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A Study of Factors That Influencing the External Audit Process Using the Cohen's Kappa Regression Model (Survey of a Sample of Employees in the Iraqi Ministry of Oil)

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Abstract: Nonparametric measures of agreement and association are essential statistical tools for assessing the relationship between two variables, especially with small sample sizes or when there is no prior knowledge of the population's distribution. The Cohen-Kappa statistic is considered one of the most important nonparametric tests for measuring agreement and association between two variables. This statistic approximates the z-distribution, which is then used to test hypotheses about Cohen-Kappa. Diagnosing the relationships among multiple Cohen-Kappa coefficients is crucial for understanding how variables are connected under the influence of a metric covariate. Therefore, researchers have used regression techniques to analyze relationships among several variables using Cohen-Kappa coefficients. In this study, the Cohen-Kappa regression method was applied to identify key factors affecting internal auditing processes, using data from internal auditors working within the organizational units of the Iraqi Ministry of Oil. The Kappa regression model was analyzed, and its parameters were estimated using both the Maximum Likelihood Estimation (MLE) method and Ridge Regression. The findings indicate the superiority of the Ridge Regression approach in analyzing the factors affecting internal auditing quality.

Keywords: Cohen's Kappa; Regression Model; External Audit Process; Ridge Regression.

1. Introduction

Tests of association and agreement are of great importance in determining the relationship between two factors or variables. Cohen-Kappa is among the most important measures used to assess the relationship between two quantitative or categorical variables, and it is sometimes applied when one of the variables is measured on a nominal scale rather than a quantitative scale. In some cases, the researcher—or the nature of the study—may require the examination of relationships among multiple Cohen-Kappa statistics, particularly when samples are numerous, and the effects of sample type or sampling location become apparent. In such situations, researchers have employed various statistical tests to assess the homogeneity of a set of Cohen-Kappa statistics, given their significance in highlighting the effect of a specific factor or variable relative to others. In certain instances, the influence of this variable emerges across different samples rather than within a single sample.

2. Research Problem and Importance

The importance of this research stems from the significant role of internal auditing for companies and institutions in general, and the Ministry of Oil in particular. Internal auditing plays a fundamental role in determining the quality of institutional management, its commitment, and its actual participation in managing state institutions. The internal auditing process is affected by several factors, including professional competence, administrative support, coordination with external auditors, and so on. This research examines the factors that affect the internal auditing process, using regression and nonparametric methods. This is because the samples obtained from auditors in state institutions are small, so it is preferable to use a nonparametric method for analysis, as the data consist of nominal or descriptive data. Therefore, the correlation and homogeneity method is usually used, and the Cohen-Kappa coefficient was chosen because it is one of the most accurate nonparametric measurement tools. Here, the problem of sampling arises, as it becomes more difficult to correlate Cohen-Kappa coefficients across different samples. Therefore, the regression method was used to identify the relationship between a set of Cohen-Kappa coefficients and the most important factors directly affecting the internal auditing process.

3. Research Methodology

The research involves a series of fundamental steps. It starts by defining the Cohen-Kappa coefficient and its significance in non-parametric statistical analysis. The study then explores the theoretical process of linking or analyzing a set of Cohen-Kappa coefficients. Next, it examines the use of regression to analyze these coefficients, applying various regression models and estimating their parameters using different methods. The research also identifies the methods used to compare different approaches for estimating the parameters of a Cohen-Kappa regression model and selects the most effective method. Moving to practical application, the study begins with simulating real data. Data similar to actual data were generated, and regression models were applied to this simulated data to identify the best estimation method. Finally, the research involves selecting samples; four groups of external auditors from the Ministry of Oil's departments across four Iraqi governorates were chosen. These samples were collected via a direct questionnaire identifying seven key factors affecting internal audit processes. The researcher then presents the conclusions and recommendations.

4. Cohen-Kappa Factor

The first idea for the Kappa test dates back to Galton in 1892. Cohen (1960) published the pioneering research that introduced the modern Cohen-Kappa, a test used to measure the homogeneity of evaluation (2x2 harmonic tables) of qualitative data. It is generally considered a more accurate measure than simply calculating the concordance ratio, as κ (Cohen-Kappa factor) takes into account the probability of concordance occurring by chance. There is some debate surrounding the Cohen-Kappa due to the difficulty in interpreting concordance indices. Some researchers have suggested that assessing the variance between variables is theoretically simpler. The Cohen-Kappa test is based on the following harmonic table, which represents the concordance of responses to a two-choice evaluation (Feinstein et al., 1990).

	Yes	*No*	*Summation*
Yes	ρ_{00}	ρ_{01}	$\boldsymbol{\rho_{0.}}$
No	ρ_{10}	ρ_{11}	$\boldsymbol{\rho_{1.}}$
Summation	$\rho_{.0}$	$\rho_{.1}$	$\boldsymbol{\rho_{..}}$

The Cohen-Kappa coefficient has the following formula:

$$\boldsymbol{k} = \frac{2(\rho_{11}-\rho_{1.}\rho_{.1})}{\rho_{1.}+\rho_{.1}-2\rho_{1.}\rho_{.1}} \qquad \ldots (1)$$

The Cohen-Kappa coefficient ranges from zero to one, and in rare cases, it can take a negative value. The closer its value is to one, the stronger the relationship between the two factors or variables in the concordance table. This test was approximated to the z-distribution as follows:

$$z \frac{k}{Se(k)} \qquad \ldots(2)$$

$$se(k) = \sqrt{\frac{1}{n\left(1-\frac{\rho_{0.}}{n^2}\right)}\left[\frac{\rho_{0.}\rho_{.0}+\rho_{1.}\rho_{1.}}{n^2} + \left(1-\frac{\rho_{0.}}{n^2}\right)^2 - \sum_{i=0}^{1}\frac{1}{n^3}\ (\rho_{i.}\rho_{i.}(\rho_{.i}+\rho_{.i})\right]} \qquad \ldots(3)$$

5- Several Cohen-Kappa Factors Analysis

The process of analyzing several independent Cohen-Kappa factors is very important in determining the relationships that bring together the variables under study in light of the presence of a standard variable (pivot preference) that helps in forming several compatibility tables for the same variable with the number of samples under study (Feinstein, et al., 1990), as in the following table which shows the presence of 3 samples under study with a size of 10 for each sample under the assumption of a certain preference for all samples.

Table (1) Analysis of several coefficients of Cohen-Kappa

No	*Sample 1*		*Sample 2*		*Sample 3*	
	X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}
1	0	1	0	1	1	0
2	0	0	1	1	1	0
3	1	0	0	0	1	1
4	0	0	1	0	0	0
5	1	1	1	1	1	0
6	1	1	0	1	0	1
7	0	0	1	0	0	1
8	1	1	0	1	0	0
9	0	1	0	0	1	0
10	0	1	0	1	0	0

Where X here represents the preferences relative to a standard (pivotal) preference for all binary questions of the questionnaire form, and therefore the three compatibility tables resulting from Table 1 are in the following form (Basu et al., 2000).

Table (2) Independent combination tables for three samples

	k(1)				k(2)				k(3)		
	Yes	No	Sum		Yes	No	Sum		Yes	No	Sum
Yes	3	3	6	Yes	2	4	6	Yes	3	2	5
No	1	3	4	No	2	2	4	No	4	1	5
Sum	4	6	10	Sum	4	6	10	Sum	7	3	10

The general formula for the Cohen-Kappa coefficient to represent m of the samples is as follows (Fleiss et al., 2013).

$$k_j = \frac{2(\rho_{11j} - \rho_{1.j}\rho_{.1j})}{\rho_{1.j} + \rho_{.1j} - 2\rho_{1.j}\rho_{.1j}} \qquad j = 1, 2, \ldots, m \qquad \ldots(4)$$

Applying a polynomial distribution to the four cells of any concordance table, we can express the maximum probability function of the table within the sample as follows (Yang et al., 2015).

$$L_j(\rho_{11j}, \rho_{1.j}, \rho_{.1j}) = \frac{n!}{\prod n_{abj}} \rho_{11j}{}^{n_{11j}} (\rho_{.1j} - \rho_{11j})^{n_{10j}} (\rho_{1.j} - \rho_{11j})^{n_{01j}} (1 - \rho_{.1j} - \rho_{1.j} + \rho_{11j})^{n_{00j}} \qquad \ldots(5)$$

Here, the existence of countable data was assumed through the values of a and b, where $n_{abj} = \sum_{i=1}^{n} I(X_{1ij} = a, X_{2ij} = b)$. To formulate independence, it is possible to introduce a multivariable structure by identifying all common probabilities across the available observations (McKenzie et al., 1996). Accordingly, the maximum probability distribution function for representing m from the harmonic tables is as follows.

$$L = \prod_{j=1}^{m} L_j(\rho_{11j}, \rho_{1.j}, \rho_{.1j}) \qquad \ldots(6)$$

.

6- Cohen-Kappa Regression Model

The Cohen-Kappa regression model was developed by (Lipsitz, et al., 2001) and is based on analyzing k from the independent Cohen-Kappa coefficients. It is considered an important application of Bayesian regression and was presented in the following form (Feuerman* et al., 2005), where k represents the vector of Cohen-Kappa coefficients.

$$k_{ij} = W_{ij}\beta \quad i = 1, 2, \ldots, n \quad j = 1, 2, \ldots, m \qquad \ldots(7)$$

Where

$$W = \begin{bmatrix} Se(k_1) & 0 & \dots & 0 \\ 0 & Se(k_2) & 0 & 0 \\ \vdots & 0 & \ddots & 0 \\ 0 & 0 & 0 & Se(k_m) \end{bmatrix} \quad \dots(8)$$

$$se(k_j) = \sqrt{\frac{1}{n\left(1-\frac{\rho_{0.}}{n^2}\right)}\left[\frac{\rho_{0.j}\rho_{.0j}+\rho_{1.j}\rho_{1.j}}{n^2} + \left(1-\frac{\rho_{0.j}}{n^2}\right)^2 - \sum_{i=0}^{1}\frac{1}{n^3}\ \left(\rho_{i.j}\rho_{i.j}\left(\rho_{.ij}+\rho_{.ij}\right)\right)\right]} \quad \dots(9)$$

Where $\boldsymbol{\beta}$ represents the regression parameters vector $\boldsymbol{\beta}' = \{\boldsymbol{\beta}_1, \boldsymbol{\beta}_2, \dots, \boldsymbol{\beta}_m\}$,which can be estimated using classical estimation methods (Kass et al., 1995).

7- Estimating the parameters of the Cohen-Kappa regression model

Two methods were chosen for estimation. The first is the maximum likelihood method, considered a classical method, which takes the following form (Donner et al., 2000).

$$\widehat{\boldsymbol{\beta}}_{ML} = (\boldsymbol{W}'\boldsymbol{W})^{-1}\boldsymbol{W}'\boldsymbol{k} \quad \dots(10)$$

The second method, the character regression method, was chosen, which can lead to improved performance of maximum potential estimators and is given by the following formula.

$$\widehat{\boldsymbol{\beta}}_{RR} = (\boldsymbol{W}'\boldsymbol{W} + \boldsymbol{\lambda I})^{-1}\boldsymbol{W}'\boldsymbol{k} \quad \dots(11)$$

Where $\boldsymbol{\lambda}$ represents the character parameter, where $\boldsymbol{0} < \boldsymbol{\lambda} < \boldsymbol{1}$, and here values for this parameter have been assumed to be between zero and one.

Here, data were generated using MATLAB for three experiments. In the first experiment, there were 2 samples with a size of 4 preferences (4 preferences in the questionnaire form) and a sample size of 6. It was assumed that the Cohen-Kappa coefficient vector was in the following form:

$\boldsymbol{k} = [\boldsymbol{0.3\ 0.5\ \ 0.5\ \ 0.6}]$

The second experiment had 3 samples with a size of 6 preferences (6 preferences in the questionnaire form) and a sample size of 6. It was assumed that the Cohen-Kappa coefficient vector was in the following form:

$\boldsymbol{k} = [\boldsymbol{0.4\ 0.4\ 0.6\ 0.6\ 0.8\ 0.8}]$

Two values for the character parameter, $\boldsymbol{\lambda} = \boldsymbol{0.25}\ , \boldsymbol{0.75}$, were assumed for all experiments. The comparison between the estimation methods will be performed using the Mean Squared Error (MSE) criterion, which has the following formula:

$$MSE = \frac{\sum_{j=1}^{m}(\hat{k}_j - k_j)^2}{m} \quad \ldots(12)$$

The data (0,1) were generated using MATLAB software according to the following algorithm and based on assumed K values.

```
% with 0 <= P <=1
RBS = rand(1,N) < P
% will give roughly a proportion of P ones among N values

% exactly M ones among N values
RBS = false(1,N) ;
RBS(1:M) = true ;
RBS = RBS(randperm(numel(RBS)
```

Table (3) Data for the first experiment

k	No	Sample 1		Sample 2		k	No	Sample 1		Sample 2	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}			X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}
	1	1	1	0	1		1	0	1	0	1
	2	0	0	1	1		2	0	0	1	1
0.3	3	1	1	0	0	0.5	3	1	1	0	0
	4	1	0	1	0		4	1	0	1	0
	5	1	0	0	1		5	1	0	0	1
	6	1	1	0	1		6	1	1	0	1
k	No	Sample 1		Sample 2		k	No	Sample 1		Sample 2	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}			X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}
	1	0	0	1	0		1	1	1	1	1
	2	1	0	0	1		2	1	1	0	0
0.5	3	1	0	0	0	0.6	3	1	0	1	0
	4	0	1	1	0		4	0	1	0	1
	5	0	1	0	1		5	0	0	1	1
	6	0	0	1	0		6	0	0	0	0

Table (4) Results of the first experiment

Method	MSE
MLE	0.6321
Ridge Regression 0.25	0.2109
Ridge Regression 0.75	0.4637

Based on the data and analysis of the first experiment, the Ridge Regression method is superior when the value of the character parameter is 0.25, followed by the same method when the value of the character parameter is 0.75, and finally by the maximum likelihood method.

Table (5) Data for the second experiment

k	No	Sample 1		Sample 2		Sample 3		k	No	Sample 1		Sample 2		Sample 3	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}			X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}
	1	1	1	0	1	1	1		1	0	1	0	1	0	1
	2	1	0	1	1	0	0		2	0	0	1	1	0	0
0.4	3	1	0	0	1	0	0	0.4	3	1	0	0	0	1	0
	4	1	1	0	0	1	1		4	0	0	1	0	0	1
	5	1	1	0	0	0	1		5	1	1	0	1	0	0
	6	1	1	0	1	0	0		6	1	1	0	1	0	1
k	**No**	**Sample 1**		**Sample 2**		**Sample 3**		**k**	**No**	**Sample 1**		**Sample 2**		Sample 3	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}			X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}
	1	0	1	0	1	0	0		1	1	1	1	1	0	0
	2	1	0	0	1	1	0		2	0	0	0	0	1	1
0.6	3	0	1	0	0	0	1	0.6	3	0	1	1	0	0	0
	4	0	0	0	1	0	0		4	0	0	0	1	1	0
	5	0	1	1	0	1	0		5	0	1	0	1	0	1
	6	0	0	1	0	0	1		6	1	0	1	0	0	0
k	**No**	**Sample 1**		**Sample 2**		**Sample 3**		**k**	**No**	**Sample 1**		**Sample 2**		Sample 3	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}			X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}
	1	0	1	0	0	0	1		1	0	0	0	0	0	0
	2	0	0	0	1	1	0		2	1	0	0	1	1	1
0.8	3	1	1	0	0	0	0	0.8	3	0	1	0	0	0	0
	4	0	0	0	1	0	1		4	0	0	0	1	0	1
	5	0	1	1	0	1	1		5	1	1	1	0	1	0
	6	0	0	1	1	0	0		6	0	0	1	0	1	0

Table (6) Results of the second experiment

Method	MSE
MLE	**0.6042**
Ridge Regression 0.25	**0.3143**
Ridge Regression 0.75	**0.3498**

Data and analysis of the second experiment show that the Ridge Regression method performs best when the character parameter is 0.25, followed by the same method at 0.75, and then the maximum likelihood method.

Table (7) Data for the third experiment

k	N	Sample 1		Sample 2		Sample 3		Sample 4		k	N	Sample 1		Sample 2		Sample 3		Sample 4	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}	X_{1i4}	X_{2i4}			X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}	X_{1i3}	X_{2i3}
	1	0	1	0	1	1	1	0	0		1	0	1	0	1	0	1	1	1
	2	1	0	0	1	0	0	1	1		2	0	0	1	0	0	0	0	0
0.5	3	0	1	0	0	1	0	1	0	0.5	3	1	0	0	1	0	0	1	0
	4	0	1	1	0	1	0	0	1		4	1	1	0	1	1	0	0	1
	5	1	0	0	1	0	1	0	0		5	0	0	1	0	0	1	0	0
	6	1	1	1	0	0	0	1	0		6	1	0	1	0	0	0	1	0
k	N	Sample 1		Sample 2		Sample 4		Sample 4		k	N	Sample 1		Sample 2		Sample 4		Sample 4	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}	X_{1i4}	X_{2i4}			X_{2i4}	X_{2i4}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}	X_{2i4}	X_{2i4}
	1	0	1	0	1	0	0	0	0		1	1	0	0	1	0	0	1	0
	2	1	0	0	0	1	0	1	1		2	0	1	0	0	1	0	0	1
0.7	3	0	0	0	1	0	1	0	0	0.7	3	0	0	1	0	1	1	0	0
	4	0	1	0	0	1	0	1	0		4	1	0	0	1	0	0	1	0
	5	0	1	1	0	1	0	0	1		5	1	1	0	1	1	0	0	1
	6	0	0	1	0	0	1	0	0		6	0	0	1	0	0	0	0	0
k	N	Sample 1		Sample 2		Sample 3		Sample 4		k	N	Sample 1		Sample 2		Sample 3		Sample 4	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}	X_{1i4}	X_{2i4}			X_{2i4}	X_{2i4}	X_{1i2}	X_{2i2}	X_{1i3}	X_{2i3}	X_{2i4}	X_{2i4}
	1	0	1	1	0	0	0	1	0		1	0	0	0	0	0	0	0	0
	2	0	0	0	1	0	0	0	1		2	0	1	0	0	1	0	1	1
0.8	3	1	1	0	0	1	1	0	0	0.8	3	0	0	1	0	0	1	0	0
	4	0	1	1	0	1	0	1	0		4	1	0	1	1	0	1	0	0
	5	0	0	0	1	0	0	1	0		5	1	1	0	0	0	0	1	1
	6	0	0	0	1	1	0	0	1		6	0	0	1	0	1	0	0	0
k	N	Sample 1		Sample 2		Sample 3		Sample 4		k	N	Sample 1		Sample 2		Sample 3		Sample 4	
		X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i2}	X_{2i2}	X_{1i4}	X_{2i4}			X_{1i1}	X_{2i1}	X_{1i2}	X_{2i2}	X_{1i2}	X_{2i2}	X_{1i4}	X_{2i4}
	1	1	1	0	0	1	0	0	0		1	0	1	1	0	0	0	1	0
	2	0	0	1	0	0	1	1	1		2	1	0	0	1	0	0	0	1
0.9	3	0	0	1	1	0	1	0	0	0.9	3	0	1	0	0	1	1	0	0
	4	1	1	0	0	1	0	1	0		4	0	1	1	0	1	0	0	0
	5	1	0	1	0	0	1	0	1		5	1	0	0	1	0	0	1	0
	6	0	1	1	0	0	1	0	0		6	1	0	0	1	1	0	0	1

Table (8) Results of the third experiment

Method	MSE
MLE	0.7001
Ridge Regression 0.25	0.3263
Ridge Regression 0.75	0.3523

Through the data and analysis of the third experiment, it becomes clear that the Ridge Regression method is superior when the value of the character parameter is 0.25, followed by the same method when the value of the character parameter is 0.75, and finally the maximum likelihood method.

8- Real Data

The actual data, representing the results of a questionnaire on factors (preferences) affecting the performance of the internal audit process for a group of auditors from various departments within the Ministry of Oil, were obtained using the questionnaire form attached at the end of the research. Four samples were collected from four different governorates (Baghdad, Wasit, Dhi-Qar, and Basrah), with a sample size of 15 each. The questionnaire included seven data preferences, which are also included at the end of the research. Seven factors affecting the internal audit process were selected:

1- Professional Competence: This includes the knowledge, skills, and experience necessary to perform the internal auditor's job effectively.

2- Managerial Support: This includes the availability of support from senior management to the internal auditor, enabling them to perform their job effectively.

3- Experience and Skills: This includes the practical experience and technical and analytical skills possessed by the internal auditor.

4- Professional Standards: This includes compliance with international standards for the professional practice of internal auditing.

5- Coordination with External Auditors: This includes cooperation and coordination between the internal auditor and external auditors to ensure comprehensive audit coverage.

6- Environmental Factors: This includes the size of the organization, the nature of the work, and the availability of resources.

7- Organizational Factors: This includes organizational structures, procedures, and policies that affect the work of the internal auditor.

The mean squared error value was calculated using the following formula.

$$\boldsymbol{MSE} = \frac{\sum_{j=1}^{m}(\hat{k}_j - \bar{k}_j)^2}{m} \qquad \ldots(13)$$

Where $\bar{k}_j$ represents the calculated Cohen-Kappa coefficient from the data for each preference, the results were as follows:

Table (11) Analysis of real data

Method	MSE	$\hat{k}$	Method	MSE	$\hat{k}$	Method	MSE	$\hat{k}$
MLE	0.5453	0.58	Ridge Regression 0.25	0.2987	0.44	Ridge Regression 0.75	0.4476	0.43
		0.88			0.89			0.90
		0.89			0.94			0.93
		0.11			0.71			0.21
		0.88			0.87			0.90
		0.41			0.33			0.30
		0.10			0.12			0.18

9- Conclusions

Based on Table (11) and observing the estimated Cohen-Kappa coefficients for the three estimation methods, the following conclusions were drawn:

1- There is a strong correlation and impact of administrative support, experience, and skills, and coordination with external auditors working with the Iraqi Ministry of Oil's formations on the internal audit process.

2- There is a reasonable correlation and impact of the internal auditor's professional competence on the internal audit process within the Iraqi Ministry of Oil's formations.

3- There is a weak correlation and impact of professional standards, organizational factors, and environmental factors on the internal audit process.

The researcher recommends adopting non-parametric statistical analysis methods in evaluating audit and control performance within the Iraqi Ministry of Oil's formations. The researcher also recommends expanding the study of preferences among broader segments of Iraqi Ministry of Oil employees in general, utilizing correlation coefficients and other statistics, and broadening the selection of statistical models to study the audit and control process within companies operating within the Iraqi Ministry of Oil.

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Data

Baghdad														
j = 1														
N	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}
1	1	0	4	0	1	7	1	1	10	1	0	13	1	1
2	0	1	5	0	0	8	1	0	11	0	0	14	0	0
3	1	1	6	1	0	9	0	0	12	1	1	15	0	1
j = 2														
N	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}
1	1	0	4	1	0	7	1	0	10	1	0	13	1	1
2	0	1	5	1	0	8	0	0	11	0	1	14	1	0
3	1	0	6	1	0	9	1	0	12	1	0	15	1	1
j = 3														

N	X_{1i3}	X_{2i3}	***N***	X_{1i3}	X_{2i3}	***N***	X_{1i3}	X_{2i3}	***N***	X_{1i3}	X_{2i3}	***N***	X_{1i3}	X_{2i3}
1	0	0	4	0	1	7	0	1	10	1	0	13	0	1
2	0	1	5	1	0	8	0	0	11	0	1	14	1	0
3	0	0	6	0	1	9	0	1	12	1	1	15	0	1

j = 4

N	X_{1i4}	X_{2i4}	***N***	X_{1i4}	X_{2i4}	***N***	X_{1i4}	X_{2i4}	***N***	X_{1i4}	X_{2i4}	***N***	X_{1i4}	X_{2i4}
1	0	1	4	1	1	7	1	1	10	0	0	13	0	0
2	0	0	5	0	0	8	1	0	11	1	0	14	0	0
3	0	1	6	0	1	9	0	0	12	0	1	15	0	1

j = 5

N	X_{1i5}	X_{2i5}	***N***	X_{1i5}	X_{2i5}	***N***	X_{1i5}	X_{2i5}	***N***	X_{1i5}	X_{2i5}	***N***	X_{1i5}	X_{2i5}
1	0	1	4	0	1	7	0	1	10	0	0	13	1	0
2	1	0	5	0	1	8	1	1	11	0	1	14	0	1
3	1	0	6	1	1	9	0	0	12	0	1	15	0	1

j = 6

N	X_{1i6}	X_{2i6}	***N***	X_{1i6}	X_{2i6}	***N***	X_{1i6}	X_{2i6}	***N***	X_{1i6}	X_{2i6}	***N***	X_{1i6}	X_{2i6}
1	0	0	4	1	1	7	0	1	10	1	0	13	1	1
2	0	1	5	0	1	8	0	0	11	0	0	14	1	1
3	1	0	6	1	0	9	0	0	12	0	1	15	0	1

j = 7

N	X_{1i7}	X_{2i7}	***N***	X_{1i7}	X_{2i7}	***N***	X_{1i7}	X_{2i7}	***N***	X_{1i7}	X_{2i7}	***N***	X_{1i7}	X_{2i7}
1	1	0	4	1	0	7	1	0	10	1	0	13	1	1
0	0	1	5	1	0	8	0	0	11	0	1	14	1	0
1	1	0	6	1	0	9	1	0	12	1	0	15	1	1

Dhi Qar

j = 1

N	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}	***N***	X_{1i1}	X_{2i1}
1	0	0	4	0	1	7	0	0	10	1	0	13	0	1
2	0	1	5	0	0	8	0	1	11	0	0	14	0	0
3	0	0	6	0	1	9	0	1	12	1	1	15	0	1

j = 2

N	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}	***N***	X_{1i2}	X_{2i2}
1	0	1	4	1	1	7	0	1	10	0	0	13	0	1
2	1	1	5	0	1	8	1	1	11	0	1	14	1	1
3	0	1	6	0	1	9	0	0	12	1	1	15	0	1

j = 3

N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}
1	1	0	4	0	0	7	0	0	10	1	0	13	0	0
2	0	0	5	0	0	8	1	0	11	0	0	14	1	0
3	1	1	6	1	0	9	0	0	12	1	1	15	0	1

j = 4

N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}
1	0	1	4	1	1	7	0	1	10	0	0	13	0	1
2	1	1	5	0	1	8	1	1	11	0	1	14	1	1
3	0	1	6	0	1	9	0	0	12	1	1	15	0	1

j = 5

N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}
1	0	1	4	0	1	7	0	1	10	0	1	13	0	1
2	0	1	5	1	0	8	0	1	11	0	1	14	1	0
3	1	0	6	0	1	9	1	0	12	0	1	15	0	1

j = 6

N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}
1	0	0	4	0	0	7	0	1	10	0	0	13	1	1
2	0	0	5	0	1	8	0	0	11	1	0	14	0	0
3	1	0	6	1	0	9	1	0	12	0	0	15	0	1

j = 7

N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}
1	1	0	4	0	0	7	0	0	10	1	0	13	0	0
2	0	0	5	0	0	8	1	0	11	0	0	14	1	0
3	1	1	6	1	0	9	0	0	12	1	1	15	0	1

Wasit

j = 1

N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}
1	1	0	4	1	0	7	1	0	10	1	0	13	1	0
2	1	0	5	0	1	8	0	1	11	1	0	14	1	0
3	0	1	6	0	1	9	1	0	12	0	1	15	1	1

j = 2

N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}
1	1	1	4	0	1	7	1	0	10	1	0	13	0	1
2	1	0	5	1	0	8	1	0	11	1	1	14	1	0

3	1	1	6	0	1	9	1	0	12	1	0	15	0	1

j = 3

N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}
1	0	0	4	1	1	7	1	1	10	1	1	13	0	1
2	1	1	5	1	0	8	0	1	11	0	0	14	1	1
3	0	0	6	1	1	9	0	1	12	1	1	15	0	1

j = 4

N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}
1	0	1	4	1	1	7	1	0	10	0	0	13	0	1
2	1	0	5	1	0	8	0	1	11	1	0	14	1	0
3	0	1	6	0	1	9	1	0	12	1	1	15	0	1

j = 5

N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}
1	1	1	4	1	1	7	0	1	10	1	1	13	1	1
2	0	0	5	1	0	8	1	1	11	0	1	14	0	0
3	1	1	6	0	1	9	0	0	12	0	1	15	1	1

j = 6

N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}
1	0	0	4	0	0	7	0	0	10	0	1	13	0	0
2	1	0	5	0	0	8	1	0	11	1	0	14	1	0
3	0	0	6	1	0	9	1	0	12	0	0	15	0	1

j = 7

N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}
1	1	0	4	0	0	7	0	0	10	1	0	13	0	0
2	0	0	5	0	0	8	1	0	11	0	0	14	1	0
3	1	1	6	1	0	9	0	0	12	1	1	15	0	1

Basrah

j = 1

N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}	N	X_{1i1}	X_{2i1}
1	1	1	4	1	0	7	1	0	10	1	1	13	1	0
2	0	0	5	1	1	8	1	1	11	0	0	14	1	1
3	0	1	6	0	1	9	0	0	12	1	1	15	1	1

j = 2

N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}	N	X_{1i2}	X_{2i2}
1	1	0	4	1	0	7	1	0	10	1	0	13	0	1
2	1	1	5	1	0	8	1	0	11	1	0	14	1	0
3	1	1	6	0	1	9	1	1	12	1	0	15	1	1

j = 3

N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}	N	X_{1i3}	X_{2i3}
1	1	0	4	1	1	7	1	1	10	1	0	13	1	0
2	1	1	5	1	0	8	0	1	11	0	1	14	0	1
3	0	0	6	0	1	9	1	0	12	1	1	15	1	0

j = 4

N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}	N	X_{1i4}	X_{2i4}
1	0	0	4	0	0	7	1	0	10	0	0	13	0	0
2	1	0	5	1	0	8	0	0	11	1	0	14	1	0
3	0	1	6	0	1	9	1	0	12	0	0	15	0	1

j = 5

N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}	N	X_{1i5}	X_{2i5}
1	0	1	4	0	1	7	0	1	10	1	1	13	1	1
2	1	1	5	1	0	8	0	1	11	0	1	14	0	1
3	1	1	6	0	1	9	1	1	12	1	1	15	1	1

j = 6

N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}	N	X_{1i6}	X_{2i6}
1	1	0	4	1	0	7	0	0	10	1	0	13	0	0
2	1	0	5	0	0	8	1	0	11	1	0	14	1	0
3	1	0	6	1	0	9	1	0	12	1	0	15	1	1

j = 7

N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}	N	X_{1i7}	X_{2i7}
1	1	0	4	0	0	7	1	0	10	1	0	13	1	0
2	1	1	5	1	0	8	1	0	11	1	0	14	1	1
3	1	0	6	1	1	9	0	0	12	1	1	15	0	1

Questionnaire form

Questionnaire form on factors affecting the internal audit process for auditors working with the Iraqi Ministry of Oil formations

Age		
Less than 30	45-30	60-45
Years of Service		
Less than 10 years	20-10	35-20
Academic Qualification		
Bachelor's Degree	Master's Degree	PhD

Do you believe that the internal auditing process is carried out with a high level of quality within the Iraqi Ministry of Oil institutions?

Yes	No
Questions	

1	Do you believe that the auditor's professional competence and academic qualifications affect the internal auditing process?	
	Yes	No
2	Do you believe that administrative support for the auditor affects the internal auditing process?	
	Yes	No
3	Do you believe that experience and skills influence the internal audit process?	
	Yes	No
4	Do you believe that professional standards influence the internal audit process?	
	Yes	No
5	Do you believe that coordination with external auditors affects the internal audit process?	
	Yes	No
6	Do you believe that environmental factors influence the internal audit process?	
	Yes	No
7	Do you believe that organizational factors affect the quality of the internal audit process?	
	Yes	No