable). The third row shows the observations for the full period grouped years (maximum of ten).										

5.3. Misstated Audited Financial Statements Hypothesis test results

The sample of companies selected for analysing this Hypothesis included those where known instances of fraudulent and/or erroneous financial statement data were reported. These include the following companies:

- Steinhoff International Holdings N.V.
- Tongaat Hulett Limited
- African Phoenix Investments Limited
- Freedom Property Fund Limited

5.3.1. Steinhoff International Holdings N.V.

The period of analysis related to financial statement data (Appendix 1) pertaining to the Income Statement and the Statement of Financial Position (previously known as

the Balance Sheet) reported during the financial years from 2009 (Year 1) to 2018 (Year 10).

5.3.1.1. First digit descriptive analysis results

The first digit analysis results for conformance with Benford´s Law based on the frequency of distribution are depicted graphically for the Balance Sheet, Income Statement, Balance Sheet and Income Statement combined per financial year and in groups of financial years.

a) <u>Balance Sheet first digit analysis</u>

The first digit frequencies relating to the Balance Sheet accounts were compared to the expected frequencies as per Benford's Law. Figure 1 depicts the results of the comparison for each year from 2009 to 2013, Figure 2 depicts the results for each year from 2014 to 2018 and Figure 3 for group of years 2009 to 2013, 2014 to 2018 and 2009 to 2018.

At a high level the results for Figure 1 for each of the years did not depict a general conformance to the expected frequencies. The actual frequencies vary from exceeding the expected frequencies in some years to been below the expected frequencies in other years for the same digit. For example, the frequency of digit three as a leading first digit in 2012 (0.2917) and 2013 (0.034) exceed the Benford's expected frequency of 0.1249. By contrast, the frequency of digit three as a leading first digit in 2009 (0.0870), 2010 (0.0870) and 2011(0.0870) are below Benford's expected frequency.

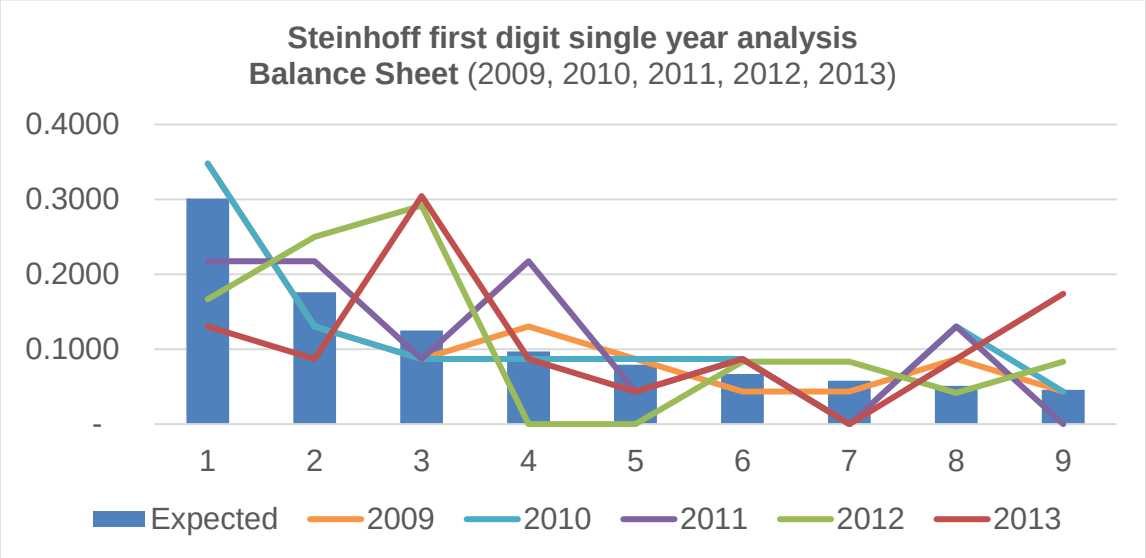

Figure 1. **Steinhoff Balance Sheet first digit analysis per year (2009-2013)**

Similarly, the results for Figure 2 for each of the years did not depict a general conformance to the expected frequencies and also vary between exceeding and been below the expected frequency (for example, digit two). By contrast, the results of Figure 3 depicted more uniformity in the trend of conformance and non-conformance with Benford's Law when the results were grouped for five year and ten year periods of data.

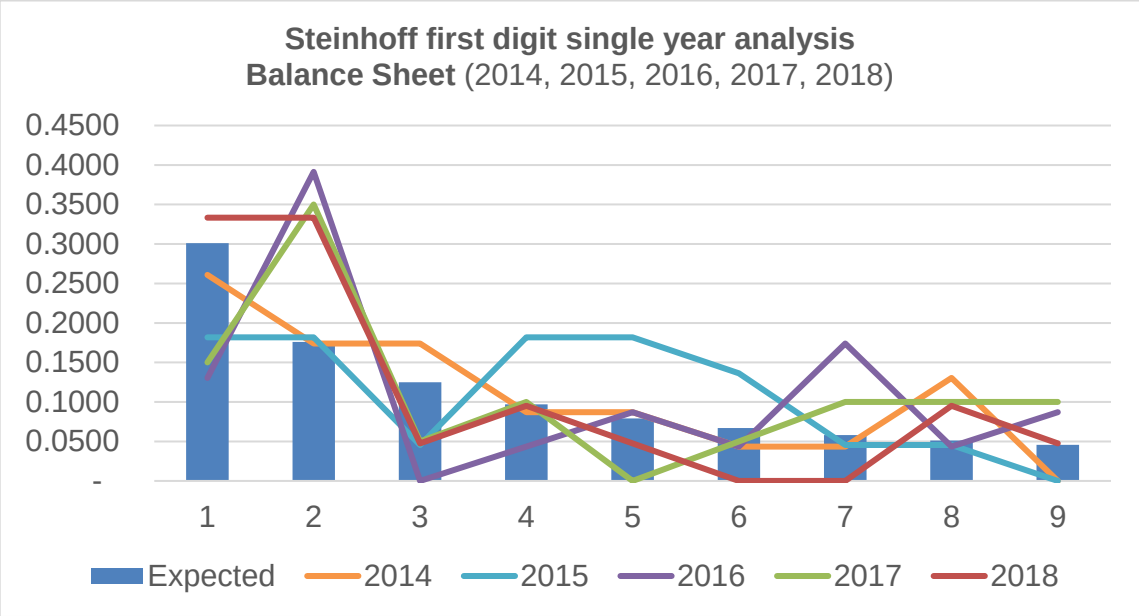

Figure 2. **Steinhoff Balance Sheet first digit analysis per year (2014-2018)**

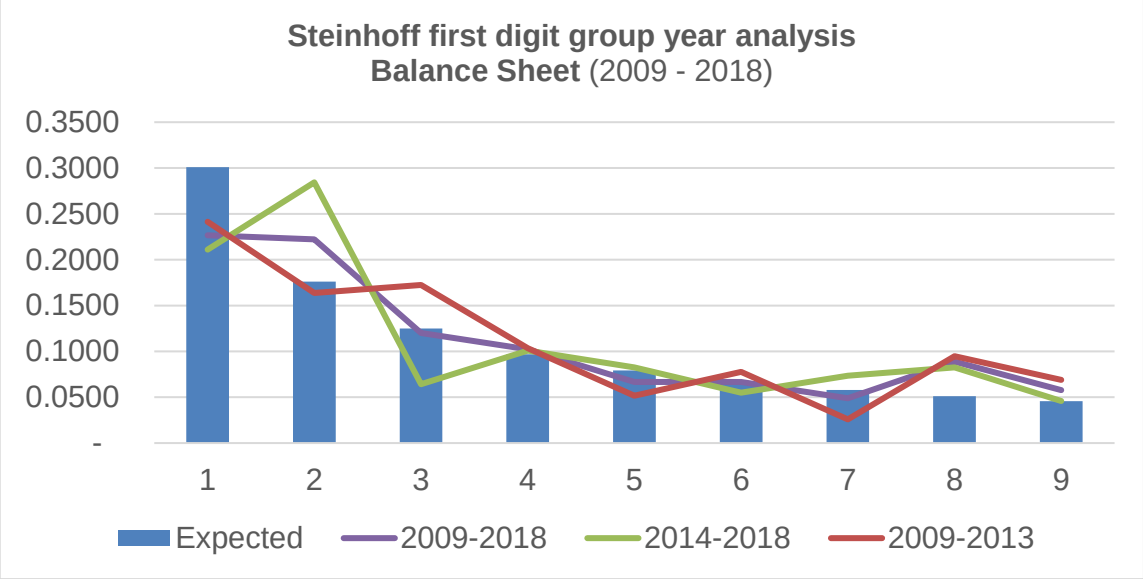

Figure 3. **Steinhoff Balance Sheet first digit analysis per group year**

b) Income Statement first digit analysis

The first digit frequencies relating to the Income Statement accounts were compared to the expected frequencies as per Benford's Law. Figure 4 depicts the results of the comparison for each year from 2009 to 2013, Figure 5 depicts the results for each year from 2014 to 2018 and Figure 6 for group of years 2009 to 2013, 2014 to 2018 and 2009 to 2018.

Similar to the Balance Sheet results in Figure 1 and Figure 2, the results did not depict a general conformity to the expected frequencies with some digit frequencies varying in opposite directions (e.g. above or below the expected frequency). By contrast, the results of Figure 6 depicted more uniformity in the trend of conformance and non-conformance with Benford's Law when the results were grouped for five year and ten year periods of data.

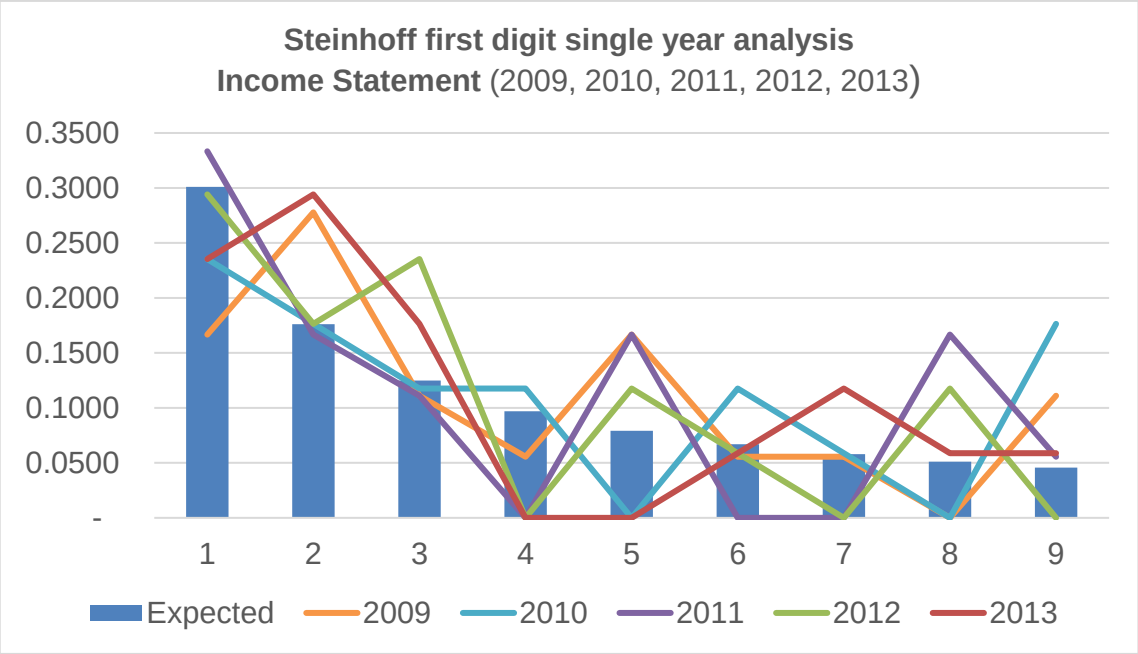

Figure 4. **Steinhoff Income Statement first digit analysis per year (2009-2013)**

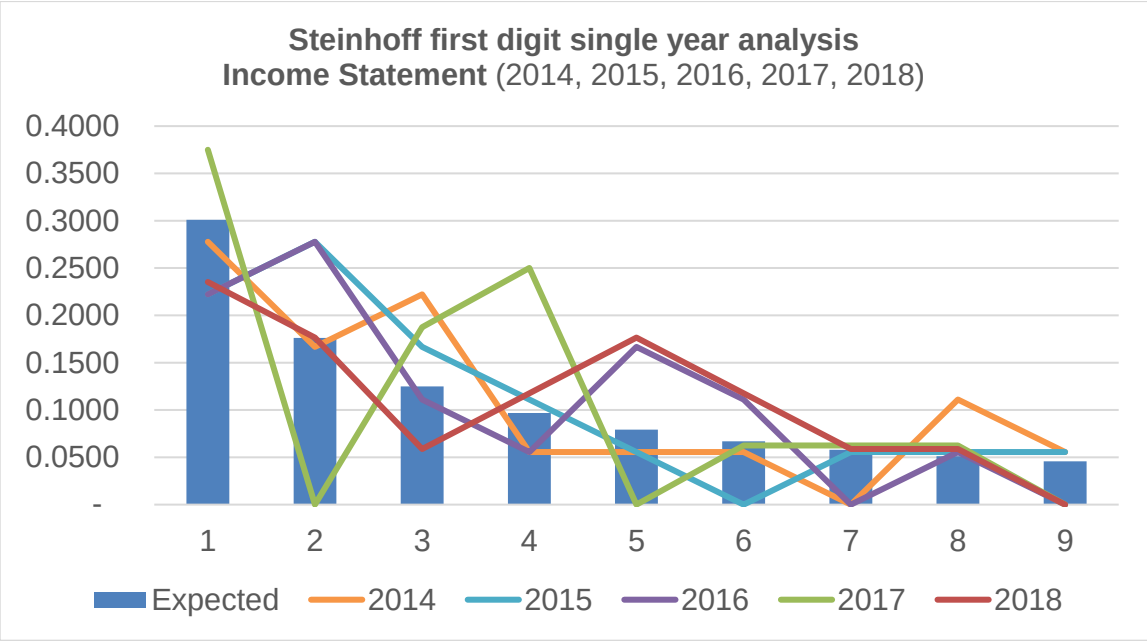

Figure 5. Steinhoff Income Statement first digit analysis per year (2014-2018)

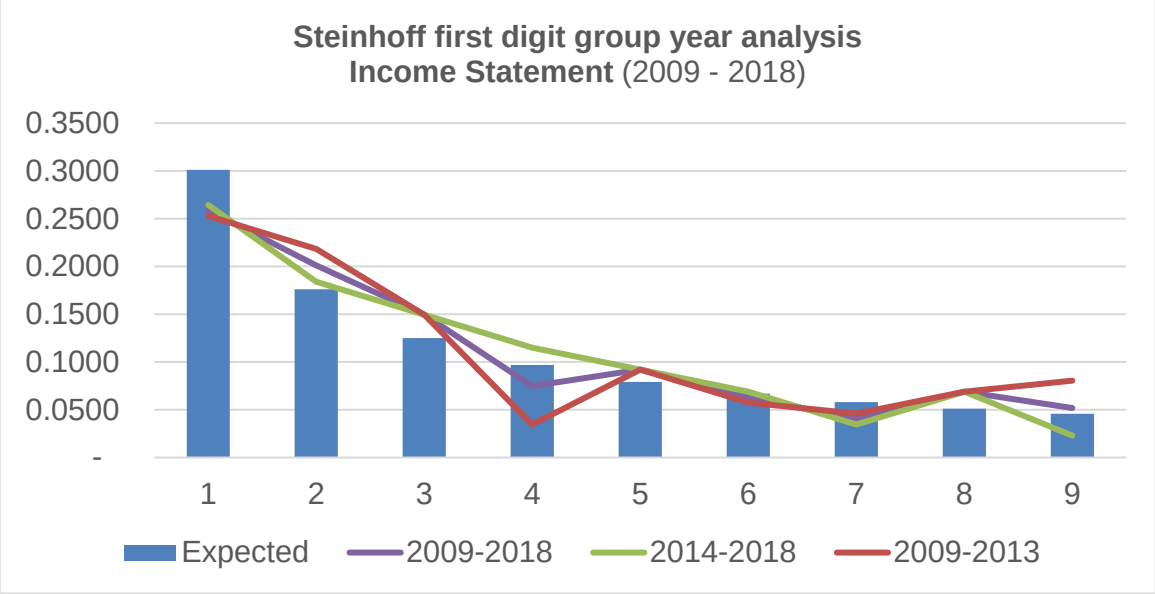

***Figure 6.* Steinhoff Income Statement first digit analysis per group year**

c) <u>Combined (Balance Sheet and Income Statement) first digit analysis</u>

The first digit frequencies relating to the Combined (Balance Sheet and Income Statement) accounts were compared to the expected frequencies as per Benford's Law. Figure 7 depicts the results of the comparison for each year from 2009 to 2013, Figure 8 depicts the results for each year from 2014 to 2018 and Figure 9 for group of years 2009 to 2013, 2014 to 2018 and 2009 to 2018.

Similar to the Balance Sheet and the Income Statement results previously discussed, the results did not depict a general conformity to the expected frequencies with some digit frequencies varying in opposite directions (e.g. above or below the expected frequency). However, there appears to be more uniformity in the trend of conformance and non-conformance with Benford's Law when the Balance Sheet and Income Statement accounts are combined and when the results were grouped for five year and ten year periods of data (Figure 9).

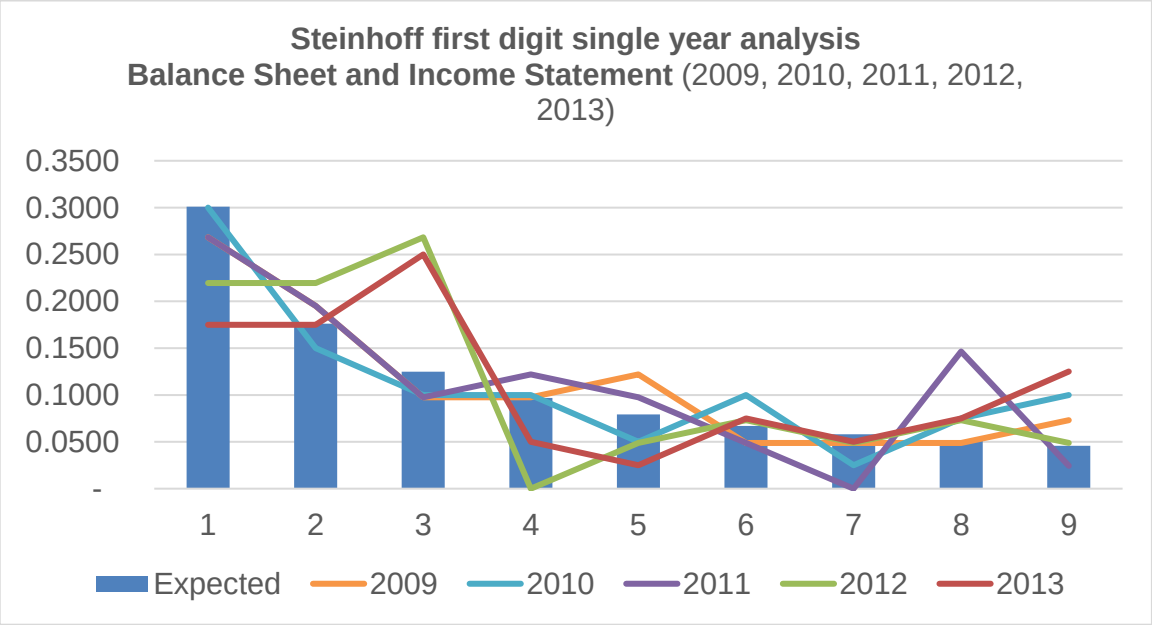

Figure 7. **Steinhoff Combined first digit analysis per year (2009-2013)**

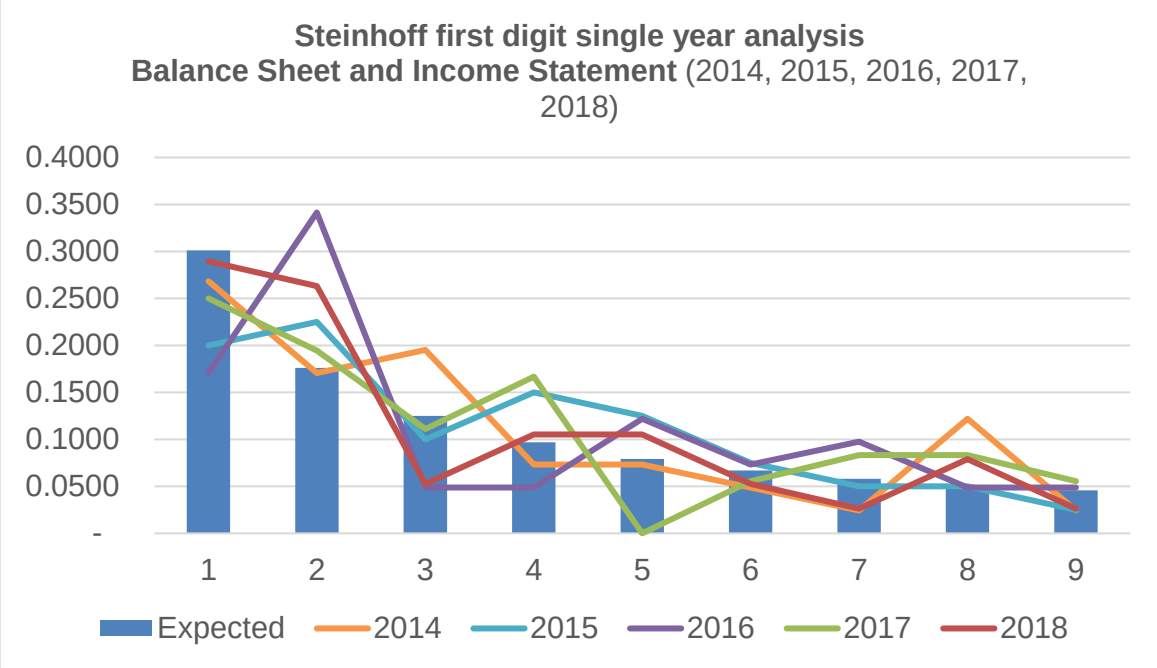

Figure 8. **Steinhoff Combined first digit analysis per year (2014-2018)**

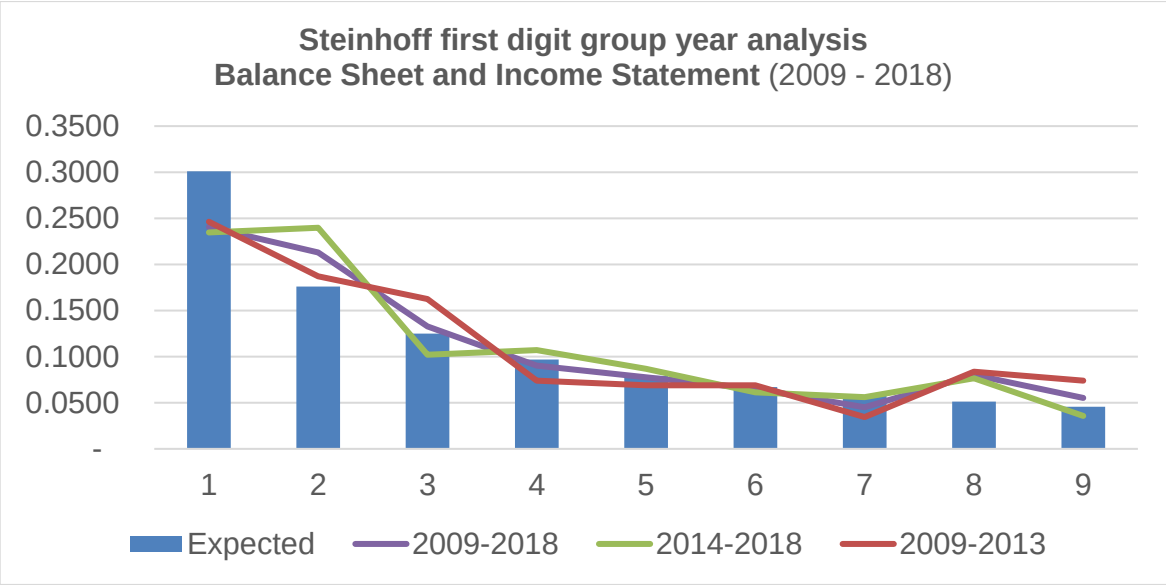

Figure 9. **Steinhoff Combined first digit analysis per group year**

5.3.1.2. Second digit descriptive analysis results

The second digit single year analysis results for both the Balance Sheet (Appendix 7) and Income Statement (Appendix 8) depicted general non-conformance with Benford's Law at a high level similar to that of the first digit analysis whilst on a combined/grouped year level there is more uniformity in the trend. Similar to the results of the second digit single year analysis discussed in the preceding paragraph, the results for the combined (Balance Sheet and Income Statement) data in Appendix 9 did not depict a general conformity to the expected frequencies. However, there appears to be more uniformity in the trend when the results were grouped for five year and ten-year periods of data (Appendix 9).

5.3.1.3. First-two digit descriptive analysis results

The first-two digit frequencies relating to the Combined (Balance Sheet and Income Statement) accounts were compared to the expected frequencies as per Benford's Law. Figure 10 depicts the results of the comparison for each year from 2009 to 2013, Figure 11 depicts the results for each year from 2014 to 2018 and Figure 12 for group of years 2009 to 2013, 2014 to 2018 and 2009 to 2018. For all grouped years, the comparison depicts a general non-conformance with Benfords's Law at a high level.

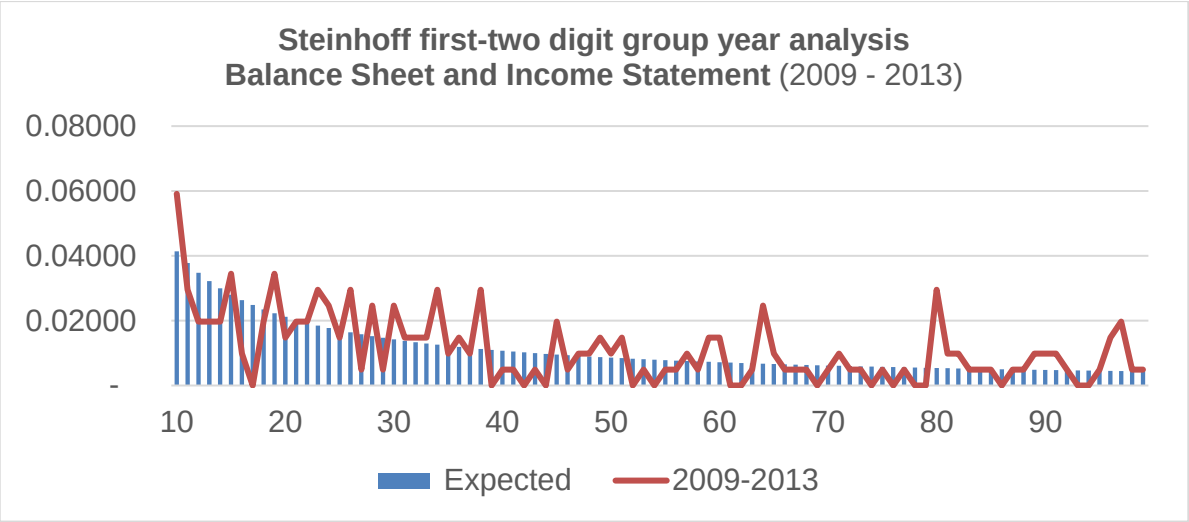

Figure 10. **Steinhoff Combined first-two digit analysis (2009-2013)**

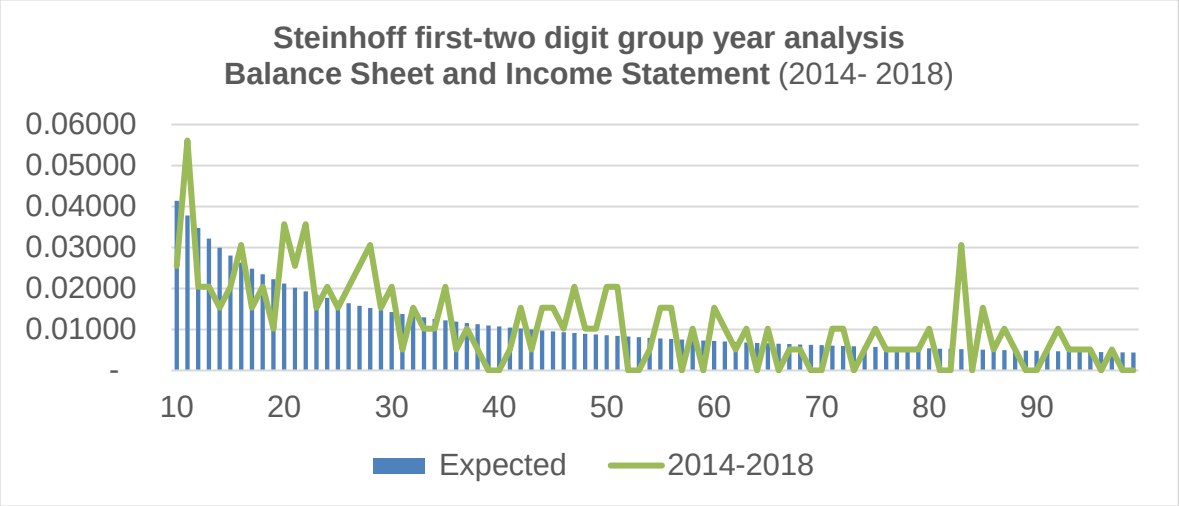

Figure 11. **Steinhoff Combined first-two digit analysis (2014-2018)**

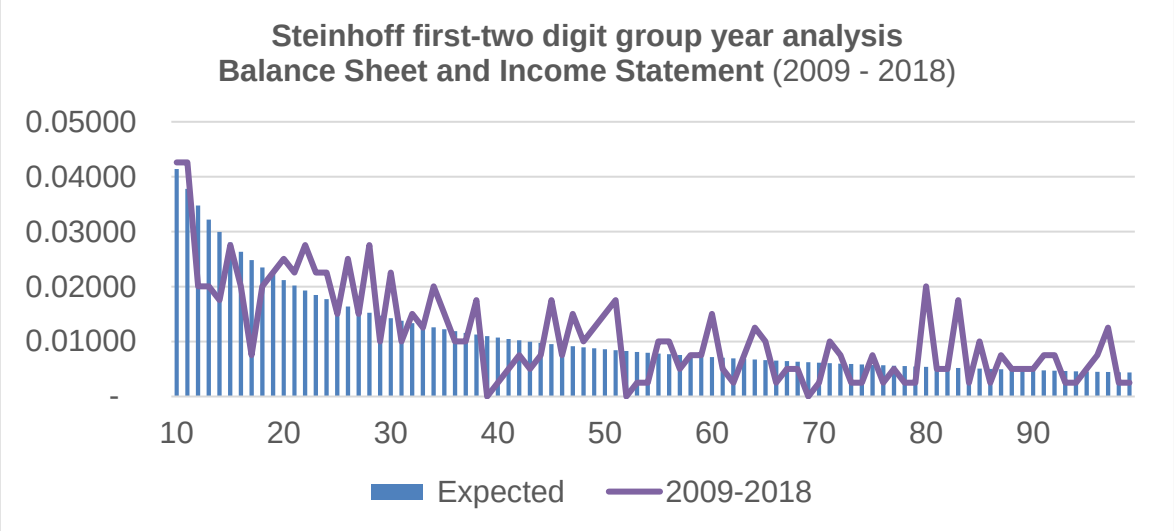

Figure 12. **Steinhoff Combined first-two digit analysis (2009-2018)**

5.3.1.4. Z-Statistic test results

The results of the z-statistic test for determining the statistical significance of variances between the actual and Benford's Law frequencies of distribution on a digit-by digit basis are presented for the first digit, second digit and first-two digits analysed.

a) <u>Z-Statistic first digit analysis</u>

The results of the z-statistic test performed on the first digit analysis are presented in the tables that follow. In Table 6, statistically significant deviations were noted in three of the ten single year's first digit analysis on Balance Sheet data. In 2016 and 2012, the use of digit two and digit three respectively did not conform to Benford´s Law whilst digit three and nine did not conform in 2013. Based on the z-statistic results majority of the single year Balance Sheet data analysed on the first digit conformed to Benford's Law.

Table 6. Steinhoff single year first digit Z-Statistic (Balance Sheet)

Z-Statistic: Steinhoff Balance Sheet first digit										
First	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
1	0.08	1.23	1.56	0.99	0.19	1.56	1.21	0.65	0.26	0.26
2	1.61	1.75	**2.44**	0.07	0.03	0.85	0.68	0.25	0.30	0.30
3	0.74	0.68	1.50	0.81	0.40	**2.29**	**2.16**	0.24	0.24	0.24
4	0.03	0.05	0.51	0.99	0.16	0.16	1.26	1.60	0.16	0.19
5	0.13	0.90	0.14	1.39	0.14	0.25	1.06	0.25	0.14	0.14
6	0.79	0.30	0.03	0.88	0.03	0.38	0.32	0.38	0.38	0.03
7	0.67	0.33	1.93	0.25	0.30	0.74	0.09	0.74	0.74	0.30
8	0.42	0.48	0.17	0.12	1.25	0.31	0.21	1.25	1.25	0.31
9	0.04	0.63	0.45	0.52	0.55	**2.44**	0.39	0.55	0.05	0.05
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

In Table 7, statistically significant deviations were noted in one of the ten single year's first digit analysis on Income Statement data. In 2010, the use of digit nine did not conform to Benford´s Law. Based on the z-statistic results majority of the single year Income Statement data analysed on the first digit conformed to Benford's Law.

Table 7. Steinhoff single year first digit Z-Statistic (Income Statement)

Z-Statistic: Steinhoff Income Statement first digit										
First	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
1	0.33	0.37	0.47	0.47	0.22	0.33	0.06	0.04	0.33	0.99
2	0.00	1.52	0.82	0.82	0.10	0.96	0.00	0.10	0.00	0.82
3	0.46	0.38	0.18	0.18	0.89	0.28	1.01	0.18	0.09	0.18
4	0.29	1.65	0.19	0.20	0.19	0.94	0.94	0.99	0.29	0.19
5	1.04	0.71	0.94	0.37	0.37	0.76	0.14	0.94	0.76	0.94
6	0.35	0.07	0.28	0.66	0.19	0.13	0.13	0.66	0.35	0.19
7	0.01	0.08	0.55	0.04	0.55	0.53	0.50	0.55	0.01	0.04
8	0.14	0.21	0.08	0.08	0.62	0.14	0.69	1.69	0.41	0.45
9	0.32	0.28	0.37	0.20	0.20	0.26	0.32	0.20	**2.00**	0.76
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

In Table 8, statistically significant deviations were noted in four of the ten single year's first digit analysis on combined data. In 2016, 2012 and 2011, the use of digit two, three and nine respectively did not conform to Benford´s Law whilst digit three and nine did not conform in 2013. Based on the z-statistic results majority of the single year Combined data analysed on the first digit conformed to Benford's Law.

Table 8. Steinhoff single year first digit Z-Statistic (Combined)

Z-Statistic: Steinhoff Balance Sheet and Income Statement first digit										
First	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
1	0.16	0.49	1.65	1.22	0.29	1.57	0.97	0.29	0.01	0.29
2	1.20	0.07	**2.57**	0.60	0.09	0.02	0.52	0.11	0.23	0.11
3	1.10	0.25	1.24	0.24	1.12	**2.15**	**2.54**	0.29	0.24	0.29
4	0.17	1.13	0.78	0.87	0.25	0.74	1.83	0.28	0.07	0.01
5	0.30	1.45	0.73	0.78	0.14	0.98	0.43	0.15	0.39	0.73
6	0.03	0.27	0.16	0.20	0.15	0.20	0.16	0.15	0.52	0.15
7	0.49	0.29	0.75	0.22	0.59	0.22	0.25	1.25	0.55	0.25
8	0.41	0.50	0.07	0.03	1.70	0.33	0.29	**2.41**	0.33	0.07
9	0.19	0.28	0.09	0.25	0.28	**2.02**	0.09	0.28	1.26	0.47
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

In Table 9, both the Balance Sheet and the Income Statement results combined for the full sample period (2009-2018) indicated that digit one and digit eight was a statistically significant deviations from Benford's Law when analysing the first digit. Similarly, the results indicated that digit two was statistically significant in the more recent five-year group (2014-2018) whilst the earlier five year group (2009-2013) had no significant deviations for the Balance Sheet and Combined data. At an Income

Statement level, none of the grouped years deviations were statistically significant when analysing the first digit.

Table 9. Steinhoff grouped year first digit Z-Statistic

First	Balance Sheet			Income Statement			Balance Sheet and Income Statement		
	2009-2013	2014-2018	2009-2018	2009-2013	2014-2018	2009-2018	2009-2013	2014-2018	2009-2018
1	1.30	1.94	**2.36**	0.86	0.63	1.14	1.62	1.95	**2.58**
2	0.23	**2.84**	1.73	0.90	0.05	0.77	0.32	**2.25**	1.87
3	1.41	1.77	0.12	0.53	0.53	0.86	1.52	0.86	0.40
4	0.08	0.14	0.16	1.79	0.39	0.86	0.99	0.36	0.37
5	0.92	0.13	0.57	0.24	0.24	0.48	0.41	0.26	0.02
6	0.27	0.31	0.02	0.14	0.08	0.05	0.12	0.18	0.04
7	1.28	0.48	0.44	0.25	0.71	0.84	1.28	0.11	0.99
8	1.92	1.27	**2.42**	0.51	0.51	0.89	1.95	1.45	**2.52**
9	0.97	0.01	0.70	1.29	0.76	0.20	1.75	0.50	0.78
At a 5% significance level, z-statistics > 1.96 are statistically significant.									

b) Z-Statistic second digit analysis

The results of the z-statistic test performed on the second digit analysis are presented in the tables that follow. In Table 10, statistically significant deviations were noted in five of the ten single year's second digit analysis on Balance Sheet data. In 2018 digit one, 2017 digit five, 2015 digit six, 2014 digit five and 2010 digit zero did not conform to Benford's Law.

Table 10. Steinhoff single year second digit Z-Statistic (Balance Sheet)

Z-Statistic: Steinhoff Balance Sheet second digit										
Second	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009
0	0.01	0.62	0.16	0.24	0.48	0.48	0.08	1.12	**2.41**	1.12
1	**2.14**	0.86	1.89	0.67	0.73	0.08	0.79	0.73	0.08	0.25
2	0.15	0.23	0.33	1.30	1.34	0.67	0.73	0.00	0.33	0.00
3	0.22	0.06	0.61	0.55	0.07	0.61	0.67	0.75	0.07	0.27
4	0.08	0.00	0.21	1.21	0.21	0.21	0.74	0.13	1.25	0.56
5	0.39	**2.70**	0.51	1.17	**3.02**	0.20	0.12	0.51	0.20	0.51
6	0.35	0.28	0.11	**2.52**	0.11	1.69	0.18	0.46	0.11	0.46
7	0.08	0.24	1.03	1.12	0.42	0.42	0.12	0.42	0.42	0.06
8	1.03	0.99	0.01	0.06	0.36	1.10	1.01	0.01	1.12	0.01
9	0.22	0.96	1.09	0.10	1.09	1.09	0.03	0.41	0.03	1.16
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

In Table 11, statistically significant deviations were noted in two of the ten single year's second digit analysis on Income Statement data namely digit eight in 2018 and digit four in 2012. Based on the z-statistic results majority of the single year Balance Sheet data analysed on the second digit conformed to Benford's Law.

Table 11. Steinhoff single year second digit Z-Statistic (Income Statement)

Z-Statistic: Steinhoff Income Statement second digit										
Second	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
0	0.03	0.07	0.98	0.48	0.98	0.35	0.40	0.98	0.03	0.48
1	0.33	0.25	0.04	0.41	0.41	0.43	1.19	0.04	0.43	0.04
2	0.12	0.61	0.35	1.17	0.41	0.12	0.27	0.35	0.12	1.10
3	0.18	0.96	0.29	0.48	0.48	0.22	1.01	0.09	0.22	0.48
4	0.97	0.09	0.54	1.02	0.54	0.24	**2.26**	1.02	0.17	0.54
5	1.52	0.04	0.21	0.19	0.21	0.12	0.29	1.40	0.12	0.61
6	0.91	0.86	0.15	0.26	0.96	0.34	0.07	0.96	0.07	0.15
7	0.03	0.92	0.10	0.10	0.10	0.39	0.39	0.31	0.88	0.10
8	**2.58**	0.09	0.35	0.35	0.90	0.42	0.42	0.35	1.73	0.06
9	0.82	0.77	0.03	0.82	0.03	0.82	0.82	0.03	0.05	0.82
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

In Table 12, statistically significant deviations were noted in two of the ten single year's second digit analysis on Income Statement data namely digit eight in 2018 and digit four in 2012. Based on the z-statistic results majority of the single year Balance Sheet data analysed on the second digit conformed to Benford's Law.

Table 12. Steinhoff single year second digit Z-Statistic (Combined)

Z-Statistic: Steinhoff Balance Sheet and Income Statement second digit										
Second	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
0	0.02	0.42	0.29	0.14	1.25	0.83	0.20	1.73	1.81	0.29
1	1.11	0.21	1.39	0.22	1.07	0.22	0.16	0.57	0.22	0.16
2	0.19	0.85	0.23	0.18	0.48	0.43	0.98	0.48	0.07	0.98
3	0.28	0.68	0.91	0.09	0.62	0.87	1.42	0.62	0.09	0.11
4	0.71	0.06	0.20	1.85	0.20	0.01	**2.28**	0.32	1.32	0.06
5	0.45	1.70	0.25	1.27	**2.40**	0.07	0.28	0.28	0.07	0.02
6	1.14	0.08	0.18	**2.05**	0.71	1.50	0.09	1.25	0.13	0.71
7	0.25	0.14	0.43	0.49	0.66	0.06	0.16	0.11	1.17	0.11
8	0.67	0.38	0.23	0.28	0.05	0.56	0.50	0.23	0.28	0.05
9	1.01	1.53	1.11	0.62	1.11	1.64	0.55	0.01	0.06	1.69
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

In Table 13, both the Balance Sheet and the Income Statement results combined for the first five-year sample group (2009-2013) and the recent five-year sample group indicated that digit one and digit nine was a statistically significant deviations from Benford's Law when analysing the second digit. In addition, digit one is also a statistically significant deviation in the 20014-2018 group for the Balance Sheet data. At an Income Statement level, none of the grouped years deviations were statistically significant when analysing the second digit.

Table 13. Steinhoff grouped year second digit Z-Statistic

Second	Balance Sheet			Income Statement			Balance Sheet and Income Statement		
	2009-2013	**2014-2018**	**2009-2018**	**2009-2013**	**2014-2018**	**2009-2018**	**2009-2013**	**2014-2018**	**2009-2018**
0	**2.75**	0.16	1.76	0.03	0.69	0.62	**2.21**	0.23	1.81
1	1.08	**2.44**	0.81	1.21	1.15	0.04	0.03	0.94	0.64
2	0.93	0.73	1.28	1.02	1.04	0.02	1.49	0.04	0.95
3	0.18	0.27	0.43	0.55	0.03	0.41	0.62	0.22	0.68
4	0.35	0.78	0.90	0.63	0.44	0.01	0.03	0.99	0.59
5	0.07	1.28	0.85	0.76	0.40	0.94	0.45	1.34	1.34
6	0.21	0.44	0.57	0.97	0.60	1.24	0.35	0.07	0.30
7	0.97	0.55	0.19	0.13	0.13	0.32	0.94	0.20	0.45
8	0.44	0.69	0.05	0.33	1.09	1.14	0.68	0.08	0.63
9	0.21	**1.98**	1.11	0.34	0.73	0.89	0.06	**2.09**	1.51
At a 5% significance level, z-statistics > 1.96 are statistically significant.									

c) Z-Statistic first-two digit analysis

The results of the z-statistic test performed on the first-two digit analysis are presented in the table that follows for the digit combinations that are statistically significant. In Table 14, statistically significant deviations were identified for five, one and four first-two digit combinations of Combined data for the 2009-2013, 2014-2018 and 2009-2018 group years respectively out of ninety possible first-two digit combinations for each group.

Table 14. Steinhoff grouped year first-two digit Z-Statistic (Combined)

Z-Statistic: Steinhoff Balance Sheet and Income Statement first-two digits			
First-two	**2009-2013**	**2014-2018**	**2009-2018**
17	**2.05**	0.63	**2.06**
38	**2.13**	0.48	0.95

Z-Statistic: Steinhoff Balance Sheet and Income Statement first-two digits			
First-two	**2009-2013**	**2014-2018**	**2009-2018**
64	**2.69**	0.72	1.11
80	**4.22**	0.43	**3.65**
83	0.05	**4.45**	**3.08**
97	**2.74**	0.14	**2.05**
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

5.3.1.5. Mean Absolute Deviation (MAD) test results

The results of the MAD statistic for determining the extent to which the actual frequency of distribution conforms to Benford's Law on a test-by test basis are presented for the first digit, second digit and first-two digits analysed. In Table 15, ten out of ten of the single year first digit MAD statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law.

Table 15. Steinhoff single year first digit MAD

MAD: Steinhoff first digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
Balance Sheet	0.05	0.07	0.08	0.06	0.03	0.08	0.07	0.06	0.03	0.03
	N	N	N	N	N	N	N	N	N	N
Income Statement	0.04	0.07	0.05	0.04	0.04	0.06	0.05	0.05	0.05	0.06
	N	N	N	N	N	N	N	N	N	N
Combined	0.03	0.03	0.06	0.03	0.03	0.05	0.05	0.04	0.03	0.02
	N	N	N	N	N	N	N	N	N	N

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

In Table 16, ten out of ten of the single year second digit MAD statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law.

Table 16. Steinhoff single year second digit MAD

MAD: Steinhoff second digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
Balance Sheet	0.05	0.07	0.05	0.07	0.07	0.06	0.04	0.05	0.05	0.04
	N	N	N	N	N	N	N	N	N	N

MAD: Steinhoff second digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
Income Statement	0.07	0.06	0.04	0.06	0.06	0.04	0.07	0.06	0.05	0.06
	N	N	N	N	N	N	N	N	N	N
Combined	0.04	0.04	0.03	0.04	0.05	0.04	0.04	0.04	0.03	0.03
	N	N	N	N	N	N	N	N	N	N

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable
Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

In Table 17, nine out of nine of the group year first digit MAD statistic results indicated that the deviations do not conform to Benford's Law. For the second digit group year MAD statistic results, non-conformance was noted in seven out of nine group year results with marginally acceptable conformity in two results in 2009-2018 group year. Conversely, results of the first-two digit results range from acceptable conformity in five grouped years and close conformity in four grouped years.

Table 17. Steinhoff group year MAD

MAD: Steinhoff group results									
	First digit			**Second digit**			**First-two**		
	2009-2013	**2014-2018**	**2009-2018**	**2009-2013**	**2014-2018**	**2009-2018**	**2009-2013**	**2014-2018**	**2009-2018**
Balance Sheet	0.03	0.04	0.02	0.02	0.03	0.02	0.009	0.008	0.006
	N	N	N	N	N	N	AC	AC	CC
Income Statement	0.03	0.02	0.02	0.03	0.03	0.01	0.009	0.008	0.006
	N	N	N	N	N	MAC	AC	AC	CC
Combined	0.02	0.02	0.02	0.02	0.02	0.01	0.006	0.006	0.004
	N	N	N	N	N	MAC	AC	CC	CC

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

5.3.1.6. Kolmogorov-Smirnov (KS) statistic test results

The results of the KS statist test for determining the extent to which the actual frequency of distribution conforms to Benford's Law on a test-by test basis are presented for the first digit, second digit and first-two digits analysed. In Table 18, ten out of ten of the single year first digit KS statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations conform to Benford's Law.

Table 18. Steinhoff single year first digit KS

KS: Steinhoff first digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
Balance Sheet*	0.190	0.151	0.171	0.193	0.046	0.260	0.134	0.084	0.077	0.047
	21	20	23	22	23	23	24	23	23	23
	0.303	0.311	0.290	0.296	0.290	0.290	0.284	0.290	0.290	0.290
	C	C	C	C	C	C	C	C	C	C
Income Statement*	0.131	0.114	0.099	0.079	0.070	0.104	0.104	0.125	0.131	0.134
	17	16	18	18	18	17	17	18	17	18
	0.337	0.348	0.328	0.328	0.328	0.337	0.337	0.328	0.337	0.328
	C	C	C	C	C	C	C	C	C	C
Combined*	0.076	0.067	0.130	0.101	0.049	0.127	0.105	0.074	0.078	0.041
	38	36	41	40	41	40	41	41	40	41
	0.225	0.232	0.217	0.220	0.217	0.220	0.217	0.217	0.220	0.217
	C	C	C	C	C	C	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.
C = Conformity, N = Nonconformity

In Table 19, ten out of ten of the single year second digit KS statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations conform to Benford's Law.

Table 19. Steinhoff single year second digit KS

KS: Steinhoff second digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
Balance Sheet*	0.220	0.256	0.136	0.280	0.125	0.112	0.197	0.105	0.205	0.114
	21	20	23	22	23	23	24	23	23	23
	0.303	0.311	0.290	0.296	0.290	0.290	0.284	0.290	0.290	0.290
	C	C	C	C	C	C	C	C	C	C
Income Statement*	0.135	0.144	0.103	0.122	0.245	0.128	0.121	0.103	0.180	0.176
	17	16	18	18	18	17	17	18	17	18
	0.337	0.348	0.328	0.328	0.328	0.337	0.337	0.328	0.337	0.328
	C	C	C	C	C	C	C	C	C	C

KS: Steinhoff second digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
Combined*	0.106	0.117	0.108	0.194	0.161	0.085	0.154	0.100	0.133	0.086
	38	36	41	40	41	40	41	41	40	41
	0.225	0.232	0.217	0.220	0.217	0.220	0.217	0.217	0.220	0.217
	C	C	C	C	C	C	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

In Table 20, nine out of nine of the group year first digit KS statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law. For the second digit and first-two digit group year KS statistic results, conformance is noted in 100% of the grouped year tests per data analysed.

Table 20. Steinhoff group year KS

KS: Steinhoff group results									
	First digit			**Second digit**			**First-two**		
	2009-2013	**2014-2018**	**2009-2018**	**2009-2013**	**2014-2018**	**2009-2018**	**2009-2013**	**2014-2018**	**2009-2018**
Balance Sheet*	0.931	0.954	0.942	0.087	0.081	0.060	0.096	0.090	0.074
	116	109	225	116	109	225	116	109	225
	0.129	0.133	0.093	0.129	0.133	0.093	0.129	0.133	0.093
	N	N	N	C	C	C	C	C	C
Income Statement*	0.920	0.977	0.948	0.054	0.030	0.034	0.060	0.068	0.052
	87	87	174	87	87	174	87	87	174
	0.149	0.149	0.105	0.149	0.149	0.105	0.149	0.149	0.105
	N	N	N	C	C	C	C	C	C
Combined*	0.926	0.964	0.945	0.053	0.044	0.042	0.067	0.066	0.061
	203	196	399	203	196	399	203	196	399
	0.098	0.099	0.070	0.098	0.099	0.070	0.098	0.099	0.070
	N	N	N	C	C	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

5.3.1.7. Key Audit Matters

The key audit matters reported in the 2016 annual report are summarised below (Steinhoff International Holdings N . V., 2016):

- The valuation of the vendor allowances receivable, goodwill and intangible assets requires significant judgement.
- Determining the fair value of assets and liabilities acquired as a result of business combinations requires significant judgement
- Provisions for uncertain tax positions (due to operating in multiple tax jurisdictions) and the valuation of the deferred tax asset.

5.3.2. Tongaat Hulett Ltd

The period of analysis related to financial statement data (Appendix 2) reported during the financial years from 2008 (Year 1) to 2018 (Year 10). There was a change in year end and therefore 2009 data was reported as part of 2010 results. The years were grouped as year 1 to year 5, year 6 to year 10 and year 1 to year 10.

5.3.2.1. First, second and first-two digit descriptive analysis results

The results are depicted graphically in Appendix 10 for the first digit, Appendix 11 for the second digit and Appendix 12 for the first-two digits. At a high level the results for the Balance Sheet, Income Statement and Combined first digit analysis for each of the years do not always depict a general conformance to the expected frequencies. More extreme deviations were noted in the second digit single year analysis results than that of the first digit analysis. By contrast, the results of the Balance Sheet, Income Statement and Combined first digit and second digit analysis for the group years depicted more uniformity in the trend of conformance and non-conformance with Benford's Law when the results were grouped for five year and ten-year periods of data. For all grouped years of the first-two digit analysis, the comparison depicted a general non-conformance with Benford's Law at a high level.

5.3.2.2. Z-Statistic test results

The results of the z-statistic test performed are presented in Appendix 13.

a) <u>Z-Statistic first digit analysis</u>

No statistically significant deviations were noted in the single year's first digit analysis on Balance Sheet data. Statistically significant deviations were noted in one of the ten single year's first digit analysis on Income Statement and Combined data.

Two out of nine first digits in the 2008-2013 group year and one out nine first digits in the 2008-2018 group year were noted as being statistically significant deviations relating to Balance Sheet data. At an Income Statement level, one out of nine statistically significant deviations were noted in the 2008-2013 group year. For the Combined data, first digit one was a statistically significant deviation for each group year (2008-2013, 2014-2018 and 2008-2018).

b) <u>Z-Statistic second digit analysis</u>

Statistically significant deviations were noted in four of the ten single year's second digit analysis on the Balance Sheet data, three out of ten on the Income Statement data and five out of ten on the Combined data. Statistically significant deviations were noted in two of the three group years analysed for the Balance Sheet and Combined data, and three out of three for the Income Statement data.

c) <u>Z-Statistic first-two digit analysis</u>

Statistically significant deviations were identified for three, two and four first-two digit combinations of Combined data for the 2008-2013, 2014-2018, and 2008-2018 group years respectively out of ninety possible first-two digit combinations for each group.

5.3.2.3. Mean Absolute Deviation (MAD) test results

The results of the MAD statistic performed are presented in Appendix 14. Ten out of ten of the single year first digit and second digit MAD statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law. The group year's first digit and second digit MAD statistic results indicated that the deviations do not conform to Benford's Law for the Balance Sheet, Income Statement and Combined Data. Conversely, results of the

first-two digit results depicted acceptable conformity for the Balance Sheet and Income Statement group years. For the Combined data, the results indicated acceptable conformance for the Balance Sheet, Income Statement and 2014-2018 Combined group year data and close conformity for the Combined 2008-2013 and 2008-2018 grouped years.

5.3.2.4. Kolmogorov-Smirnov (KS) statistic test results

The results of the KS statistic performed are presented in Appendix 15. Ten out of ten of the single year first digit and second digit KS statistic results on the Balance Sheet, Income Statement and Combined data indicated that the deviations conform to Benford's Law. The group year first digit KS statistic results indicated that the deviations do not conform to Benford's Law whilst the first-two digit test indicated that the Balance Sheet, Income Statement and Combined data did conform. For the second digit test, the Balance Sheet, Income Statement and the Combined group years (2008-2013 and 2014-2018) data conformed whilst the Combined 2008-2018 data did not conform to Benford's Law.

5.3.2.5. Key Audit Matters

The key audit matters reported in the 2018 annual financial statements are summarised below (Tongaat Hullet Limited, 2018):

- The appropriateness of the valuation of crops (e.g. sugar cane) which are growing.
- Judgement required in determining the value of the accrual for future development expenditure based on expected project costs, expected sales price and infrastructure cost allocations.

5.3.3. African Phoenix Investments Ltd (African Bank)

The period of analysis related to financial statement data (Appendix 3) reported during the financial years from 2004 (Year 1) to 2013 (Year 10).

5.3.3.1. First, second and first-two digit descriptive analysis results

The results are depicted graphically in Appendix 16 for the first digit, Appendix 17 for the second digit and Appendix 18 for the first-two digit descriptive analysis results. At a high level the results for the Balance Sheet, Income Statement and Combined first digit and second digit analysis for each of the years do not always depict a

general conformance to the expected frequencies. By contrast, the results of the Balance Sheet, Income Statement and Combined first digit and second digit analysis for the group years depicted more uniformity in the trend of conformance and non-conformance with Benford's Law when the results were grouped for five year and ten-year periods of data. For all grouped years of the first-two digit analysis, the comparison depicts a general non-conformance with Benford's Law at a high level.

5.3.3.2. Z-Statistic test results

The results of the z-statistic test performed are presented in Appendix 19.

a) <u>Z-Statistic first digit analysis</u>

One first digit was identified as a statistically significant deviation in one of the ten single years analysed on the Balance Sheet and Combined data, and two of the ten single years on Income Statement data. Statistically significant deviations were noted in three of the three group years analysed for the Income Statement and Combined data, and two out of three for the Balance Sheet data

b) <u>Z-Statistic second digit analysis</u>

Statistically significant deviations were noted in four of the ten single year's second digit analysis on the Balance Sheet data, two out of ten on the Income Statement data and three out of ten on the Combined data. Statistically significant deviations were noted in one of the three group years analysed for the Balance Sheet and Income Statement data, and two out of three for the Combined data.

c) <u>Z-Statistic first-two digit analysis</u>

Statistically significant deviations were identified for four, two and one first-two digit combinations of the Combined data for the 2004-2008, 2009-2013, and 2004-2013 group years respectively out of ninety possible first-two digit combinations for each group.

5.3.3.3. Mean Absolute Deviation (MAD) test results

The results of the MAD statistic performed are presented in Appendix 20. Ten out of ten of the single year first digit and second digit MAD statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law. The group year first digit and second digit MAD

statistic results indicated that the deviations do not conform to Benford's Law. Conversely, the first-two digit results for the Balance Sheet and Income Statement data depicted acceptable conformity. For the combined data group years, acceptable conformity was noted in 2004-2008 and 2009-2013 group, and close conformity in 2004-2013 group.

5.3.3.4. Kolmogorov-Smirnov (KS) statistic test results

The results of the KS statistic performed are presented in Appendix 21. Ten out of ten of the single year first digit and second digit KS statistic results on the Balance Sheet and Income Statement indicated that the deviations conform to Benford's Law. The single year results on the Combined data indicated that ten out of ten (first digit) and nine out of ten (second digit) conform. For the group year results relating to the Balance Sheet, Income Statement and Combined data, the first digits did not conform whilst the second digits did conform. For the first-two digit group year results the Balance Sheet, Income Statement and Combined group year data (2004-2008 and 2009-2013) conformed to Benford's Law whilst the combined group year 2004-2013 did not conform.

5.3.3.5. Key Audit Matters

None were reported for 2013 as the International Standard on Auditing 701 requiring that key audit matters be communicated in the audit report was only effective from 15 December 2016 (International Auditing and Assurance Standards Board, 2015).

5.3.4. Freedom Property Fund Limited

The period of analysis related to financial statement data (Appendix 4) reported during the financial years from 2015 (Year 1) to 2016 (Year 2).

5.3.4.1. First, second and first-two digit descriptive analysis results

The results are depicted graphically in Appendix 22 for the first digit, Appendix 23 for the second digit and Appendix 24 for the first-two digit descriptive analysis results. At a high level the results for the Balance Sheet, Income Statement and Combined first digit and second digit analysis for each of the years did not always depict a general conformance to the expected frequencies. Similarly, the results of the Balance Sheet, Income Statement and Combined first digit and second digit analysis

for the group year did not depict a general conformance. For the 2015-2016 grouped year of the first-two digit analysis, the comparison depicted a general non-conformance with Benford's Law at a high level.

5.3.4.2. Z-Statistic test results

The results of the z-statistic test performed are presented in Appendix 25.

a) <u>Z-Statistic first digit analysis</u>

One first digit was identified as a statistically significant deviation in one of the two single years analysed on the Balance Sheet and Income Statement data. No statistically significant deviations were noted in the single year's first digit analysis on the Combined data. For the group year (2015-2016) first digit analysis, one out of nine digits of the Balance Sheet data was a statistically significant deviation, and none were identified for the Income Statement and Combined data.

b) <u>Z-Statistic second digit analysis</u>

One second digit was identified as a statistically significant deviation in one of the two single years analysed on the Income Statement and Combined data. No statistically significant deviations were noted in the single year's second digit analysis on the Balance Sheet data. For the group year (2015-2016) second digit analysis, one out of ten digits of the Income Statement and Combined data was a statistically significant deviation, and none were identified for the Balance Sheet data.

c) <u>Z-Statistic first-two digit analysis</u>

Statistically significant deviations were identified for six first-two digit combinations of combined data for the 2015-2016 group year out of ninety possible first-two digit combinations.

5.3.4.3. Mean Absolute Deviation (MAD) test results

The results of the MAD statistic performed are presented in Appendix 26. Two out of two of the single year first digit and second digit MAD statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law. Similarly, non-conformance was noted relating to the group year (2015-2016) first digit and second digit analysis for the Balance Sheet, Income Statement and Combined data. For the first-two digit analysis relating to the

group year data, non-conformance was noted on the Balance Sheet and Income Statement data whilst marginally acceptable conformity was noted on the Combined data.

5.3.4.4. Kolmogorov-Smirnov (KS) statistic test results

The results of the KS statistic performed are presented in Appendix 27. Two out of two of the single year first digit and second digit KS statistic results on the Balance Sheet, Income Statement and Combined data indicated that the deviations conform to Benford's Law. The Balance Sheet, Income Statement and Combined data group years first digit KS statistic results indicated that the deviations do not conform to Benford's Law, whilst the results for the second and first-two digits indicated that the deviations do conform.

5.3.4.5. Key Audit Matters

The key audit matters reported in the 2016 annual financial statements are summarised below (Freedom Property Fund Limited, 2016):

- Valuation of investment property (commercial, residential and vacant land) based on its fair value.
- Judgement used to calculate the fair value of certain accounting corrections relating to the prior period.

5.4. Suspected Misstated Audited Financial Statements test results

The sample of companies selected for analysing this Hypothesis included those where suspected instances of fraudulent and/or erroneous financial statement data were reported. These include the following companies:

- Capitec Bank Holdings Ltd
- NEPI Rockcastle Plc

5.4.1. Capitec Bank Holdings Limited

The period of analysis related to financial statement data (Appendix 5) reported during the financial years from 2015 (Year 1) to 2019 (Year 5).

5.4.1.1. First, second and first-two digit descriptive analysis results

The results are depicted graphically in Appendix 28 for the first digit, Appendix 29 for the second digit and Appendix 30 for the first-two digit descriptive analysis results. At a high level the results for the Balance Sheet, Income Statement and Combined first digit and second digit analysis for each of the years did not always depict a general conformance to the expected frequencies. Similarly, the results of the Balance Sheet, Income Statement and Combined first digit and second digit analysis for the group year (2015-2019) did not depict a general conformance. For the 2015-2019 grouped year of the first-two digit analysis, the comparison depicted a general non-conformance with Benford's Law at a high level.

5.4.1.2. Z-Statistic test results

The results of the z-statistic test performed are presented in Appendix 31.

a) <u>Z-Statistic first digit analysis</u>

No statistically significant deviations were noted in the single year's first digit analysis on Balance Sheet and Combined data. One first digit was identified as a statistically significant deviation in one of the five single years analysed on the Income Statement data. For the group year (2015-2019) first digit analysis, one out of nine digits of the Income Statement data and two out of nine digits of the Combined data were statistically significant deviation. None were identified for the Balance Sheet data.

b) <u>Z-Statistic second digit analysis</u>

No statistically significant deviations were noted in the single year's second digit analysis on Balance Sheet data. One second digit was identified as a statistically significant deviation in two of the five single years analysed on the Income Statement and one of the five years analysed on the Combined data. For the group year (2015-2019) second digit analysis, one out of ten digits of the Balance Sheet, Income Statement and Combined data was a statistically significant deviation.

c) <u>Z-Statistic first-two digit analysis</u>

Statistically significant deviations were identified for three first-two digit combinations of combined data for the 2015-2019 group year out of ninety possible first-two digit combinations.

5.4.1.3. Mean Absolute Deviation (MAD) test results

The results of the MAD statistic performed are presented in Appendix 32. Five out of five of the single year first digit and second digit MAD statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law. Similarly, non-conformance was noted relating to the group year (2015-2019) first digit and second digit analysis for the Balance Sheet, Income Statement and Combined data. For the first-two digit analysis relating to the group year data, acceptable conformance was noted on the Balance Sheet, Income Statement and Combined.

5.4.1.4. Kolmogorov-Smirnov (KS) statistic test results

The results of the KS statistic performed are presented in Appendix 33. Five out of five of the single year first digit and second digit KS statistic results on the Balance Sheet, Income Statement and Combined data indicated that the deviations conform to Benford's Law. The Balance Sheet, Income Statement and Combined data group year first digit KS statistic results indicated that the deviations do not conform to Benford's Law, whilst the results for the second digits indicated that the deviations conform. For the first-two digits the deviations did conform for the Balance Sheet and Income Statement data, however they didn't conform for the Combined data.

5.4.1.5. Key Audit Matters

The key audit matter reported in the 2019 integrated report stated that judgement is required in the calculation of the expected credit losses on loans and advances (Capitec Bank Holdings Limited, 2019).

5.4.2. NEPI Rockcastle

The period of analysis related to financial statement data (Appendix 4) reported during the financial years from 2017 (Year 1) to 2019 (Year 2).

5.4.2.1. First, second and first-two digit descriptive analysis results

The results are depicted graphically in 0 for the first digit, Appendix 35 for the second digit and Appendix 36 for the first-two digit descriptive analysis results. At a high level the results for the Balance Sheet, Income Statement and Combined first digit and second digit analysis for each of the years did not always depict a general conformance to the expected frequencies. Similarly, the results of the Balance

Sheet, Income Statement and Combined first digit and second digit analysis for the group year (2017-2018) did not depict a general conformance. For the 2017-2018 grouped year of the first-two digit analysis, the comparison depicted a general non-conformance with Benford's Law at a high level.

By contrast, the results of the Balance Sheet, Income Statement and Combined first digit and second digit analysis for the group years depicted more uniformity in the trend of conformance and non-conformance with Benford's Law when the results were grouped for five year and ten-year periods of data. For all grouped years of the first-two digit analysis, the comparison depicted a general non-conformance with Benford's Law at a high level.

5.4.2.2. Z-Statistic test results

The results of the z-statistic test performed are presented in Appendix 37.

a) <u>Z-Statistic first digit analysis</u>

No statistically significant deviations were noted in the single year's first digit analysis on Balance Sheet, Income Statement and Combined data. For the group year (2017-2018) first digit analysis, no statistically significant deviation was identified for the Balance Sheet, Income Statement and Combined data.

b) <u>Z-Statistic second digit analysis</u>

No statistically significant deviations were noted in the single year's second digit analysis on Balance Sheet and Income Statement data. One second digit was identified as a statistically significant deviation in one of the two single years analysed on the Combined data. For the group year (2017-2018) second digit analysis, one out of ten digits of the Balance Sheet data was a statistically significant deviation whilst none were identified in the Income Statement and Combined group year data.

c) <u>Z-Statistic first-two digit analysis</u>

No statistically significant deviations were identified for first-two digit combinations of combined data for the 2017-2018 group year out of ninety possible based on the Z-Statistic.

5.4.2.3. Mean Absolute Deviation (MAD) test results

The results of the MAD statistic performed are presented in Appendix 38. Two out of two of the single year first digit and second digit MAD statistic results for the Balance Sheet, Income Statement and Combined data indicated that the deviations do not conform to Benford's Law. Similarly, non-conformance was noted relating to the group year (2017-2018) first digit and second digit analysis for the Balance Sheet, Income Statement and Combined data. For the first-two digit analysis relating to the group year data, the Balance Sheet depicted marginally acceptable conformity, the Income Statement depicted non-conformance and acceptable conformity was noted on the Combined data.

5.4.2.4. Kolmogorov-Smirnov (KS) statistic test results

The results of the KS statistic performed are presented in Appendix 39. Two out of two of the single year first digit and second digit KS statistic results on the Balance Sheet, Income Statement and Combined data indicated that the deviations conform to Benford's Law. The Balance Sheet, Income Statement and Combined data group year first digit KS statistic results indicated that the deviations do not conform to Benford's Law, whilst the results for the first-two digits indicated that the deviations do conform. The group year second digit KS statistic results depicted conformance on the Balance Sheet and Income Statement whilst non-conformance on the Combined data.

5.4.2.5. Key Audit Matters

The key audit matters reported in the 2018 annual report are summarised below (NEPI Rockcastle Plc, 2018):

- Complexity and judgement in the valuation of investment property based on estimates (rental value, vacancy rates, non-recoverable expenses, lease incentives, maintenance costs, discount rates and estimated terminal value).
- Risk of overstatement of properties due to performance targets.

5.5. Overall summary

Various test results have been presented in this chapter. In determining whether or not the Null Hypotheses are rejected or not rejected, the MAD provides an overall evaluation of the extent of conformance with Benford's Law whilst the KS statistic is a goodness-of-fit measure (Druică et al., 2018). The Z-score is limited to assessing

conformance on an individual digit level and therefore the results cannot be applied or inferred to across all digits in the analysis. A summary of the statistical inferences relating to the various test are included in the Table 21 for the Null Hypotheses. The opposite statistical inferences apply to the Alternative Hypothesis.

Table 21 Summary of statistical inferences for the Null Hypotheses

Test	Digit	Year	Data	Hypothesis 1				Hypothesis 2	
				Steinhoff	Tongaat	African Bank	Freedom	Capitec	NEPI
MAD	First digit	Single year	BS	Reject	Reject	Reject	Reject	Reject	Reject
			IS	Reject	Reject	Reject	Reject	Reject	Reject
			C	Reject	Reject	Reject	Reject	Reject	Reject
		Group year	BS	Reject	Reject	Reject	Reject	Reject	Reject
			IS	Reject	Reject	Reject	Reject	Reject	Reject
			C	Reject	Reject	Reject	Reject	Reject	Reject
	Second digit	Single year	BS	Reject	Reject	Reject	Reject	Reject	Reject
			IS	Reject	Reject	Reject	Reject	Reject	Reject
			C	Reject	Reject	Reject	Reject	Reject	Reject
		Group year	BS	Reject	Reject	Reject	Reject	Reject	Reject
			IS	Reject*	Reject	Reject	Reject	Reject	Reject
			C	Reject*	Reject	Reject	Reject	Reject	Reject
	First-two	Group year	BS	Do not Reject	Do not Reject	Do not Reject	Reject	Do not Reject	Do not Reject
			IS	Do not Reject	Do not Reject	Do not Reject	Reject	Do not Reject	Reject
			C	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
KS	First digit	Single year	BS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
			IS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
			C	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
		Group year	BS	Reject	Reject	Reject	Reject	Reject	Reject
			IS	Reject	Reject	Reject	Reject	Reject	Reject
			C	Reject	Reject	Reject	Reject	Reject	Reject
	Second digit	Single year	BS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
			IS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
			C	Do not Reject	Do not Reject	Do not Reject*	Do not Reject	Do not Reject	Do not Reject
		Group year	BS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject

Test	Digit	Year	Data	Hypothesis 1				Hypothesis 2	
				Steinhoff	**Tongaat**	**African Bank**	**Freedom**	**Capitec**	**NEPI**
			IS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
			C	Do not Reject	Do not Reject*	Do not Reject	Do not Reject	Do not Reject	Reject
	First-two	Group year	BS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
			IS	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject	Do not Reject
			C	Do not Reject	Do not Reject	Do not Reject*	Do not Reject	Do not Reject	Do not Reject

Legends

* Majority of the single/group years analysed conformed (Do not Reject) or did not conform (Reject)

BS = Balance Sheet, IS = Income Statement and C = Combined

6. DISCUSSION OF RESULTS

6.1. Introduction

The results presented in Chapter 5 (including Appendices) are discussed further in this chapter with reference to Chapters 2, 3 and 4. In this section, the results of various statistical tests applied to the first, second and first-two digit Benford's tests relating to the Balance Sheet, Income Statement and Combined data for various periods (single and group year) are discussed for each of the two hypotheses.

In discussing the hypotheses, the Kolmogorove-Smirnov (KS) statistic provides a goodness-of-fit on a test-by-test basis for conformance with Benford's Law whilst the Mean Absolute Deviation (MAD) test measures the extent of conformity on a test-by-test basis (Druică et al., 2018). The results of these two tests are compared and critiqued in terms of their accuracy and usefulness in rejecting or not rejecting the null hypotheses. Thereafter, the results of the digit-by-digit (Z-Statistic) test are discussed where the Null Hypothesis was rejected, and key information obtained from the independent auditor's report was compared to the results of the first digit Z-Statistic test.

6.2. Discussion of the results of Hypothesis 1

Hypothesis 1 below proposes that where audited financial statements were knowingly misstated due to fraud or error, they would never-the-less conform to Benford's Law. In other words, Benford's Law would not detect misstatements in financial data.

$H1_0$: Misstated Audited Financial Statements conform to Benford's Law

The term misstated relates to fraudulent or erroneous (restated financial records).

In the sub-sections that follow, the test results of the four companies are discussed in relation to the first digit, second digit and first-two digits with regard to rejecting or not rejecting the Null Hypothesis.

6.2.1. First digit analysis

a) Test-by-Test results

Hypothesis 1 was rejected when the MAD statistic was conducted on single and group year first digits relating to Balance Sheet, Income Statement and Combined data for 100% of the companies included in the sample as the results did not statistically conform to Benford's Law. These results were also consistent with the descriptive analysis of the data depicted graphically. Conversely, Hypothesis 1 was not rejected when the KS statistic was conducted on the single year first digit data for 100% of the sample. However, on the group year data the KS statistic also rejected Hypothesis 1. The companies sampled have reported financial results where misstatements are known and therefore the KS statistic on the single year first digit data failed to identify misstatements resulting in a Type 2 error (Cleary & Thibodeau, 2005). In addition, the usefulness of the KS statistic for testing overall conformance is debateable. Conceptually, it is questionable that the single year data per company over two, five- or ten-year periods did not identify non-conformances with Benford's Law whilst the equivalent group years did identify non-conformances.

These differences in results for the single year data between the MAD and KS statistics are, however, concurrent with the findings of existing literature. Specifically, the MAD statistic ignores the number of records/observations whilst the KS statistic is impacted by the number of records/observations (Nigrini, 2012) as they form part of the critical value calculation explained in 4.6.2 for assessing conformance with Benford's Law. For the single year data, the number of observations each year are similar in size relative to the company and significantly less than when the data is consolidated for the two-year, five-year and ten-year groups. Therefore, when the KS first digit analysis was applied to a smaller number of observations on single year data it resulted in higher critical values (Table 18, Appendix 15, Appendix 21, Appendix 27) than when it was applied to a larger number of observations on group year data (Table 20, Appendix 15, Appendix 21, Appendix 27). Although the KS statistic tolerates small deviations where there are a large number of observations (Nigrini, 2012), the results of this study highlight the need for future research regarding the significance of deviations where there is a small number of observations due to its impact on the critical value.

b) Digit-by-Digit results

In general, very few statistically significant deviations were observed for the Balance Sheet single year first digit Z-Statistic for all companies with some results indicating no significant deviations (Tongaat) and others identifying four out of ninety significant deviations (Steinhoff). The results at an Income Statement level indicated even less significant deviations than that of the Balance Sheet. This is inconsistent with existing research whereby the Income Statement was considered to be more susceptible to manipulations (Amiram et al., 2015). Similarly, the Combined data identified very few significant deviations. In all companies, the specific digits identified as significant in the Combined data included differences when compared to the separate Balance Sheet and Income Statement data. More differences were observed when the group year data was analysed. In addition to the inconsistencies when comparing the Z-Statistic results, there were years where no statistically significant deviations in digits were observed (e.g. Tongaat) whilst the equivalent MAD statistic assessed the overall data as not conforming to Benford's Law.

In comparing the key audit matters reported by the Independent Auditors, a common theme in the identification thereof is that they relate to account balances which require significant judgement based on estimates and valuations. A high-level comparison between the latest two years of Balance Sheet and Income Statement Z-Statistic results and key audit matters reported (where available and easily identifiable in the data) in Chapter 5 was performed. Overall, there were either no statistical deviations or very few identified in the Balance Sheet and Income Statement data whilst there were key audit matters reported relating to account balances requiring significant judgement. Due to the complexity and judgement required in applying accounting principles (Fang et al., 2017), the relationship between fraudulent financial accounting records and the completeness and accuracy of key audit matters thereof is an area for future research.

6.2.2. Second digit analysis

a) Test-by-Test results

Similar to the first digit discussion, Hypothesis 1 was rejected when the MAD statistic was conducted on single and group year second digits relating to Balance Sheet, Income Statement and Combined data for 100% of the companies included in the sample as the results did not statistically conform to Benford's Law.

For the first digit test results and consistent with existing literature, the number of observations had an impact in explaining the differences between the single and group year KS results (Nigrini, 2012). Given that there were the same number of observations for the first digit single year and group year compared to that of the second digit single year and group year respectively, there is a reasonable expectation that the results would be similar. The second digit KS results for evaluating conformance for the single and group years are identical. As a result, Hypothesis 1 was not rejected when the KS statistic was conducted on the single and group year second digit data for 100% of the sample.

The anomaly in results between the first digit and second digit KS statistic discussed in the preceding paragraph has provided additional insight into the usefulness of the test. In comparing the two sets of KS results, it was noted that the critical values were identical relating to comparative single and group year. However, there was no similarity in the KS results between the two tests at both a single year (Table 18, Table 19, Appendix 15, Appendix 21, Appendix 27) and group year (Table 20, Appendix 15, Appendix 21, Appendix 27). This is due to the first digit and second digit Benford's tests having different expected frequencies as per Table 1 whereby the second digit frequency becomes more uniform than that of the first digit (Nigrini, 1996). As a result, and as was observed, the second digit KS result was significantly less than the first digit result in all companies (Table 18, Table 19, Appendix 15, Appendix 21, Appendix 27) analysed. Based on these results, additional challenges and limitations were identified with regard to the usefulness of the KS statistic whereby different Benford's tests may require different critical values. The MAD statistic, however, not only ignores the number of observations but also includes different

critical values and related conclusions for various MAD values for a particular digit test (Nigrini, 2012, p. 160).

As the companies sampled have reported financial results where misstatements are known, the KS statistic on the single and group year second digit data failed to identify misstatements resulting in a Type 2 error (Cleary & Thibodeau, 2005) which further questions its usefulness.

Existing research has identified abnormalities in the frequency of distribution of second digits relating to an excess of zero digits and an understatement of nine digits of income related accounts (Carslaw, 1988; Nigrini & Mittermaier, 1997). The graphical representation of the descriptive results (Appendix 8, Appendix 11, Appendix 17, Appendix 23) depict a general non-conformance with Benford's Law expected frequencies. Specifically, a general overstatement of zero's and understatement of nines for Steinhoff, Tongaat and African Bank was noted whilst the converse was noted for Freedom Property.

However, in reviewing the second z-statistic results for the Income Statement included in Appendix 8, Appendix 13, Appendix 19, and Appendix 25 it was noted that no statistically significant zero and nine digits were identified for:

- Steinhoff relating to the single and group year tests;
- Tongaat relating to the single and group year tests,
- African Bank relating to the single and group year tests with the exception of digit nine in 2005, and
- Freedom property relating to the single and group year tests.

The results are thus inconclusive as to whether or not earnings management is manipulated.

b) Digit-by-Digit results

Similar to the observations discussed relating to the digit-by-digit (Z-Statistic) results for the first digit test, very few statistically significant deviations were observed, differences were observed when comparing the Combined data to the separate Balance Sheet and Income Statement data, and conducting the tests group year data was analysed. In addition to the inconsistencies when comparing the Z-Statistic

results, there were years where no statistically significant deviations in digits were observed (e.g. Steinhoff) whilst the equivalent MAD statistic assessed the overall data as not conforming to Benford's Law.

6.2.3. First-two digit analysis

Contrary to the first digit and second digit tests, both the first-two digit group year MAD and KS statistics for three of the four companies Hypothesis 1 was not rejected. Whilst for the fourth company, two of the three first-two digit group year MAD statistics rejected the Hypothesis and three out of three KS statistics did not reject it. Although the number of observations do not meet the minimum of 300 proposed by Nigrini (2012) for the first-two digit test relating to group year data five year and less, the following was noted with reference to the number of observations included in Table 5:

- The KS statistic yielded the same results in not rejecting Hypothesis 1 as the ten-year group where the minimum of 300 observations was met.
- The MAD statistic yielded different results for the company where only two years of data was analysed (maximum of 49 observations) compared to the companies where ten years of data was analysed.

One possible explanation for the understanding why the results are contrary to that of the first digit and second digit test could be relating to the number of digit combinations and their expected frequencies relative to the number of observations. The first-two digit expected frequencies are calculated based on ninety digit combinations from digits ten to ninety-nine compared to the nine and ten digits for the first digit and second digit tests respectively. However, the number of observations remained the same regardless of the digit test per group year. The usefulness of the first-two digit tests on financial statement data is debateable. This is due to the fact that data is reported on a consolidated rather than on an individual account or transactional data level. Despite the minimum number of observations proposed by Nigrini (2012), existing research has advocated its use relating to auditing, sampling and on large data sets (Barney & Schulzke, 2015; Cleary & Thibodeau, 2005; Nigrini, 2017). As the usefulness of applying the first-two digit test to financial statement data is questionable due to the nature of the data (consolidated) and the sample size, so too are the results of the Z-Statistic.

The companies sampled have reported financial results where misstatements are known and therefore both the first-two digit group year MAD and KS statistics, which did not reject Hypothesis 1, have failed to identify misstatements resulting in a Type 2 error (Cleary & Thibodeau, 2005).

6.3. Discussion of the results of Hypothesis 2

Hypothesis 2 below proposes that where audited financial statements were suspected to be misstated due to fraud or error, they would never-the-less conform to Benford's Law. In other words, suspected misstatements would not be detected by applying Benford's Law.

$H2_0$: Suspected Misstated Audited Financial Statements conform to Benford's Law

The term misstated relates to fraudulent or erroneous (restated financial records).

In the sub-sections that follow, the results of the test-by-test analyses are discussed with regard to not rejecting or rejecting the Null Hypothesis.

6.3.1. First digit analysis

a) Test-by-Test results

The results of the MAD and KS statistic applied to the first digit single and group year data yielded the same results as the tests conducted on the sample of companies for Hypothesis 1 (section 6.2.1). Hypothesis 2 was rejected when the MAD statistic was conducted on single and group year first digits relating to Balance Sheet, Income Statement and Combined data for 100% of the companies included in the sample as the results did not statistically conform to Benford's Law. Conversely, Hypothesis 2 was not rejected when the KS statistic was conducted on the single year first digit data for 100% of the sample. However, on the group year data the KS statistic also rejected Hypothesis 2. These differences were due to the impact of the number of observations on the calculation of the critical value for determining conformity when applying the KS statistic (Nigrini, 2012) and are explained in detail in section 6.2.1. Similarly to Hypothesis 1, when the KS first digit analysis was applied to a smaller number of observations on single year data it resulted in higher critical values

(Appendix 33, Appendix 39) than when it was applied to a larger number of observations on group year data (Appendix 33, Appendix 39).

The companies sampled have reported financial results where misstatements are suspected. Based on the results of the MAD statistics, anomalies exist in the data which could be fraudulent or erroneous. Due to the inconsistencies the KS results between the first single year and group year data, it appears that the KS statistic failed to identify such anomalies resulting in a Type 2 error (Cleary & Thibodeau, 2005).

b) Digit-by-Digit results

Similar to the observations discussed relating to the digit-by-digit (Z-Statistic) results for the first digit test of Hypothesis 1, very few statistically significant deviations were observed. Differences were observed when comparing the Combined data to the separate Balance Sheet and Income Statement data, and when the tests of the group year data was analysed. In addition to the inconsistencies identified when comparing the Z-Statistic results, there were years where no statistically significant deviations in digits were observed whilst the equivalent MAD statistic assessed the overall data as not conforming to Benford's Law.

6.3.2. Second digit analysis

a) Test-by-Test results

Similar to the first digit discussion, Hypothesis 2 was rejected when the MAD statistic was conducted on single and group year second digits relating to Balance Sheet, Income Statement and Combined data for 100% of the companies included in the sample as the results did not statistically conform to Benford's Law. Conversely, Hypothesis 2 was not rejected when the KS statistic was conducted on the single year second digit data for 100% of the sample and on the group year second digit data for 92% of the sample.

In comparing the two sets of KS results, it was noted that the critical values were identical relating to the comparative single and group years. However, there was no similarity in the KS results between the two sets at both a single and group year (Appendix 33, Appendix 39). The insights gained regarding the root cause of the

anomalies between the KS first digit and second digit results are explained in detail in 6.2.1. In summary, the KS statistic, unlike the MAD statistic, does not apply different critical value criteria to the different Benford's digit tests.

The companies sampled have reported financial results where misstatements are suspected. Based on the results of the MAD statistics, anomalies exist in the data which could be fraudulent or erroneous, however the KS statistic failed to identify such anomalies resulting in a Type 2 error (Cleary & Thibodeau, 2005).

b) Digit-by-Digit results

Similar to the observations discussed relating to the digit-by-digit (Z-Statistic) results for the second digit test of Hypothesis 1, very few statistically significant deviations were observed. Differences were observed when comparing the Combined data to the separate Balance Sheet and Income Statement data, and when the tests on group year data was analysed. In addition to the inconsistencies when comparing the Z-Statistic results, there were years where no statistically significant deviations in digits were observed whilst the equivalent MAD statistic assessed the overall data as not conforming to Benford's Law.

6.3.3. First-two digit analysis

Contrary to the first digit and second digit tests, majority of the first-two digit group year MAD and KS statistics for the two companies did not reject Hypothesis 2. The number of observations upon which the tests were applied are below the 300 general rule as explained in section 2.6.2.4. The discussions and observations made in section 6.2.3 are also relevant for this test's results. As the usefulness of applying the first-two digit test to financial statement data is questionable due to the nature of the data (consolidated) and the sample size, so too are the results of the Z-Statistic.

6.4. Summary and conclusion

Similarities were identified in the results reported for the various tests and data sets between the sample of companies where there were known misstatements (fraud/errors) in financial reporting (Hypothesis 1) and the sample of companies where there were suspected misstatements (Hypothesis 2).

In general, the Kolmogorove-Smirnov (KS) statistic compared with the Mean Absolute Deviation (MAD) statistic, yielded conflicting results with regard to assessing the goodness-of-fit and extent of conformance with Benford's Law respectively. The KS statistic results, for majority the tests, overall did not reject the Null Hypothesis 1 that misstated audited financial statement conform with Benford's Law meaning that it would not detect known misstatements. Conversely, the MAD statistic results rejected the Null Hypothesis 1 for majority of the tests. As the data set knowingly contained misstated data for the Hypothesis 1 tests, the overall results of the MAD statistic concurred with the underlying data. Therefore, the KS statistic in this study yielded Type 2 results overall. This was further validated by critiquing the methodology and application of the tool for the various Benford's tests together with the impact of the number of observations on the results. Whilst overall, the MAD statistic results concurred with the underlying data, conflicting results existed when it was applied to the first-two digit tests which are typically used in large data sets, in particular auditing and sampling. The consolidated account balances analysed posed a limitation in the use of this test. Similar findings were noted based on the results of the tests performed for Hypothesis 2.

Whilst the test-by-test results concluded on the overall data's conformance with Benford's Law, the Z-Statistic results analysed conformance on a digit by digit basis. In general, the Z-Statistic results contained inconsistencies when applied to different data sets (Balance Sheet, Income Statement, Combined) and analysis periods (single year, group year) further questioning the reliability thereof. In addition, no statistical deviations were identified at a high level relating to the account balances considered by the Independent Auditors as key audit matters.

7. CONCLUSION

7.1. Introduction

Chapter 1 introduced the overarching objective of this study, namely to determine whether or not a suitable tool exists for identifying fraudulent financial reporting. This was influenced by (1) the recent increase in corporate governance scandals where satisfactory audit opinions were issued and (2) the resultant questions surrounding the credibility and reliability of the external audit process.

Whilst research by Soltani (2014) into the causes of major global corporate failures identified multiple core areas as major causes thereof, Chapter 2 focussed primarily on the detection of fraud in financial reporting. Agency Theory was identified as the dominant theory for explaining conflicts that exist between the owners and managers of the business and the ultimate root cause of corporate failures. The need for and role of independent oversight and assurance providers in the detection of fraud was well established.

Research by Abbasi et al. (2012) on 14 prior studies relating to fraud detection using financial statement data, revealed that their results were inadequate. Benford's Law was selected as a useful tool for identifying anomalies in data (Cho & Gaines, 2007) and was supported by empirical evidence in terms of its usefulness and challenges. The law argues that digits in a distribution have set frequencies in which they occur (e.g. the first digit one in a data set has 30.1% probability of occurrence as opposed to nine which has a 4.6% probability) in a data set (Newcomb, 1881).

Following the literature review, two hypotheses were constructed in Chapter 3 for both Misstated Audited Financial Statements and Suspected Misstated Audited Financial Statements with regard to their conformance with Benford's Law. Chapter 4 explained the detailed research methodology adopted to test the hypotheses and achieve the research objectives relating to JSE listed companies. Thereafter, the results were presented in Chapter 5 and discussed in Chapter 6.

7.2. Principle findings

A summary of the findings are presented per Hypothesis.

7.2.1. Misstated Audited Financial Statements conform with Benford's Law

For the test-by-test results, the MAD statistic consistently rejected the Null Hypothesis for all companies when applied to the first and second digit analyses on single year and group year periods relating to the Balance Sheet, Income Statement and Combined data. As the nature of the underlying data analysed relates to companies where known instances of fraudulent financial data, the MAD statistic yields the correct result. Similarly, these results were consistent with the descriptive analysis of the data depicted graphically. However, the MAD statistic failed to reject the Null Hypothesis for majority of the companies when applied to the first-two digits for the group year periods on Balance Sheet, Income Statement and Combined data. This appears to be related to the differences in the number of digit combinations and their expected frequencies relative to the number of observations/sample size. In addition, as the financial statement data comprises of consolidated account balances, this posed a limitation in the use of first-two digit test.

The KS statistic consistently did not rejected the Null Hypothesis for all companies when applied to the second digit and first-two digit analyses on single year and group year periods relating to the Balance Sheet, Income Statement and Combined data. For the first digit group year data, the KS statistic rejected the group year period data analysed whilst it did not reject the single year data analysed. Where the KS statistic did not reject the Null Hypothesis, the overall conclusion drawn was that it produced a Type 2 error as it failed to identify fraudulent financial reporting inherent in the data set.

The differences between the results of the MAD and KS statistic are largely due to difference inherent in their methodologies for testing conformance. The MAD statistic excludes the number of observations when assessing conformance, whilst the number of observations are included for the KS statistic. In addition, the KS statistic, unlike the MAD statistic, does not apply different critical value criteria to the different Benford's digit tests.

For the digit-by-digit test results, very few statistically significant digits were observed and differences were noted when comparing the results of the Balance Sheet and Income Statement data with that of the Combined data. In addition, inconsistencies were identified whereby the overall MAD statistic result indicated non-conformance with Benford's Law (rejected the Null Hypothesis) whilst the equivalent Z-Statistic period analysed did not identify any statistically significant results.

7.2.2. Suspected Misstated Audited Financial Statements conform with Benford's Law

For the test-by-test results, similarities were identified between the results of the tests on suspected misstated audited financial data (Hypothesis 2) with those relating to the misstated audited financial data (Hypothesis 1). The MAD statistic rejected the Null Hypothesis for the first digit and second digit test, whilst the KS statistic did not reject the first digit single year analyses and second digit analyses. As a result, the MAD statistic identified anomalies in the financial data which was consistent with the underlying data whilst the KS statistic failed to identify anomalies (Type 2 error). However, despite the MAD statistic identifying anomalies in the data whereby misstatements (fraud) are suspected similar to the results where fraudulent reporting was known, caution should be exercised before concluding that the data is fraudulent without further analysis (Druică et al., 2018). The results varied for the first-two digit test but generally did not reject the Null Hypothesis for reasons explained in 7.2.1.

For the digit-by-digit results using the Z-Statistic, similarities were identified with the results relating to the misstated audited financial data (Hypothesis 1) as explained in 7.2.1.

7.3. Implications for stakeholders

The application of Benford's Law, when testing conformance using the MAD statistic, has confirmed fraudulent financial reporting relating to companies where fraudulent financial reporting was known. Its application has also confirmed anomalies in financial reporting where companies were suspected of fraudulent reporting. Whilst caution should be exercised before concluding that the data is fraudulent without further analysis (Druică et al., 2018), this study confirms that Benford's Law can be used to identify anomalies in financial statement data provided the appropriate statistical tests are used for measuring the extent of conformance/non-conformance.

This provides investors and other key stakeholders with a simplistic tool for identifying anomalies and more specifically potential fraud and error as an additional layer of scrutiny on the quality of financial statements.

Existing research has also advocated the benefit of using Benford's Law in audit processes with regard to analytical procedures and audit sampling (Durtschi et al., 2004; Nigrini, 2017; Nigrini & Mittermaier, 1997). Although not within the scope of this study, the application of Benford's Law could also assist internal auditors with planning and audit sampling processes on individual audit engagements or by auditing on an exception basis through the use of continuous audit processes.

Lastly, this study also contributes to academia with regard to evaluating the usefulness, limitations and challenges in the application of Benford's Law and the statistical tests used for measuring conformance on both a test-by-test basis and a digit-by-digit basis.

7.4. Limitations of the research

In developing the research methodology for this study, various limitations were identified which are discussed in detail in Chapter 4 and summarised below. These limitations, however, do not detract from the insights gained from this study.

Stemming from key concerns regarding reliability of external audit opinions where fraud has been detected subsequent to external auditors issuing satisfactory opinions on the fair presentation of the financial statements, the research methodology (samples) were limited to known and suspected instances of fraud/error. In addition, as the opinion issued is based on fair presentation (i.e. there are no material misstatements), fraudulent and erroneous results which are not material will not influence the opinion negatively. This creates further limitations with regard to drawing inferences from the sample data to its population as the actual population is not known/identifiable. As a result, a control group of companies where there is no fraudulent or erroneous reporting could not be used to validate the results.

Where the results of the digital analysis indicated non-conformance with Benford's Law, this should not be construed as a direct indication of fraud where the sample data is based on suspected fraud. However, this limitation is not applicable where

the analysis is conducted on known instances of fraud. As a general rule, the use of Benford's Law to detect fraud at a financial statement level should be used with caution (Druică et al., 2018).

There is limited research relating to the application of Benford's Law at a financial statement level which makes it difficult to discuss and compare results of different studies, particularly where the digit tests and statistical tests for conformance differ.

7.5. Suggestions for future research

Fraudulent financial statement reporting remains a key risk for users of financial statements, a topic of interest amongst academics, and a key concern amongst regulators and other legislative/professional bodies globally and more recently in South Africa. Based on this study and stemming from some of the research limitations, a number of opportunities for future research have been identified and are discussed below.

Although the role of and need for independent assurance by external auditors was well established in Chapter 2, additional research regarding the independence of external auditors and the related quality of their audit opinions is required. This is of particular importance where satisfactory opinions have preceded corporate failures and scandals relating to fraud at an individual company level. Threats to independence have typically been researched in isolation of one another. Future research should, however, consider a simultaneous combination of the treats to independence (audit tenure, provision of non-audit services, etc.) and their impact on the external auditor's independence. With regard to lengthy audit tenures, an analysis of whether or not audit opinions and key audit matters changed as a result of audit firm rotations (either mandated by countries or volunteered by companies) would provide additional insight into the value of such rotations.

Beyond the use of Benford's Law in this study, it could also be used for future research in assessing the independence of external auditors and the quality of their work by analysing the financial statement data's conformance with the law per audit firm, audit tenure and the extent of non-audit fees.

In discussing the findings of the statistical tests and supported by existing research, it is evident that additional research is required relating to the definition of large and small samples/observations for each digit test (first, second and first-two). This should be used as a basis to determine whether or not the accuracy of the results from the various statistical tools differs according to the size of samples/observations. In addition, the KS statistic results highlighted the need for additional research relating to the significance of deviations where there is a small number of observations due to its impact on the calculation of the critical value for assessing conformance.

The limited research available relating to the application of Benford's Law at a financial statement level reiterates the need for additional research particularly with reference to the relevant digit and statistical test for assessing conformance, the number of observations and the appropriate data set and period (single or group years).

Whilst the focus of this study involved assessing misstated (fraudulent) and suspected misstated financial statement data's conformance with Benford's Law relating to companies listed on the Johannesburg Stock Exchange, future related research could include:

- Extending the companies sampled to include international companies where fraud/errors occurred.
- A detailed analysis of financial statement anomalies at an individual account balance level and the related key audit matters identified by auditors due to the complexity and judgement required in applying accounting principles (Fang et al., 2017).
- Analysing the Income Statement data separately for the income related accounts (possible overstatement) and for the expenditure related accounts (to identify the possible understatement).

7.6. Conclusion

The overarching objective of this study was largely achieved in identifying a suitable tool for detecting fraudulent financial reporting. The application of Benford's Law in this study has confirmed that fraudulent financial statement data does not conform to the law when using the MAD statistic. Similarly, non-conformances with the law were observed when applied to data where misstatements (fraud) were suspected. Although non-conformance was assessed overall, the need to accurately identify anomalies in data on a digit-by-digit basis is important for further analysis or investigation in order to confirm existence of fraud or error.

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Appendices

Appendix 1 Steinhoff's Balance Sheet and Income Statement extract

STEINHOFF INTERNATIONAL HOLDINGS N.V. (SNH)										
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)										
	2 018	**2 017**	**2 016**	**2 015**	**2 014**	**2 013**	**2 012**	**2 011**	**2 010**	**2 009**
026 Goodwill	4 485 000	4 593 000	9 157 000	80 502 000	27 810 000	18 850 000	15 572 000	12 590 000	6 698 000	7 195 513
027 Patents & Trademarks	1 713 000	2 388 000	7 110 000	51 835 000	35 460 000	38 783 000	31 142 000	22 846 000	10 867 000	11 572 890
028 Cost of Control	-	-	-	-	-	-	-	-	-	-
029 Other Intangible Assets	113 000	269 000	241 000	2 735 000	2 846 000	2 802 000	2 692 000	494 000	110 000	106 925
032 Investment at Cost/Market Value	430 000	2 067 000	1 783 000	16 370 000	8 584 000	3 249 000	2 851 000	4 544 000	1 000 000	1 945 640
033 Long Term Loans	311 000	94 000	228 000	6 196 000	6 038 000	567 000	386 000	4 159 000	3 518 000	3 427 203
023 Fixed Assets	2 280 000	3 430 000	5 136 000	58 294 000	54 422 000	45 291 000	35 359 000	28 246 000	13 528 000	10 151 995
024 Mining Assets	-	-	-	-	-	-	-	-	-	-
030 Other Non-Current Assets	2 131 000	223 000	247 000	6 196 000	8 325 000	6 028 000	2 617 000	1 907 000	2 071 000	2 255 603
035 Inventory	2 155 000	2 556 000	2 715 000	26 394 000	18 455 000	16 320 000	14 431 000	8 813 000	4 520 000	4 756 962
036 Trade Receivables	1 477 000	1 162 000	2 620 000	26 617 000	23 589 000	23 173 000	19 754 000	10 783 000	9 713 000	8 935 263
037 Cash & Near Cash	1 275 000	723 000	2 861 000	37 905 000	16 341 000	9 188 000	8 011 000	6 300 000	5 019 000	4 736 197
038 Dividends Receivable	-	-	-	-	-	-	-	-	-	-
039 Tax Receivable	-	-	83 000	496 000	451 000	388 000	247 000	237 000	137 000	203 234
002 Ordinary Share Capital	2 070 000	2 107 000	2 122 000	113 345 000	11 000	9 000	9 000	8 000	8 000	6 847

STEINHOFF INTERNATIONAL HOLDINGS N.V. (SNH)										
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)										
	2 018	**2 017**	**2 016**	**2 015**	**2 014**	**2 013**	**2 012**	**2 011**	**2 010**	**2 009**
003 Share Premium	8 364 000	8 594 000	18 931 000	-	20 496 000	9 792 000	9 889 000	8 466 000	4 915 000	5 364 381
004 Non-Distributable Reserves	(1 177 000)	(1 237 000)	(11 917 000)	6 750 000	15 710 000	10 016 000	3 778 000	1 004 000	(824 000)	(132 666)
005 Distributable Reserves	(9 778 000)	(8 540 000)	6 286 000	56 106 000	46 637 000	36 838 000	29 616 000	24 271 000	19 224 000	15 782 759
009 Irredeemable	-	-	470 000	4 882 000	3 381 000	3 497 000	3 837 000	4 056 000	1 042 000	1 042 474
010 Redeemable	-	-	-	-	-	-	-	-	-	-
011 Convertible	-	-	-	-	-	-	-	-	-	-
012 Outside Shareholders Interest	1 162 000	1 166 000	75 000	1 087 000	1 541 000	6 467 000	6 508 000	3 025 000	2 696 000	2 859 958
014 Deferred Tax	556 000	752 000	2 094 000	13 578 000	10 878 000	9 652 000	7 765 000	6 420 000	2 392 000	3 020 423
017 Convertible Debentures	-	-	-	-	-	-	-	-	-	-
018 Director's & Shareholders Loans	-	-	-	-	-	-	-	-	-	-
019 Long Term Non Interest Bearing	-	-	-	-	-	-	-	-	-	-
020 Long Term Interest Bearing	2 027 000	-	7 142 000	56 344 000	55 580 000	45 041 000	33 858 000	26 112 000	15 107 000	12 703 880
015 Other Non-Current Liabilities	1 652 000	635 000	761 000	4 914 000	3 055 000	3 629 000	3 452 000	3 330 000	604 000	963 441
042 Trade Payables	2 903 000	4 199 000	5 027 000	46 812 000	35 440 000	30 659 000	26 365 000	19 263 000	8 230 000	8 116 919
043 Dividends Payable	-	-	-	-	-	-	108 000	-	-	-
044 Tax Payable	228 000	276 000	270 000	2 019 000	745 000	850 000	649 000	574 000	513 000	595 187
045 Short-Term Interest Bearing	8 363 000	9 553 000	920 000	7 703 000	8 847 000	8 189 000	7 228 000	4 390 000	3 274 000	4 963 822

STEINHOFF INTERNATIONAL HOLDINGS N.V. (SNH)										
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
060 Turnover	12 827 000	18 818 000	16 506 000	136 967 000	135 865 000	115 486 000	80 434 000	57 328 000	48 040 000	50 868 641
053 Cost of Sales	7 851 000	11 155 000	10 486 000	86 541 000	87 949 000	75 401 000	51 800 000	38 277 000	31 349 000	33 169 786
322 Intangible Assets Written off	180 000	721 000	51 000	286 000	322 000	713 000	146 000	83 000	48 000	46 107
323 Amortisation of Goodwill	0	0	0	0	0	0	0	0	0	0
301 Lease Charge: Land Building	835 000	1 271 000	652 000	4 277 000	3 057 000	2 796 000	2 255 000	1 516 000	1 522 000	2 395 281
302 Lease Charge: Other	22 000	47 000	32 000	470 000	424 000	375 000	316 000	253 000	184 000	245 056
303 Research & Development	0	0	0	0	0	0	0	0	0	252
088 Depreciation	358 000	371 000	284 000	1 988 000	2 575 000	2 319 000	1 655 000	1 073 000	920 000	974 714
089 Audit Fees	28 000	16 000	15 000	108 000	93 000	96 000	87 000	58 000	64 000	73 200
090 Directors Emoluments	45 249	35 507	29 906	253 388	147 000	142 000	156 000	80 000	60 000	59 243
079 Extra Ordinary Items	0	0	0	0	0	0	0	0	0	0
096 Other	0	0	0	0	0	0	0		0	
077 Convertible Debenture Interest	0	0	0	0	0	0	0	0	0	0
062 Investment Income	20 000	8 000	3 000	79 000	3 000	3 000	24 000	13 000	7 000	598
064 Interest Received	48 000	47 000	245 000	1 992 000	1 488 000	1 247 000	1 133 000	974 000	917 000	958 826
066 Interest & Finance Charges	655 000	440 000	443 000	3 830 000	3 486 000	3 267 000	2 511 000	2 149 000	1 870 000	1 959 277
074 Associate Companies	58 000	107 000	87 000	569 000	290 000	260 000	345 000	55 000	36 000	6 527
068 Current	175 000	162 000	288 000	2 300 000	1 124 000	1 063 000	672 000	301 000	228 000	217 496

STEINHOFF INTERNATIONAL HOLDINGS N.V. (SNH)										
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**
069 Deferred	-13 000	-365 000	-113 000	-925 000	835 000	213 000	140 000	123 000	234 000	345 233
070 Other	60 000	68 000	63 000	-32 000	-5 000	-8 000	51 000	11 000	19 000	18 525
075 Discontinued Operations	-518 000	0	-5 000	-2 140 000	-600 000	0	0	1 526 000	0	0
072 Preference Share Dividends	0	0	24 000	332 000	152 000	282 000	349 000	89 000	99 000	117 975
073 Minority Interest	55 000	42 000	5 000	-228 000	-227 000	640 000	388 000	208 000	212 000	248 606

Appendix 2 Tongaat's Balance Sheet and Income Statement extract

TONGAAT HULETT LTD (TON)										
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
026 Goodwill	346 000	382 000	438 000	376 000	338 000	300 000	260 000	230 000	240 000	99 000
027 Patents & Trademarks	3 000	18 000	18 000	19 000	16 000	17 000	34 000	0	0	0
028 Cost of Control	0	0	0	0	0	0	0	0	0	0
029 Other Intangible Assets	444 000	348 000	194 000	45 000	54 000	61 000	31 000	32 000	9 000	6 000
032 Investment at Cost/Market Value	24 000	27 000	25 000	26 000	17 000	13 000	11 000	6 000	7 000	265 000
033 Long Term Loans	1 000	1 000	1 000	1 000	1 000	1 000	1 000	1 000	3 000	199 000
023 Fixed Assets	13 922 000	13 688 000	13 318 000	12 059 000	11 279 000	10 287 000	9 026 000	7 665 000	7 710 000	4 659 000
024 Mining Assets	0	0	0	0	0	0	0	0	0	0
030 Other Non-Current Assets	681 000	619 000	6 712 000	5 991 000	5 490 000	5 038 000	3 984 000	3 037 000	2 041 000	742 000
035 Inventory	3 072 000	2 949 000	2 866 000	2 472 000	2 416 000	1 858 000	1 483 000	1 365 000	1 373 000	1 709 000
036 Trade Receivables	7 938 000	7 181 000	5 380 000	3 886 000	3 298 000	2 809 000	2 360 000	1 799 000	1 845 000	1 649 000
037 Cash & Near Cash	2 662 000	2 741 000	1 877 000	1 668 000	1 067 000	917 000	592 000	350 000	140 000	229 000
038 Dividends Receivable	0	0	0	0	0	0	0	0	0	0
039 Tax Receivable	22 000	0	0	0	0	0	0	6 000	0	0
002 Ordinary Share Capital	135 000	135 000	135 000	135 000	135 000	134 000	140 000	140 000	139 000	138 000
003 Share Premium	1 544 000	1 544 000	1 544 000	1 544 000	1 543 000	1 539 000	1 528 000	1 524 000	1 519 000	1 506 000
004 Non-Distributable Reserves	-909 000	58 000	3 401 000	2 251 000	1 472 000	112 000	-847 000	-2 169 000	-1 776 000	-672 000

TONGAAT HULETT LTD (TON)										
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
005 Distributable Reserves	9 401 000	9 044 000	8 295 000	7 959 000	7 412 000	6 596 000	5 888 000	5 305 000	4 691 000	2 087 000
009 Irredeemable	0	0	0	0	0	0	0	0	0	0
010 Redeemable	0	0	0	0	0	0	0	0	0	792 000
011 Convertible	0	0	0	0	0	0	0	0	0	0
012 Outside Shareholders Interest	1 838 000	1 957 000	2 155 000	1 887 000	1 628 000	1 371 000	1 087 000	840 000	870 000	276 000
014 Deferred Tax	2 376 000	2 537 000	2 896 000	2 491 000	2 131 000	1 951 000	1 663 000	1 365 000	1 272 000	582 000
017 Convertible Debentures	0	0	0	0	0	0	0	0	0	0
018 Director's & Shareholders Loans	0	0	0	0	0	0	0	0	0	0
019 Long Term Non Interest Bearing	0	0	3 000	4 000	4 000	5 000	5 000	8 000	5 000	0
020 Long Term Interest Bearing	5 048 000	4 975 000	4 393 000	4 706 000	4 781 000	4 198 000	2 464 000	2 098 000	1 885 000	1 212 000
015 Other Non-Current Liabilities	791 000	784 000	826 000	743 000	696 000	654 000	574 000	510 000	546 000	279 000
042 Trade Payables	4 165 000	3 712 000	3 521 000	3 173 000	2 742 000	2 372 000	1 836 000	1 765 000	1 750 000	1 476 000
043 Dividends Payable	0	0	0	0	0	0	0	0	0	0
044 Tax Payable	46 000	153 000	97 000	46 000	139 000	75 000	18 000	0	6 000	112 000
045 Short-Term Interest Bearing	4 680 000	3 055 000	3 563 000	1 604 000	1 293 000	2 294 000	3 426 000	3 105 000	2 461 000	1 769 000

TONGAAT HULETT LTD (TON)										
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
060 Turnover	16 982 000	17 915 000	16 676 000	16 155 000	15 716 000	14 373 000	12 081 000	9 681 000	11 136 000	7 106 000
053 Cost of Sales	13 485 000	13 814 000	13 311 000	12 532 000	11 508 000	11 223 000	888 500	7 791 000	9 629 000	5 578 000
322 Intangible Assets Written off	23 000	8 000	8 000	10 000	15 000	9 000	5 000	4 000	3 000	2 000
323 Amortisation of Goodwill	0	0	0	0	0	0	0	0	0	0
301 Lease Charge: Land Building	133 000	75 000	85 000	68 000	71 000	48 000	43 000	25 000	27 000	16 000
302 Lease Charge: Other	0	0	0	0	0	0	0	0	0	0
303 Research & Development	0	0	0	0	0	0	0	0	0	0
088 Depreciation	1 001 000	1 027 000	587 000	564 000	571 000	472 000	366 000	344 000	521 000	244 000
089 Audit Fees	21 000	22 000	19 000	17 000	16 000	14 000	13 000	12 000	14 000	8 000
090 Directors Emoluments	33 787	41 119	30 950	41 000	39 000	40 000	34 000	22 000	26 000	21 227
079 Extra Ordinary Items	0	0	0	0	0	0	0	0	0	0
096 Other	0	0	0	0	0	0	0	0	0	0
077 Convertible Debenture Interest	0	0	0	0	0	0	0	0	0	0
062 Investment Income	0	0	0	0	0	0	0	0	0	35 000
064 Interest Received	126 000	129 000	70 000	67 000	37 000	36 000	20 000	12 000	37 000	45 000
066 Interest & Finance Charges	1 004 000	939 000	750 000	684 000	646 000	596 000	527 000	484 000	489 000	325 000
074 Associate Companies	0	0	0	0	0	0	1 000	-2 000	1 000	0
068 Current	222 000	542 000	288 000	260 000	512 000	294 000	108 000	93 000	331 000	196 000
069 Deferred	80 000	-115 000	67 000	164 000	29 000	91 000	192 000	161 000	-16 000	-11 000

TONGAAT HULETT LTD (TON)										
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)										
070 Other	-53 000	1 000	3 000	1 000	-3 000	4 000	51 000	7 000	-107 000	27 000
075 Discontinued Operations	0	0	0	0	0	0	0	0	0	0
072 Preference Share Dividends	0	0	0	0	0	0	0	0	0	0
073 Minority Interest	118 000	112 000	-50 000	58 000	72 000	100 000	132 000	38 000	130 000	31 000

Appendix 3 African Bank's Balance Sheet and Income Statement extract

AFRICAN PHOENIX INVESTMENTS LTD (AXL)										
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
026 Goodwill	831 000	5 472 000	5 472 000	5 472 000	5 472 000	5 292 000	0	0	0	14 067
027 Patents & Trademarks	611 000	683 000	761 000	834 000	906 000	978 000	0	0	0	0
028 Cost of Control	0	0	0	0	0	0	0	0	0	0
029 Other Intangible Assets	190 000	0	0	0	0	0	0	0	0	0
032 Investment at Cost/Market Value	0	0	0	0	676 000	569 000	377 000	326 000	74 000	59 608
033 Long Term Loans	50 276 000	46 013 000	23 308 000	16 913 000	0	0	0	0	0	0
023 Fixed Assets	1 077 000	1 152 000	852 000	622 000	586 000	496 000	155 000	116 000	112 000	140 026
024 Mining Assets	0	0	0	0	0	0	0	0	0	0
030 Other Non-Current Assets	1 012 000	762 000	1 648 000	1 614 000	682 000	609 000	143 000	153 000	46 000	35 739
035 Inventory	731 000	871 000	885 000	851 000	859 000	767 000	0	0	0	0
036 Trade Receivables	9 127 000	5 632 000	14 256 000	9 389 000	21 230 000	17 690 000	9 103 000	6 309 000	5 862 000	5 135 390
037 Cash & Near Cash	3 091 000	3 070 000	3 198 000	3 410 000	3 828 000	2 984 000	1 961 000	1 252 000	1 147 000	1 944 148
038 Dividends Receivable	0	0	0	0	0	0	0	0	0	0
039 Tax Receivable	520 000	27 000	13 000	97 000	20 000	8 000	13 000	7 000	21 000	6 049
002 Ordinary Share Capital	20 000	20 000	20 000	20 000	20 000	20 000	12 000	12 000	12 000	11 929
003 Share Premium	9 420 000	9 131 000	9 131 000	9 131 000	9 131 000	9 131 000	0	0	0	0
004 Non-Distributable Reserves	171 000	-441 000	-168 000	573 000	587 000	577 000	297 000	-150 000	-65 000	-144 428

AFRICAN PHOENIX INVESTMENTS LTD (AXL)										
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
005 Distributable Reserves	-937 000	5 593 000	4 263 000	2 672 000	2 436 000	2 201 000	2 173 000	2 345 000	2 264 000	2 773 033
009 Irredeemable	1 130 000	1 130 000	719 000	483 000	483 000	483 000	483 000	483 000	483 000	0
010 Redeemable	0	0	0	0	0	0	0	0	0	0
011 Convertible	0	0	0	0	0	0	0	0	0	0
012 Outside Shareholders Interest	0	0	0	0	0	0	0	0	10 000	0
014 Deferred Tax	199 000	216 000	229 000	392 000	265 000	294 000	0	0	0	11 880
017 Convertible Debentures	0	0	0	0	0	0	0	0	0	0
018 Director's & Shareholders Loans	0	0	0	0	0	0	0	0	0	0
019 Long Term Non Interest Bearing	0	0	0	0	0	0	0	0	0	0
020 Long Term Interest Bearing	31 026 000	41 136 000	19 088 000	14 691 000	16 749 000	10 843 000	7 400 000	3 781 000	3 442 000	3 717 187
015 Other Non-Current Liabilities	0	0	1 000	14 000	40 000	55 000	16 000	103 000	95 000	78 659
042 Trade Payables	18 382 000	2 188 000	2 001 000	1 733 000	1 354 000	1 323 000	408 000	389 000	243 000	153 595
043 Dividends Payable	14 000	13 000	12 000	10 000	9 000	9 000	7 000	6 000	5 000	2 522
044 Tax Payable	7 000	94 000	72 000	33 000	77 000	238 000	148 000	109 000	77 000	182 716
045 Short-Term Interest Bearing	8 034 000	4 602 000	15 025 000	9 450 000	3 108 000	4 219 000	808 000	1 085 000	696 000	547 934

AFRICAN PHOENIX INVESTMENTS LTD (AXL)										
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
060 Turnover	4 034 000	4 792 000	4 710 000	4 487 000	4 196 000	3 092 000	0	0	0	0
053 Cost of Sales	2 264 000	2 658 000	2 627 000	2 513 000	2 405 000	1 779 000	0	0	0	0
322 Intangible Assets Written off	123 000	78 000	73 000	72 000	72 000	65 000	0	0	0	0
323 Amortisation of Goodwill	0	0	0	0	0	0	0	0	14 000	6 496
301 Lease Charge: Land Building	824 000	740 000	684 000	606 000	592 000	464 000	69 000	62 000	67 000	41 798
302 Lease Charge: Other	111 000	92 000	82 000	61 000	76 000	73 000	16 000	11 000	4 000	4 972
303 Research & Development	0	0	0	0	0	0	0	0	0	0
088 Depreciation	252 000	226 000	173 000	190 000	185 000	150 000	45 000	43 000	53 000	69 428
089 Audit Fees	16 000	18 000	16 000	19 000	16 000	12 000	7 000	7 000	9 000	6 411
090 Directors Emoluments	24 000	26 000	20 000	26 000	36 000	35 000	24 000	30 000	29 000	25 262
079 Extra Ordinary Items	0	0	0	0	0	0	0	0	0	0
096 Other	0	0	0			0	0	0	-478 000	6 496
077 Convertible Debenture Interest	0	0	0	0	0	0	0	0	0	0
062 Investment Income	20 000	17 000	14 000	5 000	9 000	9 000	0	0	0	2 616
064 Interest Received	12 337 000	10 121 000	7 633 000	6 335 000	5 795 000	4 613 000	3 268 000	3 087 000	2 908 000	2 607 492
066 Interest & Finance Charges	4 564 000	3 680 000	2 850 000	2 383 000	2 025 000	1 313 000	636 000	465 000	492 000	452 647
074 Associate Companies	0	0	0	0	0	0	0	0	1 000	673
068 Current	683 000	1 313 000	1 113 000	521 000	845 000	636 000	607 000	550 000	481 000	348 745
069 Deferred	-296 000	-192 000	-140 000	255 000	-64 000	146 000	15 000	-18 000	-22 000	23 992

AFRICAN PHOENIX INVESTMENTS LTD (AXL)										
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
070 Other	-178 000	73 000	155 000	144 000	172 000	206 000	132 000	121 000	192 000	182 715
075 Discontinued Operations	0	0	0	0	0	0	0	0	0	0
072 Preference Share Dividends	88 000	61 000	40 000	36 000	52 000	49 000	41 000	36 000	8 000	0
073 Minority Interest	0	0	0	0	0	0	0	0	0	-646

Appendix 4 Freedom Property's Balance Sheet and Income Statement extract

FREEDOM PROPERTY FUND LTD (FDP)		
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)		
	2016	**2015**
026 Goodwill	0	0
027 Patents & Trademarks	59	0
028 Cost of Control	0	0
029 Other Intangible Assets	0	0
031 Investments & Loans	0	0
032 Investment at Cost/Market Value	0	0
033 Long Term Loans	0	0
023 Fixed Assets	193 550	1 557 520
024 Mining Assets	0	0
030 Other Non-Current Assets	99 089	4 370
035 Inventory	12 235	87 694
036 Trade Receivables	28 737	54 325
037 Cash & Near Cash	2 875	1 337
038 Dividends Receivable	0	0
039 Tax Receivable	4 338	0
003 Share Premium	0	0
004 Non-Distributable Reserves	-2 622	0
005 Distributable Reserves	-324 738	516 405
009 Irredeemable	0	0
010 Redeemable	0	0
011 Convertible	0	0
014 Deferred Tax	30 479	245 620

FREEDOM PROPERTY FUND LTD (FDP)		
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)		
	2016	**2015**
060 Turnover	38 474	42 779
053 Cost of Sales	9 938	9 414
322 Intangible Assets Written off	0	0
323 Amortisation of Goodwill	0	0
301 Lease Charge: Land Building	492	412
302 Lease Charge: Other	224	0
303 Research & Development	0	0
088 Depreciation	646	656
089 Audit Fees	1 564	1 648
090 Directors Emoluments	8 207	3 834
079 Extra Ordinary Items	0	0
096 Other	0	0
077 Convertible Debenture Interest	0	0
062 Investment Income	0	0
064 Interest Received	2 856	32
066 Interest & Finance Charges	12 858	4 436
074 Associate Companies	0	0
068 Current	3 265	3 612
069 Deferred	-540	45 672
070 Other	0	-357
075 Discontinued Operations	0	0
072 Preference Share Dividends	0	0

FREEDOM PROPERTY FUND LTD (FDP)		
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)		
	2016	**2015**
017 Convertible Debentures	0	0
012 Outside Shareholders Interest	0	0
018 Director's & Shareholders Loans	0	0
019 Long Term Non Interest Bearing	55	55
020 Long Term Interest Bearing	127 406	82 236
015 Other Non-Current Liabilities	0	0
042 Trade Payables	37 478	19 883
043 Dividends Payable	0	0
044 Tax Payable	12 798	5 385
045 Short-Term Interest Bearing	16 790	12 331

FREEDOM PROPERTY FUND LTD (FDP)		
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)		
	2016	**2015**
073 Minority Interest	0	0

Appendix 5 Capitec's Balance Sheet and Income Statement extract

CAPITEC BANK HOLDINGS LIMITED					
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)					
	2019	2018	2017	2016	2015
026 Goodwill	0	0	0	0	0
027 Patents & Trademarks	0	0	0	0	0
028 Cost of Control	0	0	0	0	0
029 Other Intangible Assets	316 283	283 011	279 946	242 648	238 875
032 Investment at Cost/Market Value	417 193	234 352	100 000	0	0
033 Long Term Loans	34 602 721	31 601 961	30 494 018	28 586 451	26 260 041
023 Fixed Assets	2 209 847	1 754 342	1 523 395	1 110 808	848 758
024 Mining Assets	0	0	0	0	0
030 Other Non-Current Assets	1 616 915	645 509	462 067	569 899	353 936
035 Inventory	0	0	0	0	0
036 Trade Receivables	31 834 214	25 240 177	21 821 249	18 218 297	14 864 751
037 Cash & Near Cash	29 144 530	25 090 728	18 677 222	14 164 697	11 312 479
038 Dividends Receivable	0	0	0	0	0
039 Tax Receivable	286 046	107 154	0	52 702	37 635
002 Ordinary Share Capital	1 156	1 156	1 156	1 156	1 156
003 Share Premium	5 647 864	5 647 864	5 647 864	5 647 864	5 647 915
004 Non-Distributable Reserves	-4 969	-23 579	-11 736	64 147	7 035
005 Distributable Reserves	15 950 142	13 153 434	10 329 731	7 772 004	5 700 459
009 Irredeemable	81 603	112 803	150 998	173 894	207 175
010 Redeemable	0	0	0	0	0
011 Convertible	0	0	0	0	0
012 Outside Shareholders Interest	0	0	0	0	0
014 Deferred Tax	0	0	0	0	0
017 Convertible Debentures	0	0	0	0	0

CAPITEC BANK HOLDINGS LIMITED					
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)					
	2019	**2018**	**2017**	**2016**	**2015**
018 Director's & Shareholders Loans	0	0	0	0	0
019 Long Term Non Interest Bearing	0	0	0	0	0
020 Long Term Interest Bearing	14 291 911	10 144 194	13 448 932	12 775 955	13 025 145
015 Other Non-Current Liabilities	476 351	408 780	456 349	423 830	328 389
042 Trade Payables	1 824 480	1 618 294	1 161 271	912 077	832 251
043 Dividends Payable	7 509	8 258	9 652	10 382	10 790
044 Tax Payable	0	0	30 341	0	0
045 Short-Term Interest Bearing	62 151 702	53 886 030	42 133 339	35 164 193	28 156 160

CAPITEC BANK HOLDINGS LIMITED					
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)					
	2019	**2018**	**2017**	**2016**	**2015**
095 Total Income	-2 723 059	-4 069 252	-5 157 613	-4 335 299	-4 109 472
322 Intangible Assets Written off	196 381	139 878	178 531	97 531	85 904
323 Amortisation of Goodwill	0	0	0	0	0
301 Lease Charge: Land Building	502 972	461 510	404 133	343 886	291 592
302 Lease Charge: Other	39	929	4 574	2 188	3 302
303 Research & Development	0	0	0	0	0
088 Depreciation	437 078	420 272	358 446	305 646	282 043
089 Audit Fees	15 340	8 533	5 013	4 580	4 236
090 Directors Emoluments	41 789	36 919	33 736	28 064	20 588
079 Extra Ordinary Items	0	0	0	0	0
096 Other	0	0	0	0	0
077 Convertible Debenture Interest	0	0	0	0	0
062 Investment Income	0	0	45	53	0
064 Interest Received	15 501 072	15 474 457	14 934 427	12 473 038	10 782 229
066 Interest & Finance Charges	4 509 549	4 184 449	3 551 821	2 883 666	2 425 702
074 Associate Companies	1 965	2 536	0	0	0
068 Current	2 152 404	1 639 385	1 433 675	1 294 697	1 079 852
069 Deferred	-370 985	45 149	0	-50 703	-84 061
070 Other	0	0	0	0	0
075 Discontinued Operations	0	0	0	0	0
072 Preference Share Dividends	8 785	12 023	15 719	16 064	17 510
073 Minority Interest	0	0	0	0	0

Appendix 6 NEPI Rockcastle's Balance Sheet and Income Statement extract

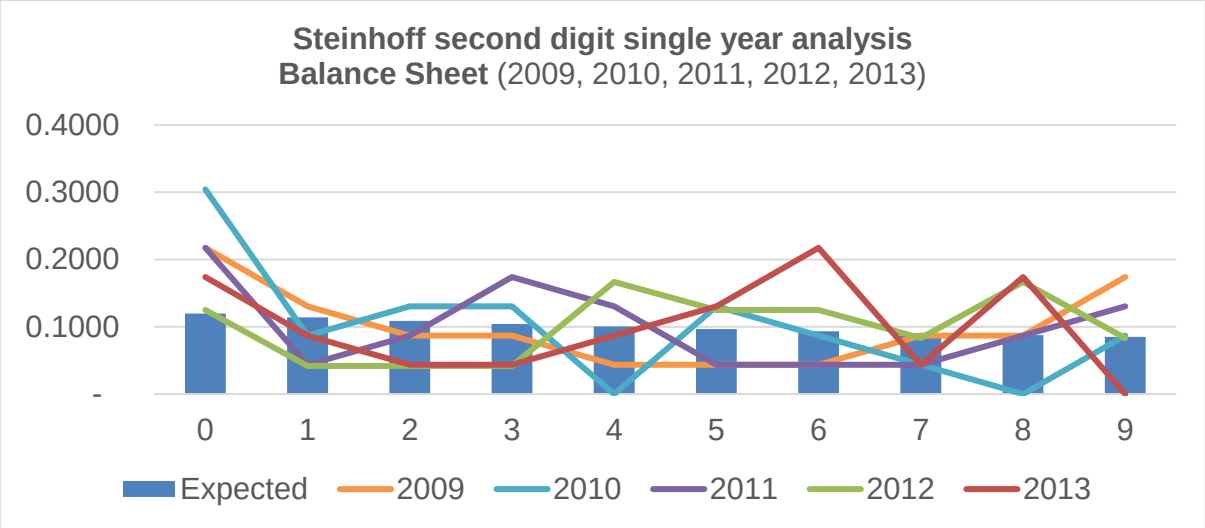
NEPI ROCKCASTLE PLC		
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)		
	2018	**2017**
026 Goodwill	93 070	82 582
027 Patents & Trademarks	0	0
028 Cost of Control	0	0
029 Other Intangible Assets	0	0
032 Investment at Cost/Market Value	49 185	40 856
033 Long Term Loans	38 069	53 724
023 Fixed Assets	5 913 351	4 929 600
024 Mining Assets	0	0
030 Other Non-Current Assets	34 341	30 673
035 Inventory	0	0
036 Trade Receivables	277 704	664 822
037 Cash & Near Cash	96 924	195 544
038 Dividends Receivable	0	0
039 Tax Receivable	0	0
002 Ordinary Share Capital	5 778	5 778
003 Share Premium	3 625 568	3 625 568
004 Non-Distributable Reserves	0	0
005 Distributable Reserves	208 426	282 897
009 Irredeemable	0	0
010 Redeemable	0	0
011 Convertible	0	0
012 Outside Shareholders Interest	**6 101**	**476**

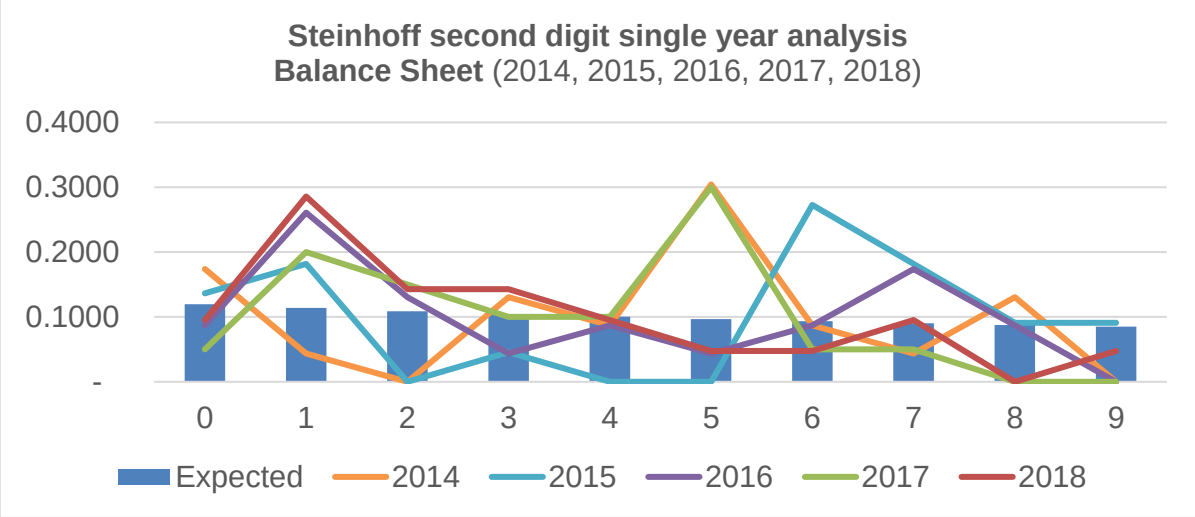
NEPI ROCKCASTLE PLC		
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)		
	2018	**2017**
095 Total Income	282 665	-537 809
322 Intangible Assets Written off	0	0
323 Amortisation of Goodwill	0	0
301 Lease Charge: Land Building	0	0
302 Lease Charge: Other	0	0
303 Research & Development	0	0
088 Depreciation	0	0
089 Audit Fees	1 092	3 254
090 Directors Emoluments	2 662	1 727
079 Extra Ordinary Items	0	0
096 Other	0	0
077 Convertible Debenture Interest	0	0
062 Investment Income	29 132	18 084
064 Interest Received	2 444	2 567
066 Interest & Finance Charges	42 303	25 473
074 Associate Companies	8 329	16 068
068 Current	9 482	1 671
069 Deferred	45 326	46 199
070 Other	0	0
075 Discontinued Operations	0	0
072 Preference Share Dividends	0	0
073 Minority Interest	-150	280

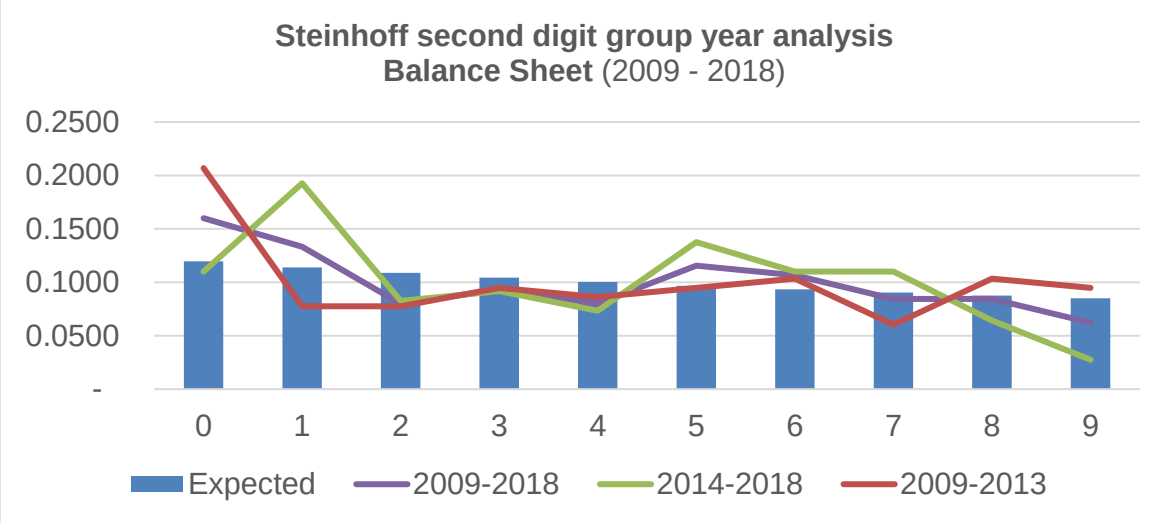
NEPI ROCKCASTLE PLC		
STATEMENT OF FINANCIAL POSITION (BALANCE SHEET)		
	2018	2017
014 Deferred Tax	351 187	271 105
017 Convertible Debentures	0	0
018 Director's & Shareholders Loans	0	0
019 Long Term Non Interest Bearing	0	0
020 Long Term Interest Bearing	1 822 445	1 624 410
015 Other Non-Current Liabilities	47 706	41 767
042 Trade Payables	159 786	124 487
043 Dividends Payable	0	0
044 Tax Payable	0	0
045 Short-Term Interest Bearing	275 647	21 313

NEPI ROCKCASTLE PLC		
STATEMENT OF FINANCIAL PERFORMANCE (INCOME STATEMENT)		
	2018	2017

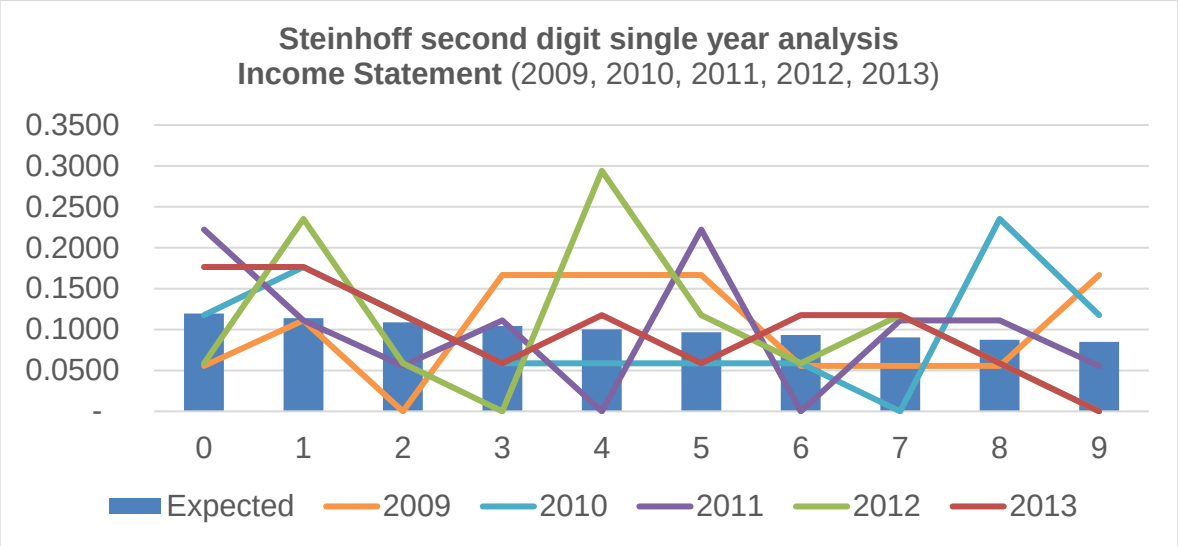
Appendix 7 Steinhoff Balance Sheet second digit analysis results

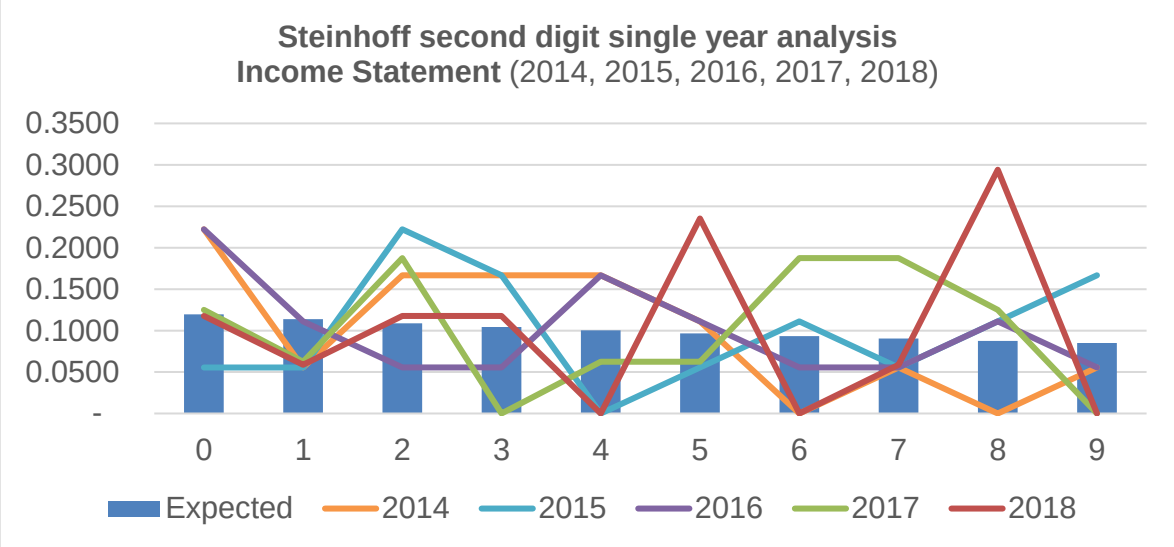


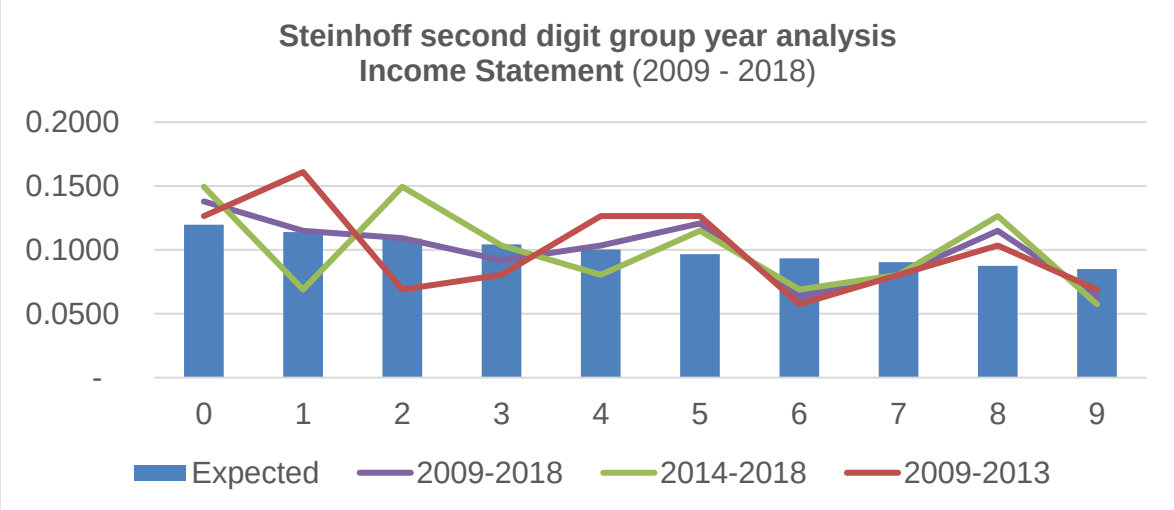




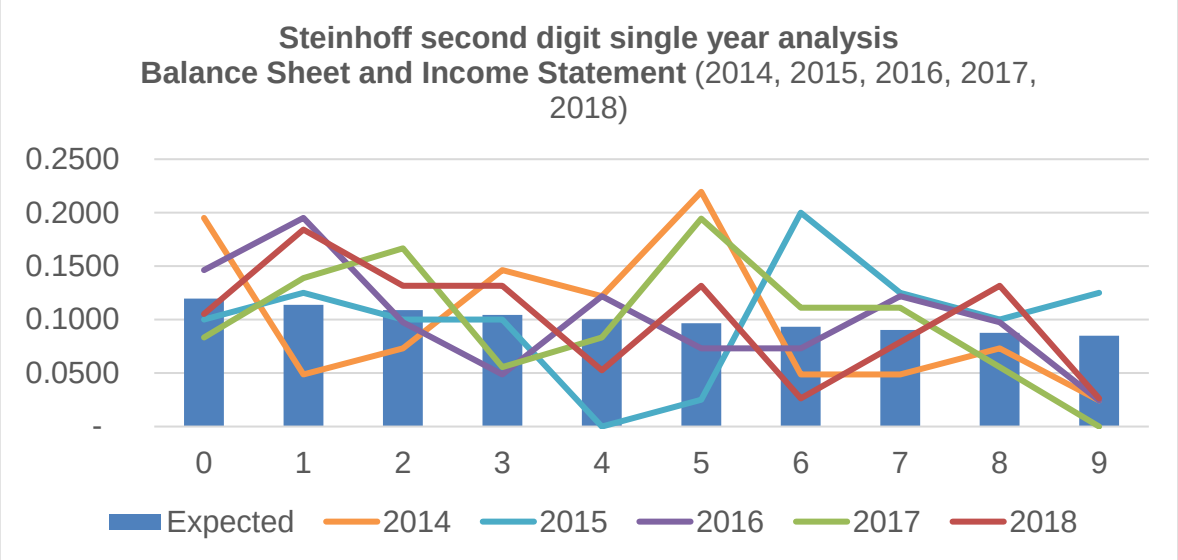
Appendix 8 Steinhoff Income Statement second analysis test results

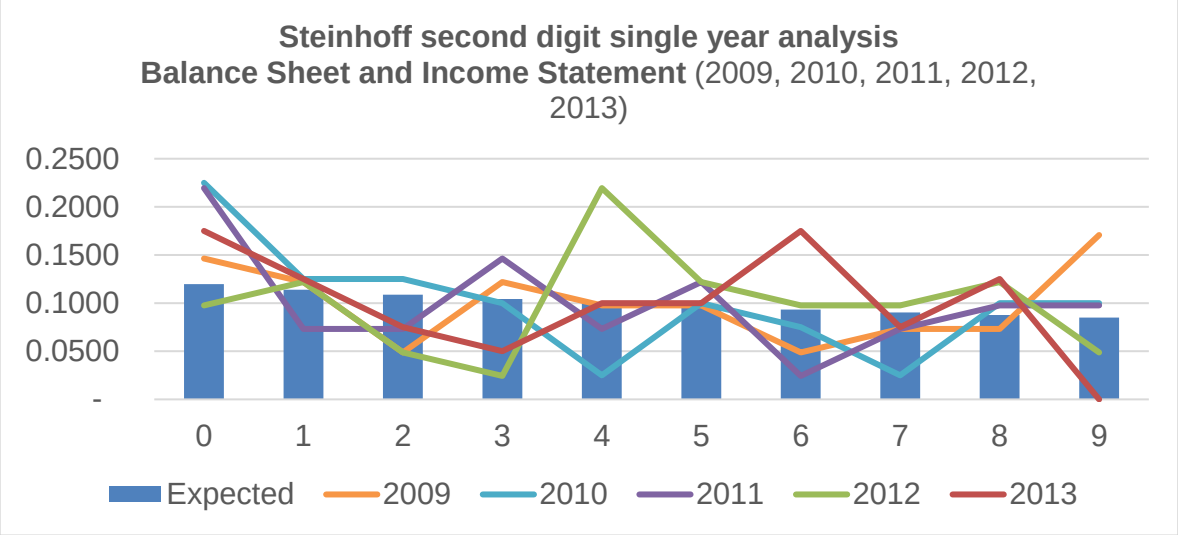


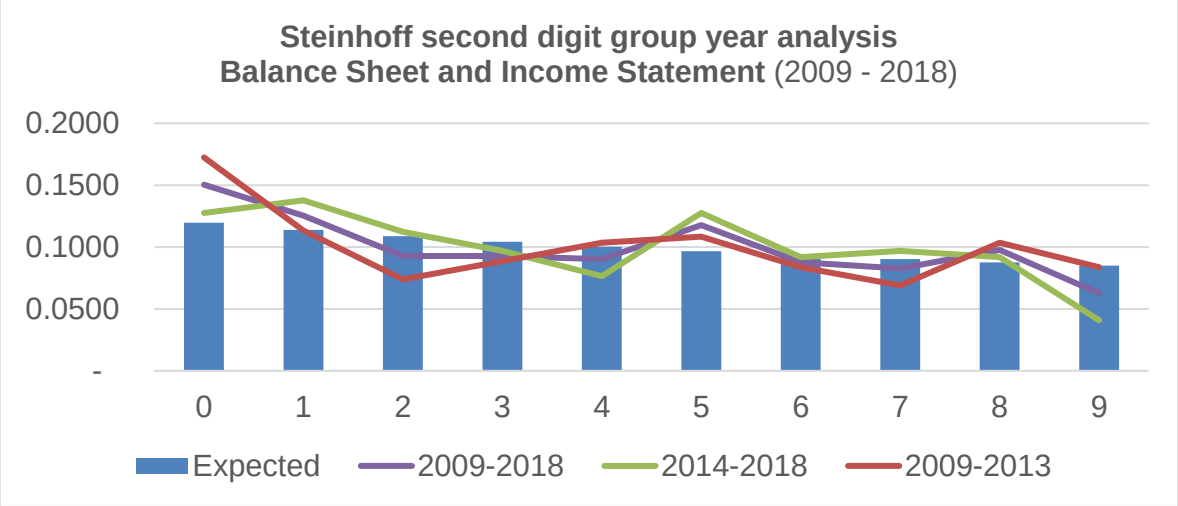




Appendix 9 Steinhoff Combined (Balance Sheet and Income Statement) second digit analysis results

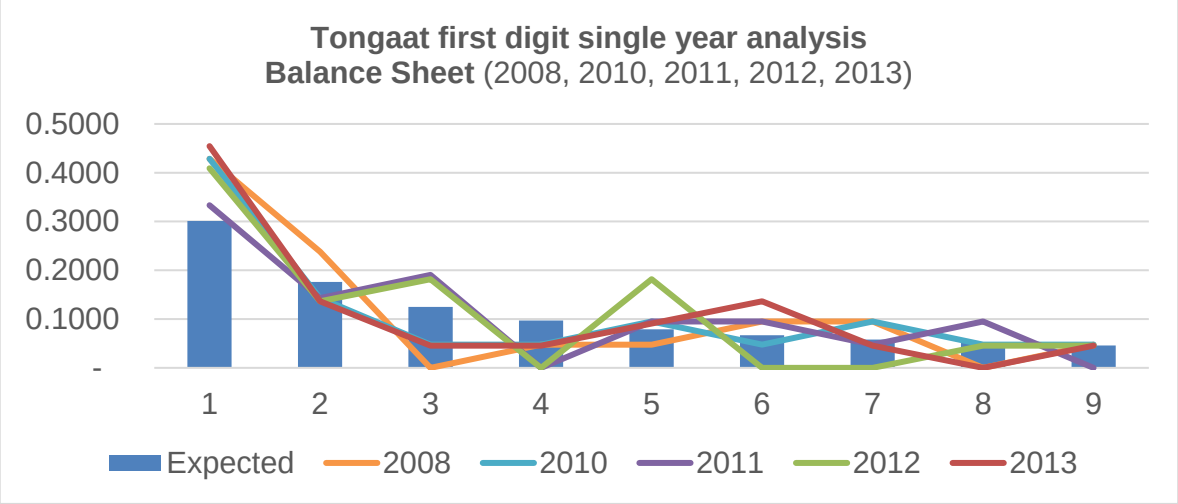


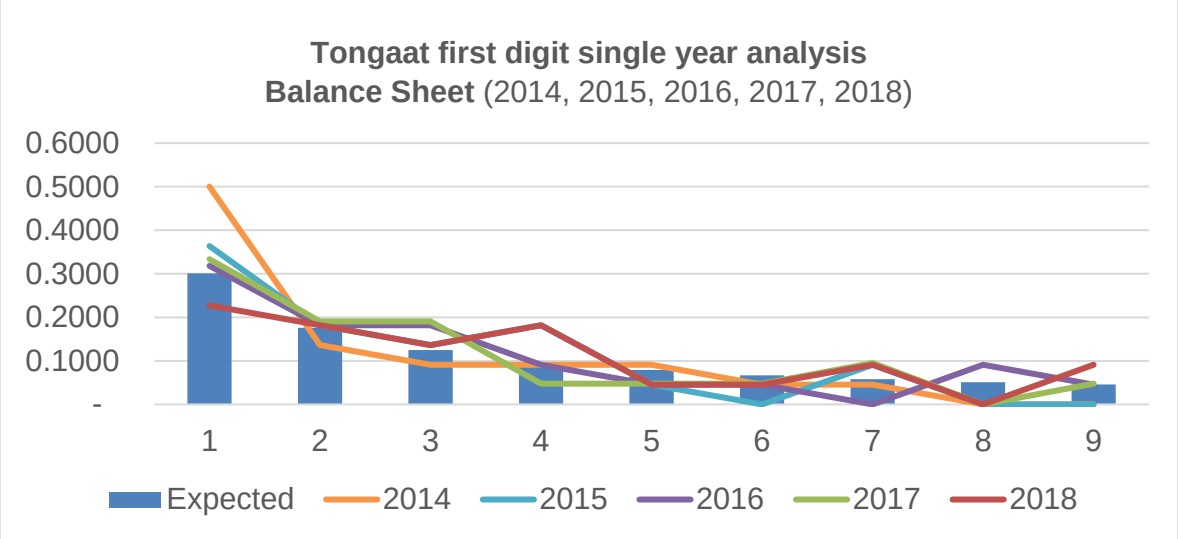


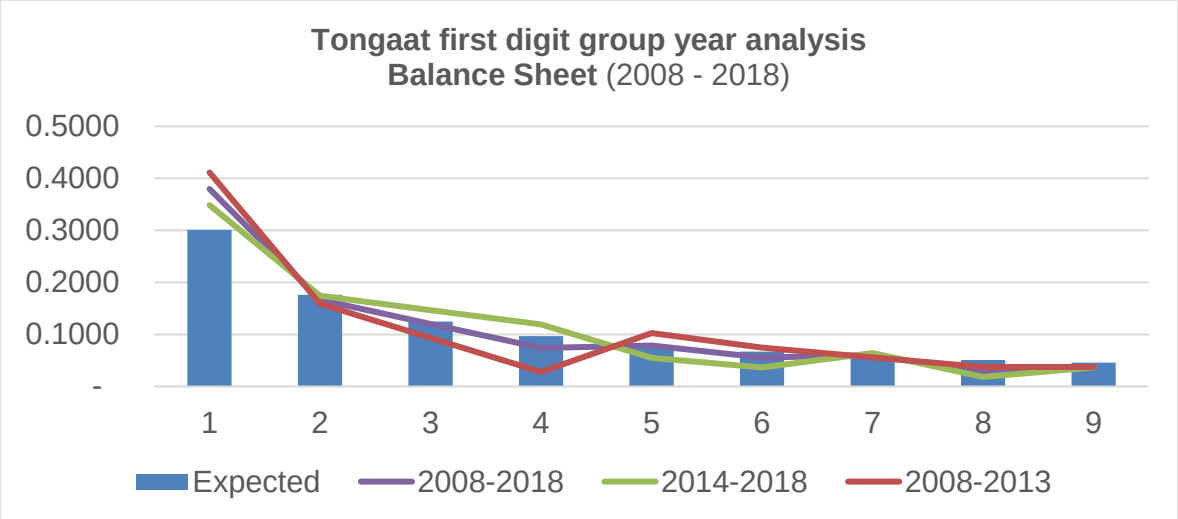


Appendix 10 Tongaat first digit analysis results

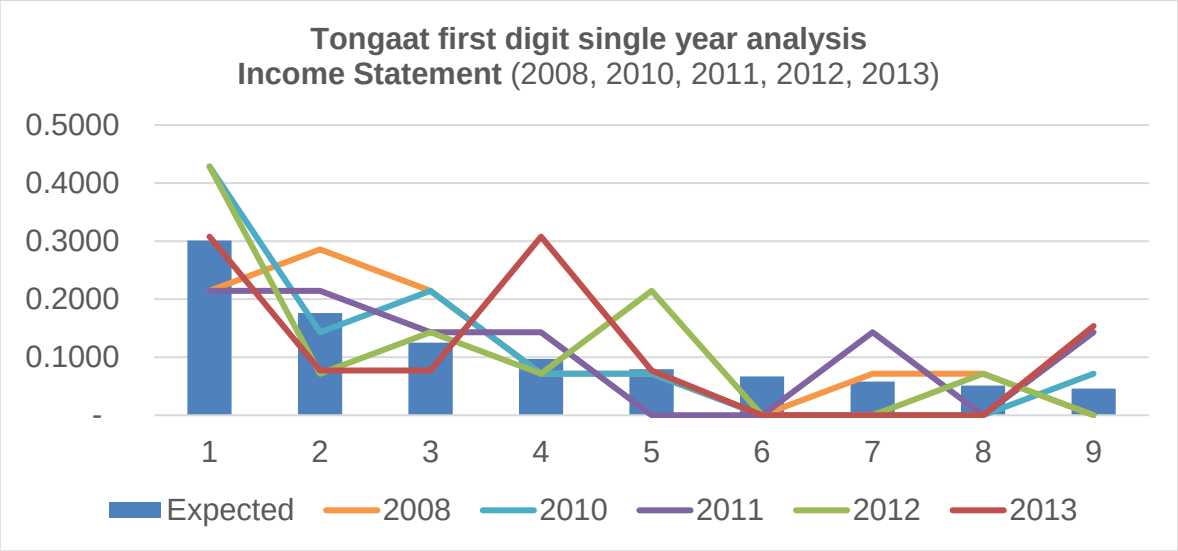
Balance Sheet (single and group year)

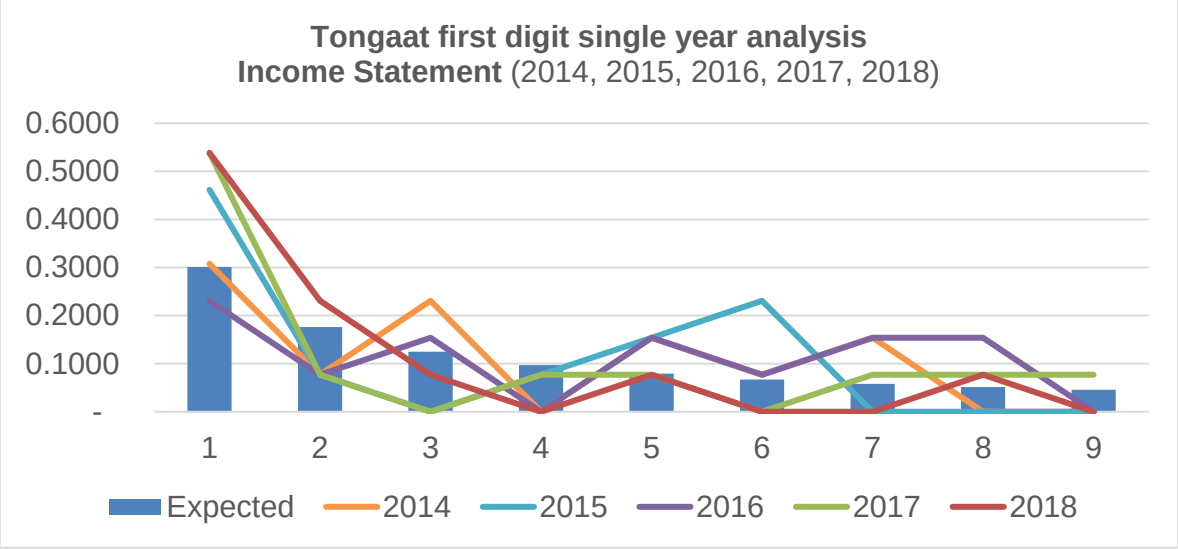


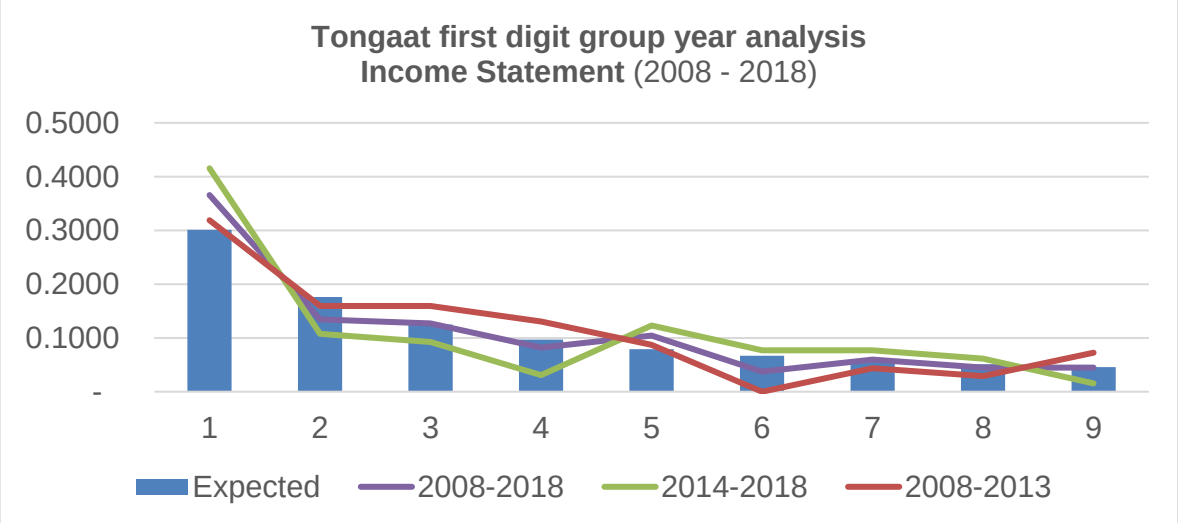




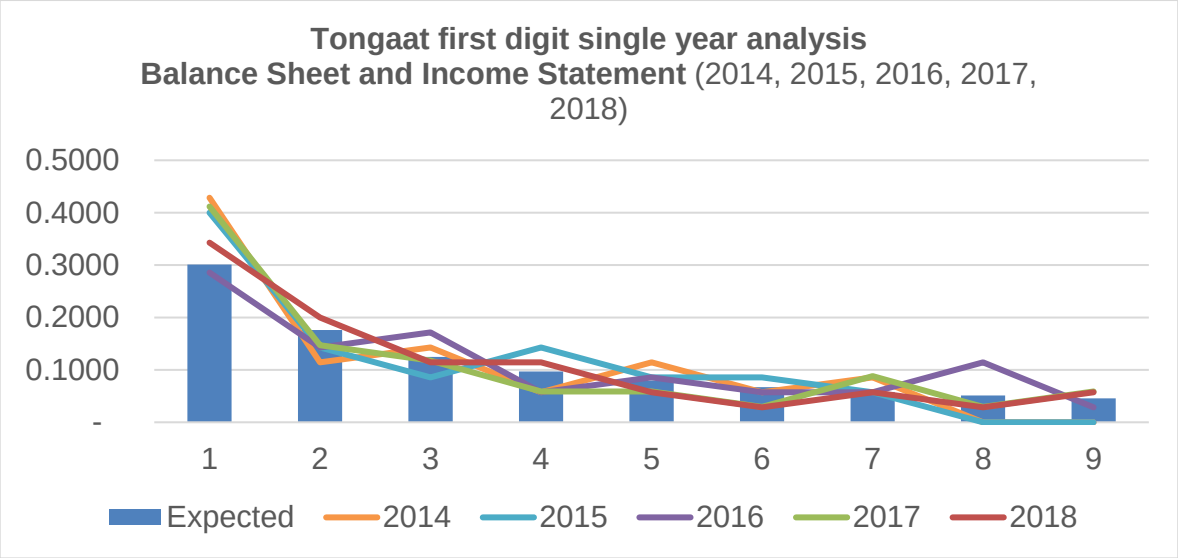
Income Statement (single and group year)

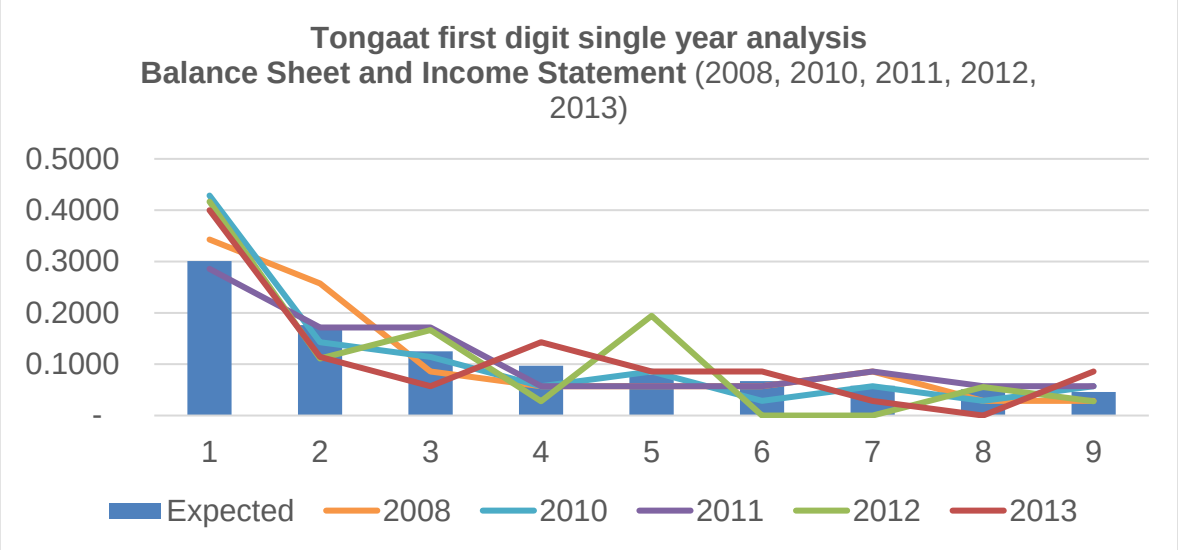


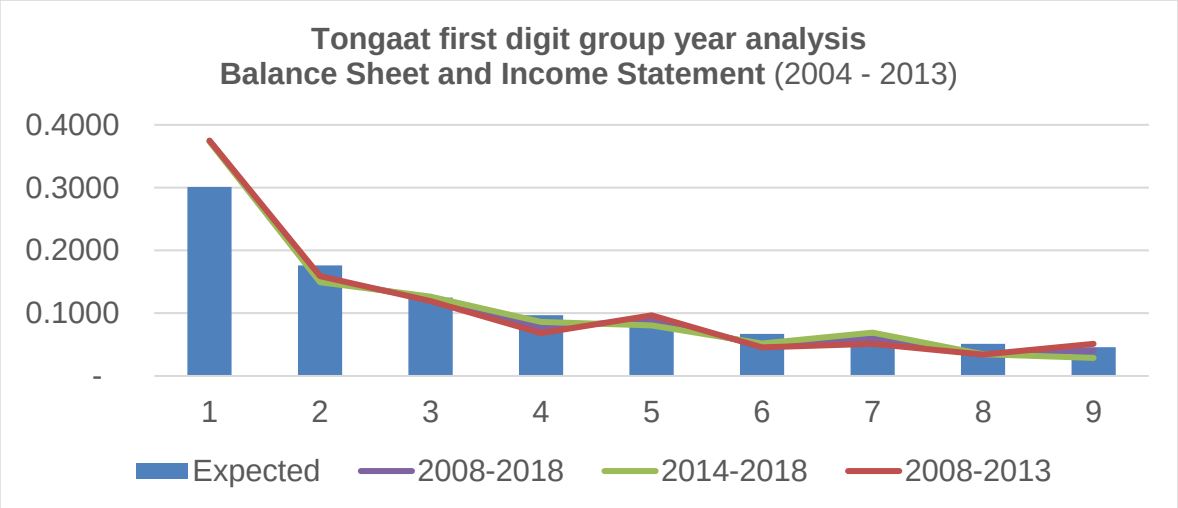




Combined (single and group year)

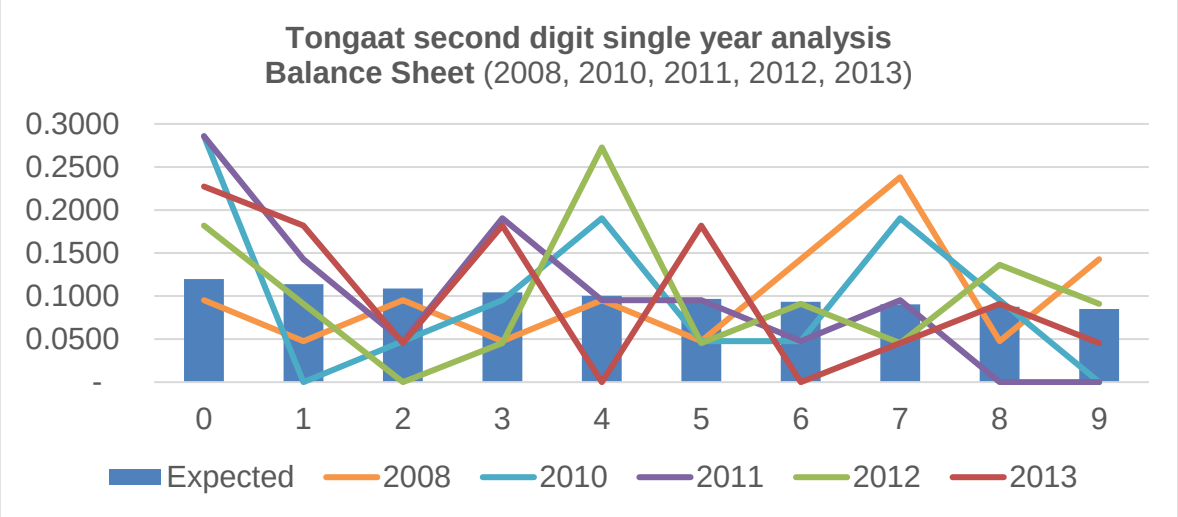


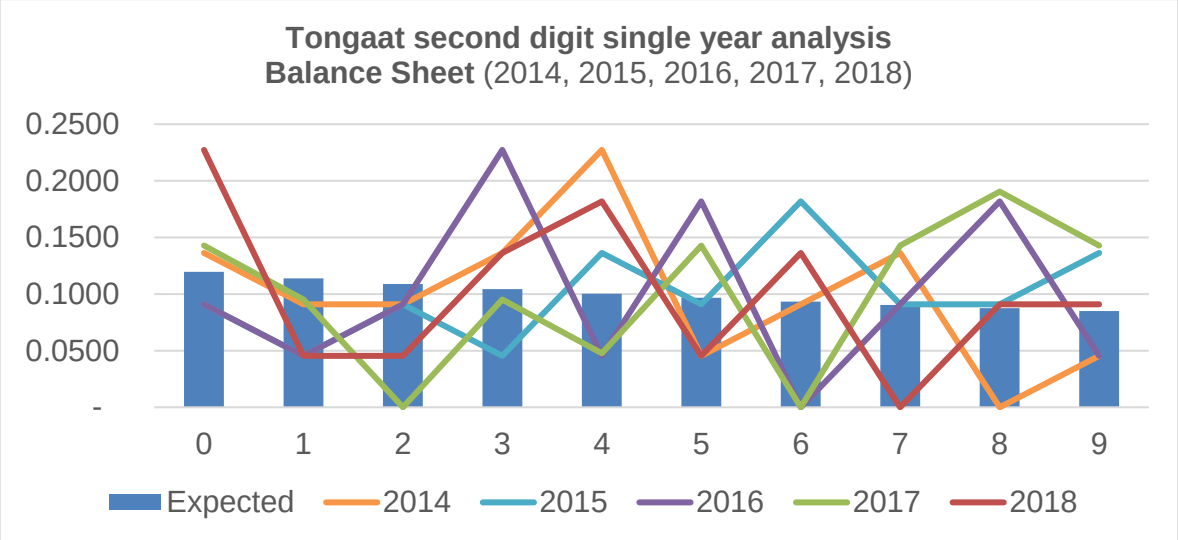


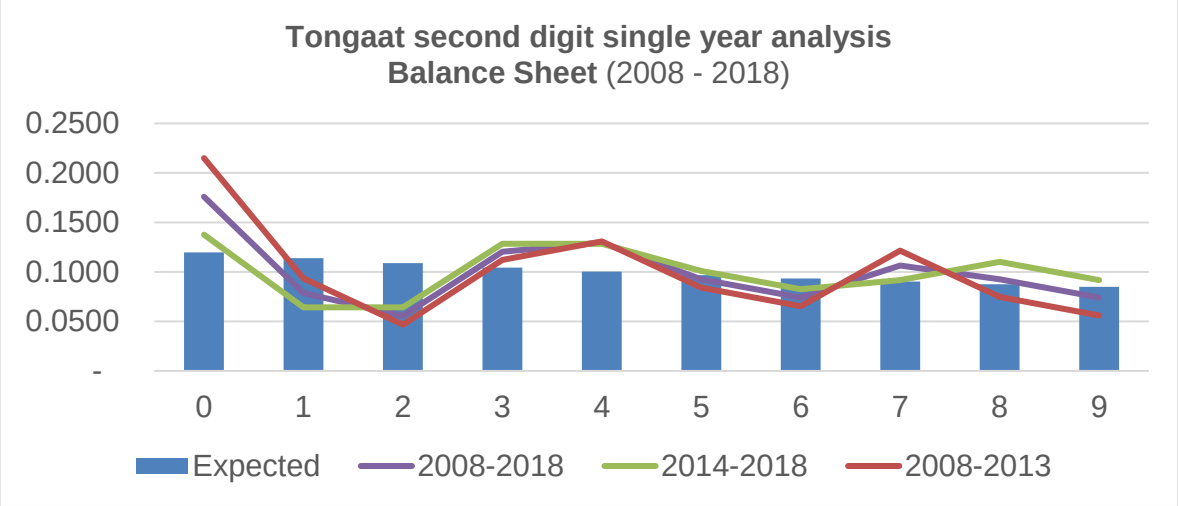


Appendix 11 Tongaat second digit analysis results

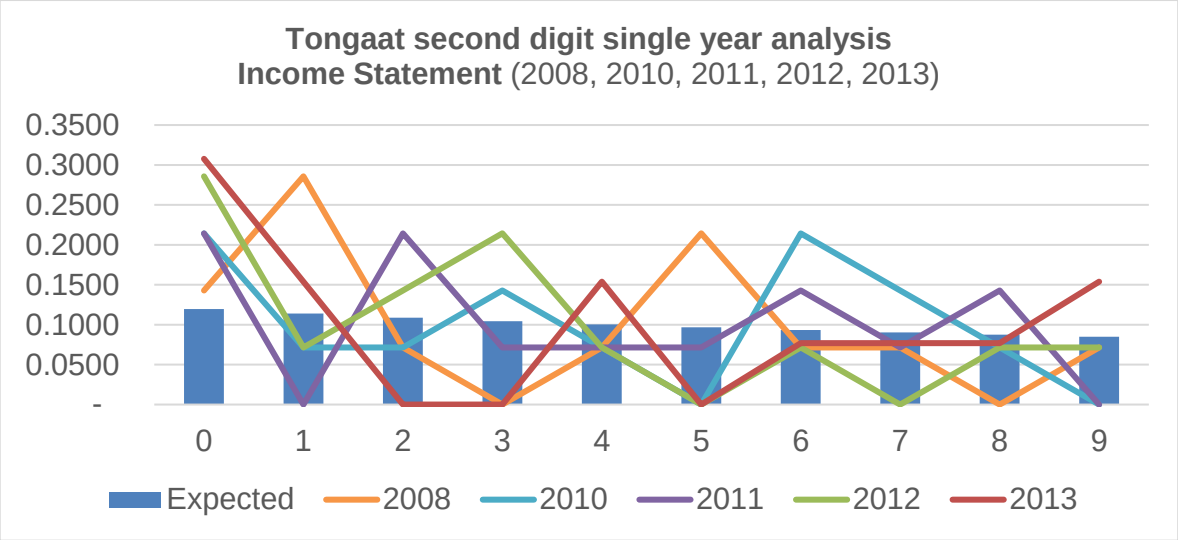
Balance Sheet (single and group year)

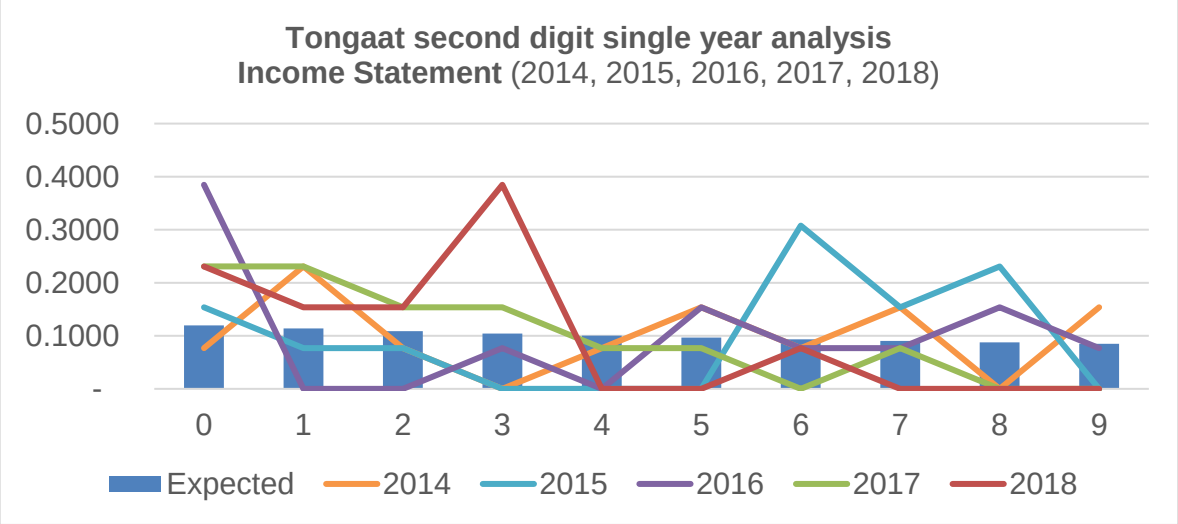


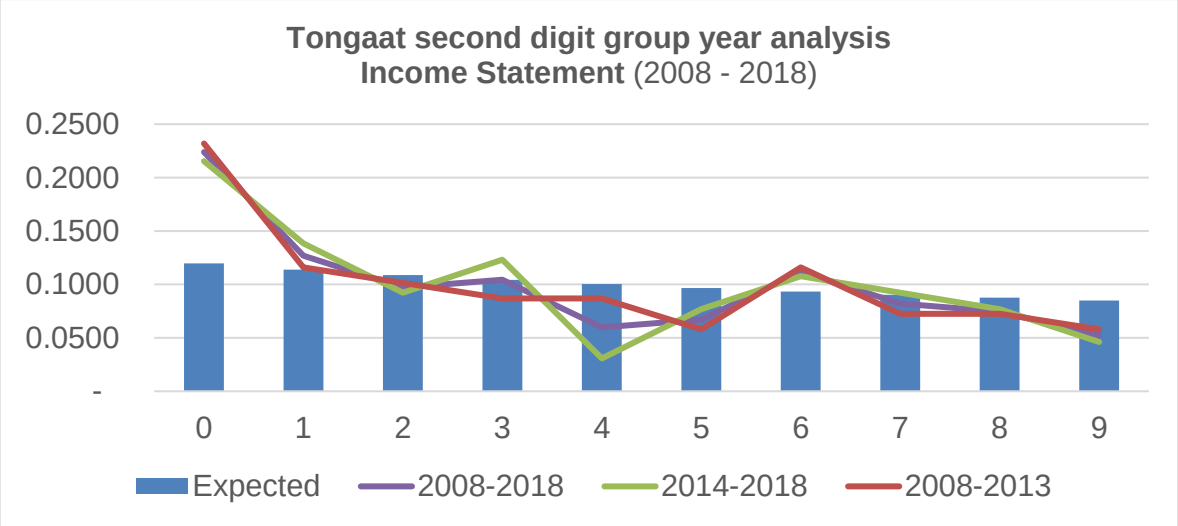




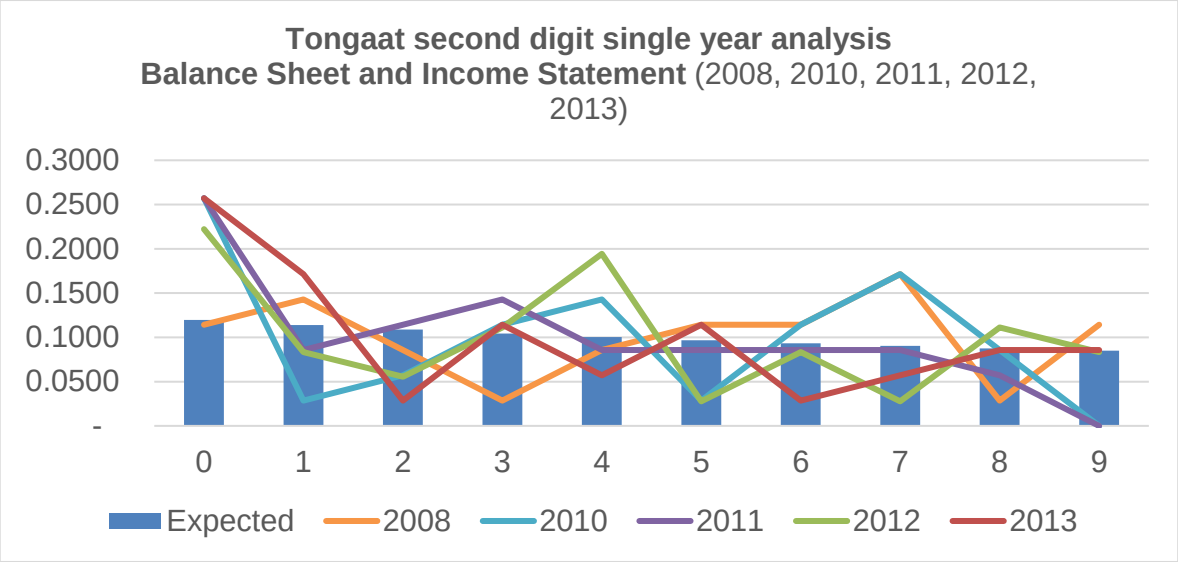
Income Statement (single and group year)

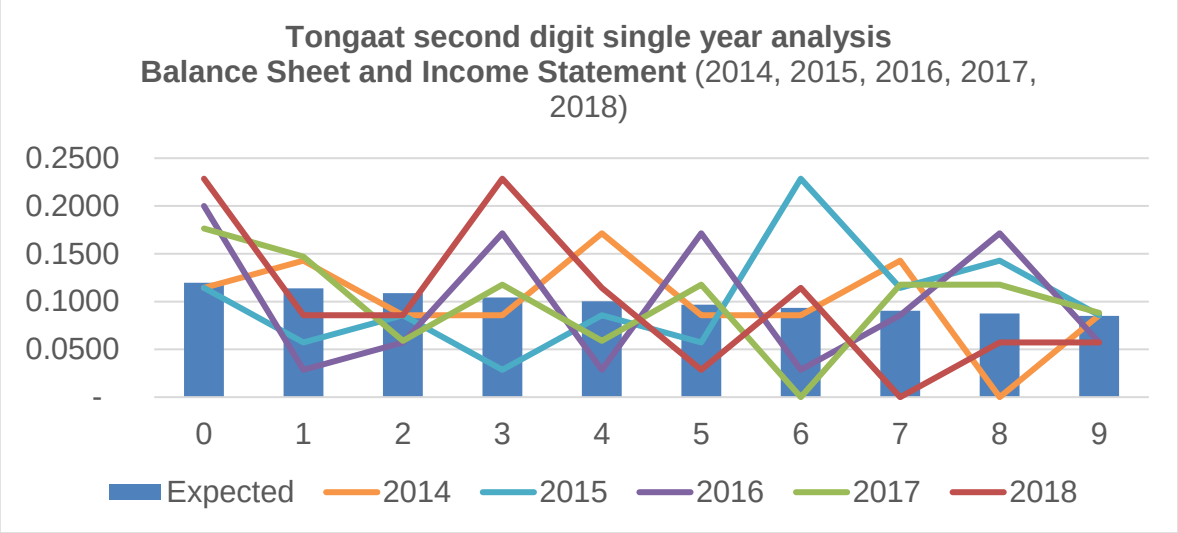


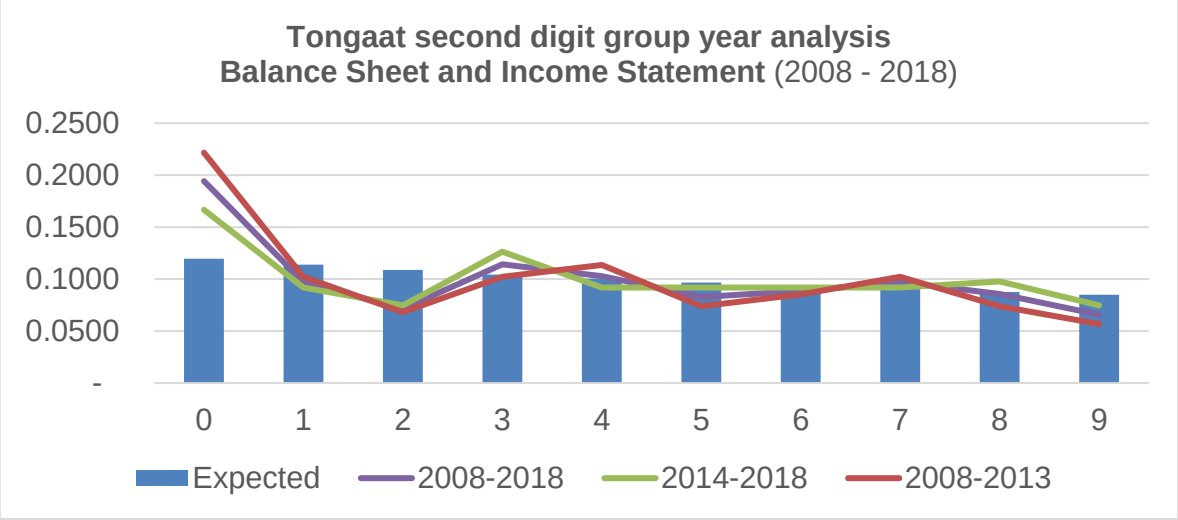




Combined (single and group year)

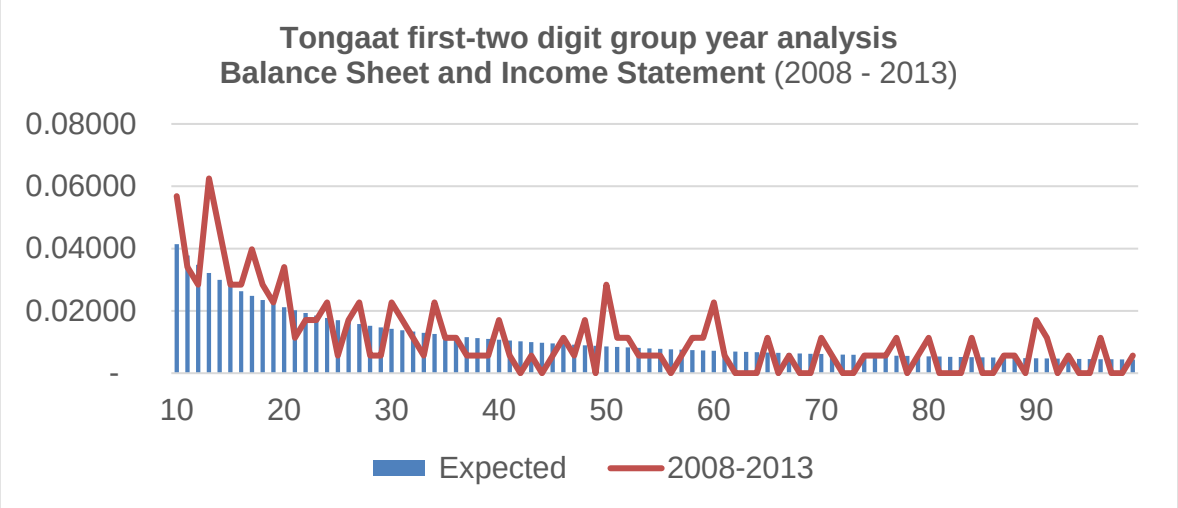


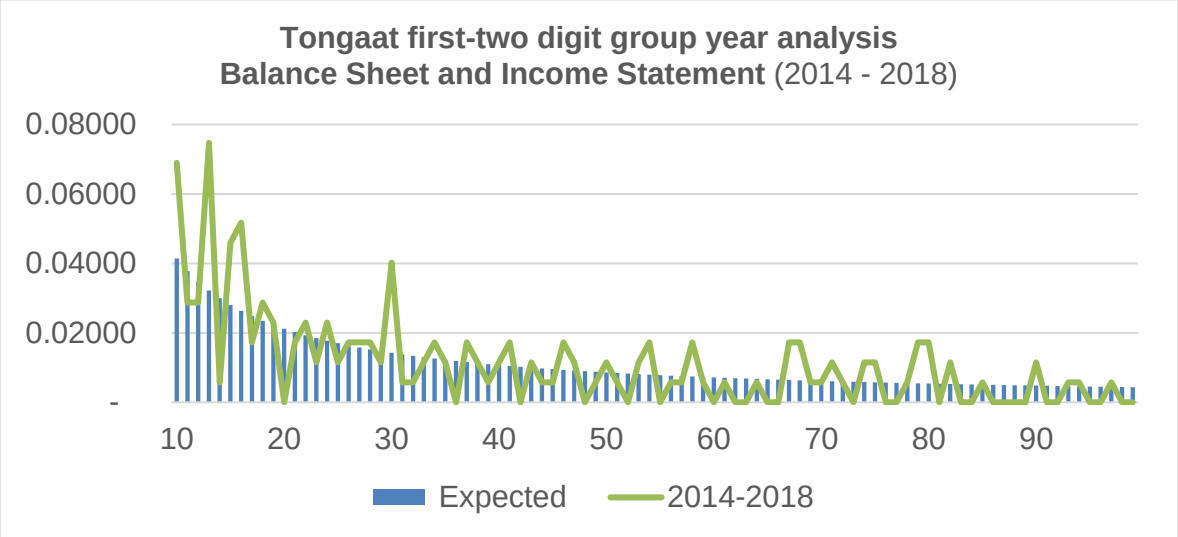


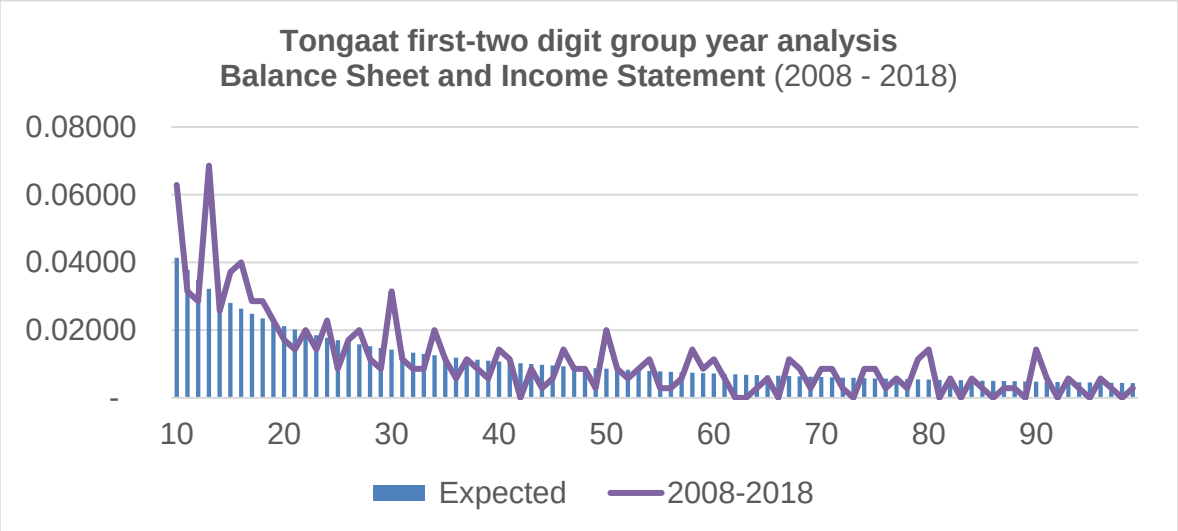


Appendix 12 Tongaat first-two digit analysis results

Combined (group year)







Appendix 13 Tongaat z-statistic results

First digit z-statistic

Z-Statistic: Tongaat Balance Sheet first digit										
First	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
1	0.52	0.08	0.18	0.41	1.80	1.34	0.87	0.08	1.04	1.04
2	0.07	0.17	0.07	0.07	0.21	0.21	0.21	0.11	0.11	0.46
3	0.16	0.58	0.48	0.16	0.16	0.81	0.48	0.58	0.74	1.40
4	0.99	0.39	0.10	0.99	0.10	0.46	1.18	1.13	0.39	0.39
5	0.19	0.13	0.19	0.19	0.20	0.20	1.39	0.27	0.27	0.13
6	0.40	0.35	0.40	0.83	0.40	0.88	0.83	0.08	0.35	0.08
7	0.20	0.26	0.71	0.20	0.25	0.25	0.71	0.20	0.26	0.26
8	0.61	0.57	0.36	0.61	0.61	0.61	0.12	0.42	0.07	0.57
9	0.50	0.04	0.01	0.52	0.52	0.01	0.01	0.48	0.04	0.04
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: Tongaat Income Statement first digit										
First	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
1	1.56	1.56	0.25	0.96	0.05	0.05	0.75	0.42	0.75	0.42
2	0.15	0.57	0.57	0.57	0.57	0.57	0.68	0.02	0.33	0.73
3	0.10	0.94	0.32	0.94	0.73	0.10	0.20	0.20	0.61	0.61
4	0.71	0.24	0.71	0.24	0.71	**2.10**	0.32	0.13	0.32	0.32
5	0.03	0.03	0.48	0.48	0.48	0.03	1.38	0.60	0.11	0.11
6	0.41	0.41	0.14	1.81	0.14	0.41	0.47	0.47	0.47	0.47
7	0.30	0.29	0.89	0.30	0.89	0.30	0.36	0.79	0.36	0.22
8	0.42	0.42	1.05	0.21	0.21	0.21	0.34	0.26	0.26	0.34
9	0.13	0.54	0.13	0.13	0.13	1.20	0.18	1.10	0.46	0.18
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: Tongaat Balance Sheet Income Statement first digit										
First	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
1	0.36	1.22	0.01	1.09	1.46	1.09	1.33	0.01	1.46	0.36
2	0.15	0.22	0.29	0.29	0.74	0.74	0.80	0.07	0.29	1.04
3	0.19	0.13	0.58	0.45	0.06	0.96	0.51	0.58	0.19	0.45
4	0.06	0.46	0.51	0.63	0.51	0.63	1.12	0.51	0.51	0.51
5	0.17	0.12	0.14	0.14	0.46	0.14	**2.25**	0.17	0.14	0.17
6	0.57	0.53	0.23	0.11	0.23	0.11	1.27	0.23	0.57	0.23
7	0.02	0.39	0.02	0.02	0.34	0.38	1.13	0.34	0.02	0.34
8	0.22	0.19	1.31	0.99	0.99	0.99	0.12	0.16	0.22	0.22
9	0.32	0.36	0.08	0.89	0.89	0.73	0.12	0.32	0.32	0.08
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: Tongaat group year first digit									
First	**Balance Sheet**			**Income Statement**			**Balance Sheet and Income Statement**		
	2008-2013	**2014-2018**	**2008-2018**	**2008-2013**	**2014-2018**	**2008-2018**	**2008-2013**	**2014-2018**	**2008-2018**
1	**2.38**	0.98	**2.44**	0.19	1.87	1.54	**2.06**	**2.00**	**2.93**
2	0.34	0.05	0.27	0.21	1.28	1.16	0.49	0.82	1.00
3	0.84	0.55	0.10	0.68	0.61	0.07	0.11	0.06	0.04
4	**2.24**	0.63	1.02	0.74	1.59	0.43	1.16	0.35	1.16
5	0.73	0.76	0.03	0.02	1.08	0.92	0.72	0.06	0.55
6	0.13	1.07	0.53	**1.98**	0.07	1.20	0.99	0.65	1.27
7	0.08	0.07	0.14	0.26	0.39	0.08	0.23	0.46	0.05
8	0.43	1.34	1.40	0.56	0.10	0.14	0.86	0.83	1.31
9	0.18	0.22	0.45	0.77	0.88	0.05	0.16	0.89	0.39
At a 5% significance level, z-statistics > 1.96 are statistically significant.									

Second digit z-statistic

Z-Statistic: Tongaat Balance Sheet second digit										
Second	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
0	1.23	0.33	0.09	0.09	0.24	1.23	0.57	**2.01**	**2.01**	0.01
1	0.67	0.27	0.67	0.67	0.00	0.67	0.00	0.07	1.30	0.61
2	0.61	1.25	0.27	0.27	0.27	0.61	1.30	0.55	0.55	0.20
3	0.14	0.14	1.54	0.55	0.14	0.84	0.55	0.93	0.14	0.49
4	0.92	0.44	0.50	0.21	1.63	1.21	**2.34**	0.08	1.01	0.08
5	0.45	0.35	0.99	0.09	0.45	0.99	0.45	0.02	0.39	0.39
6	0.33	1.10	1.14	1.06	0.04	1.14	0.04	0.35	0.35	0.40
7	1.11	0.46	0.01	0.01	0.38	0.36	0.36	0.08	1.22	**1.98**
8	0.06	1.28	1.19	0.06	1.08	0.06	0.43	1.03	0.12	0.26
9	0.10	0.56	0.28	0.48	0.28	0.28	0.10	1.01	1.01	0.56
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: Tongaat Income Statement second digit										
Second	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
0	0.81	0.81	**2.52**	0.38	0.05	1.66	1.50	0.68	0.68	0.27
1	0.02	0.89	0.86	0.42	0.89	0.02	0.08	0.92	0.08	1.60
2	0.08	0.08	0.81	0.37	0.37	0.81	0.41	0.84	0.02	0.02
3	**2.85**	0.13	0.32	0.78	0.78	0.78	0.91	0.40	0.03	0.84
4	0.74	0.28	0.74	0.74	0.28	0.18	0.36	0.36	0.36	0.36
5	0.71	0.24	0.23	0.71	0.23	0.71	0.77	0.32	0.77	1.04
6	0.20	0.68	0.20	**2.18**	0.20	0.20	0.28	0.18	1.10	0.28
7	0.65	0.17	0.17	0.31	0.31	0.17	0.71	0.25	0.22	0.25
8	0.63	0.63	0.35	1.34	0.63	0.14	0.21	0.26	0.21	0.69
9	0.60	0.60	0.10	0.60	0.39	0.39	0.18	0.66	0.66	0.18
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: Tongaat Balance Sheet Income Statement second digit										
Second	**2018**	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
0	1.72	0.76	1.20	0.10	0.10	**2.25**	1.64	**2.25**	**2.25**	0.10
1	0.26	0.34	1.32	0.79	0.27	0.81	0.31	0.26	1.32	0.27
2	0.17	0.66	0.71	0.17	0.17	1.25	0.76	0.10	0.71	0.17
3	**2.13**	0.25	1.02	1.19	0.08	0.19	0.13	0.47	0.19	1.19
4	0.28	0.52	1.13	0.01	1.12	0.57	1.60	0.01	0.56	0.01
5	1.08	0.12	1.21	0.51	0.22	0.07	1.12	0.22	1.08	0.07
6	0.13	1.58	1.03	**2.46**	0.16	1.03	0.21	0.16	0.13	0.13
7	1.57	0.26	0.10	0.20	0.79	0.39	1.02	0.10	1.38	1.38
8	0.34	0.32	1.46	0.86	1.53	0.04	0.20	0.34	0.04	0.94
9	0.29	0.07	0.29	0.02	0.02	0.02	0.04	1.50	1.50	0.32
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: Tongaat group year second digit									
Second	**Balance Sheet**			**Income Statement**			**Balance Sheet and Income Statement**		
	2008-2013	**2014-2018**	**2008-2018**	**2008-2013**	**2014-2018**	**2008-2018**	**2008-2013**	**2014-2018**	**2008-2018**
0	**2.89**	0.43	**2.44**	**2.69**	**2.19**	**3.58**	**4.05**	1.79	**4.22**
1	0.51	1.48	1.52	0.05	0.43	0.34	0.37	0.79	0.90
2	1.91	1.34	**2.40**	0.00	0.23	0.30	1.61	1.32	**2.16**
3	0.11	0.67	0.66	0.28	0.29	0.01	0.09	0.83	0.52
4	0.89	0.82	1.32	0.17	1.66	1.42	0.46	0.24	0.07
5	0.28	0.15	0.09	0.88	0.33	1.01	0.90	0.08	0.78
6	0.83	0.22	0.86	0.44	0.18	0.59	0.24	0.06	0.22
7	0.96	0.05	0.71	0.31	0.05	0.18	0.42	0.07	0.35
8	0.30	0.66	0.14	0.23	0.08	0.38	0.51	0.34	0.03
9	0.90	0.08	0.45	0.59	0.90	1.20	1.21	0.35	1.20
At a 5% significance level, z-statistics > 1.96 are statistically significant.									

First-two digit z-statistic

Z-Statistic: Tongaat Balance Sheet and Income Statement first-two digits			
First-two	**2008-2013**	**2014-2018**	**2008-2018**
13	**2.07**	**2.96**	**3.71**
30	0.63	**2.57**	**2.49**
50	**2.44**	0.00	**2.02**
60	**2.00**	0.67	0.63
90	1.81	0.73	**2.18**
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

Appendix 14 Tongaat MAD results

MAD: Tongaat first digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
Balance Sheet	0.04	0.03	0.03	0.04	0.05	0.05	0.06	0.04	0.04	0.06
	N	N	N	N	N	N	N	N	N	N
Income Statement	0.07	0.07	0.07	0.09	0.07	0.07	0.07	0.06	0.05	0.05
	N	N	N	N	N	N	N	N	N	N
Combined	0.02	0.03	0.03	0.04	0.05	0.05	0.06	0.02	0.03	0.03
	N	N	N	N	N	N	N	N	N	N
MAD: Tongaat second digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
Balance Sheet	0.05	0.06	0.06	0.04	0.04	0.07	0.06	0.06	0.07	0.05
	N	N	N	N	N	N	N	N	N	N
Income Statement	0.10	0.06	0.08	0.09	0.06	0.07	0.06	0.06	0.06	0.06
	N	N	N	N	N	N	N	N	N	N
Combined	0.05	0.04	0.06	0.04	0.03	0.04	0.05	0.04	0.06	0.04
	N	N	N	N	N	N	N	N	N	N

MAD: Tongaat group results									
	First digit			**Second digit**			**First-two**		
	2008-2013	**2014-2018**	**2008-2018**	**2008-2013**	**2014-2018**	**2008-2018**	**2008-2013**	**2014-2018**	**2008-2018**
Balance Sheet	0.03	0.02	0.02	0.03	0.02	0.02	0.008	0.008	0.006
	N	N	N	N	N	N	AC	AC	AC
Income Statement	0.03	0.04	0.02	0.03	0.03	0.03	0.009	0.011	0.007
	N	N	N	N	N	N	AC	AC	AC
Combined	0.02	0.02	0.02	0.03	0.02	0.02	0.006	0.007	0.005
	N	N	N	N	N	N	CC	AC	CC

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Appendix 15 Tongaat KS results

First digit single year KS

KS: Tongaat first digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
Balance Sheet*	0.074	0.112	0.080	0.165	0.199	0.154	0.131	0.065	0.128	0.190
	22	21	22	22	22	22	22	21	21	21
	0.296	0.303	0.296	0.296	0.296	0.296	0.296	0.303	0.303	0.303
	C	C	C	C	C	C	C	C	C	C
Income Statement*	0.292	0.237	0.237	0.161	0.097	0.141	0.150	0.131	0.184	0.112
	13	13	13	13	13	13	14	14	14	14
	0.386	0.386	0.386	0.386	0.386	0.386	0.371	0.371	0.371	0.371
	C	C	C	C	C	C	C	C	C	C
Combined*	0.072	0.111	0.049	0.099	0.128	0.099	0.139	0.045	0.128	0.123
	35	34	35	35	35	35	36	35	35	35
	0.235	0.238	0.235	0.235	0.235	0.235	0.232	0.235	0.235	0.235
	C	C	C	C	C	C	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

Second digit single year KS

KS: Tongaat second digit										
	2018	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2008**
Balance Sheet*	0.108	0.213	0.115	0.174	0.135	0.190	0.129	0.220	0.166	0.215
	22	21	22	22	22	22	22	21	21	21
	0.296	0.303	0.296	0.296	0.296	0.296	0.296	0.303	0.303	0.303
	C	C	C	C	C	C	C	C	C	C
Income Statement*	0.476	0.323	0.265	0.336	0.085	0.228	0.268	0.095	0.101	0.195
	13	13	13	13	13	13	14	14	14	14
	0.386	0.386	0.386	0.386	0.386	0.386	0.371	0.371	0.371	0.371
	N	C	C	C	C	C	C	C	C	C
Combined*	0.196	0.090	0.080	0.215	0.087	0.195	0.120	0.153	0.137	0.090
	35	34	35	35	35	35	36	35	35	35
	0.235	0.238	0.235	0.235	0.235	0.235	0.232	0.235	0.235	0.235
	C	C	C	C	C	C	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

Group year KS (first, second and first-two)

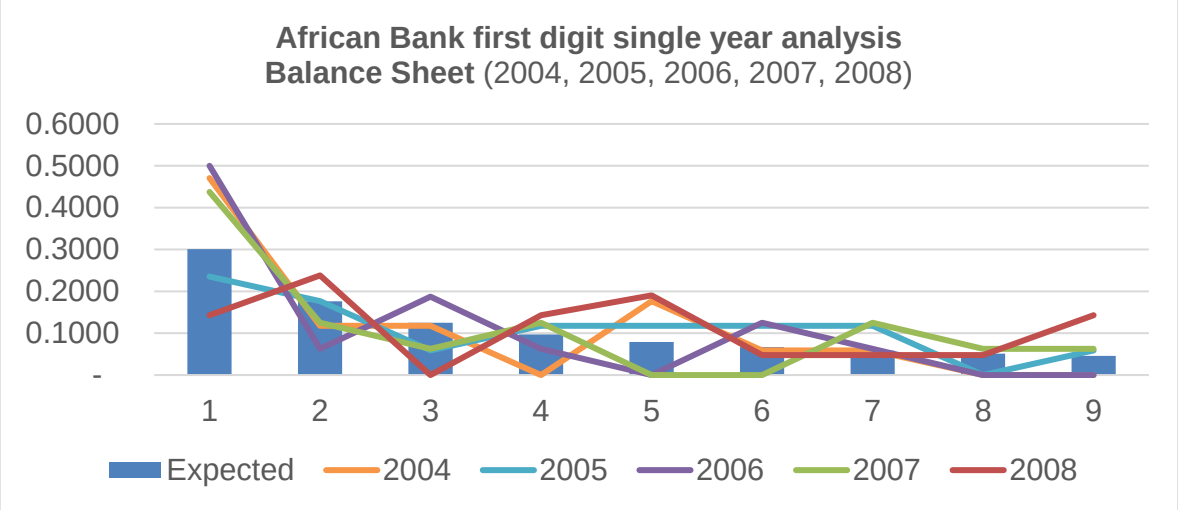
KS: Tongaat group results									
	First digit			Second digit			First-two		
	2000-2013	2014-2018	2008-2018	2008-2013	2014-2018	2008-2018	2008-2013	2014-2018	2008-2018
Balance Sheet*	0.963	0.963	0.963	0.095	0.076	0.056	0.125	0.099	0.087
	107	109	216	107	109	216	107	109	216
	0.134	0.133	0.095	0.134	0.133	0.095	0.134	0.133	0.095
	N	N	N	C	C	C	C	C	C
Income Statement*	0.928	0.985	0.955	0.114	0.123	0.117	0.102	0.145	0.098
	69	65	134	69	65	134	69	65	134
	0.167	0.172	0.120	0.167	0.172	0.120	0.167	0.172	0.120
	N	N	N	C	C	C	C	C	C
Combined*	0.949	0.971	0.960	0.102	0.047	0.075	0.087	0.074	0.073
	176	174	350	176	174	350	176	174	350
	0.105	0.105	0.074	0.105	0.105	0.074	0.105	0.105	0.074
	N	N	N	C	C	N	C	C	C

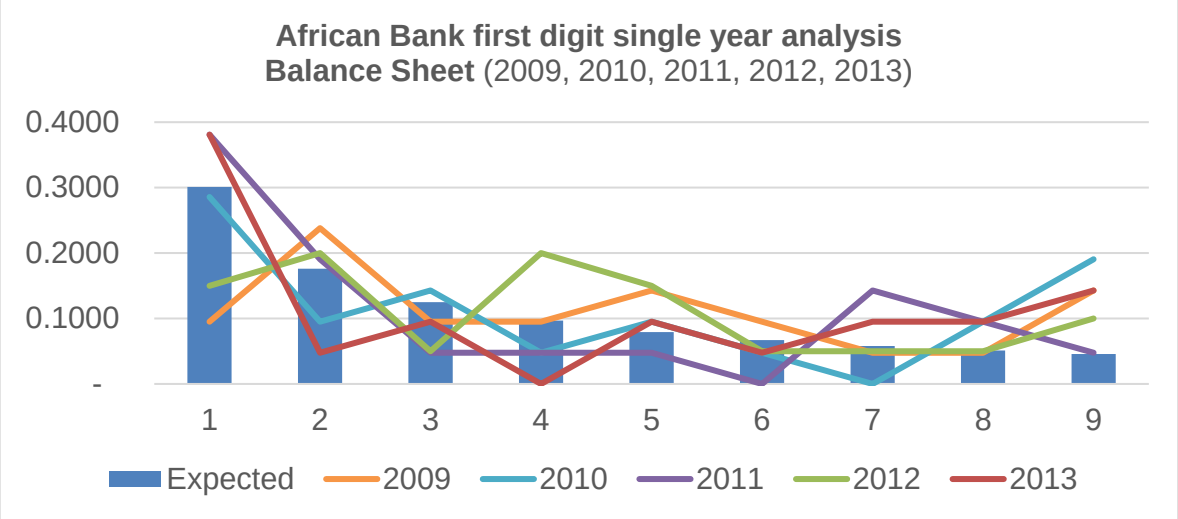
Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

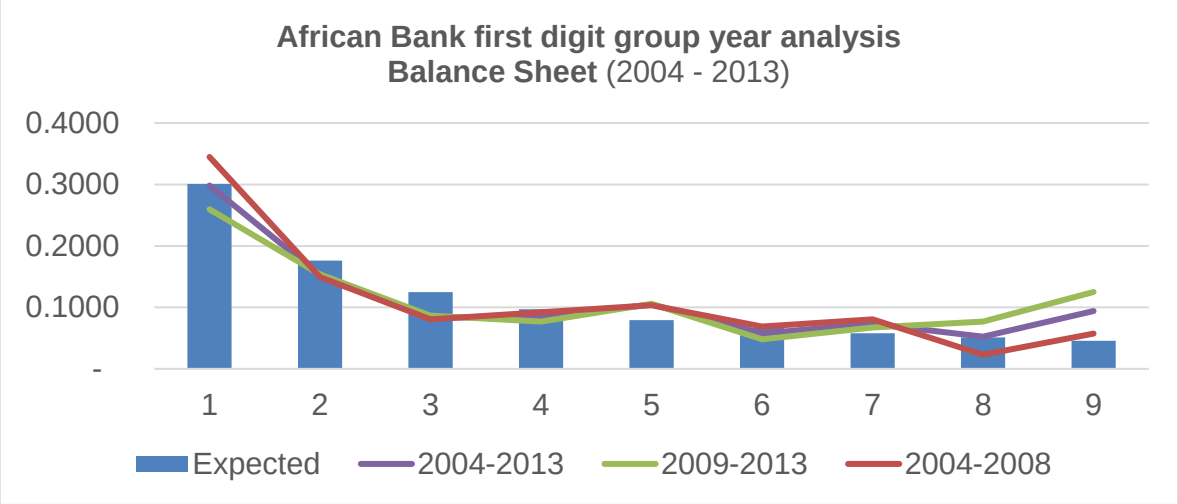
C = Conformity, N = Nonconformity

Appendix 16 African Bank first digit analysis results

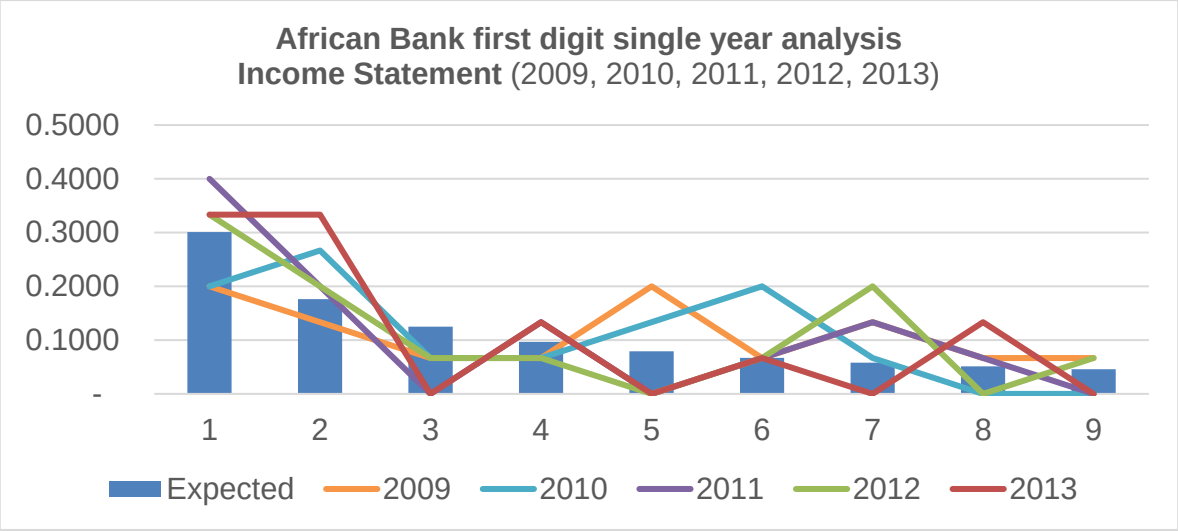
Balance Sheet (single and group year)

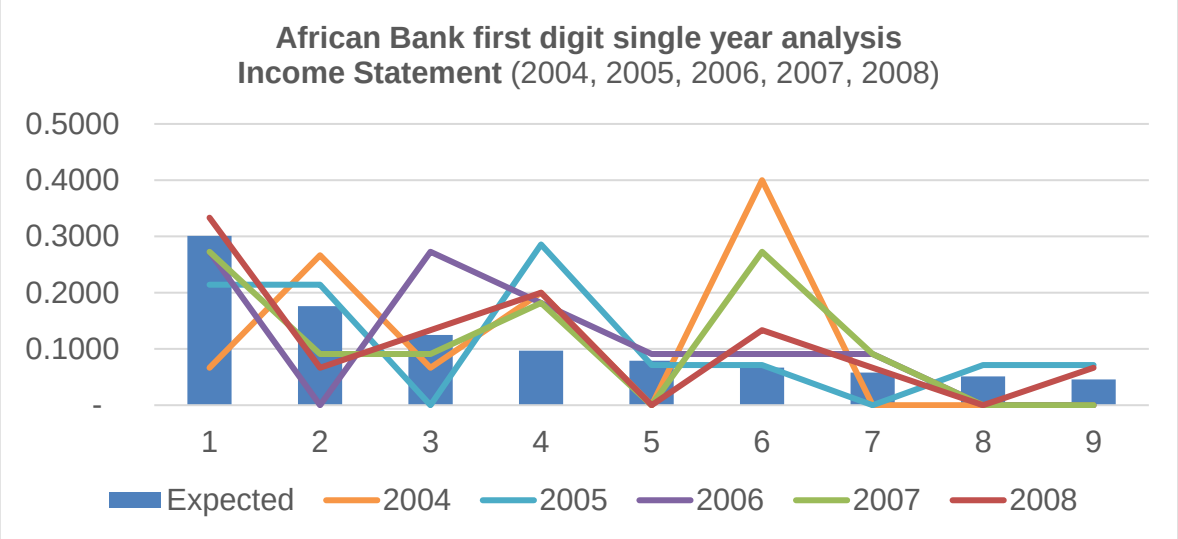


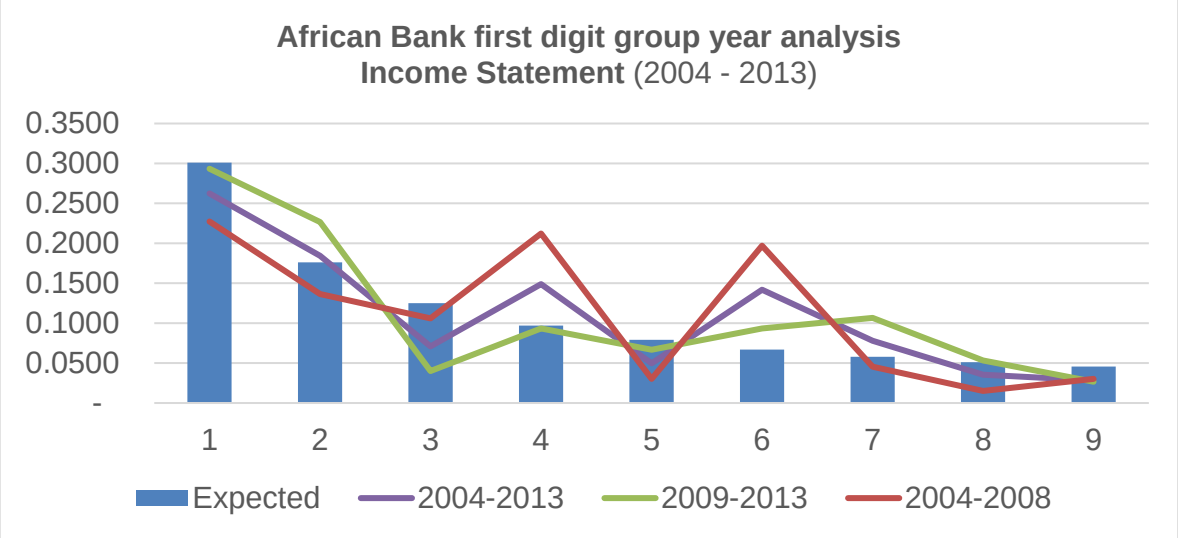




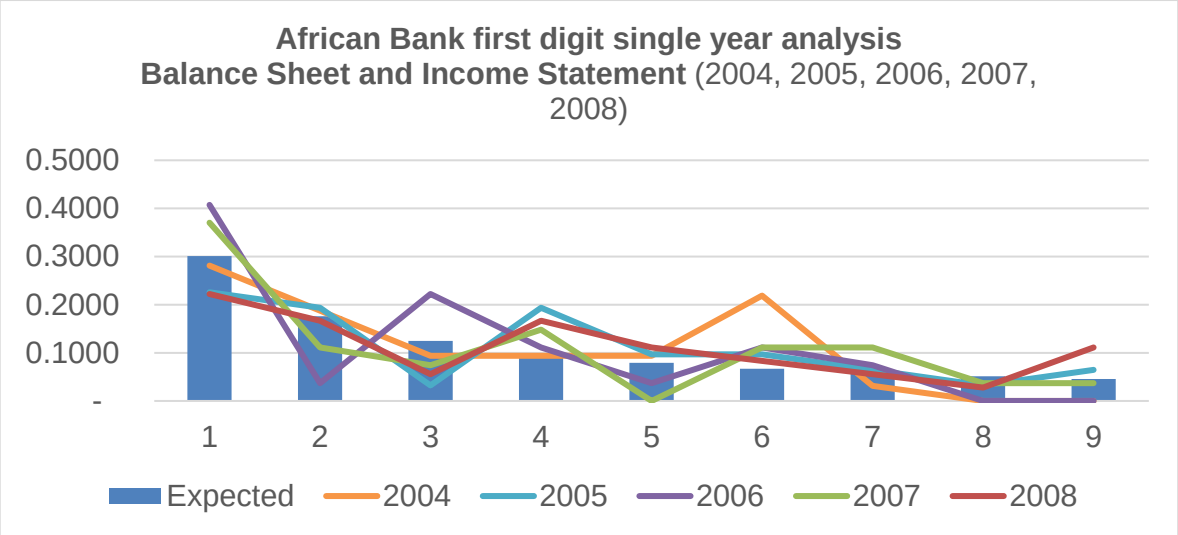
Income Statement (single and group year)

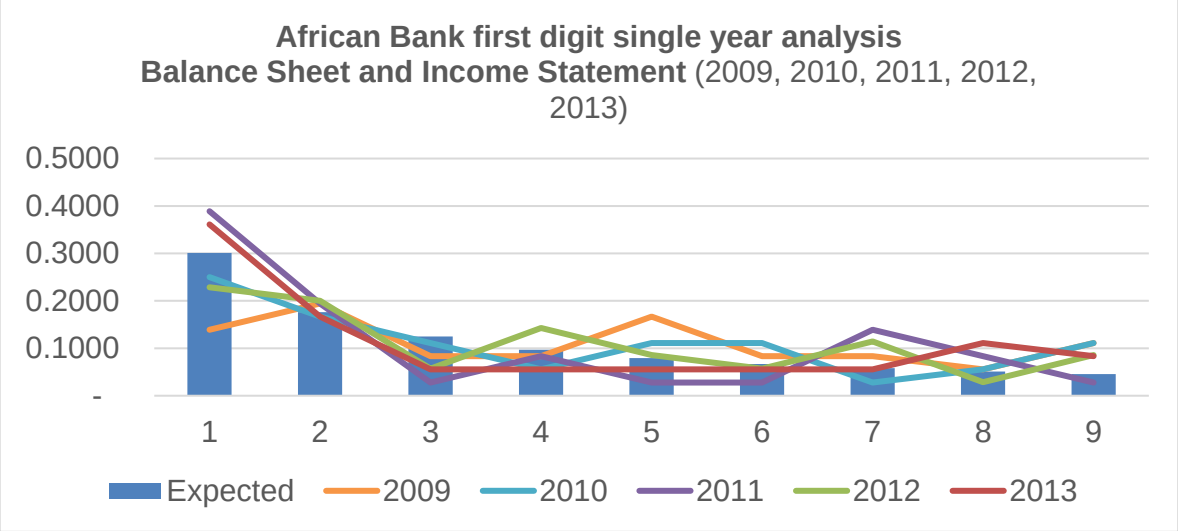


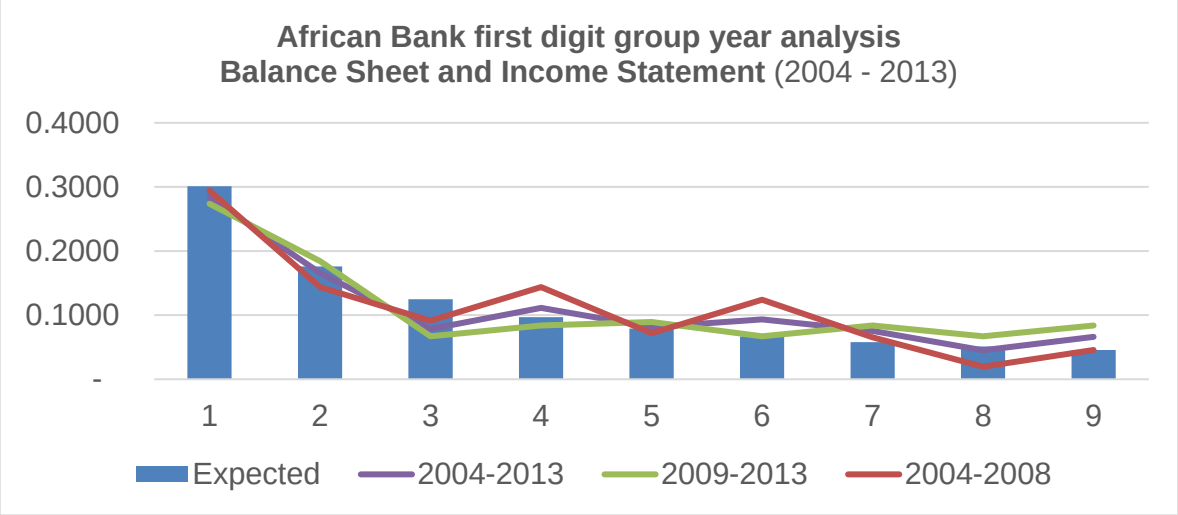




Combined (single and group year)

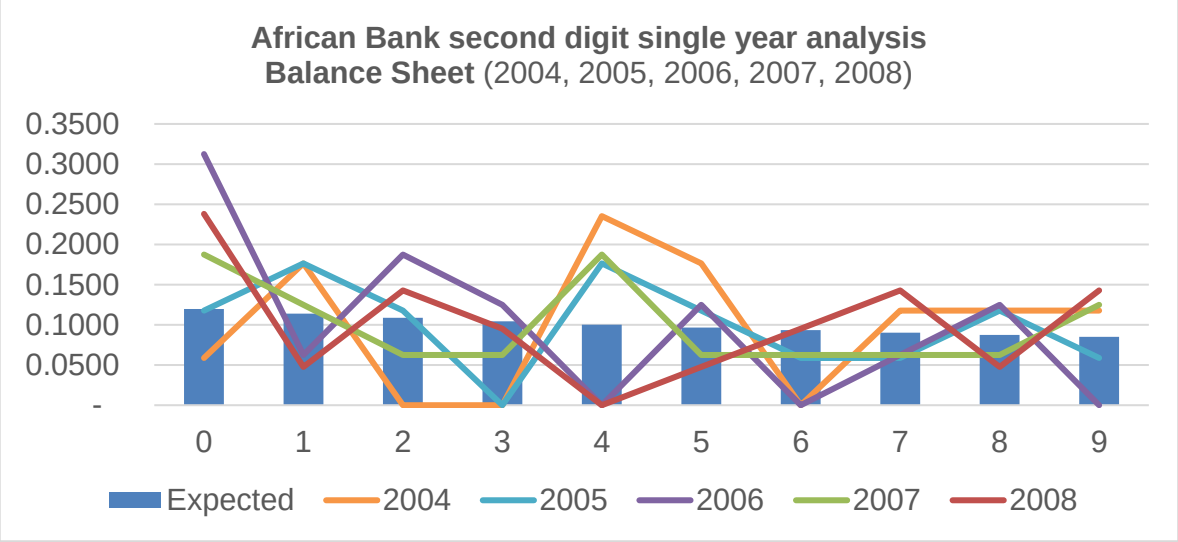


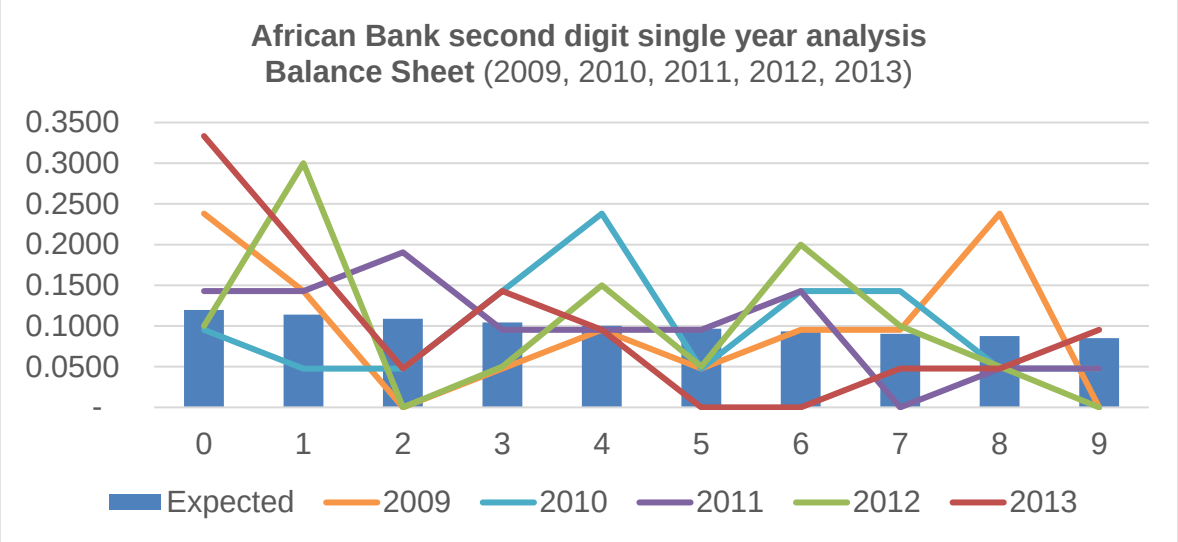


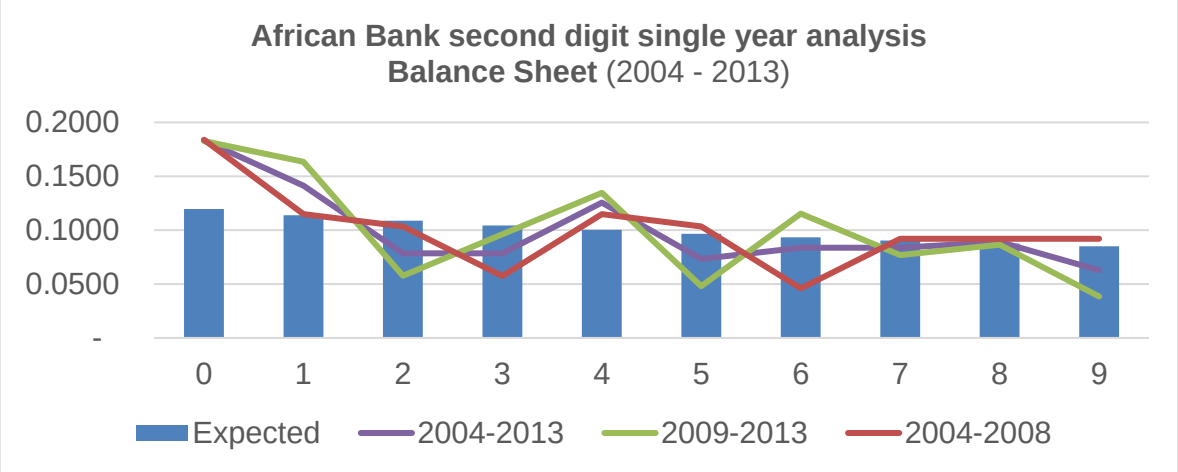


Appendix 17 African Bank second digit analysis results

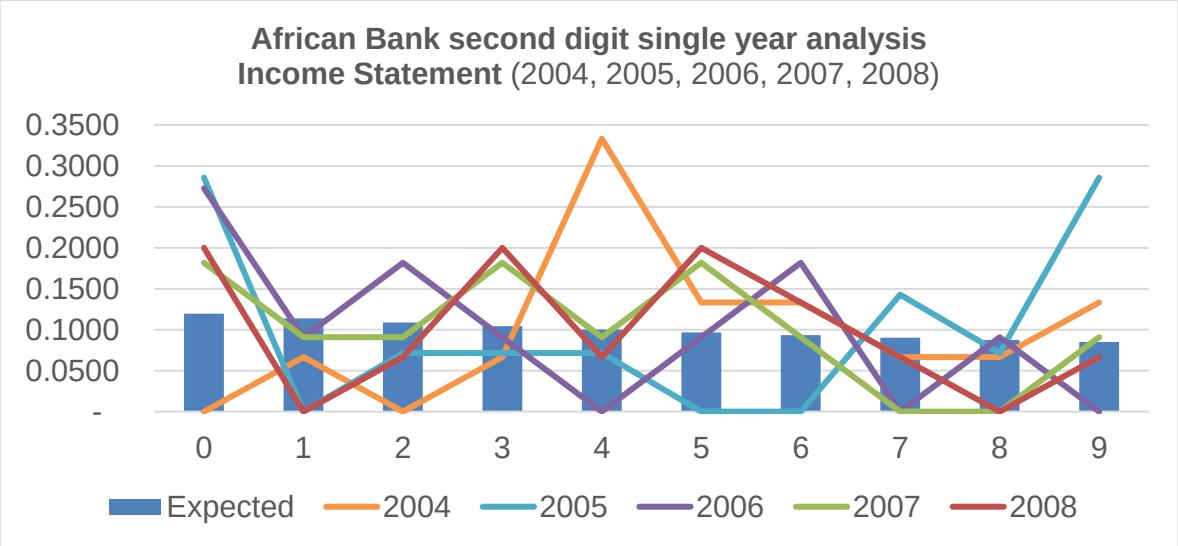
Balance Sheet (single and group year)

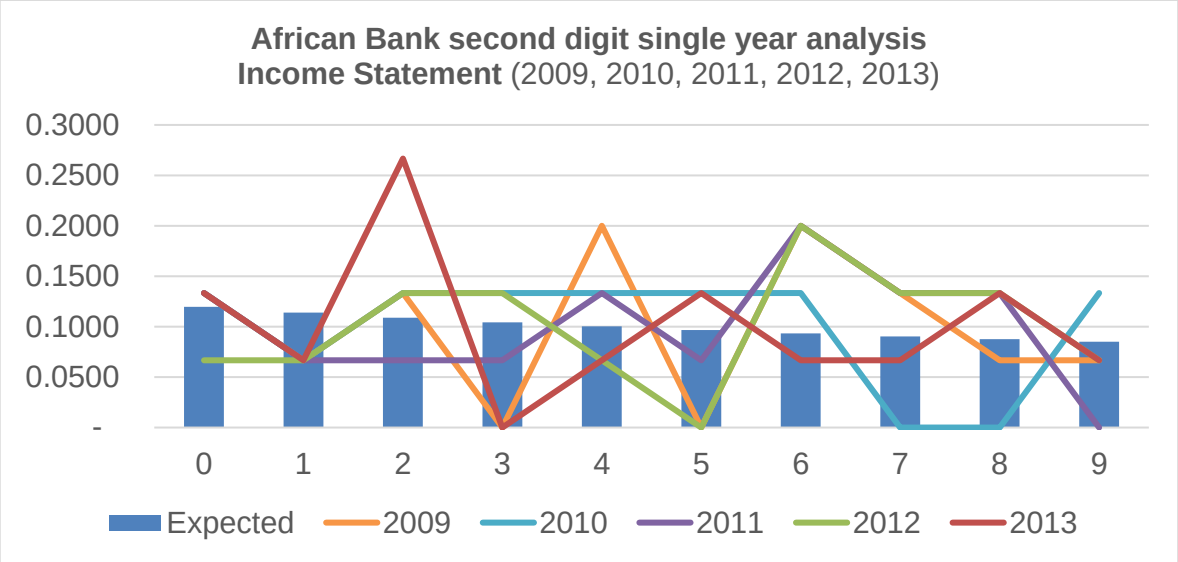


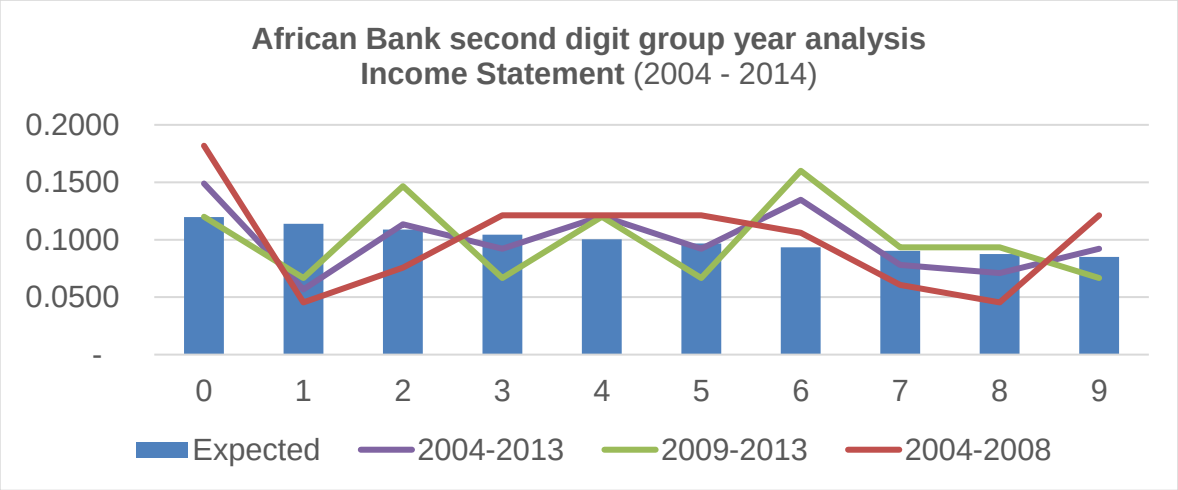




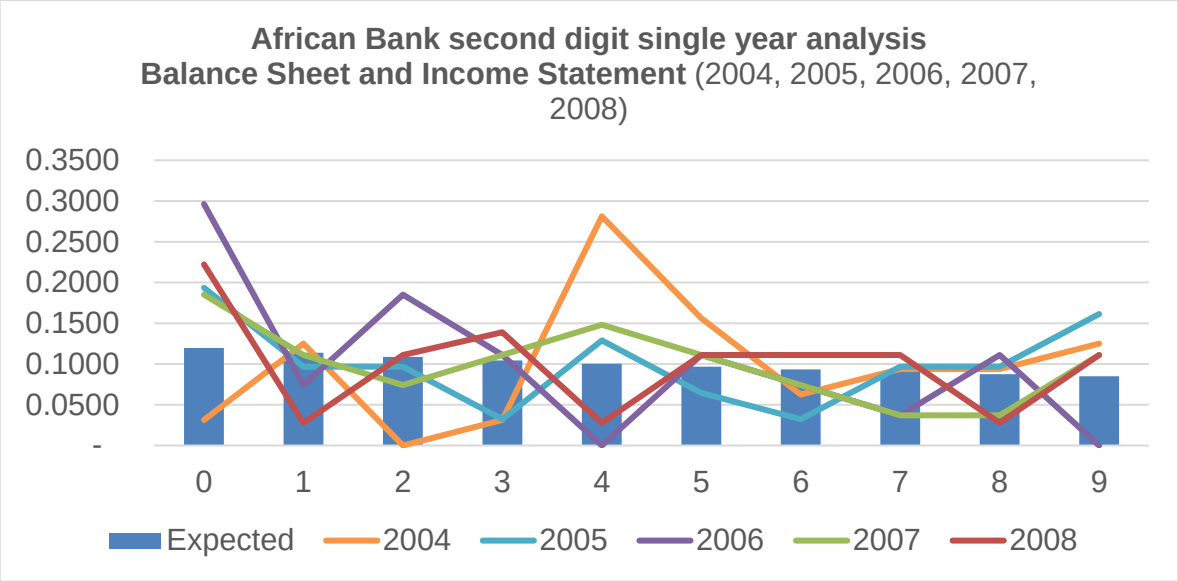
Income Statement (single and group year)

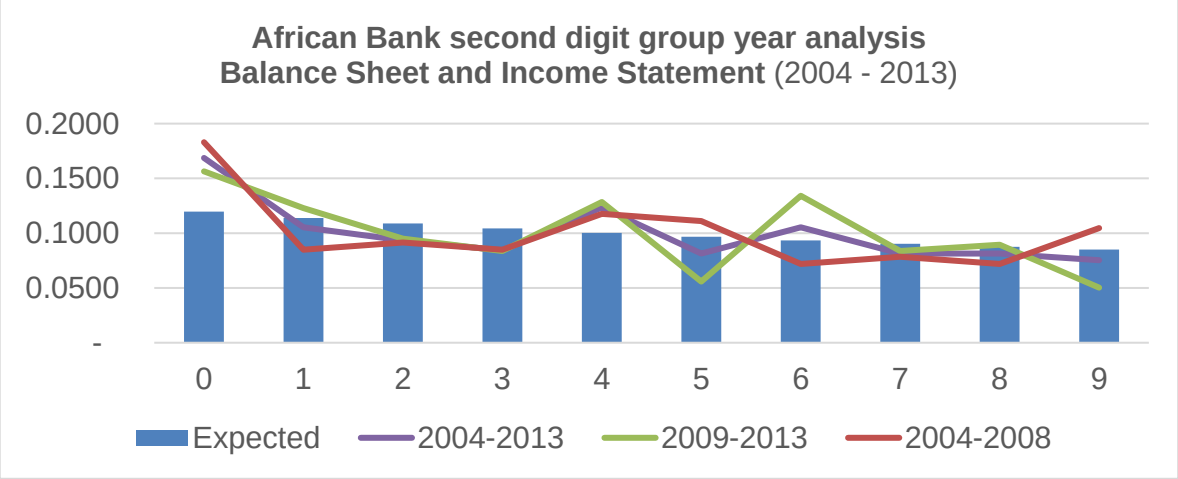


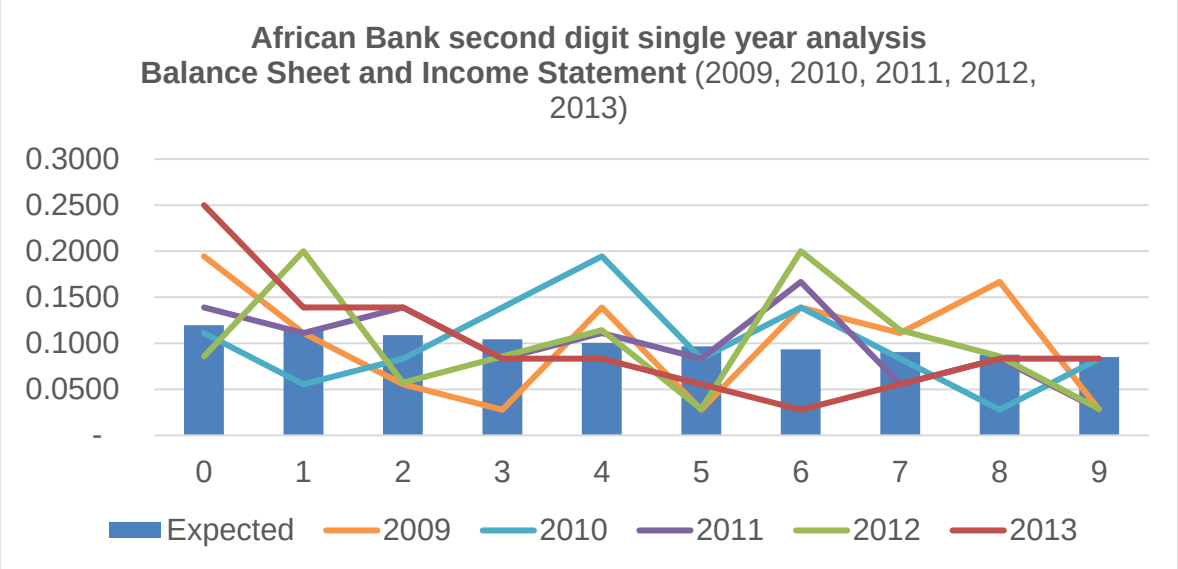




Combined (single and group year)

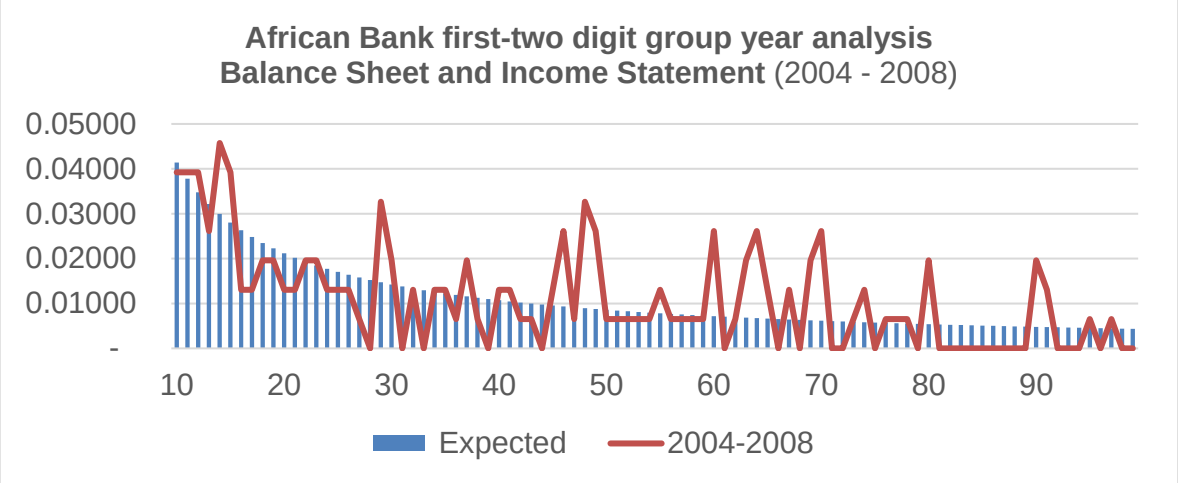


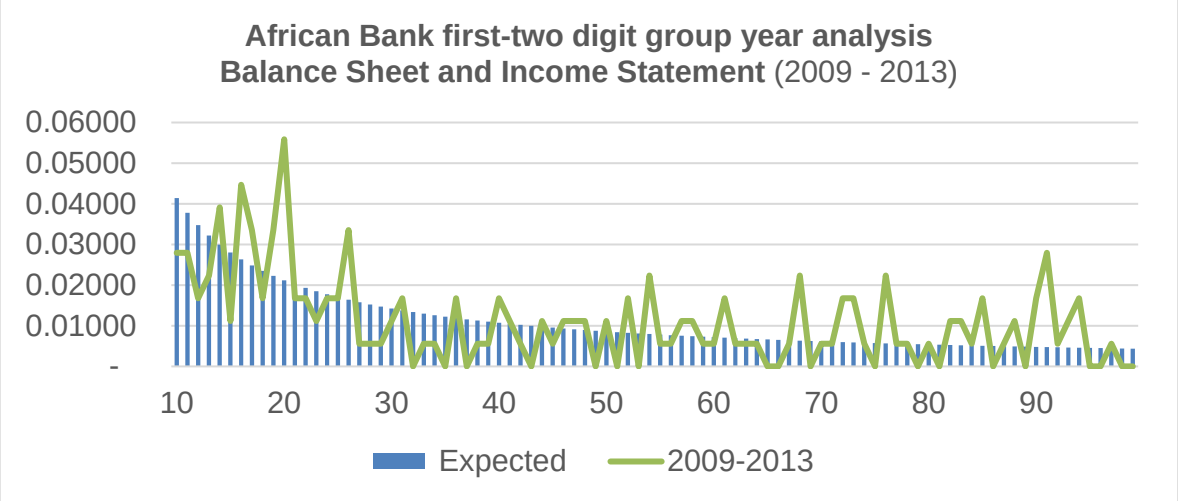


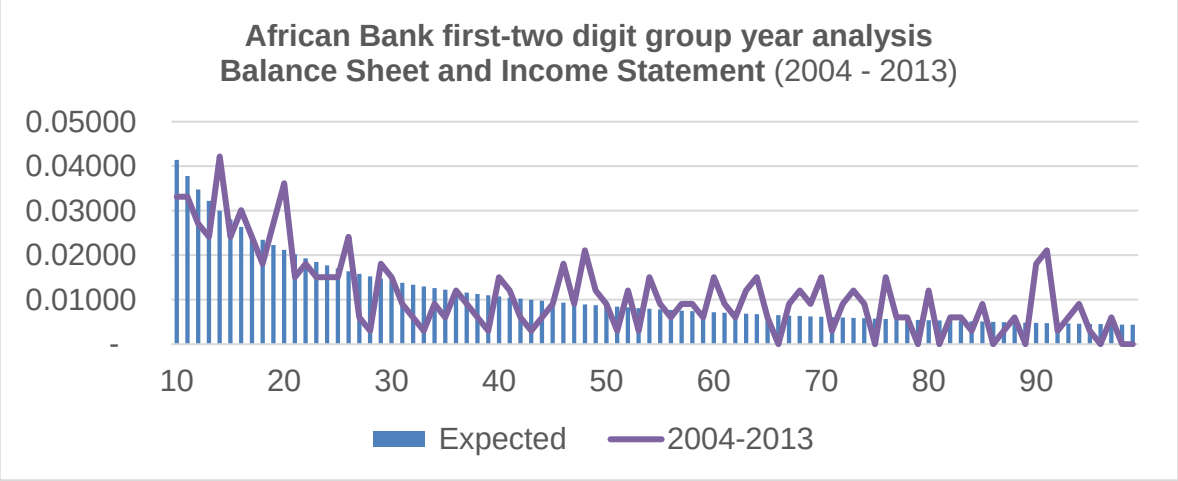


Appendix 18 African Bank first-two digit analysis results

Combined (group year)







Appendix 19 African Bank z-statistic results

First digit z-statistic

Z-Statistic: African Bank Balance Sheet first digit										
First	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
1	0.56	1.23	0.56	0.15	1.82	1.34	0.92	1.46	0.33	1.26
2	1.26	0.28	0.17	0.69	0.46	0.46	0.21	0.86	0.00	0.31
3	0.08	0.68	0.74	0.25	0.08	1.40	0.38	0.38	0.46	0.09
4	1.13	1.18	0.39	0.39	0.03	0.34	0.38	0.04	0.29	0.94
5	0.27	0.76	0.13	0.27	0.68	1.48	0.71	0.71	0.14	1.04
6	0.35	0.30	0.79	0.35	0.08	0.35	0.57	0.43	0.35	0.13
7	0.26	0.15	1.20	0.67	0.20	0.20	0.61	0.08	0.53	0.01
8	0.42	0.02	0.42	0.42	0.07	0.07	0.21	0.36	0.41	0.41
9	1.61	0.63	0.04	**2.65**	1.61	1.61	0.32	0.28	0.26	0.32
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: African Bank Income Statement first digit										
First	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
1	0.27	0.27	0.55	0.57	0.57	0.27	0.20	0.20	0.42	1.70
2	1.26	0.24	0.24	0.58	0.10	0.77	0.35	1.14	0.02	0.58
3	1.07	0.29	1.07	0.29	0.29	0.10	0.34	1.03	1.01	0.29
4	0.04	0.40	0.04	0.40	0.40	0.91	0.44	0.44	1.94	0.91
5	0.66	0.66	0.66	0.30	1.25	0.66	0.41	0.14	0.11	0.66
6	0.00	0.00	0.00	1.55	0.00	0.51	**2.13**	0.32	0.07	**4.64**
7	0.41	1.80	0.70	0.14	0.70	0.14	0.47	0.47	0.36	0.41
8	0.86	0.31	0.27	0.31	0.27	0.31	0.09	0.09	0.34	0.31
9	0.23	0.39	0.23	0.23	0.39	0.39	0.00	0.00	0.46	0.23
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: African Bank Balance Sheet Income Statement first digit										
First	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
1	0.60	0.75	0.97	0.49	1.94	0.85	0.58	1.00	0.72	0.05
2	0.15	0.15	0.07	0.15	0.07	0.15	0.63	1.64	0.02	0.17
3	1.01	0.96	1.51	0.25	0.50	1.01	0.51	1.24	1.29	0.27
4	0.56	0.63	0.28	0.56	0.28	1.13	0.57	0.25	1.52	0.06
5	0.22	0.14	0.83	0.40	1.64	0.40	1.17	0.45	0.03	0.31
6	0.27	0.23	0.61	0.73	0.06	0.06	0.53	0.53	0.31	**3.08**
7	0.06	1.06	1.72	0.42	0.29	0.06	0.77	0.36	0.16	0.27
8	1.25	0.22	0.50	0.12	0.12	0.26	0.33	0.77	0.07	0.91
9	0.68	0.73	0.12	1.48	1.48	1.48	0.22	0.68	0.07	0.82
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: African Bank group year first digit									
First	**Balance Sheet**			**Income Statement**			**Balance Sheet and Income Statement**		
	2004-2008	**2009-2013**	**2004-2013**	**2004-2008**	**2009-2013**	**2004-2013**	**2004-2008**	**2009-2013**	**2004-2013**
1	0.77	0.81	0.08	1.17	0.02	0.91	0.10	0.71	0.65
2	0.51	0.47	0.79	0.69	1.00	0.15	0.94	0.19	0.43
3	1.09	1.04	1.61	0.28	**2.05**	1.81	1.13	**2.23**	**2.49**
4	0.16	0.52	0.49	**2.96**	0.10	1.95	1.82	0.47	0.80
5	0.64	0.82	1.17	1.24	0.19	1.14	0.18	0.37	0.04
6	0.08	0.57	0.37	**3.98**	0.68	**3.39**	**2.67**	0.00	1.82
7	0.67	0.20	0.75	0.17	1.56	0.84	0.22	1.32	1.23
8	0.95	0.97	0.08	1.05	0.09	0.65	1.59	0.80	0.37
9	0.27	**3.63**	**3.03**	0.31	0.51	0.79	0.00	**2.26**	1.66
At a 5% significance level, z-statistics > 1.96 are statistically significant.									

Second digit z-statistic

Z-Statistic: African Bank Balance Sheet second digit										
Second	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
0	**2.68**	0.27	0.33	0.01	1.34	1.34	0.45	**1.99**	0.03	0.40
1	0.76	**2.27**	0.07	0.61	0.07	0.61	0.14	0.25	0.43	0.43
2	0.55	1.20	0.85	0.55	1.25	0.15	0.19	0.61	0.12	1.05
3	0.22	0.43	0.14	0.22	0.49	0.14	0.14	0.27	1.01	1.01
4	0.08	0.37	0.08	1.74	0.08	1.17	0.74	0.92	0.64	1.45
5	1.13	0.33	0.02	0.39	0.39	0.39	0.04	0.38	0.29	0.70
6	1.10	1.25	0.40	0.40	0.03	0.03	0.42	0.85	0.07	0.91
7	0.30	0.15	1.06	0.46	0.08	0.46	0.39	0.39	0.03	0.39
8	0.26	0.20	0.26	0.26	**2.05**	0.26	0.35	0.09	0.01	0.01
9	0.17	0.96	0.22	0.22	1.01	0.56	0.13	0.77	0.39	0.05
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: African Bank Income Statement second digit										
Second	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
0	0.16	0.23	0.16	0.16	0.16	0.56	0.17	1.10	1.50	1.03
1	0.17	0.17	0.17	0.17	0.17	0.98	0.24	0.24	0.92	0.17
2	1.55	0.30	0.11	0.30	0.30	0.11	0.19	0.29	0.02	0.94
3	0.90	0.37	0.05	0.37	0.90	0.79	0.35	0.15	0.40	0.05
4	0.00	0.00	0.43	0.43	0.86	0.00	0.10	0.61	0.36	**2.57**
5	0.04	0.83	0.39	0.04	0.83	0.92	0.45	0.06	0.77	0.04
6	0.36	0.98	0.98	0.09	0.98	0.09	0.03	0.49	0.74	0.09
7	0.32	0.13	0.13	0.77	0.13	0.32	0.52	0.52	0.22	0.32
8	0.17	0.17	0.17	0.74	0.29	0.74	0.49	0.04	0.21	0.29
9	0.25	0.25	0.72	0.21	0.25	0.25	0.07	0.47	**2.21**	0.21
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: African Bank Balance Sheet Income Statement second digit										
Second	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
0	**2.15**	0.36	0.10	0.16	1.13	1.64	0.75	**2.53**	0.99	1.27
1	0.21	1.34	0.05	0.84	0.05	1.36	0.05	0.35	0.02	0.20
2	0.31	0.71	0.31	0.22	0.76	0.04	0.27	0.97	0.22	1.69
3	0.14	0.08	0.14	0.41	1.23	0.41	0.12	0.12	1.02	1.06
4	0.06	0.28	0.22	1.60	0.49	1.17	0.51	1.41	0.23	**3.11**
5	0.55	1.08	0.27	0.27	1.12	0.01	0.25	0.25	0.30	0.84
6	1.07	1.88	1.22	0.65	0.65	0.08	0.01	0.01	0.86	0.30
7	0.44	0.20	0.44	0.15	0.14	0.14	0.63	0.63	0.12	0.07
8	0.09	0.04	0.09	0.97	1.38	0.97	0.59	0.09	0.18	0.12
9	0.04	0.89	0.93	0.04	0.93	0.26	0.14	1.24	1.20	0.49
At a 5% significance level, z-statistics > 1.96 are statistically significant.										

Z-Statistic: African Bank group year second digit									
Second	**Balance Sheet**			**Income Statement**			**Balance Sheet and Income Statement**		
	2004-2008	**2009-2013**	**2004-2013**	**2004-2008**	**2009-2013**	**2004-2013**	**2004-2008**	**2009-2013**	**2004-2013**
0	1.68	1.83	**2.60**	1.37	0.01	0.94	**2.29**	1.40	**2.67**
1	0.03	1.44	1.08	1.56	1.11	**2.00**	1.00	0.26	0.40
2	0.16	1.52	1.23	0.66	0.87	0.04	0.56	0.47	0.82
3	1.25	0.11	1.05	0.25	0.88	0.33	0.65	0.78	1.10
4	0.28	1.00	1.05	0.36	0.38	0.66	0.58	1.13	1.31
5	0.03	1.51	0.97	0.47	0.68	0.04	0.47	1.72	0.85
6	1.34	0.60	0.33	0.14	1.78	1.54	0.77	1.74	0.66
7	0.05	0.31	0.19	0.63	0.09	0.36	0.37	0.18	0.48
8	0.14	0.04	0.07	0.99	0.18	0.55	0.54	0.09	0.31
9	0.04	1.53	0.97	0.83	0.36	0.16	0.72	1.53	0.54
At a 5% significance level, z-statistics > 1.96 are statistically significant.									

First-two digit z-statistic

Z-Statistic: African Bank Balance Sheet and Income Statement first-two digits			
First-two	**2004-2008**	**2009-2013**	**2004-2013**
20	0.42	**2.96**	1.70
48	**2.69**	0.32	**2.05**
60	**2.30**	0.25	1.38
64	**2.44**	0.19	1.52
68	0.48	**2.23**	0.96
70	**2.64**	0.10	1.72
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

Appendix 20 African Bank MAD results

MAD: African Bank first digit										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
Balance Sheet	0.06	0.06	0.05	0.05	0.06	0.07	0.06	0.07	0.04	0.06
	N	N	N	N	N	N	N	N	N	N
Income Statement	0.07	0.05	0.06	0.06	0.05	0.05	0.07	0.07	0.06	0.12
	N	N	N	N	N	N	N	N	N	N
Combined	0.04	0.04	0.05	0.03	0.05	0.04	0.05	0.06	0.04	0.04
	N	N	N	N	N	N	N	N	N	N
MAD: African Bank second digit										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
Balance Sheet	0.07	0.07	0.04	0.06	0.06	0.05	0.04	0.07	0.04	0.07
	N	N	N	N	N	N	N	N	N	N
Income Statement	0.05	0.05	0.05	0.05	0.06	0.06	0.05	0.06	0.08	0.07
	N	N	N	N	N	N	N	N	N	N
Combined	0.04	0.05	0.03	0.03	0.05	0.04	0.03	0.06	0.04	0.06
	N	N	N	N	N	N	N	N	N	N

MAD: African Bank group results									
	First digit			**Second digit**			**First-two**		
	2004-2008	**2009-2013**	**2004-2013**	**2004-2008**	**2009-2013**	**2004-2013**	**2004-2008**	**2009-2013**	**2004-2013**
Balance Sheet	0.02	0.03	0.02	0.02	0.03	0.02	0.008	0.009	0.006
	N	N	N	N	N	N	AC	AC	AC
Income Statement	0.05	0.03	0.03	0.03	0.03	0.02	0.010	0.010	0.008
	N	N	N	N	N	N	AC	AC	AC
Combined	0.02	0.02	0.02	0.02	0.02	0.02	0.006	0.007	0.005
	N	N	N	N	N	N	AC	AC	CC

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Appendix 21 African Bank KS results

First digit single year KS

KS: African Bank first digit										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
Balance Sheet*	0.178	0.202	0.131	0.189	0.206	0.221	0.136	0.199	0.131	0.170
	21	20	21	21	21	21	16	16	17	17
	0.303	0.311	0.303	0.303	0.303	0.303	0.348	0.348	0.337	0.337
	C	C	C	C	C	C	C	C	C	C
Income Statement*	0.190	0.112	0.123	0.101	0.232	0.077	0.148	0.204	0.173	0.234
	15	15	15	15	15	15	11	11	14	15
	0.359	0.359	0.359	0.359	0.359	0.359	0.419	0.419	0.371	0.359
	C	C	C	C	C	C	C	C	C	C
Combined*	0.098	0.116	0.106	0.116	0.199	0.158	0.074	0.106	0.150	0.124
	36	35	36	36	36	36	27	27	31	32
	0.232	0.235	0.232	0.232	0.232	0.232	0.268	0.268	0.250	0.246
	C	C	C	C	C	C	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

Second digit single year KS

KS: African Bank second digit										
	2013	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
Balance Sheet*	0.290	0.166	0.168	0.152	0.147	0.118	0.079	0.241	0.069	0.211
	21	20	21	21	21	21	16	16	17	17
	0.303	0.311	0.303	0.303	0.303	0.303	0.348	0.348	0.337	0.337
	C	C	C	C	C	C	C	C	C	C
Income Statement*	0.124	0.177	0.113	0.130	0.113	0.130	0.174	0.203	0.237	0.313
	15	15	15	15	15	15	11	11	14	15
	0.359	0.359	0.359	0.359	0.359	0.359	0.419	0.419	0.371	0.359
	C	C	C	C	C	C	C	C	C	C
Combined*	0.185	0.072	0.096	0.092	0.088	0.103	0.097	0.220	0.092	0.259
	36	35	36	36	36	36	27	27	31	32
	0.232	0.235	0.232	0.232	0.232	0.232	0.268	0.268	0.250	0.246
	C	C	C	C	C	C	C	C	C	N

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

Group year KS (first, second and first-two)

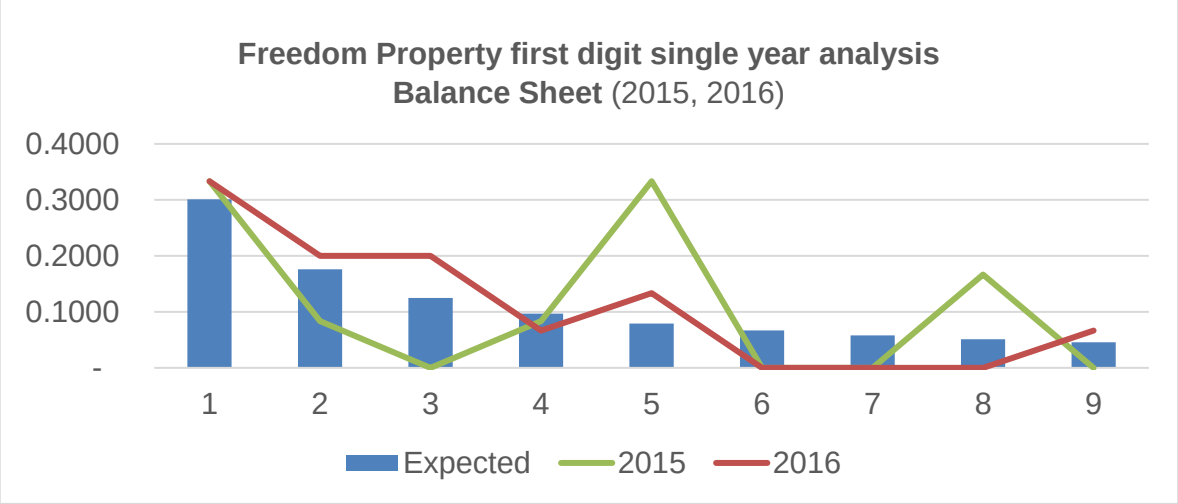
KS: African Bank group results									
	First digit			Second digit			First-two		
	2004-2008	2009-2013	2004-2013	2004-2008	2009-2013	2004-2013	2004-2008	2009-2013	2004-2013
Balance Sheet*	0.943	0.877	0.906	0.065	0.113	0.091	0.083	0.136	0.100
	87	104	191	87	104	191	87	104	191
	0.149	0.136	0.101	0.149	0.136	0.101	0.149	0.136	0.101
	N	N	N	C	C	C	C	C	C
Income Statement*	0.970	0.973	0.972	0.062	0.057	0.035	0.132	0.071	0.084
	66	75	141	66	75	141	66	75	141
	0.171	0.161	0.117	0.171	0.161	0.117	0.171	0.161	0.117
	N	N	N	C	C	C	C	C	C
Combined*	0.954	0.916	0.934	0.063	0.046	0.049	0.085	0.096	0.084
	153	179	332	153	179	332	153	179	332
	0.112	0.104	0.076	0.112	0.104	0.076	0.112	0.104	0.076
	N	N	N	C	C	C	C	C	N

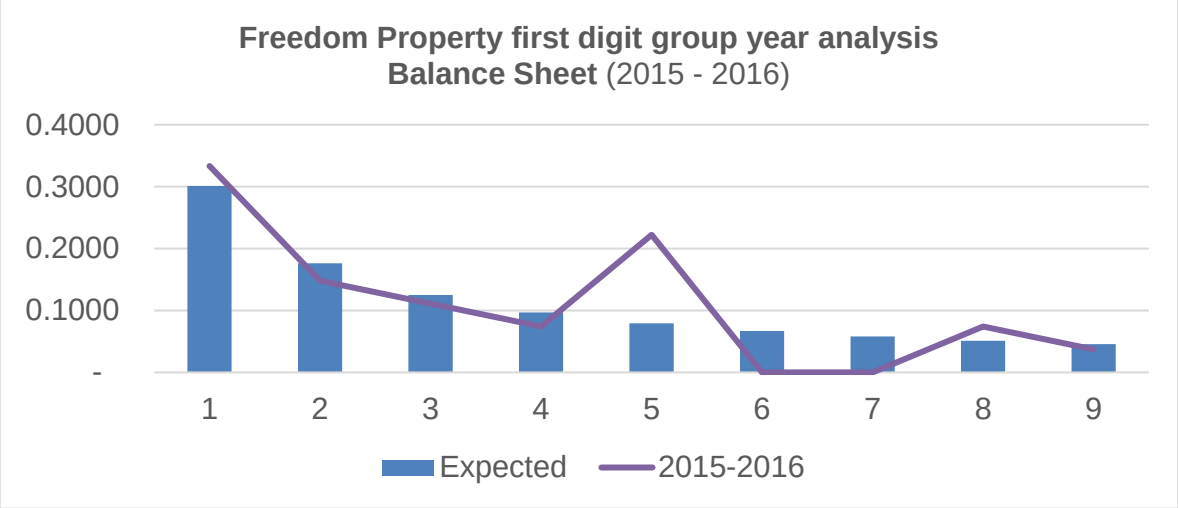
Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

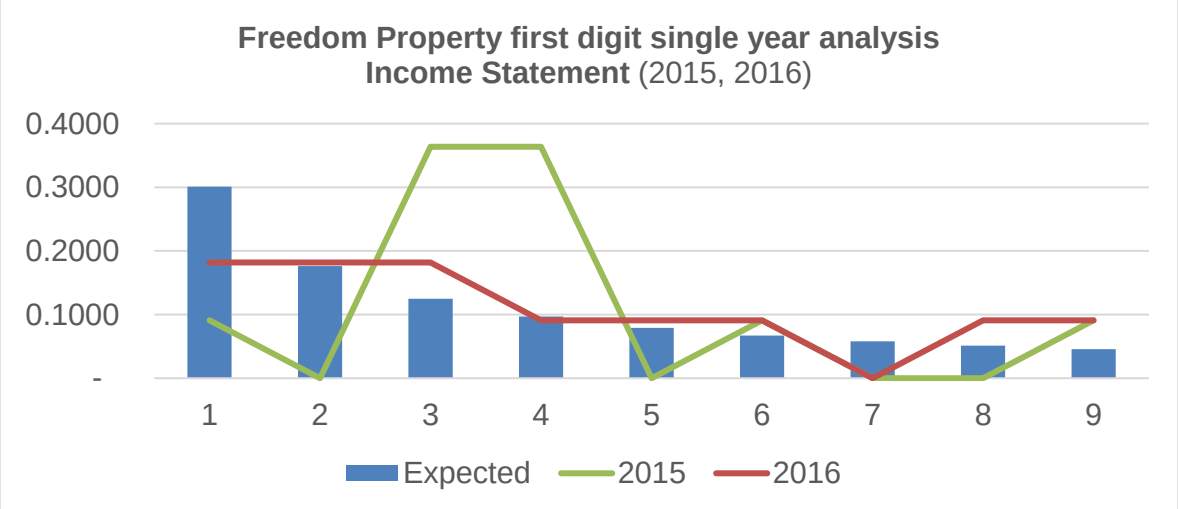
Appendix 22 Freedom Property first digit analysis results

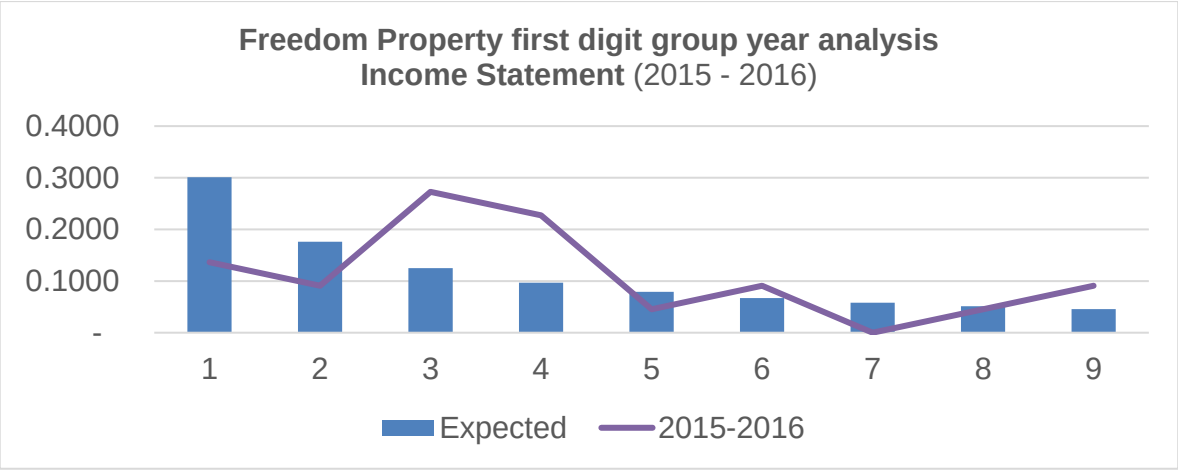
Balance Sheet (single and group year)



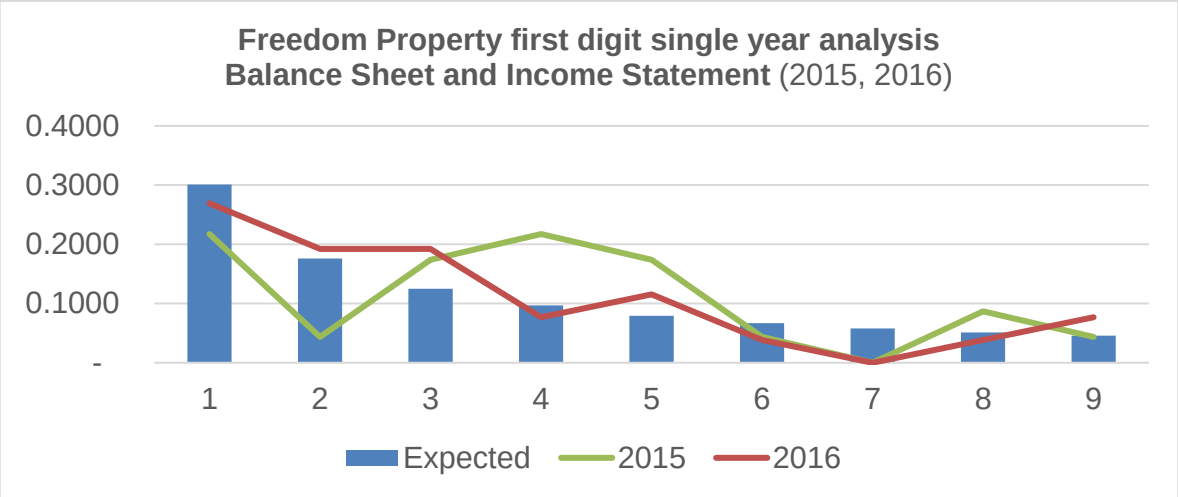


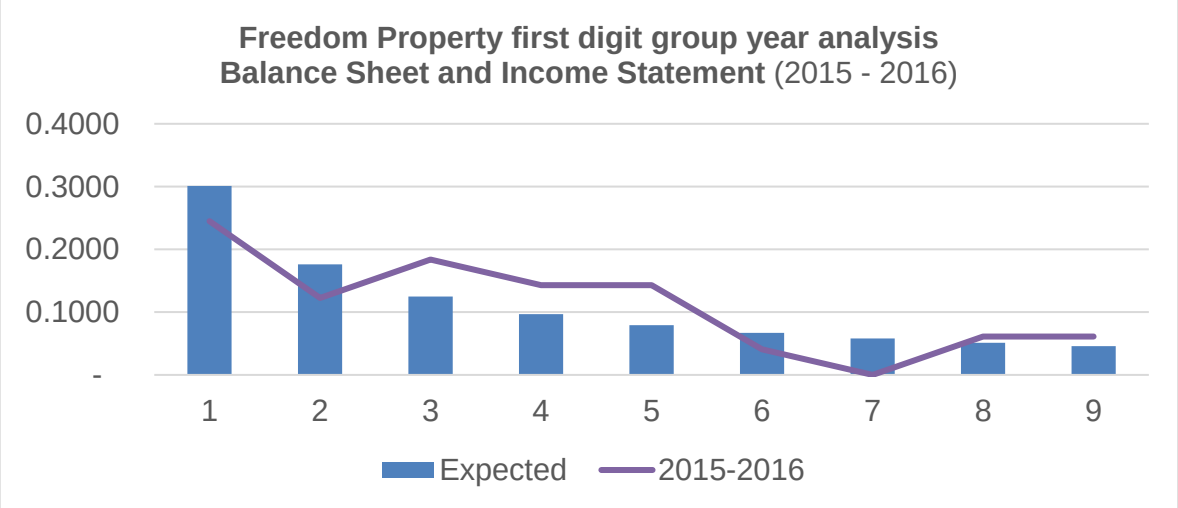
Income Statement (single and group year)





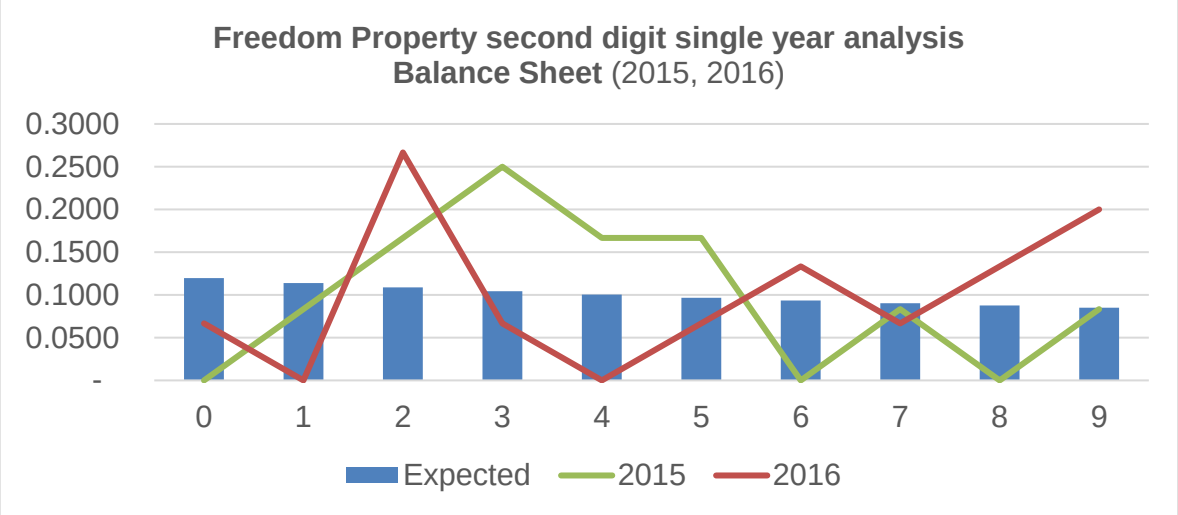
Combined (single and group year)

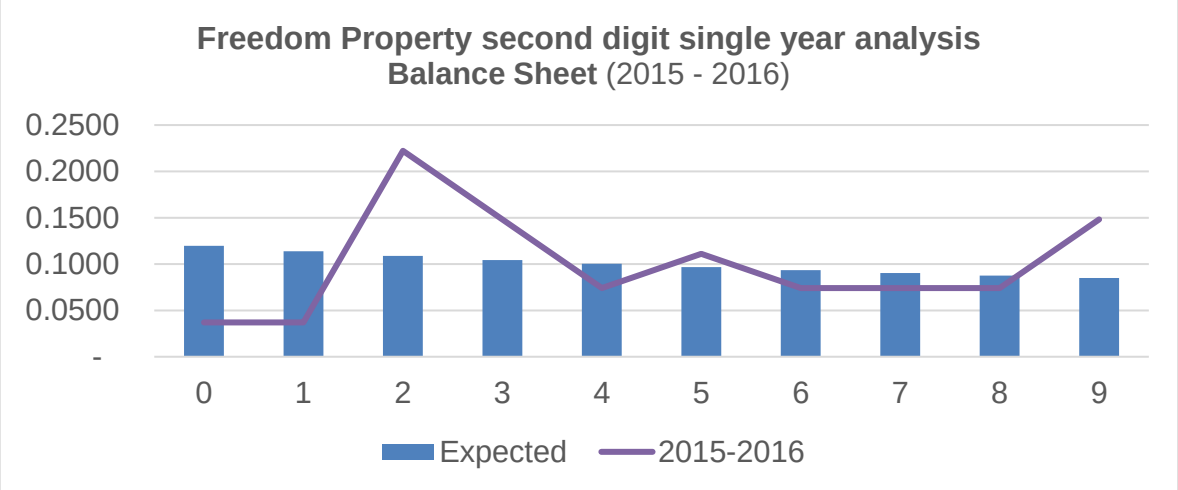




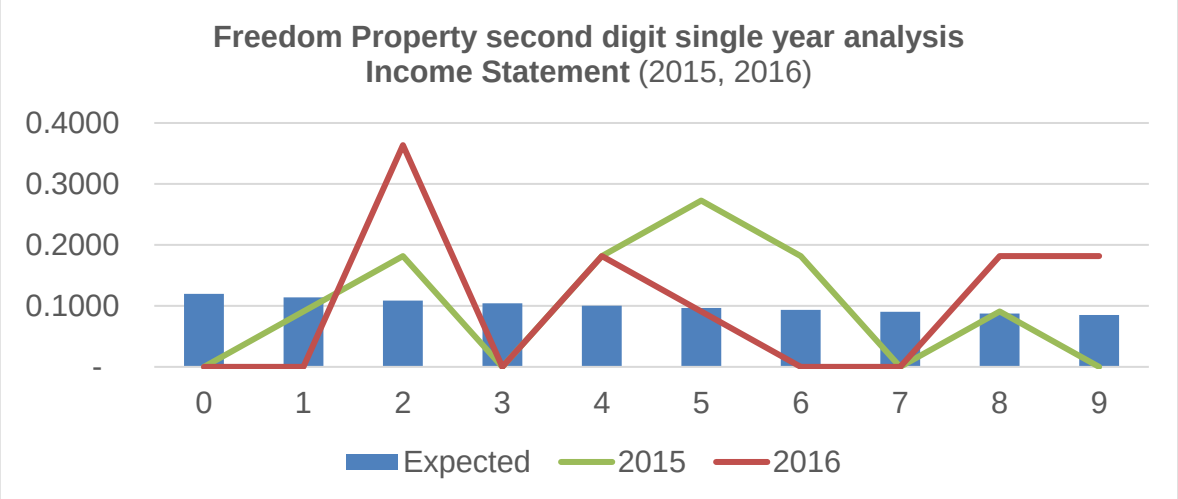
Appendix 23 Freedom Property second digit analysis results

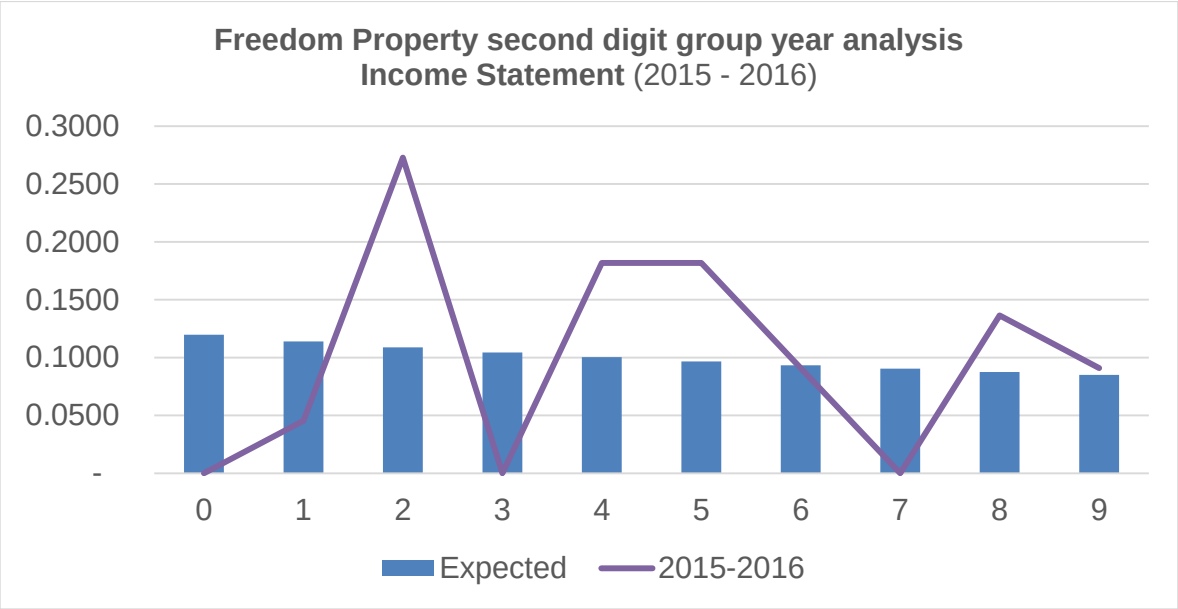
Balance Sheet (single and group year)



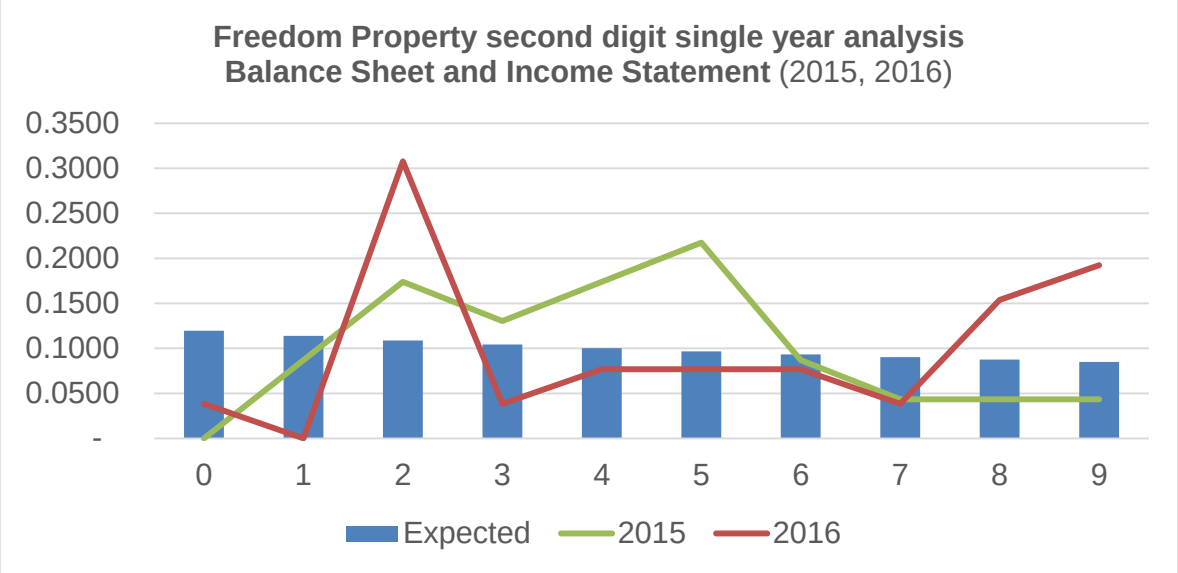


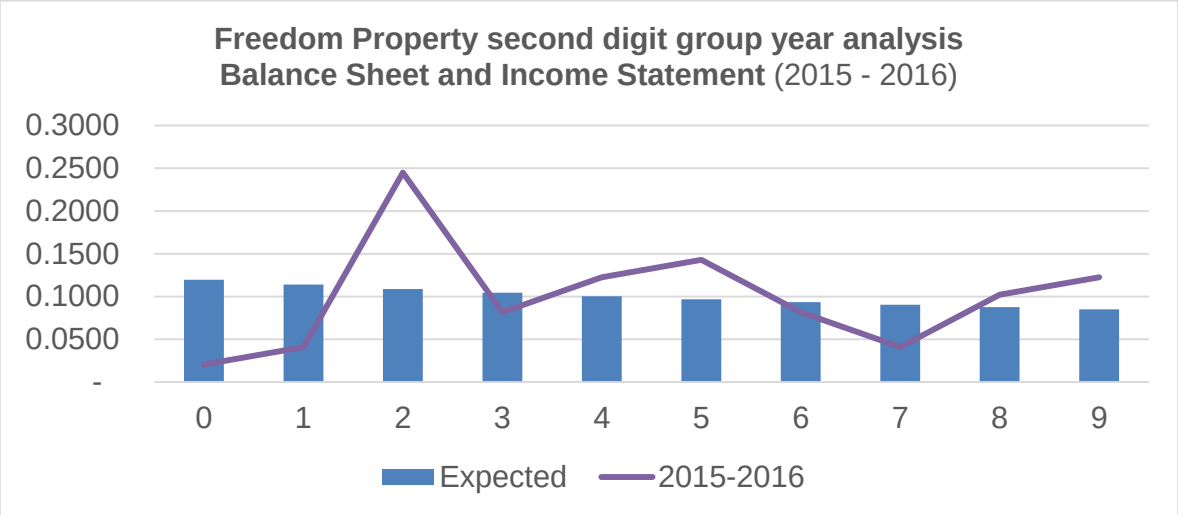
Income Statement (single and group year)





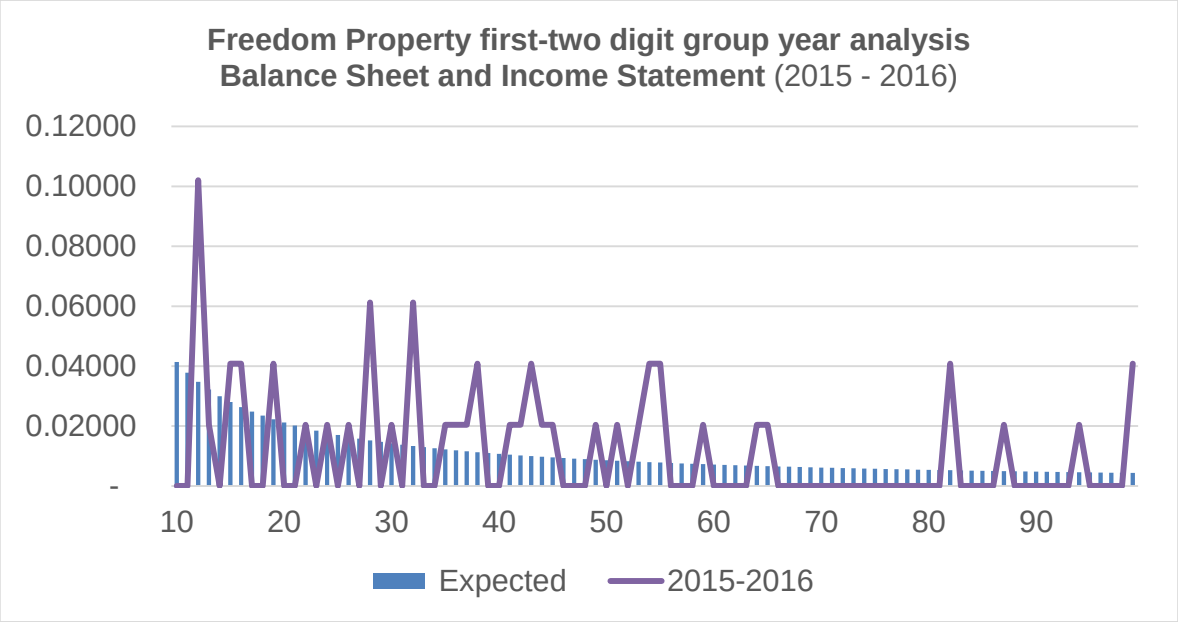
Combined (single and group year)





Appendix 24 Freedom Property first-two digit analysis results

Combined (group year)



Appendix 25 Freedom Property z-statistic results

First digit z-statistic

Z-Statistic: Freedom Property first digit						
	Balance Sheet		Income Statement		Combined	
First	2016	2015	2016	2015	2016	2015
1	0.27	0.24	0.53	1.19	0.14	0.65
2	0.24	0.46	0.05	1.14	0.22	1.40
3	0.49	0.87	0.11	1.94	0.74	0.40
4	0.40	0.16	0.07	**2.48**	0.01	1.60
5	0.30	**2.73**	0.14	0.41	0.32	1.30
6	0.52	0.35	0.32	0.32	0.19	0.03
7	0.41	0.24	0.18	0.18	0.85	0.74
8	0.31	1.16	0.60	0.09	0.29	0.31
9	0.39	0.07	0.72	0.72	0.29	0.05
At a 5% significance level, z-statistics > 1.96 are statistically significant.						

Z-Statistic: Freedom Property group first digit			
First	Balance Sheet	Income Statement	Balance Sheet and Income Statement
	2015-2016	2015-2016	2015-2016
1	0.16	1.45	0.70
2	0.13	0.77	0.80
3	0.22	1.77	1.03
4	0.08	1.71	0.85
5	**2.40**	0.19	1.39
6	1.01	0.02	0.45
7	0.88	0.71	1.43
8	0.10	0.12	0.32
9	0.22	0.50	0.18
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

Second digit z-statistic

Z-Statistic: Freedom Property second digit						
	Balance Sheet		Income Statement		Combined	
Second	2016	2015	2016	2015	2016	2015
0	0.23	0.83	0.76	0.76	0.97	1.45
1	0.98	0.33	0.71	0.24	1.52	0.08
2	1.55	0.18	**2.23**	0.29	**2.94**	0.67
3	0.05	1.18	0.64	0.64	0.78	0.07
4	0.86	0.28	0.40	0.40	0.07	0.83
5	0.39	0.33	0.06	1.47	0.01	1.61
6	0.09	0.62	0.55	0.49	0.29	0.11
7	0.32	0.08	0.52	0.52	0.58	0.42
8	0.17	0.56	0.57	0.04	0.85	0.38
9	1.13	0.02	0.61	0.47	1.61	0.34
At a 5% significance level, z-statistics > 1.96 are statistically significant.						

Z-Statistic: Freedom Property group year second digit			
Second	Balance Sheet	Income Statement	Balance Sheet and Income Statement
	2015-2016	2015-2016	2015-2016
0	1.03	1.40	1.92
1	0.95	0.67	1.39
2	1.58	**2.13**	**2.83**
3	0.43	1.25	0.29
4	0.13	0.92	0.28
5	0.25	0.99	0.85
6	0.01	0.04	0.04
7	0.30	1.11	0.96
8	0.25	0.43	0.11
9	0.83	0.10	0.68
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

First-two digit z-statistic

Z-Statistic: Freedom Property Balance Sheet and Income Statement first-two digits	
First-two	2015-2016
12	**2.18**
28	**2.04**
32	**2.30**
82	**2.45**
99	**2.79**
12	**2.18**
At a 5% significance level, z-statistics > 1.96 are statistically significant.	

Appendix 26 Freedom Property MAD results

Single year MAD

MAD: Freedom Property single year				
	First digit		Second digit	
	2016	2015	2016	2015
Balance Sheet	0.05	0.09	0.07	0.07
	N	N	N	N
Income Statement	0.04	0.13	0.11	0.08
	N	N	N	N
Combined	0.04	0.04	0.07	0.06
	N	N	N	N

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Group year MAD (first, second and first-two)

MAD: Freedom Property group results			
	First digit	Second digit	First-two
	2015-2016	2015-2016	2015-2016
Balance Sheet	0.04	0.05	0.016
	N	N	N
Income Statement	0.08	0.08	0.017
	N	N	N
Combined	0.04	0.05	0.013
	N	N	MAC

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Appendix 27 Freedom Property KS results

Single year KS

KS: Freedom Property single year				
	First digit		Second digit	
	2016	2015	2016	2015
Balance Sheet*	0.155	0.199	0.177	0.190
	15	12	15	12
	0.359	0.401	0.359	0.401
	C	C	C	C
Income Statement*	0.119	0.386	0.234	0.174
	11	11	11	11
	0.419	0.419	0.419	0.419
	C	C	C	C
Combined*	0.068	0.216	0.195	0.147
	26	23	26	23
	0.273	0.290	0.273	0.290
	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

Group year KS (first, second and first-two)

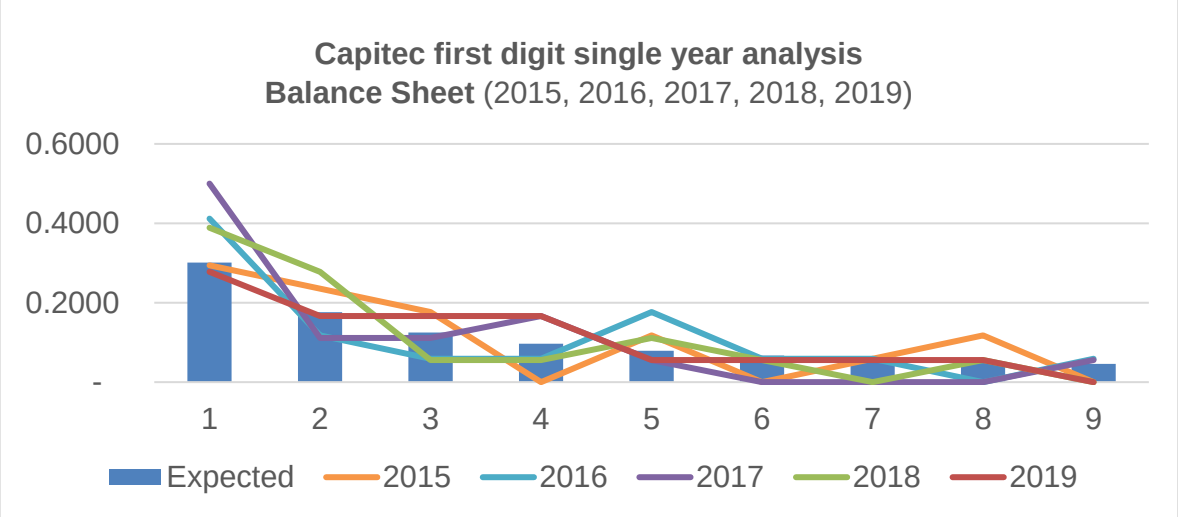
KS: Freedom Property group results			
	First digit	Second digit	First-two
	2015-2016	2015-2016	2015-2016
Balance Sheet*	0.963	0.159	0.111
	27	27	27
	0.268	0.268	0.268
	N	C	C
Income Statement*	0.909	0.188	0.278
	22	22	22
	0.296	0.296	0.296
	N	C	C
Combined*	0.939	0.172	0.141
	49	49	49
	0.199	0.199	0.199
	N	C	C

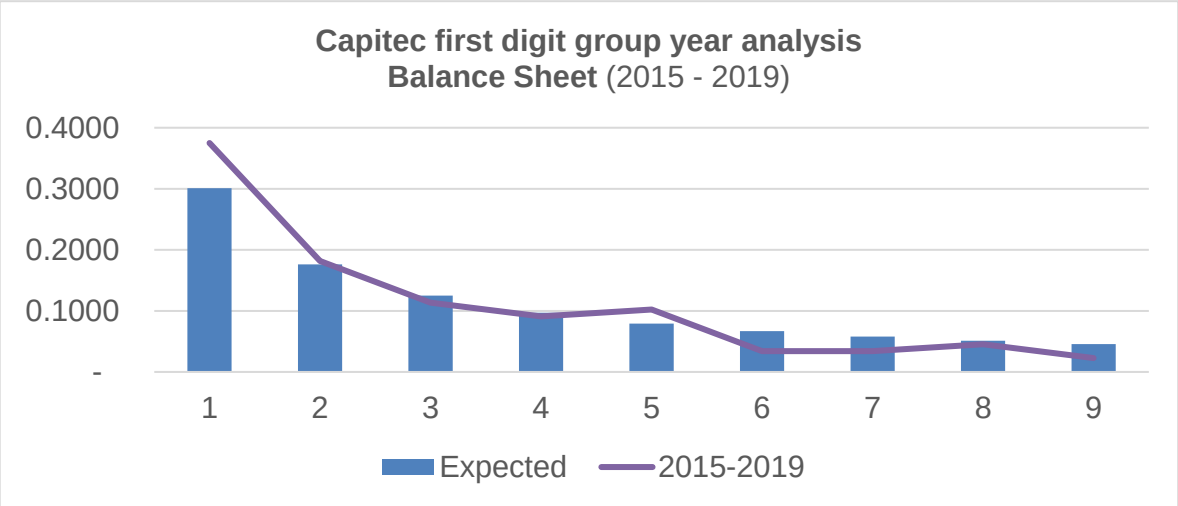
Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

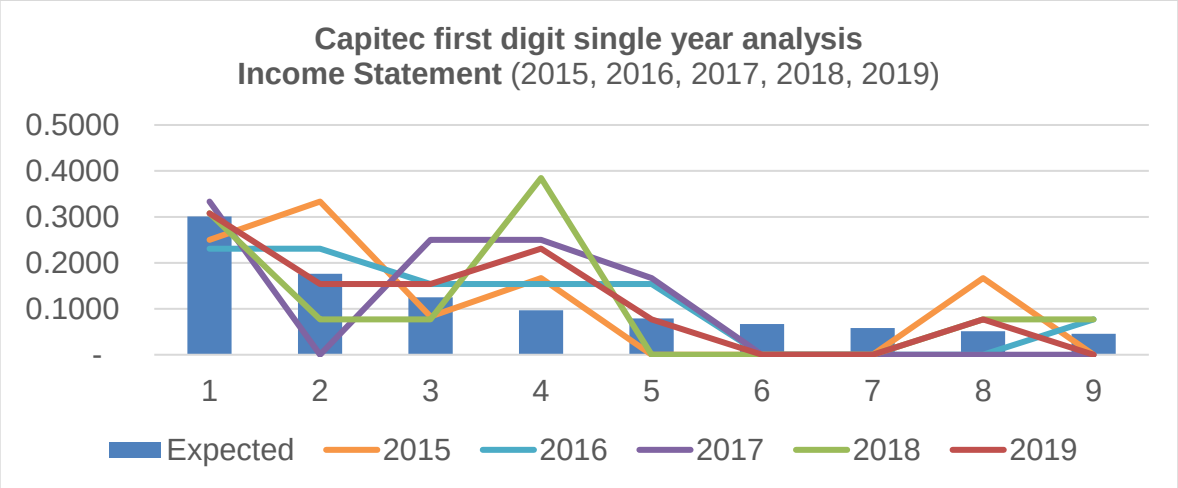
Appendix 28 Capitec first digit analysis results

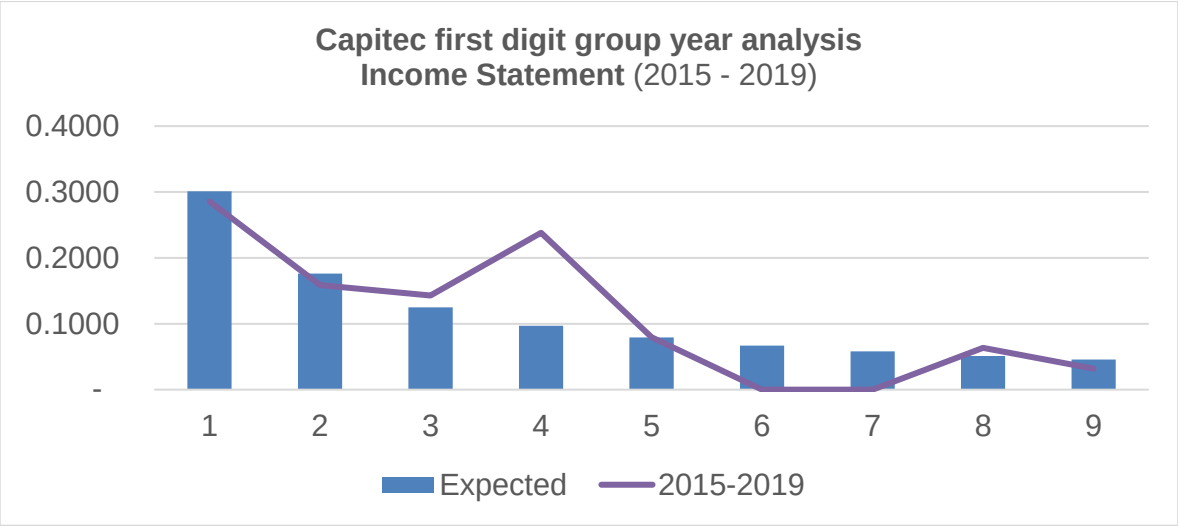
Balance Sheet (single and group year)



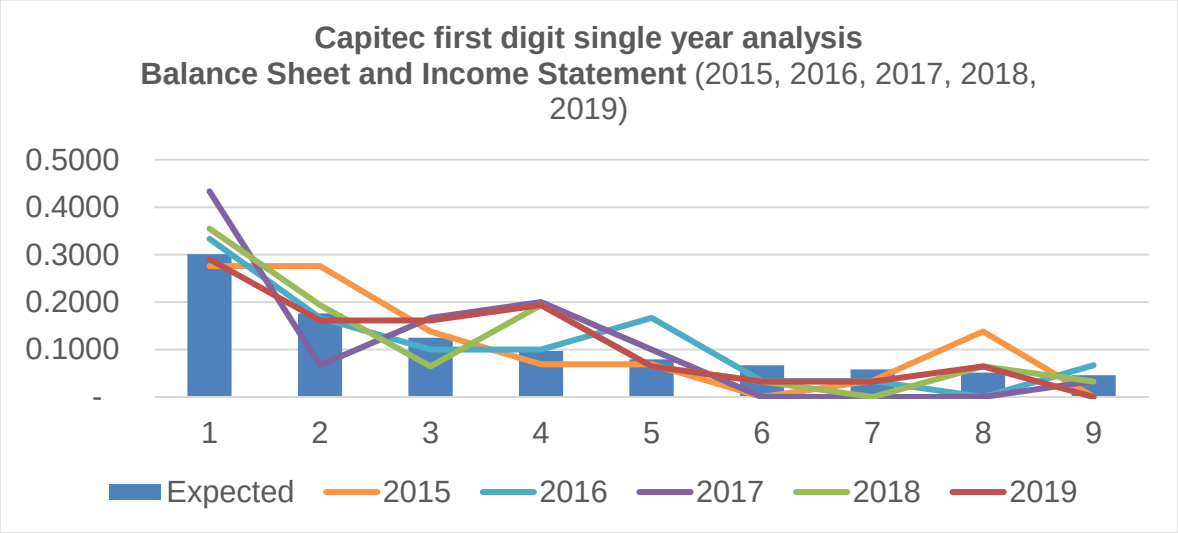


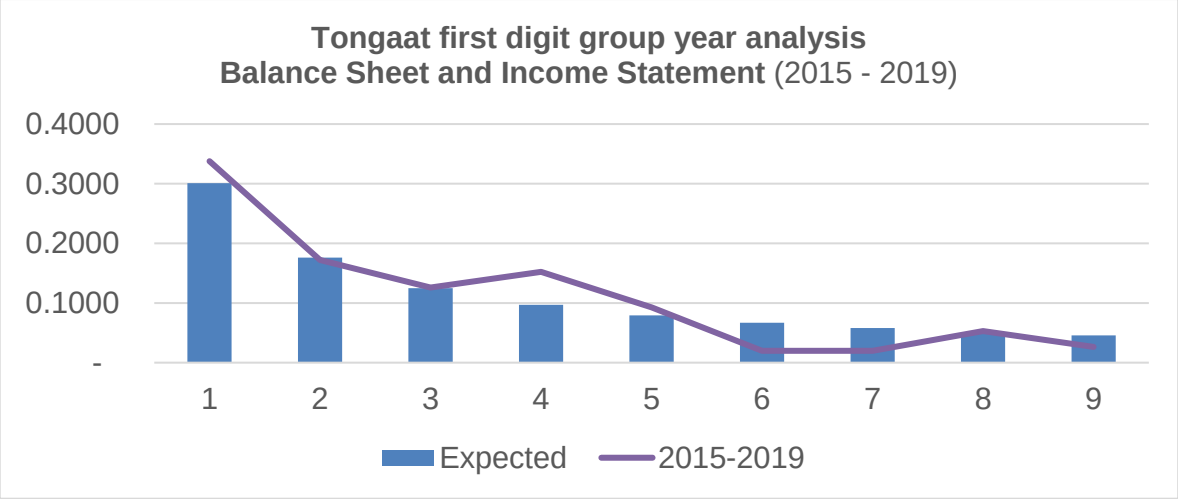
Income Statement (single and group year)





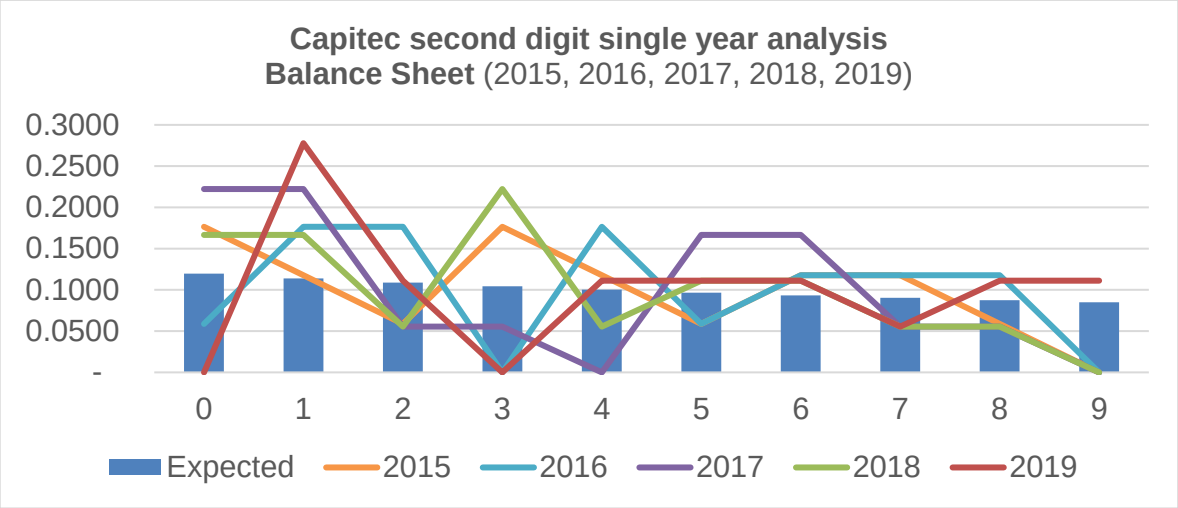
Combined (single and group year)

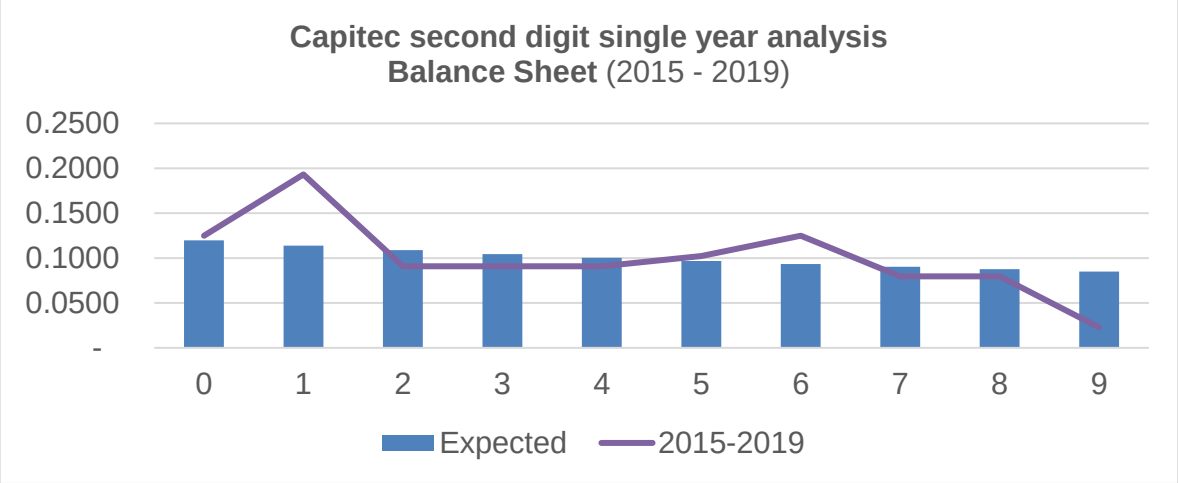




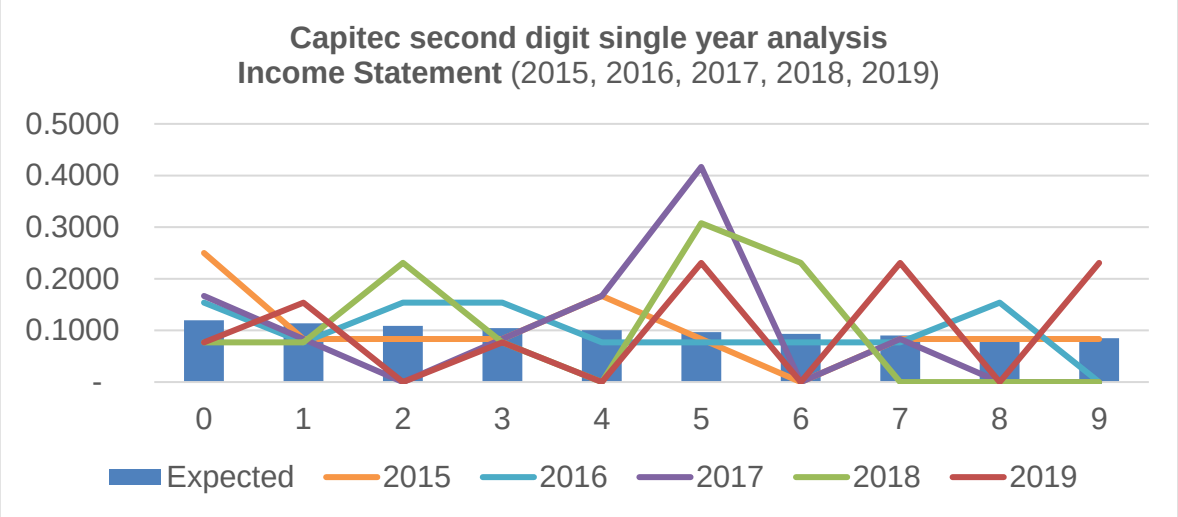
Appendix 29 Capitec second digit analysis results

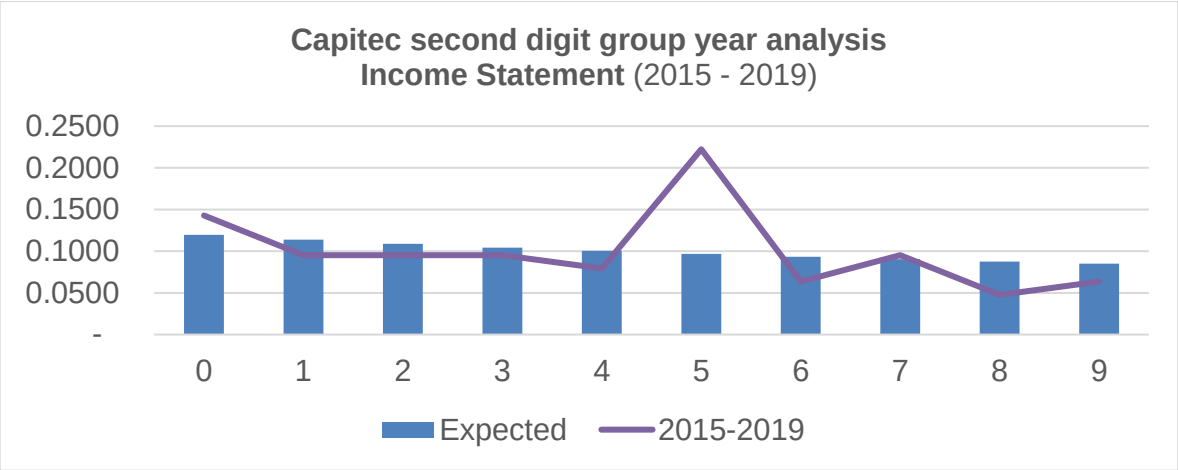
Balance Sheet (single and group year)



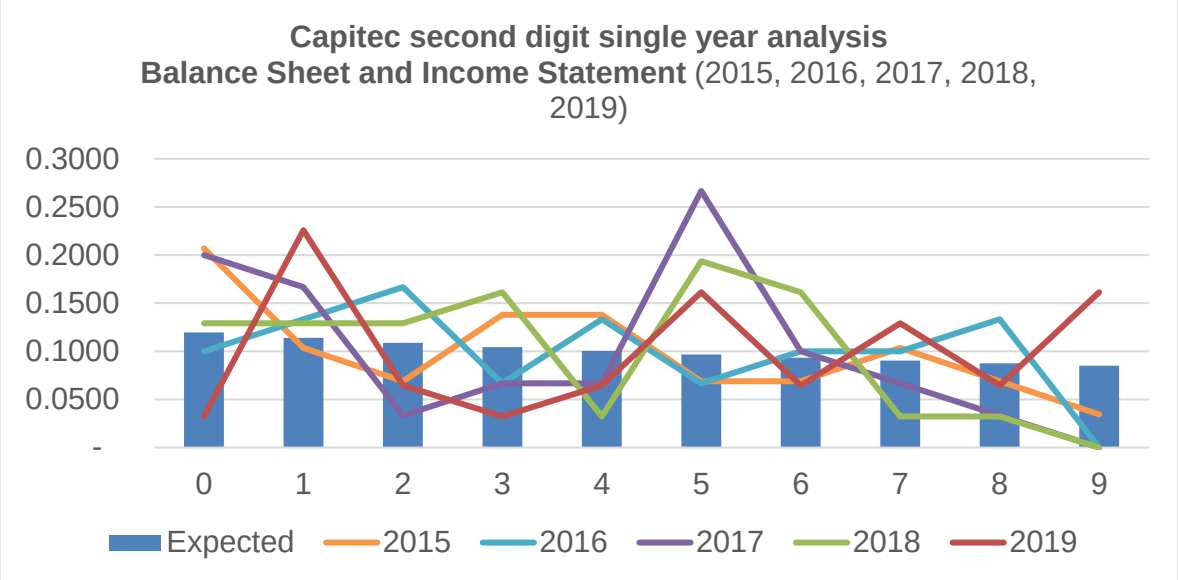


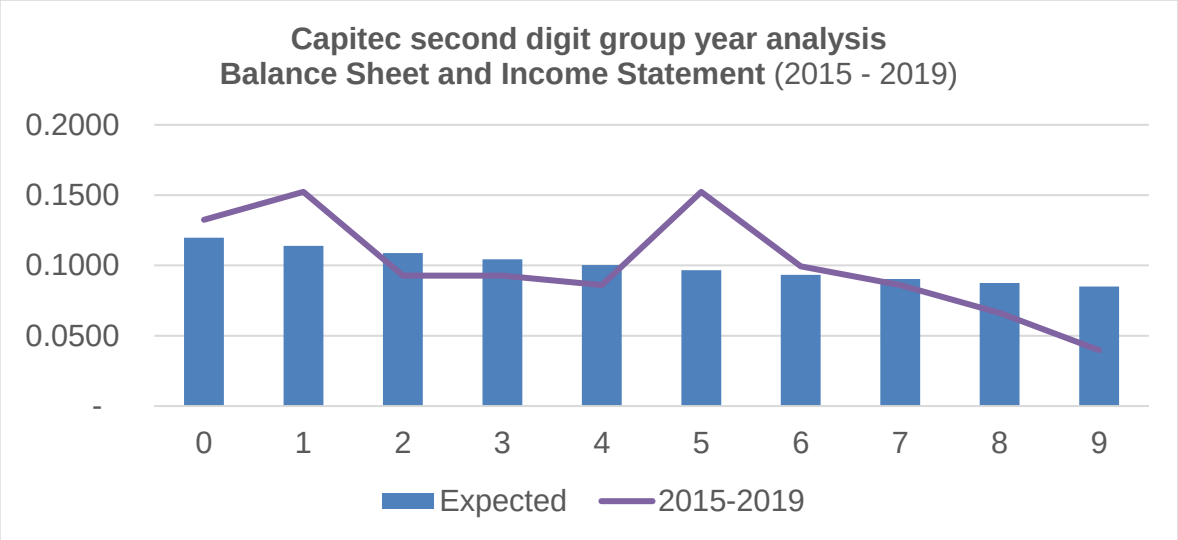
Income Statement (single and group year)





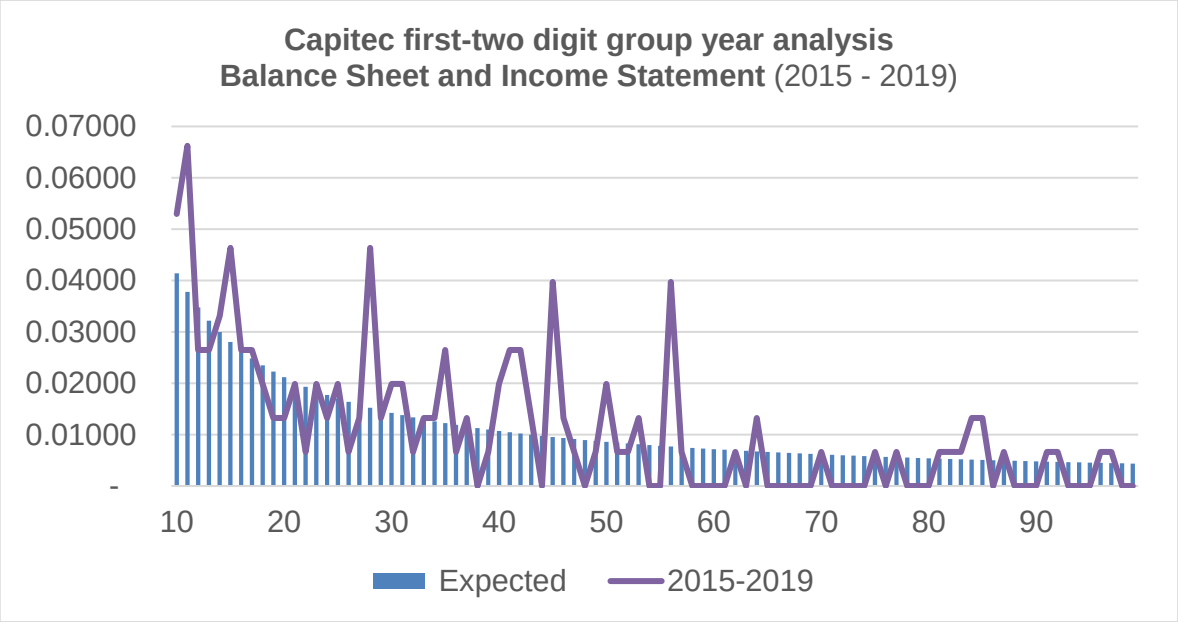
Combined (single and group year)





Appendix 30 Capitec first-two digit analysis results

Combined (group year)



Appendix 31 Capitec z-statistic results

First digit z-statistic

Z-Statistic: Capitec Balance Sheet first digit					
First	**2019**	**2018**	**2017**	**2016**	**2015**
1	0.22	0.56	1.58	0.73	0.06
2	0.10	0.82	0.41	0.31	0.32
3	0.18	0.53	0.18	0.46	0.28
4	0.60	0.19	0.60	0.12	0.94
5	0.37	0.07	0.37	1.04	0.14
6	0.19	0.19	0.66	0.13	0.62
7	0.04	0.55	0.55	0.01	0.01
8	0.08	0.08	0.45	0.41	0.69
9	0.37	0.37	0.20	0.26	0.32
At a 5% significance level, z-statistics > 1.96 are statistically significant.					

Z-Statistic: Capitec Income Statement first digit					
First	**2019**	**2018**	**2017**	**2016**	**2015**
1	0.05	0.05	0.24	0.25	0.07
2	0.21	0.57	1.22	0.15	1.05
3	0.32	0.10	0.87	0.32	0.44
4	1.16	**3.04**	1.30	0.23	0.33
5	0.03	0.54	0.59	0.48	0.48
6	0.41	0.41	0.35	0.41	0.35
7	0.30	0.30	0.24	0.30	0.24
8	0.42	0.42	0.15	0.21	1.16
9	0.13	0.54	0.07	0.54	0.07
At a 5% significance level, z-statistics > 1.96 are statistically significant.					

Z-Statistic: Capitec Balance Sheet Income Statement first digit					
First	**2019**	**2018**	**2017**	**2016**	**2015**
1	0.13	0.46	1.38	0.19	0.09
2	0.22	0.02	1.33	0.14	1.17
3	0.34	0.75	0.42	0.14	0.21
4	1.52	1.52	1.60	0.06	0.19
5	0.30	0.30	0.08	1.44	0.20
6	0.41	0.41	1.10	0.37	1.07
7	0.23	1.00	0.97	0.19	0.14
8	0.34	0.34	0.86	0.86	1.70
9	0.79	0.36	0.33	0.11	0.73
At a 5% significance level, z-statistics > 1.96 are statistically significant.					

Z-Statistic: Capitec group year first digit			
First	**Balance Sheet**	**Income Statement**	**Balance Sheet and Income Statement**
	2015-2019	**2015-2019**	**2015-2019**
1	1.40	0.13	0.89
2	0.00	0.20	0.02
3	0.16	0.24	0.03
4	0.01	**3.58**	**2.16**
5	0.60	0.01	0.47
6	1.02	1.87	**2.15**
7	0.73	1.70	1.83
8	0.00	0.16	0.10
9	0.78	0.23	0.94
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

Second digit z-statistic

Z-Statistic: Capitec Balance Sheet second digit					
First	**2019**	**2018**	**2017**	**2016**	**2015**
0	1.20	0.25	0.98	0.40	0.35
1	1.82	0.33	1.08	0.43	0.05
2	0.03	0.35	0.35	0.51	0.27
3	1.06	1.25	0.29	1.01	0.58
4	0.15	0.24	1.02	0.64	0.24
5	0.21	0.21	0.61	0.12	0.12
6	0.26	0.26	0.66	0.34	0.34
7	0.10	0.10	0.10	0.39	0.39
8	0.35	0.06	0.06	0.01	0.42
9	0.40	0.87	0.87	0.82	0.82
At a 5% significance level, z-statistics > 1.96 are statistically significant.					

Z-Statistic: Capitec Income Statement second digit					
First	**2019**	**2018**	**2017**	**2016**	**2015**
0	0.05	0.05	0.06	0.38	0.95
1	0.02	0.42	0.33	0.42	0.33
2	0.81	0.97	0.75	0.08	0.28
3	0.32	0.32	0.24	0.13	0.24
4	0.74	0.74	0.28	0.28	0.28
5	1.17	**2.11**	**3.26**	0.24	0.16
6	0.68	1.23	0.62	0.20	0.62
7	1.28	0.65	0.08	0.17	0.08
8	0.63	0.63	0.56	0.35	0.05
9	1.39	0.60	0.54	0.60	0.02
At a 5% significance level, z-statistics > 1.96 are statistically significant.					

Z-Statistic: Capitec Balance Sheet Income Statement second digit					
First	**2019**	**2018**	**2017**	**2016**	**2015**
0	1.22	0.16	1.07	0.05	1.16
1	1.68	0.27	0.62	0.05	0.18
2	0.50	0.07	1.03	0.72	0.39
3	1.02	0.74	0.38	0.38	0.29
4	0.36	0.96	0.31	0.30	0.37
5	0.91	1.52	**2.84**	0.25	0.19
6	0.24	0.99	0.12	0.12	0.13
7	0.44	0.82	0.13	0.18	0.25
8	0.14	0.77	0.73	0.56	0.03
9	1.20	1.37	1.34	1.34	0.64
At a 5% significance level, z-statistics > 1.96 are statistically significant.					

Z-Statistic: Capitec group year second digit			
Second	**Balance Sheet**	**Income Statement**	**Balance Sheet and Income Statement**
	2015-2019	**2015-2019**	**2015-2019**
0	0.15	0.37	0.36
1	**2.17**	0.27	1.36
2	0.37	0.14	0.50
3	0.24	0.03	0.33
4	0.12	0.34	0.45
5	0.18	**3.16**	**2.18**
6	0.84	0.60	0.11
7	0.17	0.14	0.04
8	0.08	0.90	0.78
9	1.90	0.39	1.85
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

First-two digit z-statistic

Z-Statistic: Capitec Balance Sheet and Income Statement first-two digits	
First-two	**2015-2019**
28	**2.79**
45	**3.40**
56	**4.04**
At a 5% significance level, z-statistics > 1.96 are statistically significant.	

Appendix 32 Capitec MAD results

First and second digit single year MAD

MAD: Capitec single year										
	First digit					Second digit				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Balance Sheet	0.03	0.05	0.06	0.05	0.05	0.05	0.05	0.07	0.06	0.04
	N	N	N	N	N	N	N	N	N	N
Income Statement	0.04	0.08	0.09	0.05	0.08	0.09	0.09	0.09	0.04	0.04
	N	N	N	N	N	N	N	N	N	N
Combined	0.03	0.04	0.07	0.03	0.04	0.06	0.05	0.06	0.03	0.03
	N	N	N	N	N	N	N	N	N	N

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Group year MAD (first, second and first-two)

MAD: Capitec group results			
	First digit	Second digit	First-two
Balance Sheet	0.02	0.02	0.009
	N	N	AC
Income Statement	0.04	0.03	0.011
	N	N	AC
Combined	0.02	0.02	0.007
	N	N	AC

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Appendix 33 Capitec KS results

First digit single year KS

KS: Capitec single year										
	First digit					Second digit				
	2019	2018	2017	2016	2015	2019	2018	2017	2016	2015
Balance Sheet*	0.079	0.190	0.199	0.111	0.104	0.120	0.164	0.211	0.085	0.114
	18	18	18	17	17	18	18	18	17	17
	0.328	0.328	0.328	0.337	0.337	0.328	0.328	0.328	0.337	0.337
	C	C	C	C	C	C	C	C	C	C
Income Statement*	0.147	0.147	0.222	0.145	0.134	0.239	0.263	0.273	0.092	0.130
	13	13	12	13	12	13	13	12	13	12
	0.386	0.386	0.401	0.386	0.401	0.386	0.386	0.401	0.386	0.401
	C	C	C	C	C	C	C	C	C	C
Combined*	0.107	0.107	0.189	0.089	0.088	0.128	0.198	0.163	0.085	0.108
	31	31	30	30	29	31	31	30	30	29
	0.250	0.250	0.254	0.254	0.258	0.250	0.250	0.254	0.254	0.258
	C	C	C	C	C	C	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

Group year KS (first, second and first-two)

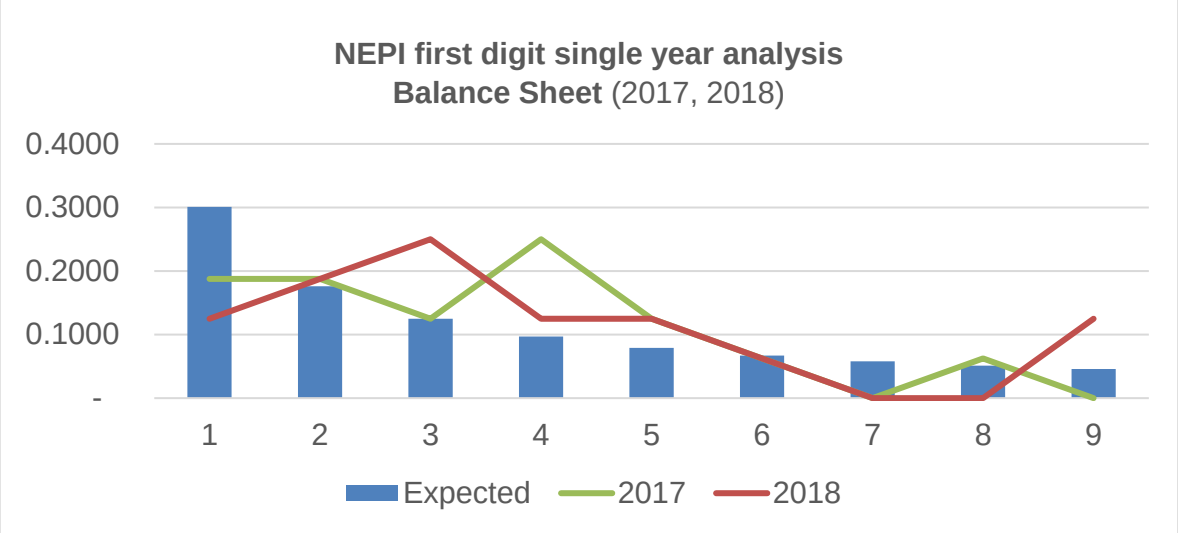
KS: Capitec group results			
	First digit	Second digit	First-two
Balance Sheet*	0.977	0.085	0.108
	88	88	88
	0.148	0.148	0.148
	N	C	C
Income Statement*	0.968	0.086	0.173
	63	63	63
	0.175	0.175	0.175
	N	C	C
Combined*	0.974	0.071	0.118
	151	151	151
	0.113	0.113	0.113
	N	C	N

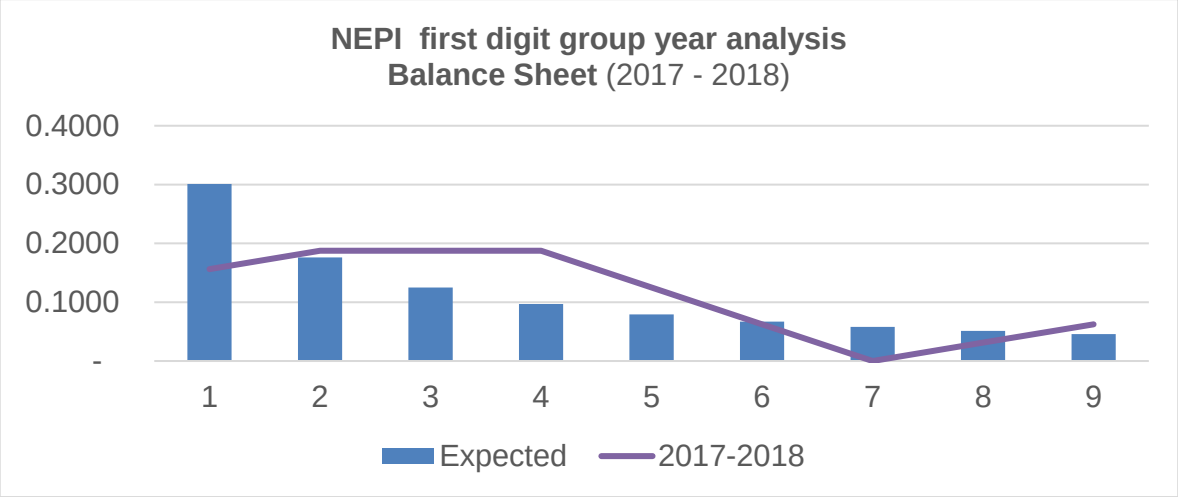
Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

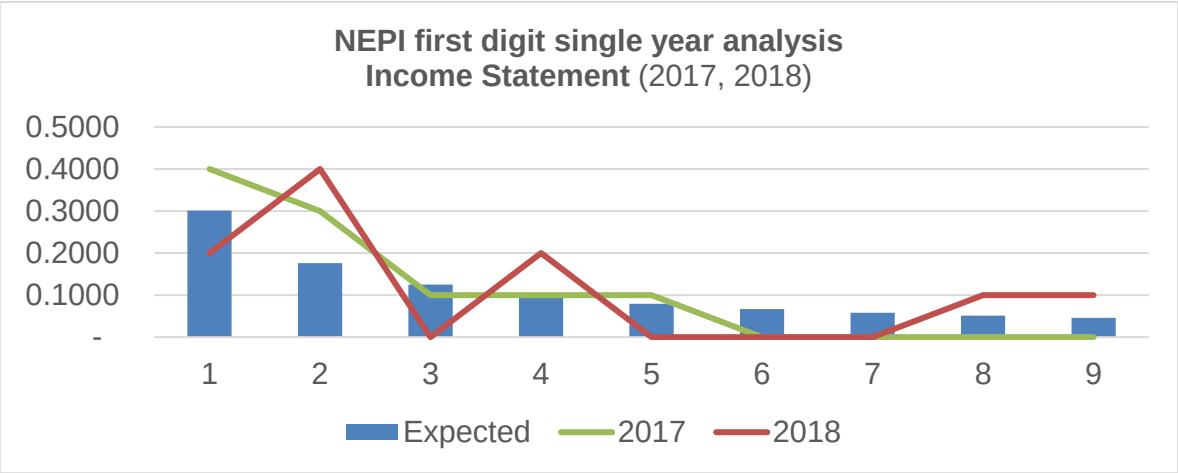
Appendix 34 NEPI Rockcastle's first digit analysis results

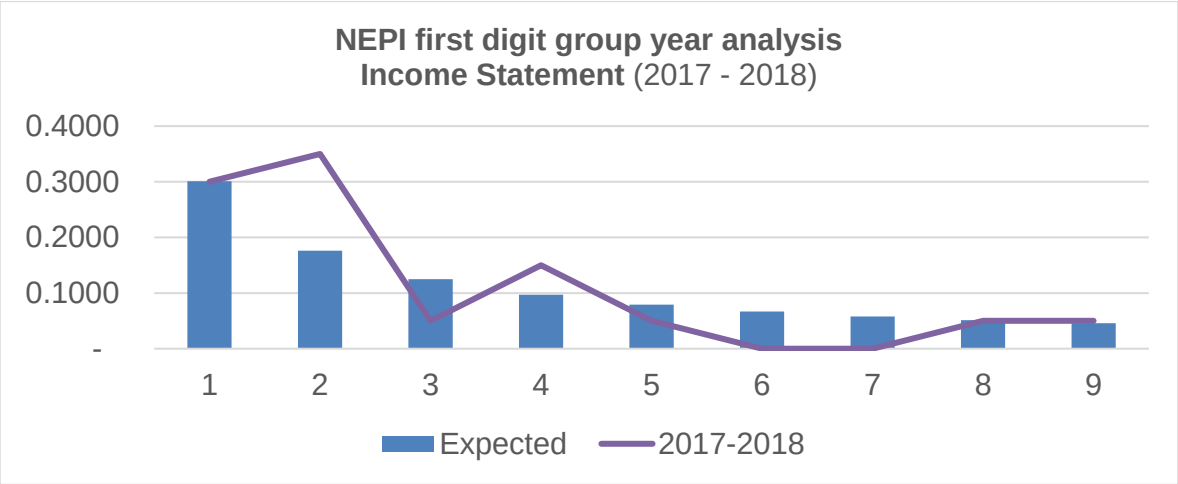
Balance Sheet (single and group year)



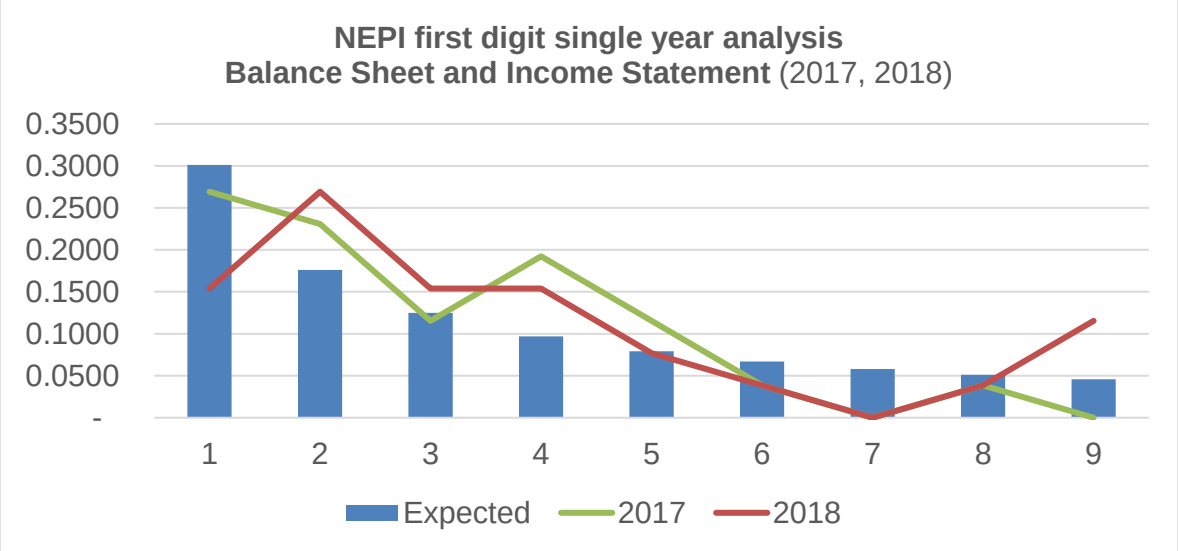


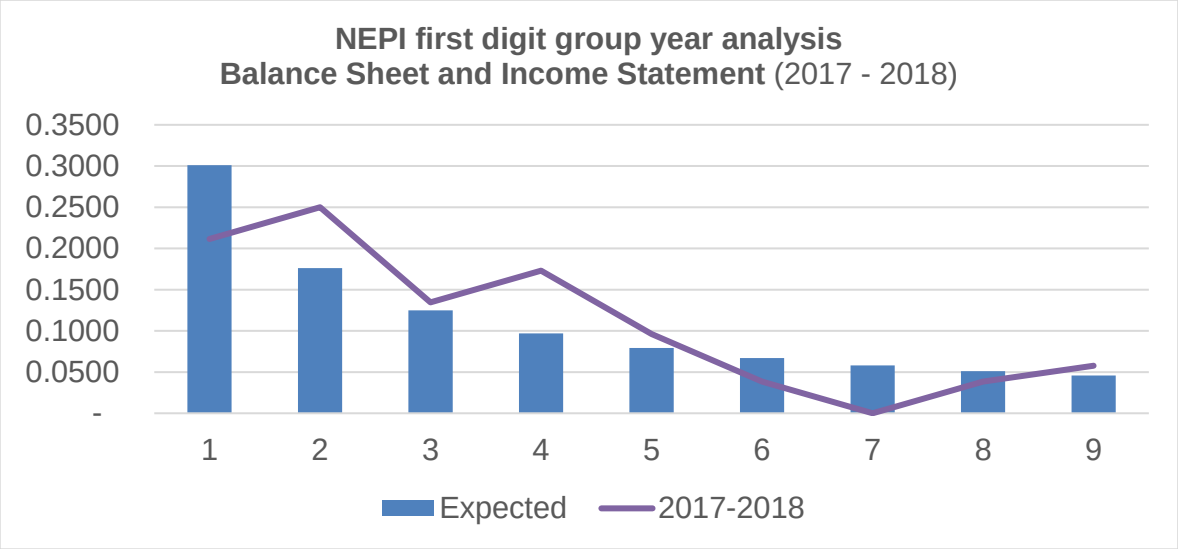
Income Statement (single and group year)





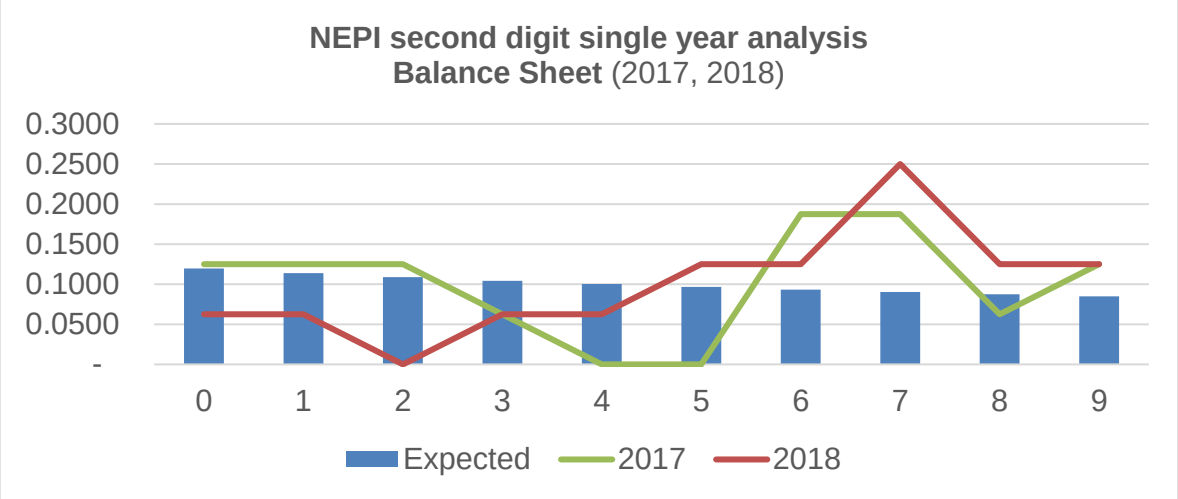
Combined (single and group year)

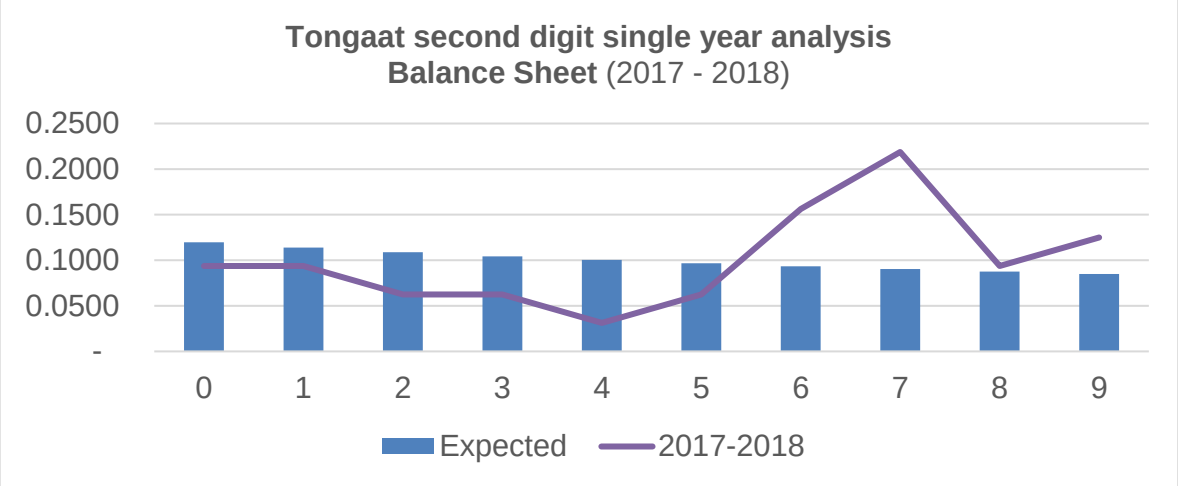




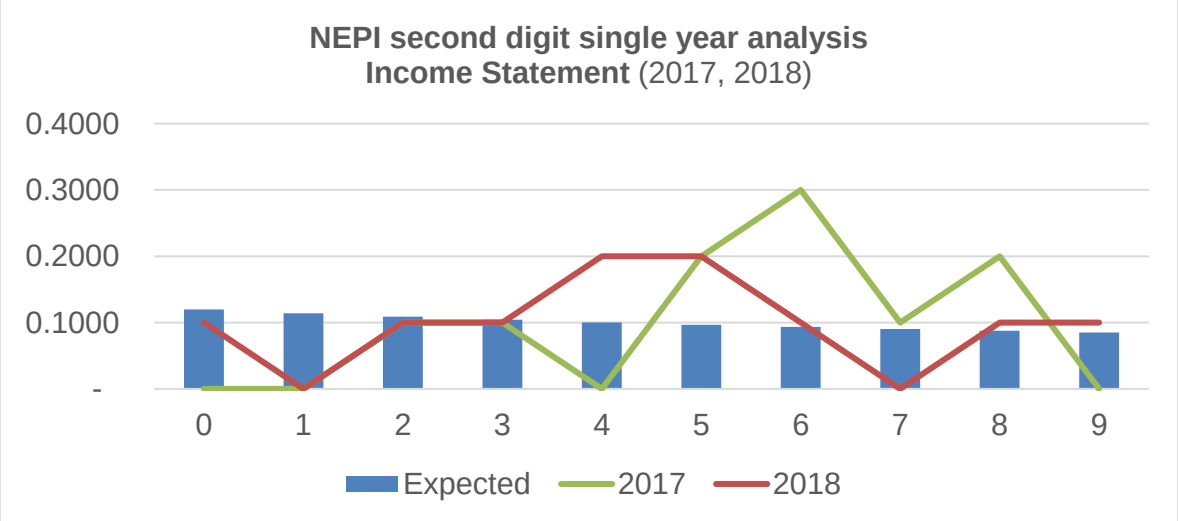
Appendix 35 NEPI Rockcastle second digit analysis results

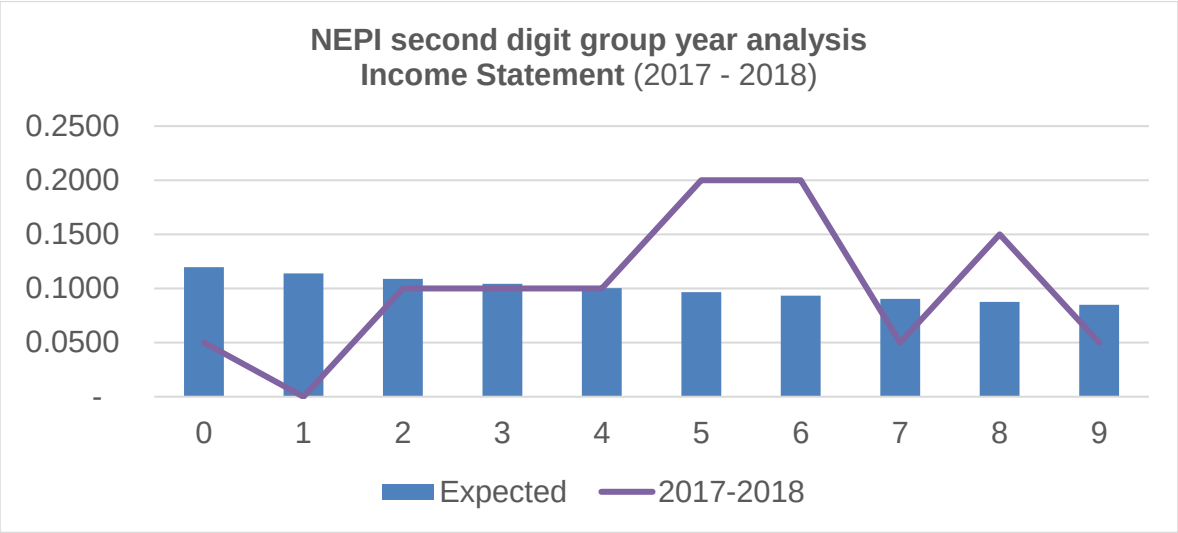
Balance Sheet (single and group year)



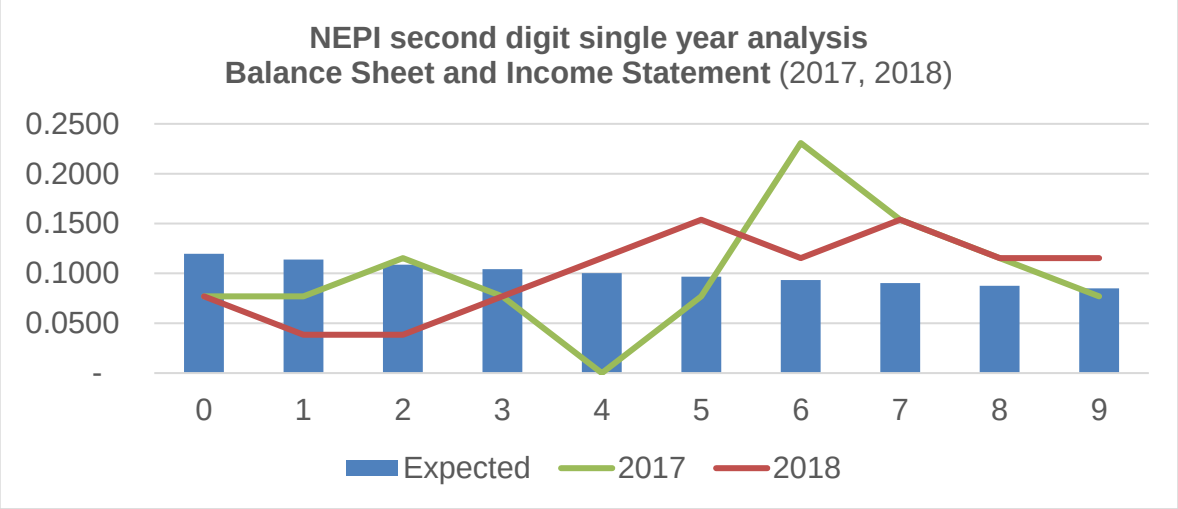


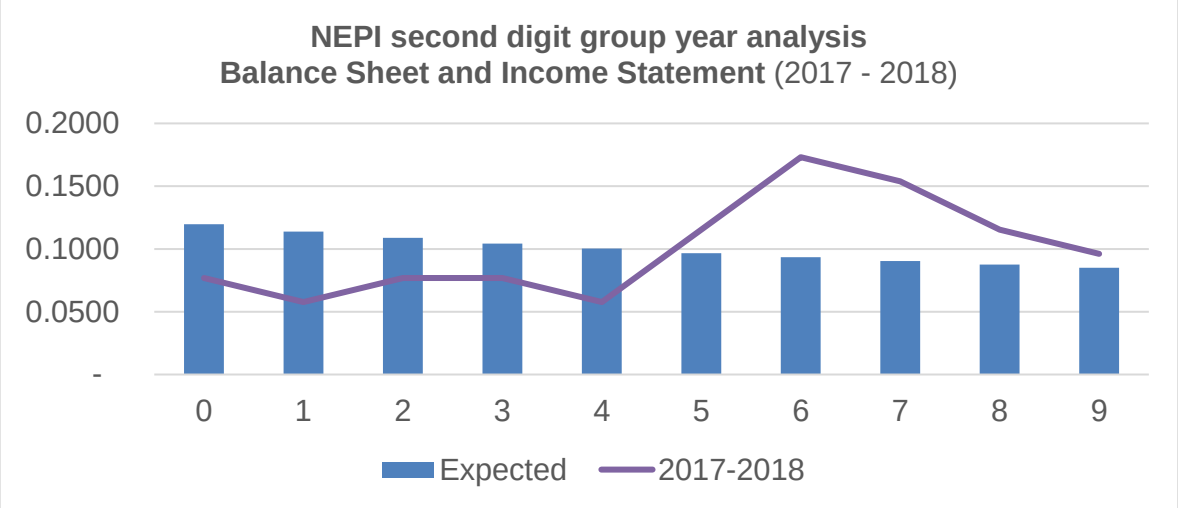
Income Statement (single and group year)





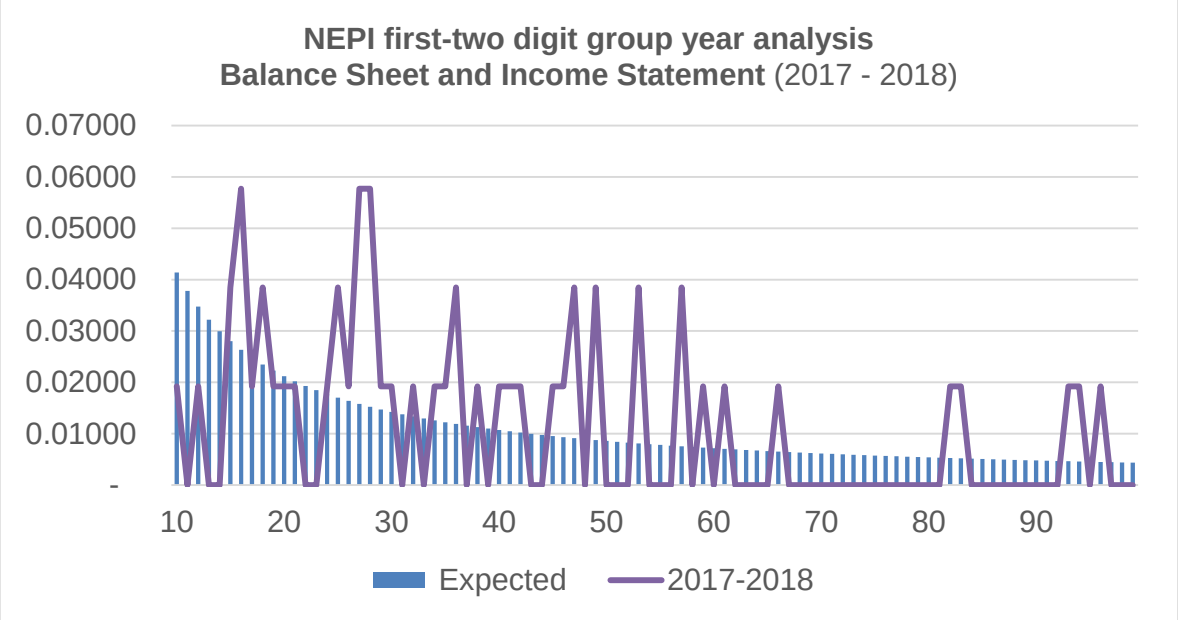
Combined (single and group year)





Appendix 36 NEPI Rockcastle first-two digit analysis results

Combined (group year)



Appendix 37 NEPI Rockcastle z-statistic results

First digit z-statistic (single and group year)

Z-Statistic: NEPI Property first digit						
	Balance Sheet		Income Statement		Combined	
First	2018	2017	2018	2017	2018	2017
1	1.26	0.72	0.35	0.34	1.42	0.14
2	0.12	0.12	1.44	0.61	0.99	0.47
3	1.13	0.00	0.72	0.24	0.15	0.15
4	0.38	1.65	0.57	0.03	0.65	1.31
5	0.22	0.22	0.34	0.24	0.04	0.32
6	0.07	0.07	0.21	0.21	0.19	0.19
7	0.46	0.46	0.11	0.11	0.85	0.85
8	0.36	0.21	0.70	0.02	0.29	0.29
9	0.92	0.28	0.06	0.69	1.23	0.65
At a 5% significance level, z-statistics > 1.96 are statistically significant.						

Z-Statistic: NEPI group year first digit			
First	Balance Sheet	Income Statement	Balance Sheet and Income Statement
	2017-2018	2017-2018	2017-2018
1	1.59	0.01	1.26
2	0.17	1.75	1.22
3	0.80	0.68	0.00
4	1.43	0.42	1.62
5	0.63	0.07	0.20
6	0.10	0.75	0.54
7	1.03	0.63	1.49
8	0.11	0.02	0.10
9	0.03	0.09	0.08
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

Second digit z-statistic (single and group year)

Z-Statistic: NEPI Property second digit						
	Balance Sheet		Income Statement		Combined	
Second	2018	2017	2018	2017	2018	2017
0	0.32	0.07	0.19	0.68	0.37	0.37
1	0.25	0.14	0.64	0.64	0.90	0.28
2	1.00	0.21	0.09	0.09	0.84	0.11
3	0.14	0.14	0.04	0.04	0.14	0.14
4	0.09	0.92	0.52	0.53	0.26	1.38
5	0.38	0.89	0.57	0.57	0.65	0.01
6	0.01	0.86	0.07	1.70	0.05	**2.07**
7	1.79	0.92	0.45	0.11	0.79	0.79
8	0.09	0.35	0.14	0.70	0.15	0.15
9	0.13	0.13	0.17	0.40	0.20	0.15
At a 5% significance level, z-statistics > 1.96 are statistically significant.						

Z-Statistic: NEPI group year second digit			
Second	Balance Sheet	Income Statement	Balance Sheet and Income Statement
	2017-2018	2017-2018	2017-2018
0	0.18	0.62	0.74
1	0.08	1.25	1.06
2	0.56	0.13	0.52
3	0.48	0.06	0.42
4	1.01	0.00	0.79
5	0.36	1.19	0.22
6	0.92	1.25	1.74
7	**2.23**	0.24	1.36
8	0.12	0.59	0.46
9	0.49	0.16	0.04
At a 5% significance level, z-statistics > 1.96 are statistically significant.			

First-two digit z-statistic

There were no z-statistics which were statistically significant.

Appendix 38 NEPI MAD results

Single year MAD

MAD: NEPI single year				
	First digit		Second digit	
	2018	2017	2018	2017
Balance Sheet	0.06	0.05	0.06	0.05
	N	N	N	N
Income Statement	0.10	0.05	0.05	0.09
	N	N	N	N
Combined	0.06	0.04	0.04	0.05
	N	N	N	N

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Group year MAD (first, second and first-two)

MAD: NEPI group results			
	First digit	Second digit	First-two
	2017-2018	2017-2018	2017-2018
Balance Sheet	0.05	0.05	0.014
	N	N	MAC
Income Statement	0.05	0.05	0.016
	N	N	N
Combined	0.04	0.04	0.011
	N	N	AC

Legend
CC = Close Conformity, AC = Acceptable Conformity, MAC = Marginally Acceptable Conformity, N = Nonconformity

The abovementioned classifications used are based on the set of critical values for determining conformance with Benford's Law developed by Nigrini (2012, p. 160).

Appendix 39 NEPI KS results

Single year KS

KS: NEPI single year				
	First digit		Second digit	
	2018	2017	2018	2017
Balance Sheet*	0.176	0.114	0.297	0.206
	16	16	16	16
	0.348	0.348	0.348	0.348
	C	C	C	C
Income Statement*	0.123	0.223	0.147	0.347
	10	10	10	10
	0.440	0.440	0.440	0.440
	C	C	C	C
Combined*	0.147	0.145	0.216	0.221
	26	26	26	26
	0.273	0.273	0.273	0.273
	C	C	C	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity

Group year KS (first, second and first-two)

KS: NEPI group results			
	First digit	Second digit	First-two
	2017-2018	2017-2018	2017-2018
Balance Sheet*	0.938	0.237	0.213
	32	32	32
	0.246	0.246	0.246
	N	C	C
Income Statement*	0.950	0.197	0.181
	20	20	20
	0.311	0.311	0.311
	N	C	C
Combined*	0.942	0.201	0.138
	52	52	52
	0.193	0.193	0.193
	N	N	C

Legend
*The first row records the KS result, the second row records the number of records and the third row records the critical value.

C = Conformity, N = Nonconformity