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# Evaluation of Forensic Accounting Techniques in Fraud Prevention/Detection in the Banking Sector in Nigeria

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**Abstract** The study evaluated the application of forensic accounting techniques in preventing/detecting fraudulent practices in commercial banks in Nigeria by specifically assessing the impact of commercial data mining, ratio analysis and trend analysis techniques in fraud detection/prevention. With the aid of descriptive statistics and Ordinary Least Square (OLS) model, the result revealed the application of forensic accounting techniques significantly enhanced detection/prevention of fraud in the banking system. The study further revealed the importance of ratio analysis as well as trend analysis techniques in fraud detection/prevention. Also the study revealed the importance of commercial data mining software in fraud detection/prevention and the lack of capacity and awareness of most staff of the workings of data mining technology as well as the use of trend analysis technique in detecting/preventing fraud in the banks. It was recommended that commercial banks should mandatorily be required to acquire robust data mining software facilities as well as enhanced training on the application of data mining and its usefulness in the banking sector. Also, use of anonymous response hotlines be encouraged as well as extensive awareness put in place for the attention of the public as well as quick responses from the banks to queries.

**Keywords** Forensic accounting, Fraud, Commercial banks, Data mining

## 1. Introduction

According to Association of Certified Chartered Accountants (ACCA) & Ernst and Young (EY.) [1], the scale of financial crimes is enormous, with global estimates ranging from US\$1.4 trillion to US\$3.5 trillion annually. Underlying these trillions of dollars is criminal activities that damages human wellbeing and harms economies and societies throughout the world, Thomas & Dancey [39]. The banking sector globally plays a crucial role in economic development of any nation. In Nigeria while money supply to Gross Domestic Product (GDP) in 2018 stood at 19.63% and credit to private sector to GDP stood at 17.63%, every other sector revolves around the banking sector for credit management and so it is a critical sector in any developed or developing economies of the world. In view of the pivotal and critical role it plays in the economy, governments all over the world are keen in ensuring the sector is devoid of fraudulent manipulations and avoid the 2008 financial crisis in the US and Europe. In Nigeria because of socio-political and economic dynamics, there is a general upward trend in corrupt and fraudulent practices among the people. Nigeria has thus faced various financial crisis resulting from many

failed banks and finance houses in the last two decades. There are various advanced fee and other investment frauds perpetrated in Nigeria and that has bedevilled the Nigerian economy and the world. This is fuelled by the emerging trend where societal appeal for power, authority and recognition is strong and compelling as many believe that power, authority and recognition can be achieved through acquisition of wealth, legally or illegally. This desire for wealth is also propelled by the need to take care of personal health, education, housing, security and other services which are the primary responsibilities of governments, but which governments have failed and/or neglected to provide.

Also as stated by Ewa, Adebisi & Kankpang [9], Nigeria has thus experienced big investment frauds and trading scams that have resulted in the loss of billions of dollars from gullible people as it is alleged Nigeria's financial sector does not have efficient fraud detection mechanism and the prevailing business laws are inadequate to prosecute offenders. Globally many financial institutions collapse like Fannie Mae, Freddy Mae, Stamford Group, Leman Brothers and Northern Rock in the US and UK are attributable to fraud. These criminal vices have led to reduction or even dis-investment from Nigeria and its attendant negative consequences on economic growth is enormous as unemployment is projected to hit 33.5 per cent by 2020 and national poverty rate of 40.09 per cent, NBS [26] & Ngigi [27]. Also with the introduction of electronic banking and enhanced Information and Technology (IT) infrastructures in

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the banking sector and in Nigeria generally, there is an astronomical increase in financial crimes, mismanagement and misappropriation of funds in the government agencies and the banking sector. In 2017, the Nigerian Deposit Insurance Corporation (NDIC) reported that frauds and forgeries involved in the banking sector amounted to ₦12.01 billion.

This growing level of fraudulent activities and the negative image on the banking sector is a cause of concern for necessary mechanism or controls that will address this cancer in the system. Against this backdrop is the introduction of forensic accounting techniques in curbing fraudulent practices and easy identification of infractions in the banking system in Nigeria.

### 1.1. Statement of the Problem

As the fraudsters have over time developed and are continuously developing skills to outwit both internal and external auditors and management who are expected to superintend over the businesses, there is an urgent need to put in place mechanism to address this menace. As Wall and Fogarty [40] stated, fraud mitigation remains key in the justification for internal control implementation, auditing effect and regulatory design. Therefore there arises the need to evolve techniques to stem the tide of these fraudulent practices. In fact most of these frauds are perpetuated under the watchful eyes of both Internal and External Auditors without their knowledge interrogating a vexed question of the capacity of the auditors and the application techniques the organizations are adopting. Uncovering and fighting these fraudulent activities and illicit financial flows requires information on how, where, who owns, controls or ultimately benefits from any business involved in potentially illegal activities in the bank: namely, the beneficial owners. Could the ineffectiveness in tackling this menace therefore be as a result of the lack of application of forensic accounting techniques in banks' operations in Nigeria?

It is in the light of the above that this study attempts to evaluate the extent to which Forensic Accounting techniques can help in the prevention and detection of fraudulent activities in the banking sector in Nigeria.

### 1.2. Objectives of the Study

Anchored on fraudsters' continuous development of skills to outwit both internal and external auditors and management, this study is to evaluate the probable effect of forensic accounting techniques on fraud prevention and detection in the banking sector in Nigeria. Specifically to:

- i. Ascertain the effect of commercial data mining technique (CDM) on fraud prevention and detection in commercial banks in Nigeria.
- ii. Ascertain the effect of the application of ratio analysis technique (RAS) in fraud prevention and detection in commercial banks in Nigeria.
- iii. How the application of trend analysis technique (TRD) prevents or detects fraud in commercial banks in

Nigeria.

### 1.3. Research Question

The research question for the study is to examine to what extent can forensic accounting techniques (commercial data mining, ratio analysis and trend analysis) detect or prevent fraudulent activities in the banks in Nigeria.

- i. To what extent can the application of commercial data mining technique (CDM) prevent or detect fraud in commercial banks in Nigerian.
- ii. To what extent can the application of ratio analysis technique (CDM) prevent or detect fraud in commercial banks in Nigerian.
- iii. To what extent can the application of trend analysis technique (CDM) prevent or detect fraud in commercial banks in Nigerian.

### 1.4. Research Hypotheses

The research hypotheses are:

H<sub>01</sub>: The application of commercial data mining technique (CDM) has no significant effect on fraud prevention and detection in commercial banks in Nigerian.

H<sub>02</sub>: The application of ratio analysis (RAS) technique has no significant effect on fraud prevention and detection in commercial banks in Nigerian.

H<sub>03</sub>: The application of trend (TRD) analysis technique has no significant effect on fraud prevention and detection in commercial banks in Nigerian.

## 2. Literature Review

### 2.1. Theoretical Framework

Several attempts have been exerted on defining fraud. This is so because it evokes a visceral reaction in the society. It could be described as a trick with a purpose to obtain someone else assets. It thus involves deception, confidence and trickery. Fraud can thus be distilled into four basic elements of false representation of a material nature which is false, and or recklessly so but is believed and acted upon by the victim and the victim suffers damages resulting from his reliance thereon. This study is anchored on rational choice theory and the fraud deterrence cycle following the rational behaviour of man in satisfying his wants and the deterrence of management to stem the tide of individuals' quest for illegal acquisitions.

#### 2.1.1. Rational Choice Theories

The Rational choice theories which were developed by Marcus Felson and Lawrence Cohen (1968) (cited by Felson & Clarke in [15] are applicable to employee fraud by combining elements of classical theory as well as economic theory in explaining the criminal behaviour of individuals. Human beings from a classical perspective are considered inherently reasonable and hedonistic who rationally evaluate the possible costs and benefits of a given act (Beccaria, 1764

cited by Hollinger & Davis [17]. Ordinarily people are tempted to take decisions that will avoid pain but with maximum amount of satisfaction notwithstanding breaking the law of the land (Bentham, 1789 cited by Hollinger & Davis [17]).

### 2.1.2. Fraud Deterrence Cycle Theory

Individuals may not often make distinction between the outrageous and the fraudulent or between bad judgment and wrong doing. A systematic and rigorous approach is essential to manage transactions from the prism of deterrence, discovery, investigation and remediation, [16]. Fraud deterrence cycle according to Golden, Skalak and Clayton [16] is an interactive process with four main elements of corporate governance, transaction level controls, retrospective examination of governance and control processes and investigation and remediation of suspected or alleged problems.

### 2.1.3. Fraud Triangle

Classic fraud theory explains the reasons behind fraud as a triangle of perceived opportunity, perceived motivation and perceived rationalization. Edwin Sutherland in his book *White Collar Crime* in 1949 is credited to have coined the term and so he is seen as the initial contributor to the model. The fraud triangle theory was propounded by Cressy [7] in an attempt to understand what precipitates, inspire or motivates people to commit fraud or crime. Through extensive interview of fraudsters in prisons, he postulated that every fraud has three things in common – motivation or pressure, rationalization and opportunity to commit the crime. Fraud or crime will occur only when there is pressure of motivating factor on the fraudster. These factors may be extreme financial need, organizational action, entailed organizational rewards or punishment for individuals not meeting set targets. Notwithstanding the desire to commit fraud, without the second leg of the triangle – existence of opportunity, the fraud will not occur. There must therefore be a distinctive avenue or situation for the fraudster to gain access or control over the resources to be defrauded. These opportunity ranges from weak internal controls in the organization, absence of proper accountability and disproportionality between the perceived benefits of the fraud and the perceived costs of being detected and punished. According to the theory, although there may be pressure and opportunity to commit fraud, without rationalization fraud will not occur. Rationalization thus completes the precipitating factors that must be present for fraud to occur. Rationalization is self-justification for deviant act which involves justifying the crime under the circumstance by giving excuses why the action is necessary as perpetrators need a way to justify their actions as being acceptable or normal.

## 2.2. Conceptual Framework

### 2.2.1. Fraud and Its Classification

The word Fraud has many definitions according to the circumstance. Fraud as a crime includes all the multifarious means that man invents to get an advantage over others by false representation. Fraud as a tort in the other hand is defined as a material representation by the defendant which is false and which was not actually believed by the defendant to be true and was made with the intent to be acted upon and indeed it was acted upon innocently by the compliant to his detriment. However, to the layperson, fraud is dishonesty in the form of an intentional deception or manipulation of material facts with clear intention to deceive by coercing people to act against their own best interests for the fraudster's material gain.

Fraud may be classified according to those committed against organizations or committed on behalf of the organizations. Employee fraud is a fraud where the victim of the fraud is the organization while financial statement fraud is fraud committed on behalf of the organization by making the financials of the organization look better than they actually are. Fraud may also be classified under occupational fraud taxonomy. Occupational fraud is the use of one's position in the organization for personal enrichment through the deliberate misuse or misapplication of the organization's resources or assets. This involves use of official resources for personal benefit. This ranges from asset misappropriation, corruption and fraudulent falsification of an organization's financial statements. Occupational fraud classes include employee embezzlement, management fraud, investment scams, vendor fraud, customer fraud and miscellaneous frauds. The Association of Certified Fraud Examiners [2] defined Occupational fraud as "the use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets".

### 2.2.2. Forensic Accounting

Forensic Accounting has been defined by many scholars according to their perspective of the subject matter. Whereas Zysman [43] defined forensic accounting as the integration of accounting, auditing and investigative skills, Joshi [20] defined forensic accounting as the application of specialized knowledge and specific skill to stumble up on the evidence of economic transaction. On the application of forensic accounting while Coenan [6] opined that it involves the application of accounting concepts and techniques to legal problem, Akintoye [3], Degboro and Olofinola [8] and Singleton, Bologna, Singleton and Lindquist [38] opined that it involves with the relationship and application of financial facts to legal problems. Forensic accounting is also seen as the practice of utilizing accounting, auditing and investigative skills to assist in legal matters, Manning [22]; Murray [25]; Owojori & Asaolu [33].

As the discipline is changing in response to the growing needs of corporations, so it is being redefined as the application of financial expertise and detailed examination and analysis of financial documents and records for use as

evidence in a court of law, Howard & Sheetz [18]; Ramaswamy [34]; Sage Forensic Accounting [36] and Zysman [34].

### 2.2.3. Forensic Accounting Tools

Among the tools employed by experts in the profession to carry out investigation, detailed examination, analysis and diagnosis of financial transactions with a view to giving expert advice include; Data mining, ratio/vertical and horizontal analysis and trend analysis.

#### 2.2.3.1. Commercial Data Mining

Data mining is the application of specialized software that looks for anomalies, patterns and correlations in databases to predict outcomes. It facilitates the extraction of hidden predictive information from large databases and has great potential to assist organizations identify trends, anomalies and other unusual activities thus allowing businesses to make proactive knowledge driven decisions. Data mining software are extremely helpful in detecting fraud as it has scripting capabilities and can search organizations' databases for anomalies and suspicious patterns that are symptoms of fraud. Some of the commercial data mining software are Audit Command Language (ACL) and CaseWare IDEA.

#### 2.2.3.2. Ratio Analysis

Ratio analysis is the act of measuring the relationships among different financial statement items as well as between these items and nonfinancial data. While vertical analysis is a method of comparing elements of a financial statement with a common base item, horizontal analysis is used to understand the ratio of change in different financial statement items over a defined period. Ratio analysis as a forensic accounting technique is used to compare either on a historical basis, industry basis or against a defined benchmark. It identifies fraud therefore by examining the patterns of the data to highlight possible deceitful transactions. Vertical analysis in the other hand expresses financial statement numbers to percentages.

The technique is very useful for fraud detection because percentages are easily understood by all and sundry. When vertical analysis is applied in analysing changes in income statement, gross sales are set at 100 per cent while all other amounts are converted to a percentage of sales. Horizontal analysis focuses on changes over period. While under ratios and vertical analysis, statements are converted to numbers that are easier to understand and the numbers are compared from period to period, under horizontal analysis, the changes in amounts from period to period are converted to percentages.

#### 2.2.3.3. Trend Analysis

Trend analysis is one of the important forensic accounting techniques that can be deployed to identify frauds. Emphasis is on focusing on the transactions which are exceptional in nature. It may be difficult to identify certain transactions

from the current data but if the transactions current entries are compared with the previous year data entries they can easily be identified as fraudulent. By comparing sales and bad debts data over the years in an organization, it is easy to establish if the level of sales increases is at the same rate as bad debts increases. Under such scenario, it could be suspected that such bad debts are nothing but the product of fraudulent sales transactions or manipulations entered in the system to increase turnover. Such fraudulent manipulations could not be identified without the help of trend analysis over a defined period.

## 2.3. Empirical Review

There are numerous researches carried out on impact of forensic accounting and fraud prevention and detection both in Nigeria and globally. In examining forensic accounting and financial Crimes, Izedonmi and Ibadin [19], looking at some basic and common financial crimes in corporate organizations in Nigeria revealed the motivations for financial crimes are built around some risk factors, such as incentive (or pressure), opportunity and rationalization surrounding the financial criminals.

In the study that examined the application of forensic auditing in fraud control by analysing the trend of fraud cases, Zachariah, Masoyi, Ernest and Gabriel [41], recommended the employment of forensic auditing in Nigeria by amending the Audit Act to incorporate compulsory inclusion of forensic auditors in each audit team. In the study examining the level of forensic auditors' ability to fulfil effectiveness in detecting, investigating and preventing fraud, Njanike, Dube and Mashayanye [28] found among other constraints, lack of technical capacity by auditors, lack of necessary resource materials, and management interference on audit assignments and non-recognition of the profession.

Also on the need to enhance capacity, Okafor and Agbiogwu [29] in their study on the effect of forensic accounting skills on the management of fraud in banks in Nigeria highlighted the need to enhance accountants' skills as it aids in the discharge of their duties. However, in their study, Enofe, Omagbon and Ehigiator [12] examined the impact of forensic audit on corporate fraud and concluded that frequent utilization of forensic audit services will significantly help in detecting, preventing and reducing incidences of fraud.

Investigating the relative merits of engaging forensic accountants when drawing up an audit plan to effectively identify management fraud, Okoye and Gbegi [30] study revealed forensic accountants effectively modified the scope and nature of audit tests when the risk of management fraud was considered high by proposing special audit procedures. They recommended more training and the involvement of forensic accountants' right from the planning stage of an audit when there is suspicion of management fraud risk. In investigating how forensic accounting services can prevent and manage fraud in Microfinance banks, Bassey [5] employed litigation support and forensic investigation

services as independent proxies and the study revealed an active engagement of both litigation support and forensic investigation services by Microfinance banks drastically reducing fraud and playing a significant role in the prevention of crimes and corruption.

In examining agreement amongst stakeholders on the effectiveness of forensic accounting in the control of financial fraud, qualities of financial reports and internal control, Modugu and Anyaduba [23] adopting a survey research method revealed significant agreement among the stakeholders on the effectiveness of forensic accounting in controlling fraudulent practices, improvement in the quality of financial reports as well as improvement in the quality of internal control procedures in the organizations. On his part Ejoh [10] investigated the impact of forensic accounting application in monitoring internal controls, detection and prevention of financial fraud in Nigeria. The study which employed survey research design and enlisted 150 accountants, auditors and top management staff revealed the application of forensic accounting techniques is effective and significant in fraud detection, prevention and in monitoring and evaluating internal controls.

In investigating the role of forensic accounting in curtailing financial crimes, Enofe, Agbonkpolor and Edebiri [11] study revealed the dire need for forensic accountants in the banking sector in Nigeria as forensic accounting is an effective tool to addressing financial crimes. In its ability in combating fraudulent activities in the banking sector, Ezejiofor, Nwakoby and Okoye [14] study revealed that forensic accounting is an effective tool for handling financial crimes and ensuring corporate governance in the banking sector. Examining the relationship between fraud detection and forensic accounting services, Enofe, Okpako and Atube [13] found the application of forensic accounting services by organizations affected the level of fraud incidences in the organizations.

Investigating the effect of forensic investigation methods on corporate fraud deterrence in Nigerian Banks, Onodi, Okafor and Onyali [31] adopting a survey research design method revealed among others the existence of a significant relationship between the forensic investigative methods and corporate fraud deterrence. But examining the impact of using forensic accounting on financial corruption, Albdullah, Alfadhl, Yahya and Rabi [4] adopting survey research method to gather respondents for the research revealed existence of significant relationship between forensic accounting methods and the effectiveness of audit firms in detecting financial corruption.

In examining data mining framework for prevention and detection of financial statement fraud following the alarming proportion of reported financial statements frauds globally, Rajan and Nasib [35] proposed data mining framework for prevention and detection of fraudulent practices in financial statements whose features includes the various financial ratios measuring profitability, liquidity, safety and efficiency and also incorporating behavioural characteristics.

Surveying data mining techniques used in fraud detection and prevention, Sheela and Sandip [37] stated that data mining is a powerful tool applied by many enterprises to enhance their operations and competitive advantage. They stated that although there are studies on data mining and various data mining techniques that can be used to detect and identify different types of fraud, this study arose due to little research that synthesizes various facets of fraud that uses the data mining technique. The study thus categorized fraud into four categories management fraud, customer fraud, network fraud and computer based fraud. In the study to explore the effectiveness of data mining classification techniques in detecting firms that issue fraudulent financial statements, Kirkos, Spathis and Manolopoulos [21] investigated the usefulness of decision tree, neural networks and Bayesian Belief Networks in the identification of fraudulent financial statement and found dependency between falsification and the ratio, debt to equity, net profit to total assets, sales to total assets, working capital to total assets and Z score under Bayesian model. The decision tree model revealed falsification of financial statements with distress. Investigating detection of financial fraud using data mining techniques, Monsa [24] revealed logistic regression model tool as the leading data mining tool employed by many organizations in detecting financial fraud.

In a study on fraudulent activities and forensic accounting services of banks in Port Harcourt, Nigeria, Onuorah and Ebimobowe [32] employed a sample of (24) banks and analysed the data with the aid of least-squares, and Granger Causality. The study revealed a significant impact of forensic accounting applications on the level of fraudulent activities in the banks as forensic accounting services gives banks good mechanisms that help to detect these fraudulent activities.

### 3. Research Methodology

The study is geared towards evaluating the application of forensic accounting techniques in fraud prevention and detection in the banking sector in Nigeria. The study sampled respondents from commercial banks operating in Cross River State, Nigeria.

A survey design was adopted for the study. Its anonymity necessitated by the sensitive nature of the subject of this study allowed participants to make honest responses. The population of the study consisted of 170 senior and management staff of the 15 commercial banks branches in Cross Rivers State. They include accountants, auditors, IT specialists and economists. Using purposeful sampling, 150 out of the population of 170 were selected to participate in the study and 150 structured questionnaires were distributed. A five-point Likert scale (strongly agree – 5points, agree – 4points, undecided – 3points, disagree – 2points and strongly disagree – 1point) was used to grade the responses and logically reflect the degree of the ranking. The number of questionnaires distributed yielded 140 useful responses

which were then used in the data analyses.

Since this study is an opinionated research, the questionnaire instrument was structured to elicit responses from the research participants. The questionnaire was divided into two sections, A and B. Section A contained the demographic data of the respondents while section B contained critical belief questions that elicited responses on the impact of forensic accounting techniques in fraud prevention and detection. The instrument was designed so as to enable respondents choose from the five optional probable responses to each belief question.

### 3.1. Techniques of Data Analysis

This study examined the extent of the application of forensic accounting techniques using proxies as commercial data mining technique, ratio analysis technique and trend analysis technique in detecting and preventing fraudulent activities in the banking sector in Nigeria using multiple regression analysis. This model is suitable because the research focus is on examining the relationship between forensic accounting techniques and fraud prevention and detection in Nigerian banks. All estimations were performed using SPSS 20.0 software.

### 3.2. Model Specification

The model specification used to examine the forensic accounting techniques as the determinants of fraud prevention is specified functionally as:

Fraud prevention/detection =  $f$  (Forensic accounting technique) =  $FP = f(CDM, RAS, TRD)$

It is stated econometrically as:

$$FRP = \beta_0 + \beta_1 CDM + \beta_2 RAS + \beta_3 TRD + \mu_1$$

Where:

$\beta_0$  = Unknown Constant term to be estimated

FRP = Fraud Prevention/Detection

CDM = Commercial Data Mining Software technique

RAS = Ratio Analysis technique

TRD = Trend Analysis technique

$\mu$  = Stochastic error term

$\beta_1 - \beta_3$  = Unknown coefficients to be estimated

$\beta_0, \beta_1, \beta_2, \beta_3 \geq 0$

#### 3.2.1. A Priori Expectation

This is a theoretical statement which expresses what a probable result analysis would be. In this study, it is assumed commercial data mining technique, ratio analysis technique and trend analysis technique are to be positively related to fraud detection and prevention. The coefficients of  $\beta_1, \beta_2, \beta_3 > 0$ .

## 4. Data Presentation

### 4.1. Test of Hypotheses

**Table 2.** Descriptive statistics result on the effect of commercial data mining software (CDM), ratio analysis (RAS), and trend analysis (TRD) techniques on fraud prevention and Detection (FRP)

	Mean	Std deviation	Min	Max	Skewness	Kurtosis
CDM	27.050	5.094	20.00	33.00	0.118	-1.837
RAS	40.471	4.688	34.00	45.00	-0.271	-1.890
TRD	22.129	4.863	12.00	27.00	-0.990	-0.603
FRP	33.643	2.919	27.00	37.00	-1.019	0.029

Dependent Variable: FRP

Independent Variables: CDM, RAS, TRD

Source: Researcher's SPSS 20.0 Computation, 2020

**Table 3.** Inter correlation among the variables

	FRP	CDM	RAS	TRD	SIG
FRP	1.000	0.746	0.855	0.782	0.000
CDM	0.746	1.000	0.822	0.516	0.000
RAS	0.855	0.822	1.000	0.750	0.000
TRD	0.782	0.516	0.750	1.000	0.000

Dependent Variable: FRP

Independent Variables: CDM, RAS, TRD

Source: Researcher's SPSS 20.0 Computation, 2020

**Table 4.** Least square regression result model summary of Forensic Accounting Techniques on Fraud Prevention and Detection (Regression constant and coefficients)

Item	Unstandardized Coefficient		Standardized Coefficients		
	B	Std Error	Beta	t	Prob
Con	15.559	1.133		13.728	0.000
CDM	0.145	0.040	0.253	3.583	0.000
RAS	0.225	0.057	0.361	3.959	0.000
TRD	0.229	0.036	0.381	6.269	0.000
R	0.892				
R Square	0.796				
Adjusted R square	0.791				
F. Ratio	176.390				
Prob.	0.000				
Durbin-Watson	0.160				

Dependent Variable: FRP

Independent Variables: CDM, RAS, TRD

Source: Researcher's SPSS 20.0 Computation, 2020

#### Hypothesis 1:

$H_{O1}$ : The application of commercial data mining technique (CDM) has no significant effect on fraud prevention and detection in commercial banks in Nigerian.

$H_{A1}$ : The application of commercial data mining technique (CDM) has a significant effect on fraud prevention and detection in commercial banks in Nigerian.

**Decision rule:** accept  $H_{O1}$  if probability of t-stats is greater than 0.05 else reject  $H_{O1}$ . From our model we can see that CDM has a probability of 0.000 which is less than 0.05, therefore we reject the notion that the application of commercial data mining technique (CDM) by banks has no

significant effect on fraud prevention and detection in the commercial banks in Nigerian rather accept that, the application of commercial data mining technique (CDM) has significant effect on fraud prevention and detection in the commercial banks operations. This implies that commercial data mining technique has a significant effect in preventing or detecting fraudulent activities in the banking system in Nigerian. This is in agreement with [24,35&37].

#### *Hypothesis 2:*

$H_{O2}$ : The application of ratio analysis (RAS) technique has no significant effect on fraud prevention and detection in commercial banks in Nigerian.

$H_{A2}$ : The application of ratio analysis (RAS) technique has a significant effect on fraud prevention and detection in commercial banks in Nigerian.

*Decision rule:* accept  $H_{O2}$  if probability of t-stats is greater than 0.05 else reject  $H_{O2}$ . From our model we can see that ratio analysis technique has a probability of 0.000 which is less than 0.05. Arising from the result, the null hypothesis is rejected while the alternative hypothesis that ratio analysis technique has a significant effect on preventing and detecting fraudulent activities in the banking system in Nigeria is accepted.

#### *Hypothesis 3:*

$H_{O3}$ : The application of trend (TRD) analysis technique has no significant effect on fraud prevention and detection in commercial banks in Nigerian.

$H_{A3}$ : The application of trend (TRD) analysis technique has a significant effect on fraud prevention and detection in commercial banks in Nigerian.

*Decision rule:* accept  $H_{O3}$  if probability of t-stats is greater than 0.05 else reject  $H_{O3}$ . The model result shows a probability of 0.000 which is less than the test significance of 0.05. Arising from the result, the null hypothesis is hereby rejected while the alternate hypothesis that trend analysis technique has a significant effect in preventing and detecting fraudulent activities within the banking system is accepted.

## 5. Discussion of Findings

The descriptive statistics in Table 2 shows that the mean response for the entire commercial data mining is 27.0500 which indicated that the average responses to the nine belief statements clustered around the undecided responses. This implies their lack of awareness of the functionality of data mining technique in detecting and preventing fraudulent activities in the banks. The standard deviation of 5.09383 is an indication of the degree of dispersion of the total responses from the mean response. The maximum and minimum values are 33.00 and 20.00 respectively.

Also, the mean response for the entire ratio analysis technique sample in Table 2 is 40.4714 which translated to average response of the nine belief statements clustering between strongly agreed and agreed responses. That is most of the respondents' responses either fell under strongly

agreed or agreed. This shows the awareness of the respondents to the application of ratio analysis as forensic accounting technique that can be used in detecting and preventing fraudulent acts. The standard deviation of 4.68803 indicates the degree of dispersion of the total responses from the mean response. The maximum and minimum values are 45.00 and 34.00 respectively.

Similarly, the mean response for the entire trend analysis technique sample in Table 2 is 22.1286. This showed the average response of the six belief statements clustering between agreed and undecided responses. That is most of the respondents' where either agreeing or undecided to the belief questions. Again this implies respondents' limited awareness of the functionality of trend analysis technique in detecting and preventing fraudulent activities in the banks. The standard deviation of 4.86337 indicates the degree of dispersion of the total responses from the mean response. The maximum and minimum values are 27.00 and 12.00 respectively.

The mean response for the entire dependent variable sample in Table 2 is 33.6429. This showed the average response of the nine belief statements skewed to agreed response. Again this highlights respondents' degree of knowledge of policies in place to detecting and preventing fraudulent activities in the banks. The standard deviation of 2.91873 indicates the degree of dispersion of the total responses from the mean response. The maximum and minimum values are 37.00 and 27.00 respectively.

The Ordinary Least Squares (OLS) results presented in Table 3 revealed positive and significant relationship between the commercial data mining, ratio analysis and trend analysis and fraud prevention and detection in the banking sector. This is evidenced by their correlation coefficients of 0.746, 0.855 and 0.782 and their probability values of 0.000, 0.000 and 0.000. The result implies application of forensic accounting techniques in the operations of the banks have strong association with fraud prevention and detection in the system. This confirms the various studies on the impact of forensic accounting on fraud detection and prevention, [4,5,13,14,10,31&12].

Table 4 is the econometric linear model specified in our model equation. The result suggests that a one unit rise in data mining leads to 14.5 unit increase in fraud prevention and detection with a probability value ( $p=0.000$ ). The probability value (0.000) is less than the test significance level of  $\alpha < 0.05$ . This is in agreement with [24,35,&37]. Also one unit rise in ratio analysis technique in the banks' operations leads to 22.5 unit increase in fraud prevention and detection with also probability value ( $p=0.000$ ) which again is less than the test significance level of  $\alpha < 0.05$ . The result similarly revealed a one unit rise in in the use of forensic accounting technique of trend analysis leads to 22.9 unit increase in fraud prevention and detection commercial banks in Nigeria with a similarly probability value ( $p=0.000$ ) which is less than the test significance level of  $\alpha < 0.05$ , implying the significant effect that trend analysis which is one of the



forensic accounting techniques has on fraud prevention and detection in commercial banks operations. Likewise, the coefficient of determination (adjusted R-Square) shows that 79.1 per cent of the variation in fraud prevention and detection is attributable to the application of forensic accounting techniques proxies of data mining, ratio and trend analysis techniques by the banks while the remaining 20.9 per cent is due to other factors not included in the model. The F-ratio of 164.169 confirmed the fitness of the model to test the data. The Durbin Watson of 0.160 indicates positive autocorrelation among the variables.

The three forensic accounting techniques studied (CDM, RAS and TRD) are significant and positively related to fraud prevention and detection in the commercial banks in Nigeria with probability value ( $p = 0.000$ ) at 0.05 per cent significance level. The result reveals that everyone per cent increase in CDM, RAS and TRD will lead to 14.50 per cent, 22.50 per cent and 22.90 per cent respectively in fraud prevention and detection in the commercial banks in Nigeria.

### 5.1. Summary of Findings

This study revealed that a significant relationship exists between forensic accounting techniques application and fraud detection and prevention as the three forensic accounting techniques investigated have positive relationship between with fraud detection and prevention in commercial banks in Nigeria. The study specifically showed that data mining software is a veritable in detecting and preventing fraudulent practices in the banking sector. Also, the study highlighted the importance of ratio analysis technique as it is also a veritable tool to detect and prevent fraudulent activities in the banking operations. Thirdly, the study showed the importance of trend analysis technique in detecting and preventing fraudulent practices.

### 5.2. Conclusions

Arising from the analysis of participants' responses, many bank staff are ignorant of what data mining software is all about and so they were on the fence in their responses to the belief questions put across to them. Also from the analysis of participants' responses, there is limited awareness of trend

analysis technique as a tool that can be employed to detect or prevent fraud in the system.

### 5.3. Recommendations

In view of the observations and findings that the application of forensic accounting techniques have the potential to detect or prevent fraudulent practices in the banking system and the apparent weaknesses highlighted, we recommend as follows:

1. All commercial banks as a regulatory policy should be mandated to install robust commercial data mining software in their internal audit units and Servers across the branches. Also as the banks embraces technology, there should be human capacity building through staff training in information technology system.
2. Anonymous response hotline should be introduced in all the banks and extensive awareness put in place for the attention of the public.
3. The data mining software should incorporate features that will capture independently from the branch management instances where deposits and withdrawals from same account are made on a given date to be used in cross checking the exception reports from branches on the subject matter. Also features that will capture exception reports reflecting fraudulent transactions with unusual questionable patterns of supervisory overrides or transactions with no apparent business purposes as well as instances where accounts are either opened or closed or transactions are effected in an account in the absence of the account holder.

## Annexures

### Questionnaires Analysis

Key:

SA = Strongly Agree

A = Agree

UD = Undecided

DA = Disagree

SD = Strongly Disagree

**Table 1A.** Analysis of commercial data mining technique questionnaire

S/N	Belief statement	SA	A	UD	DA	SD
	<b>Commercial Data Mining Software</b>					
1	The bank hasn't the technique that can examine loan portfolio trends of customers by sector, age and individual		125	15		
2	The bank hasn't facility that looks for anomalies in the banks database		10	130		
3	The bank hasn't the facility that detect amount of pass due	54	68	18		
4	The bank hasn't facility to electronically compare employees telephone numbers with customers telephone numbers		69	23	21	27
5	The bank hasn't a software that reports transactions with no apparent business purpose and transactions involving unusually large amounts		69	31	29	11
6	The bank hasn't the possibility of identifying instances of journal vouchers containing only one signatory and reflecting transfers between different customers' accounts		69	30	40	1

S/N	Belief statement	SA	A	UD	DA	SD
	<b>Commercial Data Mining Software</b>					
7	The bank hasn't the possibility of identifying instances of deposits and withdrawals from the same account made on the same day or within a short period of time and not appearing on the exception reports			55	49	36
8	The bank hasn't the possibility of identifying instances of customers not present when accounts were opened and closed or when transactions were effected in their account			50	65	25
9	The bank hasn't the software that reports exception reports reflecting fraudulent transactions which exhibits unusual, atypical and otherwise questionable patterns of supervisory overrides, transactions with no apparent business purpose and transactions involving unusually large amounts			50	73	17

Source: Field survey analysis

**Table 1B.** Analysis of Ratio analysis technique questionnaire

S/N	Belief statement	SA	A	UD	DA	SD
	<b>Ratio analysis technique</b>					
1	Ratio analysis is the use of our accounting information to help us be aware of prospective problems and to compare with other industry ratios.	79	61			
2	Return on Assets (ROA) is expressed as: Net Income divided by Total Assets, Multiplied by 100. This ratio is computed in your bank to measure how management is using its assets to generate more income.	79	61			
3	Return on Equity (ROE) is expressed as: Net Income divided by average Equity, Multiplied by 100. This ratio is computed in your bank to measure how well management is using investments (shareholders fund) to generate more income.	79	61			
4	Return on Investment (ROI) is expressed as: Net Income divided by cost of investment, Multiplied by 100. This ratio is computed in your bank to evaluate the efficiency of an investment or compare the efficiency of a number of different investments.	43	57	31	9	
5	Debt-to-assets ratio is an indicator of a company financial leverage. Expressed mathematically as Total debt divided by total assets. This ratio is computed in your bank to measure total assets financed by creditors.	79	61			
6	Debt-to-equity ratio is an indicator of a company financial leverage. Expressed mathematically as Total debt divided by total equity. This ratio is computed in your bank to measure if it has more debt financing than equity financing and vice versa.	79	61			
7	Debt-to-capital ratio is an indicator of a company capital structure, financial solvency and degree of leverage. Expressed mathematically as Total debt divided by total debt plus total equity. This ratio is computed in your bank to measure total debt and financial liabilities against the total shareholders' equity.	79	61			
8	Asset-to-equity ratio is an indicator of a company financial leverage. Expressed mathematically as Total assets divided by total equity. This ratio is computed in your bank to measure the portion of the bank's assets that are financed by shareholders equity.	79	61			
9	The cash ratio compares a company's liquid assets to its current liabilities. It is the most conservative of all liquidity measurements. Expressed mathematically as Total cash and cash equivalents divided by current liabilities. Your bank uses this ratio to determine if it can meet its short-term obligations.	79	61			

Source: Field survey analysis

**Table 1C.** Analysis of Trend analysis technique questionnaire

S/N	Belief statement	SA	A	UD	DA	SD
	<b>Trend analysis technique</b>					
1	The bank has not the technique that can compare loan granted to customers categorized into principal sum, date of loan and name of approving/booking officials	41	59	23	17	
2	The bank has not the facility that has register of gratifications to staff and comparing yearly impact on staff character		105	14	21	
3	The facility enables procurement prices to be cross-checked outside monthly and BY sector.		55	64	21	
4	The facility enables effective monitoring of employees via telephones, their financial transactions and close associate		105	14	21	
5	The facility is enabled to detect all possible collusion between employees and others in business transactions		105	14	21	
6	The facility is enabled to detect loose internal controls in the bank operations	55	35	18	32	

Source: Field survey analysis

**Table 1D.** Analysis of Fraud prevention/detection questionnaire

S/N	Belief statement	SA	A	UD	DA	SD
	<b>Fraud Detection/Prevention</b>					
1	There is no policy in the bank to report all fraudulent cases to the public.					
2	There is no deliberate policy in the bank to prosecute all fraud perpetrators in court without fear of backlash					
3	Risk assessment processes under forensic accounting does specially cover risk of fraud					
4	Staff are not allowed to grant overdraft facilities to one singular customer					
5	There is no policy regulating the frequency of staff going on vacation					
6	There is no policy regulating gratification to staff from customers.					
7	There is no policy as to how long a staff spends in a given department.					
8	The banks' response hotline does not acts swiftly to anonymous tips.					
9	It is not normal for a staff to grant temporary overdraft without reporting to the head office					

Source: Field survey analysis

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