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FORENSIC ACCOUNTING TECHNIQUES AND SHADOW ECONOMY IN THE PUBLIC SECTOR OF SOUTH-WEST, NIGERIA

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Abstract
Shadow economy of every country and the society suffer greatly from corruption and other fraudulent activities, which has resulted into a global threat. Shadow economy has been the focus of ongoing discussions in literature as the reason for the current stagnation of developing economies in places like Africa, Latin America, and Asia. Based on this, the studies have shown that not many countries have integrated forensic accounting techniques in resolving the problem of shadow economy. The study therefore, examined the effect of forensic accounting technique on shadow economy in the public sector of South-West, Nigeria. The study adopted a survey research design. The population of the study comprised 395 staff working in the Anti-graft agencies and ministry and departmental agencies in South-West, Nigeria. A sample of 254 respondents was determined using the Krejcie and Morgan formula. The result of Cronbach's alpha was greater than 0.70 and the AVE was greater than 0.5, the adapted questionnaire was deemed reliable and valid to proceed for analysis. The paper used the two methods of statistics (descriptive statistics and inferential statistics) to analyse the data. Forensic accounting techniques had significant effect on shadow economy (Adj.R2 = 0.29, F (5, 220) = 19.78, $p < 0.05$). Audit quality and quality of governance significantly controlled the effect of forensic accounting techniques on shadow economy (Adj.R2 = 0.29, F (7, 218) = 14.2; $p < 0.05$). The study concluded that forensic accounting technique affected shadow economy in the public sector of the South West, Nigeria. Therefore, the study recommended that the government of South-West, Nigeria should establish forensic accounting units in the ministries and department to ensure proper monitor of their daily transactions.

Keywords: Forensic accounting techniques, public sector, Shadow economy, Fraud, Technological advancement

Introduction
Shadow economic activity is prevalent throughout the world, and studies showed that it is on the rise. Some countries attempt to reduce the shadow economy through education or harsh sanctions rather than reforms in the tax and social security systems, which could improve the dynamics of the official economy. The shadow economy is a subset of any economy in which transactions take place illegally and away from official scrutiny (Omodero, 2019). Such activities are purposefully concealed from government agencies in order to avoid paying income tax, value-added tax, or other form of taxes and social security contributions, or to avoid certain legal labor market obligations such as minimum wage, maximum working hours, and safety standards.

The shadow economy focuses on productive economic activities that would normally be included in national accounts but are not as a result of tax or regulatory burdens (Polese et al. 2022). Economic understanding of shadow economies seeks to establish a link between a given governmental framework or measure and the response of economic and business actors. As stated by the International Monetary Fund (IMF) estimates from 2018, the American shadow economy reached $1 trillion, accounting for approximately 8% of GDP (GDP).

However, by 2013, shadow economic expenditures had reached an estimated $2 trillion, owing primarily to the long-term effects of the 2008 financial crisis and the resulting contraction of the formal economy. According to the findings of a 2018 International Monetary Fund study in progress, which examined the shadow economic activity of 158 countries from 1991 to 2015, America's shadow economy is relatively flat in comparison to most other nations.

One of the most common threats to the global economy has been financial crime and fraudulent activity. The economy of every country and the society there suffer greatly from corruption and other fraudulent activities, which seem to be a global threat. It has been the focus of ongoing discussions in literature as the reason for the current stagnation of developing economies in places like Africa, Latin America, and Asia.

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Most intellectual discourse regards economic and financial crimes as one of the core issues plaguing Nigeria's economy and having a detrimental effect on the country's ability to grow economically and develop as a whole. The widespread and pervasive nature of these crimes in public areas is the bane of the Nigerian economy's sluggish development. From the financial sector to the health and education sectors, as well as the public service, there is not a single aspect or sector of the economy that is not affected by this threat. Government spending is big business, and the public wants to know if the large sums of money are being spent wisely for the public good. As a result, forensic accounting techniques are required to determine the level of value received from government massive spending (Clement & Comfort, 2018).

The forensic accounting literature and shadow economy not only represents a great variety of perspectives but also covers a wide range of questions, problems and issues to be solved. Despite the importance and breadth of forensic accounting technique, little research has been carried out on forensic accounting technique and shadow economy. The objective of the paper is to synthesize the volume of empirical analysis and identify the gaps in the study. Also, the research investigated the effect of forensic accounting technique on shadow economy in the Nigeria public sector using south-west as a case study.

Literature Review

Conceptual Review

Shadow Economy

Borlea, Achim, and Miron (2017) referred to shadow economy as a harmful undertaking that jointly undermine democratic governance, legal framework, and economic advancement. Greenidge (2009) defines the shadow economy as "economic activity that does not appear in national income or GDP statistics" (GDP). This definition assumes that, while illegal activity is included in the hidden economy, many legal activities may also be included. Thus, someone who earns extra money working in his spare time but does not report it is said to be involved in the underground economy. The ethical judgments of various societies and governments are brought to bear in defining the shadow economy.

Forensic Accounting Technique

Forensic accounting as defined by Oyedokun, (2017) is a scientific accounting method for uncovering, analyzing, resolving, and preventing fraud and white-collar crime matters in a way that produces admissible evidence capable of proving or disproving facts issue suitable for a court of law. Forensic accounting is a rapidly expanding field of accounting that describes the engagement that occurs as a result of an actual or anticipated dispute or litigation. It conducts any type of investigation by utilizing accounting, auditing, and investigative skills (Abdulrahman, 2019; Ogundana, Okere, Ogunleye & Oladapo, 2018). It is the action of identifying, recording, settling, extracting, sorting, reporting, and verifying past financial data or other accounting activities in order to settle current or prospective legal disputes, or the use of such past financial data in order to settle legal disputes in the future (Oyedokun, 2018). The importance of forensic accounting in detecting fraud cannot be overstated, and Nigeria is no exception. Similarly, forensic accounting is a scientific accounting method of uncovering, resolving, analyzing, and presenting fraud and related matters in a legal manner (Oyedokun, 2018). Forensic accounting (also known as investigative accounting or fraud auditing) is a combination of forensic science and accounting. Due to this, forensic accounting technique is measured using litigation support service, investigative accounting, expert witness, data mining, and fraud investigation

Theoretical Review

This study investigated forensic accounting technique on shadow economy using the white-collar crime theory or the social conflict theory. The study was supported by white collar theory, and forensic accounting was supported by fraud diamond theory. The theories focused on fraud in the integration of shadow economy, and the theories were developed as a technique to assist and evaluate accounting tools towards the conventional methodology of investigating fraud. The differences between each of these theories open gaps in the literature and framework for forensic accounting techniques in investigating shadow economy and tracking the financing routine of terrorists and terrorists' activities. The study described the fundamentals and expectations of forensic accounting techniques and shadow economy. According to the theory, if forensic accounting techniques were used by investigators to gather, preserve, and present evidence during court proceedings and the prosecutors and judges handed down just punishment to the accused, it would have served as a deterrent to others, bringing down the shadow economy to a manageable minimum.

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Empirical Review

Shadow economy was used an independent variable with different variables such as foreign direct investment, environmental pollution, environmental degradation, among others variables. Ajide, Dada and Olowookere (2022) worked on shadow economy and foreign direct investment using Nigerian manufacturing industry. The study was analyzed ARDL and NARDL estimation techniques between the period 1975 to 2017. The study discovered an increase in shadow economy reduces FDI net inflow in the short run while this relationship turns to be positive in the long run. This result persists after using NARDL to re-estimate the model. Negative and positive changes in the size of shadow economy have negative and significant effects on FDI in the short run, while in the long run both changes have positive effects on FDI in the sector. Younas, Qureshi, and Al-Faryan, (2022) worked on financial inclusion, shadow economy and economic growth in the developing countries using the dataset between the period 2008 to 2017. The study was analyzed using panel OLS fixed effect, two step difference generalized method of moments, and panel granger causality approach. The study concluded that financial inclusion positively and statistically significant impact on economic growth while in developing economies, the size of the shadow economy has a significant negative impact on economic growth.

Some researchers used shadow economy has an independent variable and they include Dada, Ajide, and Adeiza (2022) studied shadow economy and environmental pollution using the role of institutions in West Africa countries. The study used two step system generalized method of moments and revealed that shadow economy, corruption control, and law and order which contribute significantly to environmental pollution while bureaucratic quality though not significant, reduces environmental pollution in the region. Further, the interactive effect of shadow economy with all the institutional indicators shows that strong institutional indicators abate environmental pollution through reduction in the presence of shadow economy. Lu, Ullah, and Younas (2022) worked on re-evaluating the dynamic role of shadow economy and environmental policy stringency using the energy-growth nexus in China. The study used a secondary data for the period 1993 to 2019 as well as adopting Asymmetric ARDL to discover that the positive shocks in shadow economy and environmental policy stringency significantly. However, the negative shocks in shadow economy exert positive and significant impacts on energy consumption and economic growth in the long run, but magnitudes are small compared to positive shocks.

Şenhaz et al. (2021) examined the dynamic impact of SE and pollution on energy stock prices for the case of OECD. Results from GMM estimation showed significant links among the variables. Further results showed a negative impact of carbon dioxide (CO2) emissions on energy stock prices. A U-shaped relation is also documented for the OECD countries. The study of Baloch et al. (2022) contributed to the debate by studying the case of Pakistan in relation to SE and environmental pollution over the period 1966–2008. Using ARDL, dynamic OLS, and fully modified OLS techniques, the results showed that SE boosts CO2 emission. Using fixed effects-instrumental variables GMM approach, they document that informal sector size impacts environmental quality significantly. The study of Baklouti and Boujelbene (2020) examined the effect of corruption and shadow economy on growth. Using GMM as an estimation technique, corruption increases the size of shadow economy and further leads to a reduction in economic growth in 34 OECD countries. Additional results reveal that the size of shadow economy magnified the impact of corruption on growth. Nguyen and Luong (2020) examined the relationship between corruption and SE with growth in selected 17 Asian countries. Employing GMM on panel data over the period 2000–2015 from World Bank and Transparency International, the results showed that corruption has a significant impact on growth while shadow economy hurts growth.

Ewa et al. (2020) used descriptive statistics and ordinary least square regression model to explain how application of forensic accounting technique preventing/detecting fraudulent practice in commercial data mining, ratio analysis and trend analysis technique in fraud detection. Their study showed that importance of commercial data mining technique, ratio analysis and trend analysis technique in fraud detection. Abdulraham (2019) used secondary source or content analysis to examine forensic accounting and fraud prevention using the Nigerian public sector. The study found significant positive influence which exists between forensic accounting technique and fraud prevention. Medina, Jonelis, and Mehmet (2017) used the light intensity approach and the Predictive Mean Matching (PMM) method to estimate the size of Sub-Saharan Africa's informal economy. The study discovered evidence that the informal economy ranged from 20% to 25% in Mauritius, South Africa, and Namibia, while it ranged from 50% to 65% in Benin, Tanzania, and Nigeria. This study backs up the IMF's (2017) claim that the shadow economy accounts for up to 65 percent of Nigeria's nominal GDP.

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Other studies used another dependent variable, fraud detection with the independent variable is Edheku et al. (2020) who studied the impact of forensic accounting and fraud detection using public and private sectors in Nigeria. The study used descriptive survey design and discovered that accounting officers in the private and public sectors strongly agreed that forensic accounting has an impact on fraud detection. Adrian et al. (2020) focused on the exhibit the several statistical and data mining techniques analyzed using descriptive analysis and extensive literature review. The study discovered that forensic accountant's prerogative to choose the appropriate methods and tools according to the nature of the investigation, its complexity, and its purpose, as some of them proved to be more useful than others. Bingilar et al. (2021) used fraud detection and prevention in Nigerian banks. The study also used forensic audit to measure fraud detection and prevention in Nigeria. The study discovered that forensic auditing has an insignificant impact on expected losses generated through fraud activities in Nigeria.

Omodero, (2019) studied the impact of shadow economy using the transaction approach and the MIMIC approach, which assisted in determining the size of the shadow economy as a percentage of GDP and the government's tax revenue losses from 1991 to 2018. The study used OLS method to discover that tax revenue earned has a significant positive impact on economic growth, whereas tax revenue lost has a significant negative impact on GDP. Nmesirionye and Ihendinihu (2016) investigate the impact of unrealized tax revenue from shadow economic activities on Nige-economic ria's growth. Data on macroeconomics (time series) from 1980 to 2013. The findings also confirm that there is a significant causal link between the size of the underground economy and total unrealized tax revenue, with variations in the size of underground economic activities accounting for approximately 85.7 percent of the changes in annual tax revenue losses. Guillermo and Deyvi (2018) used a panel data set of OECD members and Latin American countries from 1995 to 2016 to examine the impact of the shadow economy on tax revenues and economic growth using a MIMIC approach and the GMM. The study found that the informal economy reduced the amount of tax revenue collected by the government in both Latin American and OECD countries.

Nchor, Adamec, and Kolman (2016) used the MIMIC model and data set from 1983 to 2011 to compare the size of shadow economies in Ghana, Nigeria, and the United Kingdom. According to the findings, the size of the shadow economy in Ghana, Nigeria, and the United Kingdom was 36.73 percent, 47.75 percent, and 15.05 percent, respectively. The study also discovered that unemployment was a common cause of the shadow economy in all countries. Medina and Schneider (2018) expanded their study on the shadow economy to include 158 countries at random from 1991 to 2015. Currency Demand Approach (CDA) and Multiple Indicators Multiple Causes (MIMIC) in a structured hybrid-model based estimation procedure were used in the study. The study set out to determine the average size of the shadow economy in each of the 158 countries chosen at random.

However, there is a gap in the area of how forensic accounting techniques could be applied to ensure that shadow economy in the public sector of South-West, Nigeria are reduced to bare minimum. The paper main goal is to bridge this gap by empirically investigating how the government is prepared to give anti-graft agencies full support and ensure that institutions are stronger that individuals.

Methodology

Utilizing a survey research design to explain the effect of forensic accounting technique on shadow economy in the public sector of South-West, Nigeria is an important aspect of this study. To achieve this research study, a total population of 395 staff were calculated from the ministries and departmental agencies. 160 staff were gathered from the office of Auditor General of the States, 150 staff from the office of Accountant General of the States, 45 staff from the office of the Economic and financial crimes commission, and 40 staff from the independent and corrupt practice and other related offenses commission.

A sample size was determined from the 395 population of the selected organisation using the Krejcie and Morgan (1970) sample size determination. The calculation is as thus:

$$S = X^2 NP\,(1-P) \div d^2\,(N-1) + X^2 P\,(1-P)$$

$$s = \frac{X^2\,NP\,(1\text{-P})}{d^2\,(\text{N-1}) + X^2\,P\,(1\text{-P})}$$

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Where:
S = Required Sample size.
X^2 = Z value (e.g.1.96 for 95% confidence level) the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).
N = Population Size (assumed to be 0.5or 50%).
P = The population proportion (assumed to be 0.50 since this would provide the maximum sample size).
D = the degree of accuracy expressed as a proportion (0.05). It is a margin of error.

$$s = \frac{X^2 NP\,(1\text{-}P)}{d^2\,(N\text{-}1) + X^2 P\,(1\text{-}P)}$$

$$s = \frac{1.96^2 * 395 * 0.5\,(1\text{-}0.5)}{0.05^2\,(395\text{-}1) + 1.96^2 * 0.5(1\text{-}0.5)}$$

$$s = 194.99$$
$$= 195$$

The expected number of samples to be taken for this study is 195. However, to compensate for non-response probability; 30% of the sample is added to it to increase the sample base suggested by (Israel, 2009)

Therefore 30% of 195 = 59
Then the appropriate sample size is given as
s = 195 + 59 = 254
s = 254.

Consequently, the sample size for the study was 254.

Office of Auditor General of the States = $\frac{160}{395} * 254 = 102.87 \approx 103$

Office of Accountant General of the States = $\frac{150}{395} * 254 = 96.46 \approx 96$

Economic and Financial Crimes Commission = $\frac{45}{395} * 254 = 28.94 \approx 29$

Independent and Corrupt Practice and Other Related Offenses Commission =

$$\frac{40}{395} * 254 = 25.72 \approx 26$$

In total, the sample size is given as calculated as thus:

$$103 + 96 + 29 + 26 = 254$$

Hence, 254 copies of the questionnaire will administer randomly to selected respondents.

A structured questionnaire designed of two hundred and fifty-four (254) copies were distributed among the five selected organisations using a simple random sampling technique. Before proceed with the analysis, 15% of the total sample size were selected for reliability and validity test of instrument. The validity and the reliability test were tested using Cronbach's alpha and AVE test. The result of Cronbach's alpha was greater than 0.70 and the AVE was greater than 0.5, the adapted questionnaire was deemed reliable and valid to proceed for analysis.

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Thus, the paper used the two methods of statistics (descriptive and inferential method of analysis) to investigate the effect of forensic accounting technique on shadow economy in the Nigeria public sector. Following the main objective, the hypotheses are stated as thus:

$H_0$1: *There is no significant effect between forensic accounting techniques and shadow economy in the public sector of South West, Nigeria;*

$H_0$2: *Audit quality and quality of governance do not have a controlling effect on the relationship between forensic accounting technique and shadow economy in the public sector of South West, Nigeria;*

As shown in Figure 1 below, the study used forensic accounting technique as an independent variable or the explanatory variable and its proxy include litigation support service, investigative accounting, expert witness, data mining and fraud investigation while the dependent variable is shadow economy. Also, the Audit quality and quality of governance are used as control variables.

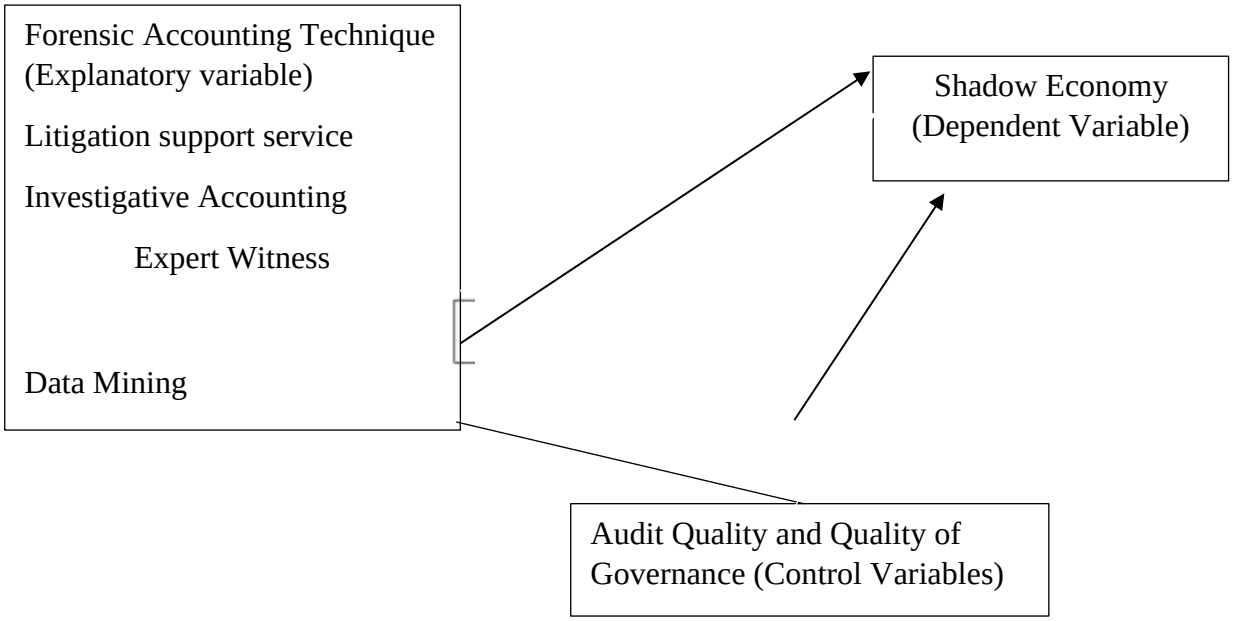

Figure 1: Authors' Conceptual Model, 2023

Data Analysis, Results and Discussion of Findings

The study adopted the descriptive statistics include mean, standard deviation, minimum, and maximum with the number of observations. The study also used multiple linear regression analysis (inferential method of statistics) which tested the developed hypothesis o forensic accounting technique and financial crime in the public sector of Nigeria using Southwest as a case study. From the study, the total retrieved and used correctly for the research work is 226 (89 percent) from a sample size of 256 copies of questionnaire distributed among the staff of the five selected organisations.

Table 1: Summary Statistics

	Minimum	Maximum	Mean		Std. Deviation	Skewness
	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
SE	2.00	5.00	4.3009	.03803	.57170	-.253
LSS	1.00	5.00	3.8938	.04099	.61627	-.508
IA	2.00	5.00	4.2788	.03952	.59419	-.306
EW	3.00	5.00	4.2832	.03599	.54109	.082

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DM	2.00	5.00	4.0973	.04342	.65272	-.487
FI	3.00	5.00	4.0929	.03290	.49463	.203
AQ	1.00	5.00	4.1549	.03804	.57186	-.576
QOG	2.40	5.00	4.0628	.03260	.49002	-.308

Where SE indicates Shadow economy, LSS – Litigation support services, IA – investigative accounting, EW – expert witness, DM – data mining, FI – Fraud investigation, AQ – Audit quality, QOC – quality of governance.
Source: Author's Computation, 2023; data from Field Survey
Number of Observations: 226

The first proxy of forensic accounting technique is LSS which has the mean of 3.8938 with the minimum value and maximum value of 1.000 and 5.000 respectively. The standard deviation of 0.61627. The value of -0.508 for skewness showed that the data are fairly symmetrical. The value of the mean falls with the minimum and the maximum value. IA has the mean value of 4.2788, the minimum value of 2.000 and the maximum value of 5.000. The standard deviation of 0.59419 and it indicated that there is a wide spread of data.

On the aspect of the skewness, the value of the skewness value is -0.306 which indicated the data are highly skewed. On the other hand, expert witness has the mean value of 4.2832 with the standard deviation of 0.54109, showing that there is a widespread of the data. DM has the mean value of 4.0973 with the standard deviation of 0.65272, and the last proxy was FI, which has the mean value of 4.0929 and the standard deviation of 0.49463.

On the control variable, the audit quality has the mean value of 4.1549 showing the minimum value of 1.000 and the maximum value of 5.000. The mean value falls within the minimum value and the maximum value. Also, the standard deviation of 0.57186, indicating there is a wide spread of data. The skewness value of -0.576 showed that the data are moderately skewed. The quality of governance has the mean value of 4.0628 with the standard deviation of 0.49002, indicating that there is a wide spread of dataset.

Table 2: Correlation and Multicollinearity Analysis

	Correlation Test						**Multicollinearity Test**	
	LSS	IA	EW	DM	FI	AQ	VIF	1/VIF
LSS	1.000						1.361	0.735
IA	.300**	1.000					1.403	0.713
EW	.304**	.389**	1.000				1.546	0.647
DM	.280**	.468**	.463**	1.000			1.590	0.629
FI	.251**	.229**	.333**	.330**	1.000		1.269	0.788
AQ	.324**	.317**	.274**	.364**	.342**	1.000	1.338	0.748
QOG	.470**	.318**	.489**	.425**	.346**	.374**	1.683	0.594

Where SE indicates Shadow economy, LSS – Litigation support services, IA – investigative accounting, EW – expert witness, DM – data mining, FI – Fraud investigation, AQ – Audit quality, QOC – quality of governance.
Source: Author's Computation, 2023; data from Field Survey

The result displayed in Table 2 above is shown that a weak positive relationship between all the proxies of forensic accounting technique. This indicated that the value of the correlation is not greater than 0.75, as indicated by Baltagi, (2012). Hence, there is no problem of multicollinearity as the variables are independence of each other. The result of the multicollinearity test is also tested by variance inflation factor and tolerance level. From the result of the VIF, if the VIF is less than 10, it indicates there is problem of multicollinearity test. The result of the tolerance level is less than 1, also proving there is problem of multicollinearity. Hence, a need to proceed with the multicollinearity test.

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Inferential Analysis

The study examined the effect of forensic accounting technique on shadow economy in the public sector of South West, Nigeria. Hypothesis three is the main model for forensic accounting technique and shadow economy while hypothesis four used control variable of audit quality and quality of governance to study the effect of forensic accounting technique and shadow economy. From the result of the analysis, model 1 shows that IA, EW and DM significantly affect shadow economy while LSS and FI revealed an insignificant effect on shadow economy in the public sector of South West, Nigeria. These results further show that all the proxies of forensic accounting technique show positive effect on shadow economy.

Model 1 (Without Control Variables)

$$SE = \beta_o + \beta_1 LSS_i + \beta_2 IA_i + \beta_3 EW_i + \beta_4 DM_i + \beta_5 FI_i + u_i \quad \text{..... (1)}$$

$$SE = 1.331 + 0.023LSS_1 + 0.290IA_2 + 0.241EW_3 + 0.133DM_4 + 0.016FI_5$$

Model 2 (With Control Variables)

$$SE = \beta_o + \beta_1 LSS_i + \beta_2 IA_i + \beta_3 EW_i + \beta_4 DM_i + \beta_5 FI_i + \beta_6 AQ_i + \beta_7 QOG_i + u_i \quad \text{..... (2)}$$

$$SE = 1.379 + 0.038LSS_1 + 0.288IA_2 + 0.260EW_3 + 0.139DM_4 + 0.0220FI_5 + 0.023AQ_6 - 0.079QOG_7$$

Table 3: Forensic Accounting Technique and Shadow Economy

	Without Control Variables				**With Control Variables**			
Variable	Coeff	Std. Err	T-Stat	Prob	Coeff	Std. Err	T-Stat	Prob
Constant	1.331	.351	3.793	.000	1.379	.369	3.738	.000
LSS	.023	.057	.400	.689	.038	.061	.622	.535
IA	.290	.063	4.578	.000	.288	.064	4.504	.000
EW	.241	.071	3.412	.001	.260	.074	3.521	.001
DM	.133	.060	2.199	.029	.139	.062	2.239	.026
FI	.016	.071	.229	.819	.020	.073	.275	.783
AQ					.023	.065	.361	.718
QOG					-.079	.085	-.924	.356
Adj R^2	0.294				0.291			
F-Stat (Prob)	19.782 (0.000)				14.190 (0.000)			

Where SE indicates Shadow economy, LSS – Litigation support services, IA – investigative accounting, EW – expert witness, DM – data mining, FI – Fraud investigation, AQ – Audit quality, QOC – quality of governance.
Source: Author's Computation, 2023; data from Field Survey

Dependent Variable: Shadow Economy

This indicates that as LSS, IA, EW, DM, and FI increase, the effect of shadow economy also increases. A unit increases in LSS, IA, EW, DM and FI will also result in an increase in shadow economy. 1unit increase in LSS will have positive effect of 0.023 on Shadow economy, while the t-statistics is 0.400, the P-Value as 0.689 shows that LSS has no significant effect on Shadow economy. 1 unit increase in IA will lead to 0.290 positive effect on Shadow economy with the t-statistics 4.578, the P-value of 0.000 reflects that IA has Significant effect on Shadow economy. 1 unit increase in EW will have positive effect of 0.241 on Shadow economy, while the t-statistics is 3.412, the P-Value as 0.001 shows that EW has significant effect on Shadow economy. 1unit increase in DM will lead to 0.133 positive effect on Shadow economy with the t-statistics 2.199, the P-value of 0.029 reflects that DM has Significant effect on Shadow economy. 1unit increase in FI will lead to 0.016 positive effect on Shadow economy with the t-statistics 0.229, the P-value of 0.819 reflects that FI has no Significant effect on Shadow economy.

The equation 2 was controlled by audit quality and quality of governance in relation with the effect of forensic accounting technique and shadow economy in the public sector of South West, Nigeria. The model 2 showed

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consistency result with IA, EW, and DM. This indicates that IA, EW, and DM showed significant effect on shadow economy in the public sector of South West, Nigeria. Other proxies which are insignificant include LSS and FI. The study found positive effect between LSS, FI and SE. Meanwhile, AQ and QOG insignificantly affect SE. It was also revealed that AQ shows positive effect on SE and QOG reveals negative effect on SE. Thus, the result displays that a unit increase in IA, EW, LSS, FI, AQ and DM result a positive increase in SE while a unit increase in QOG results to a decrease in SE in the public sector of South West, Nigeria.

The adjusted R^2 of forensic accounting technique and shadow economy reveal the change in shadow economy caused by the joint effect of forensic accounting technique. Model 1 having adjusted R^2 value 0.294 meant that only 29.4% variations of shadow economy (SE) in the public sector of South West, Nigeria is attributed to the collective interactions of all the independent variables (i.e. all Forensic Accounting Techniques (FATs) proxies) used in that model. Model 2 having adjusted R^2 value 0.291 meant that only 29.1% variations on shadow economy (SE) in the public sector of South West, Nigeria is attributed to the collective interactions of all the independent variables (Forensic Accounting Techniques (FATs) proxies) in the model, even when controlled by Audit Quality (AQ) and Quality of Governance (QOG). The comparison of the R^2 and adjusted R^2 implies that there is good fit of the model since it has positive adjusted r square value.

The individual significance of the proxies of forensic accounting technique in model 1 and 4 is displayed in the regression result of model two. In model 1, IA, EW, and DM are significant at 5% with the p-value of 0.000; 0.001, and 0.029 respectively. All other proxies of forensic accounting technique (LSS and FI) were insignificant on shadow economy with the p-value of 0.689 and 0.819 respectively. In model 2, IA, EW, and DM found a consistency result at 5% level of significance with p-value 0.000,0.001, and 0.026 respectively, while LSS and FI insignificantly affect the shadow economy and the p-value of 0.535, and 0.783 respectively obtained is greater than 5% level of significance.

On the other hand, F-statistics measures the combined significance of all the proxies of forensic accounting technique on shadow economy (SE) in the public sector of South West, Nigeria. The F-statistics value for model 1 and model 2 showed 19.782 and 14.190 respectively. The significance of these F-statistics values, depicted by their corresponding p-values were 0.000 and 0.000 respectively, which are less than the 5%, showed that the combined proxies of Forensic Accounting Techniques (FATs) in model 1 (without the control variables) and model 2 (with the control variables) have a significant effect on shadow economy (SE) in the public sector of South West, Nigeria.

Decision – Without Control Variables
At a level of Significance 0.05, the F-Statistics is 19.782 while the P-Value of the F-Statistics is 0.000 which is less than 0.05 adopted level of Significance. Therefore, the study rejected the null hypothesis which mean that Forensic accounting techniques have significant effect on Shadow economy in the public Sector of South west, Nigeria.

Decision – With Control Variables
At a level of Significance 0.05, the F-Statistics is 14,190 while the P-Value if the F-Statistics is 0.000 which is less than 0.05 adopted level of Significance. The study therefore rejected the null hypothesis which means that Audit quality and quality of governance have significant controlling on the relationship between forensic accounting technique and Shadow economy in the public sector of South West, Nigeria.

Discussion of Findings

The findings revealed that IA, EW, and DM significantly affect shadow economy in the public sector in South West, Nigeria for model 1 and 2. The study for model 1 and 2 showed that an increase in IA, EW, and DM result to an increase in shadow economy in the public sector, Nigeria. Other variables include LS and FI which are consistent and insignificant with shadow economy in the public sector of South West, Nigeria. The study, thus, showed that all the proxies of forensic accounting technique include one of the control variable (AQ) showed positive effect on shadow economy while QOC showed a negative insignificant effect on shadow economy in the public sector of South West, Nigeria. From the result of the analysis, it was revealed that model 1 and model 2 showed good fit since the value obtained were positive. Meanwhile, out of the two models, model 1 is better than model 2 since it has the highest adjusted r square of 0.294.

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The result further showed that the null hypothesis of model 1 and 2 were rejected at p-value < 0.05 (5%) significance level. These results were consistent with the findings of Younas et al (2022) which concluded that financial inclusion positively and statistically significant impact on economic growth while in developing economies, the size of the shadow economy has a significant negative impact on economic growth. Ullah and Younas (2022) found positive and significant impacts on energy consumption and economic growth. Other researchers such as Baklouti and Boujelbene (2020) examined the effect of corruption and shadow economy on growth. Nguyen and Luong (2020) showed that corruption has a significant impact on growth. Abdulraham (2019) found significant positive influence which exists between forensic accounting technique and fraud prevention. The research of Baklouti and Boujelbene (2020) also showed that there is an effect of shadow economy and pollution on energy stock prices for the case of OECD which is in corroboration with the research findings, indicating that forensic accounting technique has significant effect on shadow economy in the public sector, Nigeria. The study of Abdulraham (2019) discovered that forensic accounting had a significant on fraud prevention using the Nigeria public sector.

Contrary to the findings of forensic accounting technique and shadow economy, Guillermo and Deyvi (2018) found that the informal economy reduced the amount of tax revenue collected by the government in both Latin American and OECD countries. Bingilar et al. (2021) discovered that forensic auditing has an insignificant impact on expected losses generated through fraud activities in Nigeria. Nguyen and Luong (2020) showed that shadow economy hurts growths.

Guillermo and Deyvi (2018) was not in line with the research findings of the study. The study discovered that informal economy reduced the amount of tax revenue collected by the government in both Latin American and OECD countries. Bingilar et al. (2021) discovered that forensic auditing has an insignificant impact on expected losses generated through fraud activities in Nigeria.

Conclusion and Recommendations

The research considered forensic accounting technique as an independent variable using the proxies such as litigation support service, investigative accounting, expert witness, data mining technique, and fraud investigation. The dependent variable is measured using shadow economy. Using the variables, different research objectives, research questions, and research hypotheses were formulated. The objectives formulated were analyzed using descriptive and inferential method of data analysis. The decision for rejection of the null hypothesis is that the probability value must be less than 0.05 (p-value < 0.05). The hypothesis investigated the effect of forensic accounting technique on shadow economy in the public sector of the South West, Nigeria. The study rejected the null hypothesis and concluded that forensic accounting technique has a significant effect on shadow economy in the public sector of the South West, Nigeria. It was recommended that government must ensure that the public sector maintain an ethical workplace culture, strong internal controls system, and can prevent employees from committing fraud that goes undetected. Also, government must implement policies that ensure crucial control measure that has grown in significance in the modern technological world is cybersecurity.

Contribution to Further Studies

This paper has explained the in-depth examination of the effect of forensic accounting techniques on shadow economy in the public sector of South-West, Nigerian. It has added to the existing literature. The paper has established that developed countries use forensic accounting techniques to successfully prevent shadow economy. This research has laid the groundwork for a significant reduction in shadow economy in the Nigeria public sector. The study is, however, limited to the Public Sector of South-West, Nigeria only and a certain department. The study can be extended to other departments and most especially the private sector.

The study lends credence to earlier works done in related area of study thereby contributing significantly to literature and knowledge by considered Forensic accounting techniques in combating shadow economy in the public sector of South-West, Nigeria:

To the Forensic Accountant: The two models developed are predictive, and have given directions to Forensic accounting on the future resolution on Shadow economy. Its domesticated qualitative survey approach to expand literature with influence on Nigeria geographical economic background, and largely made the result significant input to dialogue on the Nigeria domestic economic climate.

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