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THE EFFECT OF INTEGRATION BETWEEN ARTIFICIAL INTELLIGENCE AND ELECTRONIC AUDITING TECHNIQUES IN ENHANCING THE EFFICIENCY OF FINANCIAL HEDGING TOOLS – AN EXPLORATORY STUDY

Allawi Shahad Dahham

Al-Qasim Green University, College of Biotechnology, Iraq

Email: allawi83@uoqasim.edu.iq

Ilham Abdulhussein

Al-Qasim Green University, Iraq

Email: ilham@uoqasim.edu.iq

Ridha Mohanad Al-Salman

Al-Furat Al-Awsat Technical University, Iraq

Email: rida.ghazi.cku@atu.edu.iq

Abstract. This research aims to identify the impact of the application of artificial intelligence (AI) and electronic auditing techniques as independent variables on the effectiveness of the use of financial hedging tools as a dependent variable in the Iraqi economic environment. The theoretical framework of the study was developed through a deductive approach while the field survey approach was based on a questionnaire and was inductive in nature to achieve the objectives of the study. The number of questionnaires distributed to the target groups was 120 questionnaires. The number of returned questionnaires was 105 questionnaires, which formed the final valid sample for statistical analysis in three companies listed on the Iraq Stock Exchange. Statistical analysis was based on SPSS statistical software outputs to obtain arithmetic means, standard deviations, test multiple linear regression model and one-way analysis of variance (ANOVA). The results showed a positive correlation and a statistically significant and strong impact of the technological and supervisory integration on improving the efficiency of financial hedging tools, with the explanatory power of the estimated regression model reaching 76.5%. The study developed a set of recommendations, most importantly, the need to develop flexible governance guidelines on financial technologies, allocate independent budgets to develop electronic infrastructure and update academic curricula at universities to meet the requirements of the electronic economy.

Keywords: Artificial Intelligence, Electronic Auditing Techniques, Financial Hedging Tools

Introduction

Today's business climate is one of rapid change and structural transformation, with a very difficult working environment for economic units, with dramatic swings in exchange values, interest rates and commodity prices. These swings are compelling financial management to do more and more to preserve its assets and obligations against deterioration. It is pushing it to utilise complex financial engineering instruments called derivatives and hedging mechanisms. But these instruments bring their own complicated operational, credit and legal risks and, therefore, the auditing profession must change its methodologies to keep pace with these intricate systems and to mitigate financial reporting risks. The application of Artificial Intelligence techniques and continuous electronic audit looks to be an important doorway to improve the quality of the audit and to activate real-time control mechanisms.

This challenge becomes a very essential regulatory feature in Iraq as the Central Bank of Iraq compels the financial units to adhere to the regulatory standards, risk management controls, financial transparency and guarantees for the financial position stability of the economic units. Traditional audit procedures focused on post-auditing and restricted statistical sampling expand the expectation gap and are incapable of identifying manipulation in complex systems. This emphasises the need for studying the influence of the integration of artificial intelligence with electronic auditing techniques on the effectiveness of financial hedging instruments.

Methods

Research Problem

Sharp and continual variations in currency values, interest rates and commodity prices cause economic entities to operate in a highly complicated environment in the conditions of globalisation and global economic openness. This puts increasing demand on financial managements to safeguard their assets and liabilities. That is the reason why economic agents resort to sophisticated financial engineering techniques called derivatives and financial hedging. These tools subject users to a variety of operational, legal and credit risk. Financial statement fraud is a small percentage of total fraud cases, but causes significant losses averaging \$766,000 per incident, demanding high precision and highly effective control mechanisms, according to global reports from the Association of Certified Fraud Examiners (ACFE).

Traditional auditing mechanisms – based on post-examination and limited statistical sampling – are contributing to a widening expectation gap between what the auditor provides and what financial statement users expect. Moreover, these mechanisms are not strong in complex environments to detect manipulations. The low efficiency of the control and audit tools can lead to severe regulatory fines that can affect the liquidity and the continuity of the economic units

The research raises the pivotal question of what is the impact of integrating Artificial Intelligence and electronic auditing techniques in improving the efficiency of financial hedging tools for economic units listed on the Iraq Stock Exchange? In addition to the main question, a number of sub-questions are generated:

1. How well are electronic auditing techniques and computer assisted audit software understood and used in Iraq?
2. What is the impact of standard artificial intelligence algorithms on the accuracy of market risk prediction and optimal hedging ratios in the continuous auditing processes?
3. Do technological and supervisory integration contribute to reducing the operational costs linked to hedging transactions and minimizing human errors?
4. Are there statistically significant differences in the opinions of the study sample on the effectiveness of financial hedging tools according to the different economic sectors (Banking vs. Industrial)?

Importance of the Research

1. Contributes to the accounting and financial literature by establishing the link among Artificial Intelligence, electronic auditing and financial hedging tools in a modern and integrated research framework.

2. Explains the importance of the integration of smart technologies and electronic auditing in enhancing the efficiency of financial risk management and improving the effectiveness of hedging tools.
3. It constitutes a useful scientific contribution for researchers, because it deals with a subject that combines accounting and technological aspects, thus opening the way for future studies on electronic auditing and risk management.
4. Assists bank management, economic units and decision-makers in the Central Bank of Iraq in developing intelligent control systems based on early warning and rapid response to risks.
5. Improves the quality of financial reporting, the reliability of accounting information and compliance with regulatory standards, thus decreasing losses and fines and promoting financial stability.

Objectives of the Research

1. The notion of Artificial Intelligence and its importance in the creation of electronic methods of auditing in economic units.
2. To clarify the effect of application of electronic auditing techniques in increasing the efficiency of financial risk management associated with hedging tools.
3. To study the relationship between electronic auditing and the improvement of the quality of controls over complex financial transactions.
4. To measure the extent to which smart technologies contribute in reducing financial errors and manipulations, and increasing report reliability.
5. To provide a set of proposals that can help economic units to adopt more effective control tools dynamically responding to risks.

Research Hypotheses

The research is based on the following hypotheses:

1. First Sub-Hypothesis (H1): There is a statistically significant effect of using Artificial Intelligence at a significance level of ($\alpha \leq 0.05$) on developing and improving the efficiency of electronic auditing techniques.
2. Second Sub-Hypothesis (H2): There is a statistically significant effect of using Artificial Intelligence at a significance level of ($\alpha \leq 0.05$) on improving the efficiency of financial hedging tools.
3. Third Sub-Hypothesis (H3): There is a statistically significant effect of electronic auditing techniques at a significance level of ($\alpha \leq 0.05$) on improving the efficiency of financial hedging tools.
4. Fourth Main Hypothesis (H4): There is a statistically significant effect of the interactive integration between Artificial Intelligence and electronic auditing techniques at a significance level of ($\alpha \leq 0.05$) on increasing the accuracy and effectiveness of financial hedging tools.

Data and Information Collection Tools

1. Theoretical Framework Tools: To enrich the theoretical aspect, the researchers relied on scientific journals, periodicals, and research studies related to the research variables, in addition to using the internet and its electronic research resources to support the theoretical framework with relevant information.
2. Fieldwork Tools: In preparing the fieldwork component of the research, the researchers relied on a questionnaire distributed to (120) experts and practitioners (accountants, auditors, financial managers).

Research Boundaries

1. Time Boundaries: Represents the financial data for the year (2025).
2. Spatial Boundaries: Targeted a sample of 3 companies listed on the Iraq Stock Exchange (National Bank of Iraq, Mansour Bank for Investment, Baghdad Soft Drinks Co.).

Research Methodology

The research adopted the descriptive-analytical approach due to its suitability to the nature of the current study. The descriptive aspect was used to clarify concepts related to AI, electronic

auditing techniques, and financial hedging tools, while the analytical approach was used to test correlation and impact relationships between research variables and statistically analyze questionnaire results.

Literature Review

Study (Author & Year)	Study Title	Study Type & Methodolog y	Study Objective	Main Findings / Conclusions
[1]	The Role of Artificial Intelligence in Achieving Audit Quality Under Digital Transformation	Field study (Descriptive-Analytical Approach) using a survey administered to a sample of 70 Iraqi accountants and auditors / Published Research.	To evaluate the role and impact of AI applications and digital transformation in enhancing the quality of auditing practices within the Iraqi professional environment.	There is a statistically significant positive impact of AI applications (such as expert systems) on raising audit efficiency and quality, as well as assisting auditors in decision-making.
[2]	Accounting for Financial Derivatives and Its Role in Reducing Financial Risks	Applied analytical study analyzing the financial statements of a sample of banks listed on the Iraq Stock Exchange / Published Research.	To explore how the measurement and disclosure of financial derivatives contribute to mitigating financial risks facing the Iraqi banking sector.	Adherence to accounting standards and methods related to financial derivatives effectively supports bank efforts in hedging against foreign exchange rate fluctuations and managing credit risk.
[3]	The Impact of Implementing IFRS 9 on Improving the Level of Disclosure in Financial Reports	Exploratory applied study based on published data from Jordanian commercial banks / Published Research.	To measure the impact of compliance with IFRS 9 requirements on elevating financial disclosure levels and hedging practices within banks.	Implementing IFRS 9 enhances the reliability, quality, and comparability of financial reports, while bolstering the credibility of hedging practices and financial instrument disclosures.
[4]	Digitalization of Accounting and Digital Auditing in the System	Comprehensive analytical survey of international	To analyze the impact of digitalizing accounting	Transitioning toward digital auditing and artificial

Study (Author & Year)	Study Title	Study Type & Methodology	Study Objective	Main Findings / Conclusions
	of Using Financial Instruments to Hedge Price Risks	practices and experiences / Published Research.	systems and modern digital auditing techniques on enabling and optimizing the use of financial instruments for hedging price risks.	intelligence provides a highly accurate flow of information that supports sound hedging decisions and enhances transparency and oversight levels.
[5]	The Impact of Financial Derivatives and Hedge Accounting Relationships on Audit Risk and Internal Control Weaknesses	Applied empirical study using regression models on a large sample of 6,000 non-financial firms in the United States / Published Research.	To examine the relationship between the use of financial derivatives and hedge accounting applications and the increase in audit risk and internal control weaknesses.	The highly complex nature of hedge accounting and its requirements (under ASC 815) strains control resources, thereby increasing audit risk and leading to higher external audit fees.

Prepared by researchers based on the above sources

Points of Similarity

Reviewing previous research highlights several points of similarity with the present study:

1. All were interested in the improvement of accounting information quality and the efficiency of the audit process. Also, the interest in financial risk management as a core element to increase the institutional financial and control performance.
2. The variables studied in those studies were relevant to the current study such as artificial intelligence, online auditing techniques, financial hedging tools and financial disclosure, which indicates convergence in the cognitive framework.
3. Most of the previous studies have used descriptive-analytical approach in addition to applied and field studies in an effort to analyze relationships between variables and test them in various work environments, which is similar to the approach used in the current study.
4. The results showed the significance of employing modern electronic technologies and adhering to international accounting and auditing standards in improving financial/control performance and the efficiency of auditing and risk management.

Points of Difference and Distinction

The current research differs from previous research in several key aspects:

1. None of the previously conducted studies has examined the relationship between all three core variables (Artificial Intelligence, Electronic Auditing Techniques and Financial Hedging Tools Efficiency) in a single study, but each study has focused on a specific

element of it as per the objectives of the respective study.

2. Some studies looked into the effect of AI on improving audit quality or reducing risks, while others explored derivative accounting, IFRS 9 implementation, or internal control/disclosure enhancement, without investigating how the integration of AI and electronic auditing techniques could support financial hedging tools.
3. The current research is characterized by its focus on measuring the impact of the integration between AI and electronic auditing techniques in improving the effectiveness of financial hedging tools. This paper studies how this combination helps to improve the quality of accounting data, speed up risk detection, increase the accuracy of financial instrument valuation and provide timely information to decision makers. This orientation is a scientific contribution to fill a research gap that has not been sufficiently addressed in the previous literature

Literature Review and Theoretical Framework

First: Concept of Artificial Intelligence

The real development of artificial intelligence (AI) technology can be traced back to the 1940s, after the invention of electronics in the early 20th century and after World War II, researchers said. The last century saw major developments in artificial intelligence (AI) technology, giving massive potential in the new millennium. Artificial Intelligence (AI) term was first coined by John McCarthy in 1956, and the history of AI started in the 1950s where generations of mathematicians and philosophers started to blend AI concepts [6].

The idea of artificial intelligence is not only technical, but also economic and managerial in terms of value creation and improvement of organizational performance. Equipped with its advanced analytical capabilities it helps us understand economic phenomena and predict future trends and has become a primary driver of innovation in modern business environments. AI is seen as a strategic tool that helps to be efficient and effective in using resources and improve corporate competitiveness in an ever-changing environment with increasing complexity [7]. There are many perspectives on AI, which is the study and design of intelligent agents. An intelligent agent is a system that perceives its environment and takes actions that maximize its chance of success [8].

It has also been defined as an advanced software system processing big data to produce intelligent responses mimicking human learning and adaptive skills [7], [9], [10]. The conceptual dimension of AI is further evident in its role as a tool transforming data into valuable accounting knowledge. This is based on the study of patterns and trends in financial data. This enables management to take decisions on scientific grounds. This helps to the evolution of the accounting function from being a simple financial reporting system to an intelligent decision support system that provides advanced analytical skills to assist in the interpretation of financial results and prediction of future hazards [10].

Objectives of Artificial Intelligence

Smart technologies assist economic units to shift from traditional to knowledge-based management to increase their innovation and sustainability potential [11]. For example, Russell & Norvig (2021: 25) define AI as the construction of systems that are capable of responding intelligently in demanding situations, learning, reasoning and deciding. The primary goal of AI is to create intelligent systems that require minimum human involvement [11], [12], [13], [14].

1. Artificial intelligence or AI machine learning refers to the simulation of human intelligence processes by machines, notably computer systems. They are learning, reasoning, problem solving, perception, language understanding and, in some instances, social intelligence.
2. Better decision making: Big data and patterns analysis to deliver more accurate and objective results.
3. Increased efficiency and productivity: This is due to automation of procedures and decrease of human errors resulting in better organisational output.
4. Forecasts Analytical models that use previous data to produce forecasts into the future.
5. Building Innovation and Competitive Advantage To offer intelligent solutions, which assist economic enterprises adapt to the changes of the environment.

Concept of Electronic Auditing Techniques

The word "audit" comes from the Latin "audire". In the days of old, the owners of businesses, feudal lords or officials of government inspected the books in English to comfort themselves as to authenticity. This technique was called auditing and it involved checking accounts to see how credible they were. It however evolved continuously impacted by numerous elements (economic system nature, entity kind, size, operational complexity). Verification was needed alongside examination, as well as reporting, until auditing reached its core modern components: examination, verification, and report preparation. Yet, the nature of examination and verification today differs from the past [15].

The use of electronic technologies impacted the financial system, accounting system, and internal control in business enterprises, necessitating electronic technologies in performing the audit process (e.g., emergence of electronic auditing and professional standards guiding handling these systems). Auditing using electronic technologies improves external audit efficiency and effectiveness, completing audits in less time and at lower cost. This improves audit service quality, reduces audit risk, and increases audit firm profitability and market share [16]. Definitions for this audit type vary; electronic auditing means "applying any type of system using information technology to assist the auditor in planning, controlling, and documenting audit work" [17]. It is also defined as "applying any type of electronic techniques to help the auditor plan, control, and document audit tasks" [18].

Objectives of Electronic Auditing Techniques

Using computers to complete audit work enables the auditor to leverage computer capabilities to execute tasks quickly and accurately. Software allows verifying information, selecting samples, and establishing evidence-gathering steps, helping execute logical and accounting procedures. Thus, the use of computers has numerous purposes [15], [17]:

1. Reviewing computer use to ensure that the company is making the best use of the computer.
2. Review the effectiveness of control mechanisms to ensure the efficiency of the internal control system in management, financial and operational operations.
3. Confirming computer utilisation from the materiality notion to meet the basic corporate requirements.
4. Protection of the system from various hazards (system failure, loss of accounting data, virus problems, theft of data or deliberate sabotage to cover up violations).

Benefits of Electronic Auditing Techniques

The audit sector is undergoing several developments because of technical improvements, electronic/communication means or AI conducting most of the audit activities. It provides audit standards, checklists and tools that may appropriately review and choose data flows, increase the quality of audits and support current technological projects. These technologies are used to construct economic units, to give services to clients and to compete in the commercial market. Electronic solutions improve decision making and production and are the main tools for data processing in commercial enterprises [19], [20], [21]:

a. Better Planning and Scheduling: E-auditing is utilised in the planning of time schedules and the planning of audit techniques.

1. Risk Analysis & calculations: E-auditing assesses and classifies the customer's risk (high, medium, low) and calculates materiality and acceptable audit risk.
2. Enhancing Effectiveness and effectiveness: Measures the effectiveness of internal control to enhance the performance of economic unit and reduce errors.
3. Time and Cost lowering: Requires less time for extensive testing/procedures compared to traditional methods, hence lowering operational costs.
4. Accuracy and Reduction of Fraud: Computerised tools are more accurate in analysis of data and thus chances of inaccuracy and manipulation of financial statements are minimised.
5. Evidence Collection Helps in collecting and analysis of financial evidence and providing more reliable reports.
6. Better Quality of Disclosure: It improves the quality of disclosure by ensuring uniformity

of information between the financial statements and auditor report.

7. Internal Control Assessment: Confirms the internal control design, completeness and effectiveness, improving risk management and compliance.

Challenges of Applying Electronic Auditing Techniques

Attention to electronic technologies and keeping pace with technological advancement has become a competitive advantage for economic units exploiting tech factors to achieve goals. Utilizing IT in auditing is a contemporary issue where auditors stress its necessity. Given growing data volumes, electronic techniques were developed to control and process data. Auditing responded by shifting from manual to electronic operations to express fair opinions on financial statements. However, electronic auditing faces technology, data, and legal challenges [22]:

The following are some of the challenges facing the implementation of electronic auditing technologies [22], [23]

1. The application of artificial intelligence is still in its experimental phase, and its effects on the accounting profession are still somewhat unknown. From the perspective of auditors and accountants, the fear is that artificial intelligence will develop to the point where it can replace human labor and ultimately cause job losses.
2. Economic units increasingly need experienced professionals as entry-level tasks diminish. The focus is on expertise in electronic technologies, which may create a need for new types of training and encourage the hiring of engineers and data scientists. The implementation of BT may also lead to a loss of control. One of the main risks is the risk of cybercrime.
3. Data security requires protecting sensitive data from breaches and cyberattacks. This is a major challenge, and the technologies used must include strong security measures to protect information.
4. Economic units face the problem of integrating the different systems they use. Software incompatibility can affect the flow of information. c) Legal compliance, i.e., adherence to laws and regulations pertaining to electronic data and information, can be complex, especially given the differences in laws from one country to another.
5. Credibility and the balance between human and machine, as the electronic auditing process sometimes relies on automated systems that may affect the auditors' ability to objectively evaluate the results.

Types of Electronic Auditing Techniques

Technological developments presented auditing with challenges to update tools. Computer programs communicate with client software for fast, accurate audits. "The software is able to work through vast quantities of audit data in minutes, freeing up more time for key matters and less on documentation. This is because the analytical audit software evaluates actual and expected values separately which allows data to be kept and retrieved [3], [22], [23], [24]

1. CAATs (computer assisted audit techniques) These are technologies to review financial data, to find errors and fraud and to analyse big quantity of information in a reliable and efficient manner (for example IDEA and ACL).
2. Artificial intelligence (AI). AI combines machine learning and natural language processing techniques to spot irregularities, uncover fraud and forecast financial hazards in financial records.
3. Big Data analysis – the Hadoop architecture and the visual data analysis tools enable the examination of huge volumes of data and the discovery of financial trends and fraudulent activities.
4. Distributed Ledger Technology It is a system that allows transactions to be documented in an understandable and sustainable way, without risk of manipulation (validation of immutable data, oversight of monetary transactions).
5. Robotic Process Automation (RPA): Automates repetitive manual work like data collecting and initial validation to cut down human errors. (UiPath, BluePrism)
6. Cloud computing makes auditing more efficient as it ensures that the auditing team may access data from anywhere.

7. Security and Cryptology We use the latest encryption methods to protect the financial information from hackers.
8. Internet of Things in Auditing – Use rich data from sensors on assets/inventory (asset tracking, real-time monitoring of processes) for operations audit purposes.

Integration Between AI and Electronic Auditing Techniques in Improving Audit Quality

1. [22], [23], [24] The integration of AI with electronic audit methods increases the quality:
2. Decreasing the cost of audit service and raising the profitability of audit firms by placing the audit software into the audits of financial statements and expediting the execution of service on several organisations.
3. Increasing the professionalism of the audit profession, doing jobs efficiently/ effectively with specialised software, saving time and effort.
4. Achieving the quality of internal audit through the speed and accuracy of supplying financial data and increasing the competitiveness of the unit in the economy.
5. Providing competitive advantages for economic units and audit businesses in performing duties with high quality.
6. Encouraging innovation in e-auditing, helping the auditors to develop programs for sustainability of audit tasks and to adapt current systems with the use of AI and expert systems.
7. Improvement of quality of control operations on software/electronic files, decrease of audit expenses with increase in accuracy.
8. Enhance the quality of audit planning by accurate sample size determination, selection of components, and development of schedule and time budgeting.
9. Improve the efficiency of the analytical technique for comparing estimated ratios, discovering variations and quickly reviewing current and past financial data.
10. Reviewing competitor reports across multiple years/entities, enabling auditors to express opinions with greater credibility and objectivity.

Financial Hedging Tools

With the development of the financial market and the expansion of international trade, the exposure of economic units to changes in exchange rate, interest rate, commodity and security prices increased, which has developed the idea of financial hedging. Modern financial innovations have introduced modern instruments such as futures, forwards, options and swaps as primary risk management tools [25]. IFRS 9 has changed hedge accounting to better reflect the risk management activities actually undertaken and to better match hedging instruments with hedged items, thus improving the quality of financial statements [26].

Financial hedging is defined as practices of economic units to reduce their exposure to financial risk by using appropriate financial tools, minimizing uncertainty and improving investment/financing decisions [27]. It is the use of financial derivatives to control the risks of price volatility, to contain losses and to provide financial stability [28]. It is also the IFRS requirement that acts as a safeguard and leads to the improvement in the quality of accounting information and the reliability of financial reports [29].

Importance of Financial Hedging Tools

Financial hedging tools are an integrated system of risk management, which includes derivatives (forwards, futures, options, swaps) and operational tools (natural hedging, money market hedging, compound strategies). Their role is important as it protects cash flows, stabilizes costs/revenues, mitigates potential losses, improves the quality of financial reporting and enhances the financial stability of the entity [30]. Due to the exchange rate volatility, foreign currency hedging tools are becoming more and more important for import costs, financing costs and pricing costs. The application of hedge accounting for risks of foreign currency in accordance with IFRS improves the quality of accounting information and the reliability of financial reports in the Iraqi environment, supporting management decisions and reducing instability [29] as the study of Iraqi states.

Financial Hedging Tools

Adopting these tools locally and internationally reflects an inevitable response to market

uncertainty [31]. Effective hedging requires choosing the appropriate tool according to the entity's operational and financial risk structure [32], [33], [34], [35], [36]:

1. **Forward Contracts:** Customized agreements between two parties to buy/sell an asset at a future date at an agreed price. Very flexible, but has higher counterparty credit risk because there is no central clearinghouse. Can be used to hedge the costs of acquisitions or income in the future in the event of large currency swings.
2. **Futures Contracts:** Standardised agreements to buy or sell an item at a specified price on a certain future date, traded on regulated exchanges. Clearinghouses lower the probability of default, and the day-to-day settlement of mark-to-market accounts promotes transparency. It is widely used as a hedge against risks in interest rates, commodities and currency.
3. **Options Contracts:** Give the buyer the right (but not the obligation) to buy (call) or sell (put) an asset at a predetermined price over a given period of time for a premium. Strong downside protection, with upside potential. Dynamic management of equity, currency, commodities and interest rate hedging
4. **exchange Agreements:** Agreements between two parties to exchange future cash flows based on pre-determined criteria (e.g. interest rate swaps, currency swaps). Used by financial institutions and large companies to reorganise finance, reduce loan costs and manage long term liabilities.
5. **The money market hedge** consists of borrowing and lending in the money markets to hedge the future value of cash flows, notably in the case of foreign currency risk. Simulates borrowing ahead in currency, offers conversion and funds investment or future liabilities. Useful when derivative markets are poorly developed or costly.
6. **Techniques for Combining Options (Collars and Spreads)** Add options (e.g. Collars, Spreads, Straddles) to reduce hedging costs or to specify the acceptable ranges of price movements. Provides risk mitigation, possibility for rewards and flexibility for oversight.

Impact of Integration Between AI and Electronic Auditing Techniques in Enhancing Financial Hedging Tools Efficiency

Modern accounting information systems based on data analytics and AI deliver accurate real-time information that supports risk management and financial decision-making, positively affecting financial hedging strategies [37]. Hall [38] explained that electronic auditing techniques allow auditors to electronically analyze all financial transactions rather than traditional sampling. This improves anomaly/risk detection, curtails failures of financial risk management, and increases efficiency of hedging tools against price, interest rate, and exchange rate volatility.

According to the Institute of Internal Auditors guidelines, AI audit applications help in assessing risk proactively through machine learning and pattern analysis, providing early warnings and improving timely hedging selection [39]. International Federation of Accountants reports noted that integration of smart technologies with electronic control/audit processes increases quality, transparency and reliability of financial reporting – key factors for successful hedging policies and reduction of market uncertainty [40].

The artificial intelligence proved to be more effective in supporting the accounting and auditing processes than traditional methods due to the analysis of financial data and the more accurate identification of inaccuracies or fraud, as well as improving the risk management related to hedging decisions [41]. Al-Ani [42] says that electronic auditing has improved the quality of financial reporting by accelerating data processing and increasing audit accuracy, hence providing reliable information for hedging strategies. Al-Saadi [43] concluded that the application of electronic audit systems reduces the chance of fraud and manipulation, which allows economic organisations to manage market, credit and operational risks using proper hedging methods.

The effect of this structural combination on the efficiency of hedging instruments can be stated in a systematic way as follows [11], [32], [44], [45], [46], [47]:

1. **Continuous Auditing Automation and Hedging Positions Review.** The AI-enabled e-audit methods facilitate ongoing tracking of the hedging portfolios. Smart algorithms

automatically examine derivative contracts and link them to actual currency or interest rate movements to ensure hedging products satisfy objectives.

2. Enhancing Risk Assessment Models and Forecasting Asset Prices Options/futures are worthless if VaR model is not computed correctly. Machine learning algorithms can grasp unstructured data (political news, fast economic reporting) and so increase the foresight in financial management and reduce the margins of error in pricing.
3. Mitigation of counterparty credit and transfer risk The main problem with forward contracts is the default risk of the counterparty. Computerised auditing is intelligent, dynamically analysing the integrity of counterparties, with actual cash flows and cloud data, giving firms the ability to change hedging contracts or demand collateral before a crisis occurs.
4. Less transaction costs and operational inefficiencies. The integration eliminates the high level of manual processes involved in executing and settling contracts. Cognitive contracts and automated assessments provide for the lowest operating costs and fastest transaction speeds, hence avoiding the loss of hedging opportunities under volatile market situations.
5. Improving the Reliability of Financial Reporting and Disclosure for Hedging Activities: Intelligent electronic auditing is an independent certification of compliance with international financial reporting standards (e.g. IFRS 9). It immediately demonstrates the efficiency of the hedging, prevents accounting gimmicks and preserves the veracity of the declared earnings.

To recap, the developing trends that are boosting the effectiveness of financial risk management and hedging include artificial intelligence and electronic auditing methods. Artificial Intelligence can be used for complete analysis of big data and risk prediction. E-auditing allows for continuous and real-time evaluation and improves data integrity for hedging approaches.

Results and Discussion

Description of the Study Population

One of the important aspects that directly contribute to the effectiveness of research is defining the study population, since it is the primary source of data. The sample of the current study consists of economic units listed on Iraq stock exchange. The hypotheses were tested on a sample of auditors and accountants in the surveyed units, 120 randomly selected individuals. The total number of responses was (105) persons.

Profile of Sample Respondents

Step 3. Determining sample size This is a difficult and important step. In management literature, the sample size, whether inadequate or improper, greatly affects the quality and accuracy of research results. Simple random sampling was used.

Table 2. Distribution of Respondents by Age

Age Category	Frequency (Count)	Percentage (%)
25 to less than 30 years	37	35.2%
30 to less than 40 years	58	55.2%
40 to less than 50 years	10	9.6%
50 years and above	0	0.0%
Total	105	100.0%

The facts presented in the table (3) are prepared by researchers from field study data

Table (2) above shows that 35.2% of the sample are aged between (20 and less than 30) years, 55.2% are aged between (30 and less than 40) years, and 9.6% are aged between (40 and less than 50) years, while the percentage of those over 50 years was 0%. It is noted that the percentage of the first and second categories, which are the youth category, is high, which indicates the interest of the bank and the units in this category because it is the most active and dynamic category and able to interact with modern technologies and deal with smart

auditing software.

Table 3. Distribution of Respondents by Educational Qualification

Educational Qualification	Frequency (Count)	Percentage (%)
Bachelor's Degree	37	35.2%
Higher Diploma	47	44.8%
Master's Degree	14	13.3%
Ph.D.	7	6.7%
Total	105	100.0%

The facts presented in the table (3) are prepared by researchers from field study data, 2025. It reveals that 35.2% have a Bachelor's degree, 44.8% have a Higher Diploma, 13.3% have a Master's degree and 6.7% have a Ph.D. The high number of university graduates, higher diploma holders and specialised degrees shows the bank's concentration on employing educated staff to run sophisticated financial structures and to handle hedging risks effectively.

Table 4. Distribution of Respondents by Academic Specialization

Academic Specialization	Frequency (Count)	Percentage (%)
Accounting	51	48.6%
Business Administration	14	13.3%
Banking and Finance	28	26.7%
Economics	12	11.4%
Total	105	100.0%

The facts presented in the table (4) are prepared by researchers from field study data

Table 4. shows that 48.6% are specialists in Accounting, 13.3% in Business Administration 26.7% in Banking and Finance and 11.4% in Economics. Clearly, accounting and financial specialists are dominant, dealing with the severe technical, regulatory and auditing standards expected by smart business environments.

Table 5. Distribution of Respondents by Professional Qualification

Professional Qualification	Frequency (Count)	Percentage (%)
ACCA (British Fellowship)	0	0.0%
CPA (American Fellowship)	0	0.0%
Arab Certified Public Accountant	5	4.8%
Sudanese Certified Public Accountant	12	11.4%
None	88	83.8%
Total	105	100.0%

Prepared by researchers from field study data, 2025

Table 5. demonstrates that 4.8% of the sample have an Arab accounting fellowship, 11.4% have a Sudanese accounting fellowship, and 83.8% do not have a professional fellowship. Most of which do not have authorised professional fellowships. This clearly indicates the urgency to improve the professional qualification and specialised training of local staff to catch up with the continual electronic auditing approaches.

Table 6. Distribution of Respondents by Job Title (Sample Size = 105)

Job Title	Frequency (Count)	Percentage (%)
Accountant	51	48.6%
Department Manager	14	13.3%
Office Manager	5	4.8%
Employee	35	33.3%

Job Title	Frequency (Count)	Percentage (%)
Total	105	100.0%

The facts presented in the table (6) are prepared by researchers from field study data

As shown in Table (6), 48.6% of the work is accountants, 13.3% is department manager, 4.8% is office managers and 33.3% is staff in different departments. The core group is the majority that works directly in accounting and auditing departments. This core group is best placed to evaluate the efficacy of electronic audit tools.

Table 7. Distribution of Respondents by Years of Experience

Years of Experience	Frequency (Count)	Percentage (%)
Less than 5 years	54	51.4%
5 to less than 10 years	33	31.4%
10 to less than 15 years	11	10.5%
15 years and above	7	6.7%
Total	105	100.0%

The facts presented in the table (7) are prepared by researchers from field study data

In table (7) above, we see that 51.4 % of the respondents have less than 5 years experience, 31.4 % have 5 to less than 10 years experience, 10.5 % have 10 to less than 15 years experience and 6.7 % have 15 years or more of experience. It is important to point out that the younger category of recent and intermediate experience is the most adaptable and sensitive to technological integration and artificial intelligence in the modern Iraqi corporate environment.

Statistical Description Diagnosis of Study Variables

Arithmetic means, standard deviations, coefficients of variation and relative relevance were calculated across all items to measure the perceptions of the respondents about the contribution of artificial intelligence (AI) technology to audit quality and continuous control.:

Table 8. Defining Statistics of Artificial Intelligence Items

#	Artificial Intelligence Axis Items	Mean	Standard Deviation	Coefficient of Variation (%)	Relative Importance (%)
1	Auditors are aware of artificial intelligence and its application in the audit process.	2.38	1.05	44.08%	47.20%
2	Using artificial intelligence techniques increases auditor efficiency.	3.72	1.05	28.26%	74.31%
3	Artificial intelligence systems perform audit activities at high speed.	3.76	0.99	26.19%	75.23%
4	Artificial intelligence techniques help reduce human errors in auditing and raise its quality.	3.79	1.18	31.18%	75.78%
5	Using artificial intelligence techniques helps mitigate audit risks.	3.68	1.07	29.20%	73.58%

#	Artificial Intelligence Axis Items	Mean	Standard Deviation	Coefficient of Variation (%)	Relative Importance (%)
6	Artificial intelligence techniques reduce audit process costs.	3.69	1.11	30.22%	73.76%
7	Economic units' reliance on artificial intelligence techniques facilitates their audit process.	3.58	1.18	33.07%	71.56%
8	Artificial intelligence techniques contribute to developing creative capacities and perceiving the unseen.	3.65	1.10	30.00%	73.03%
9	Applying artificial intelligence techniques facilitates solving complex problems.	3.54	1.10	30.96%	70.83%
10	Using artificial intelligence techniques allows delivering optimal services to users.	3.79	0.88	23.19%	75.78%
-	General Average for Independent Variable (Artificial Intelligence)	3.56	0.40	11.24%	71.40%

Prepared by researchers from SPSS output

The overall mean of 3.56 (SD 0.40, Relative Importance 71.40%) in Table (8) indicates considerable agreement about the good influence of AI on professional/control performance. The top scoring items were (10) and (4) with 3.79 each (delivering optimum services and decreasing human error). This reveals that there is deep awareness that smart technology can improve financial reporting and eliminate operational errors.

Conversely, Item (1) (auditors' familiarity with AI) scored the lowest mean of 2.38 (SD 1.05, CV 44.08%) implying a significant knowledge/training gap for Iraqi practitioners on the direct use of AI software and neural networks, necessitating urgent capability building and curriculum development.

Table 9. Descriptive Statistics for Electronic Auditing Techniques Items

#	Electronic Auditing Variable Items	Mean	Standard Deviation	Coefficient of Variation (%)	Relative Importance (%)
1	Electronic auditing permits the auditor to review enormous volumes of data in an effort to obtain information in the fastest and the most timely way.	4.06	1.05	25.84%	81.10%
2	Electronic auditing facilitates obtaining highly credible evidence as well as boosting trust in internal audit.	3.91	0.93	23.90%	78.17%
3	Practicing electronic auditing reduces human errors and	3.68	1.24	32.73%	73.58%

#	Electronic Auditing Variable Items	Mean	Standard Deviation	Coefficient of Variation (%)	Relative Importance (%)
	misstatements in financial data.				
4	Electronic auditing makes it easier for the auditor to perform continuous auditing.	3.94	1.05	26.72%	78.72%
5	Electronic auditing is used in estimating risk materiality.	3.94	0.99	25.12%	78.72%
6	Electronic auditing helps the auditor comprehensively examine the internal control system continuously and in a short time.	4.02	0.86	21.31%	80.37%
7	Electronic auditing helps the auditor provide necessary recommendations to management for making appropriate decisions.	3.60	1.08	30.16%	71.93%
8	Using electronic auditing helps the auditor easily review annual financial reports of competing economic units.	3.69	1.14	30.88%	73.76%
9	Using electronic auditing increases audit success and enhances audit precision and reliability.	3.79	1.05	27.71%	75.78%
10	Data in electronic audit reports feature transparency, full disclosure, detail, and clarity benefiting all parties.	3.70	1.10	29.88%	73.94%
-	General Average for Electronic Auditing Variable	3.83	0.55	14.36%	76.61%

Prepared by researchers from SPSS output

The mean score was 3.83 (SD 0.55, Relative Importance 76.61%), indicating high support of the integration of electronic technologies into the audit process (Table 9). Item (1) (processing enormous data) obtained the highest score, 4.06 (Relative Importance 81.10%), which reflects the critical role of electronic platforms in overcoming the limitations of traditional sampling.

The lowest score was for item (7) (management suggestions) with 3.60, which confirms that advisory/decision activities still need independent human professional judgement, so as to retain human supervision in the loop and minimise automated model bias.

Table 10. Descriptive Statistics for Financial Hedging Tools Efficiency Items

#	Financial Hedging Tools Efficiency Items	Mean	Standard Deviation	Coefficient of Variation (%)	Relative Importance (%)
1	Selecting the right hedging instrument (e.g. forwards or futures) helps to protect corporate assets from currency rate changes.	3.77	1.10	29.10%	75.41%
2	Call and put options contracts help provide great flexibility to meet basic commodity and derivative price volatility.	3.83	1.00	26.08%	76.70%
3	Accurate swap contract coordination maintains cash flow consistency and reduces interest rate volatility threats.	3.78	1.01	25.97%	77.43%
4	The success of hedging techniques relies on the availability of real-time price data that accurately represents market fair value.	4.02	0.82	20.50%	80.37%
5	Allocating enough risk management budgets allows the organization to pay margin account and collateral expenses effectively.	3.94	0.76	19.37%	78.90%
6	Following established hedging procedures and internal rules will lower the risk of losses from changes in the valuation of the firm's financial position.	3.94	0.97	24.64%	78.72%
7	Reliable fair value estimation of complex derivatives prevents misleading or biased hedging decisions.	3.59	1.15	32.09%	71.74%
8	Good monitoring of hedging positions can assist you prevent margin calls and forced liquidation of contracts and liabilities.	4.08	0.84	20.49%	81.65%
9	Compliance with approved corporate financial hedging policies/manuals, is part of enhancing transparency and financial disclosure.	3.94	0.94	23.75%	78.90%
10	Regular assessment of the efficiency of financial hedging strategies allows for quick identification and rectification of shortcomings.	3.96	0.88	22.13%	79.27%
-	General Average for Efficiency of Financial Hedging Tools Variable	3.90	0.47	12.05%	77.91%

Prepared by researchers from SPSS output

Derivatives (Financial) Efficiency achieved the highest overall mean score of 3.90 (SD 0.47, Relative Importance 77.91%). This supports a general consensus that the use of technology delivers the necessary efficiency in the management of complicated derivative transactions. The top scoring item was (8) (monitoring hedging positions to minimise margin calls) with a mean score of 4.08 (Relative Importance 81.65%) followed by item (4) (real-time market fair value pricing) with a mean score of 4.02. This finding establishes continuous tracking and real-time data as two cornerstones of successful financial risk engineering.

Testing Correlation and Impact Hypotheses Between Study Variables

The test was conducted to investigate the Pearson correlation coefficients among variables as follows:

Table 11. Correlation Matrix Results Among Study Variables

Target Variables	Artificial Intelligence Techniques	Electronic Auditing Techniques	Financial Hedging Tools Efficiency
Artificial Intelligence Techniques	1.000	0.308 (Sig: 0.001)	0.299 (Sig: 0.002)
Electronic Auditing Techniques	0.308 (Sig: 0.001)	1.000	0.459 (Sig: 0.000)
Financial Hedging Tools Efficiency	0.299 (Sig: 0.002)	0.459 (Sig: 0.000)	1.000

Prepared by researchers from SPSS output

The results of the correlation table demonstrate that all the variables are positively and significantly correlated at 0.05 levels. The highest correlation between the variable of electronic audit and the efficiency of financial hedging tools is 0.459 and significant at the level of 0.000, which confirms that the enhancement and activation of the electronic digitisation of audit processes is directly reflected in raising the levels of accuracy and transparency of hedging reports and reducing human and operational errors and deviations.

To measure direct, indirect, and total interactive impacts, the model was statistically examined against the four positive research hypotheses:

Table 12. Estimated Direct, Indirect, and Total Standardized Impact Results

Target Impact Path	Direct Impact	Indirect Impact	Total Impact	Statistical Significance Level
AI Techniques $\rightarrow$ Electronic Auditing Techniques	0.4229	—	0.4229	0.0016
AI Techniques $\rightarrow$ Financial Hedging Tools Efficiency	0.1741	0.1249	0.2990	0.0000
Electronic Auditing Techniques $\rightarrow$ Financial Hedging Tools Efficiency	0.4053	—	0.4053	0.0000

Prepared by researchers from SPSS output

Based on statistical outputs, hypothesis decisions were made as follows:

1. Testing the first sub-hypothesis: The first sub-hypothesis states that there is a statistically significant effect of using artificial intelligence techniques at a significance level of $\alpha \leq 0.05$

in developing and improving the efficiency of electronic auditing techniques. The results of the statistical analysis showed a significant and positive direct effect of artificial intelligence in electronic auditing, with a value of 0.4229 and a significance level of 0.0016, which is less than the adopted significance level $\alpha \leq 0.05$. Accordingly, the first sub-hypothesis is fully accepted, indicating that the use of intelligent systems and algorithms is the primary driver for upgrading the efficiency and processes of electronic auditing and electronic regulatory transformation.

2. Testing the second sub-hypothesis: The second sub-hypothesis states that there is a statistically significant effect of applying artificial intelligence techniques at a significance level of $\alpha \leq 0.05$ in enhancing the efficiency of financial hedging instruments. The results showed that the artificial intelligence technologies variable had a significant positive overall effect on the efficiency of financial hedging instruments, with a value of 0.2990 and a complete significance level of 0.0000, which is less than the adopted significance level $\alpha \leq 0.05$. Accordingly, the second sub-hypothesis is fully accepted, highlighting the substantial effect that artificial intelligence applications have on improving the quality of measuring and managing financial hedging instruments and reducing their operational and credit risks.
3. Testing the third sub-hypothesis: The third sub-hypothesis states that there is a statistically significant effect of using electronic auditing technologies at a significance level of $\alpha \leq 0.05$ in enhancing the efficiency of financial hedging instruments. The analysis results showed that electronic auditing has a significant, positive, and direct effect on the efficiency of financial hedging instruments, with the value of 0.4053 and the absolute significance level of 0.0000 which is far lower than the required significance level of $\alpha < 0.05$. Thus, the third sub-hypothesis is fully accepted, and it corroborates that dependence on digital platforms and continuous auditing programs is a fundamental pillar for improving transparency and accuracy in derivatives and hedging transactions.
4. Testing the main overall hypothesis and the fourth sub-hypothesis: The main overall hypothesis and the fourth sub-hypothesis suggest that the interactive, shared and indirect integration of artificial intelligence through electronic auditing has a statistically significant effect on the efficiency of financial hedging instruments. The results of the path analysis in Table (12) indicate that there is a significant indirect effect of artificial intelligence on the efficiency of financial hedging tools through electronic auditing, which amounted to 0.1249, and the overall significance level reached 0.0000, which is less than the adopted significance level $\alpha \leq 0.05$. Based on this integrated and very important path, the overall main hypothesis and the fourth sub-hypothesis are fully accepted, which definitively and rigorously proves that the integration of artificial intelligence technologies with electronic auditing enhances and achieves an efficient interactive integration that positively contributes to upgrading the efficiency and processes of financial hedging for economic units.

To verify perception consistency across sectors, a One-Way ANOVA was conducted comparing respondent answers based on economic sector (Banking vs. Industrial; \$N = 105, df = 104\$):

Table 13. One-Way Analysis of Variance (ANOVA) Results Across Economic Sectors

Source of Variance	Sum of Squares	Degrees of Freedom (df)	Mean Square	Calculated F-Value	Significance Level	Statistical Decision & Result
Between Groups (Sectors)	2.198	1	2.198	1.717	0.193	Accept Null Hypothesis (No statistically significant differences)
Within Groups	131.828	103	1.280	—	—	Accept Null Hypothesis (No

Source of Variance	Sum of Squares	Degrees of Freedom (df)	Mean Square	Calculated F-Value	Significance Level	Statistical Decision & Result
Overall Total	134.026	104	—	—	—	statistically significant differences) Accept Null Hypothesis (No statistically significant differences)

Prepared by researchers from SPSS output

The results of the one-way analysis of variance (ANOVA) shown in the table indicate that the calculated F value for the differences between sectors was 1.717, with a statistical significance level of 0.193. Because this significance level is significantly higher than the accepted significance level of 0.05, the null hypothesis was adopted, stating that there are no statistically significant differences in the variance of the sample's perceptions attributable to the sector. This important finding confirms that the awareness of regulatory authorities of the importance and value of advanced technology and its positive impact on improving and tightening control over financial hedging instruments represents a mature, unified and very close professional culture among those working in the financial and regulatory sectors. This awareness is shared equally between management and employees in the banking sector, which manages large-scale credit operations and financing facilities, and their counterparts in the industrial sector, which faces the risks of currency fluctuations and hedging against the cost of importing raw materials.

Conclusions and Recommendations

According to the theoretical framework and empirical findings, the following conclusions were drawn:

1. Electronic auditing and artificial intelligence (AI) technologies serve as control anchor scrutinising tools and curb financial waste. The effectiveness of financial hedging instruments and the volatility of profit/loss are highly tied to the accuracy, quality and integration of these technologies.
2. Advanced electronic audit software and continuous audit systems are the appropriate answer for high speed and precision processing of whole populations of transactions, enabling management and auditors real time information to maintain optimal hedge ratios and avoid manual margin calculation errors.
3. The application of machine learning and algorithms based on deep learning in the creation of dynamic hedging strategies to balance assets and liabilities in the face of rapid changes in the market is the backbone of a strategic move away from traditional reactive risk management to proactive predictive management.
The requirements of the Central Bank of Iraq and international financial reporting standards (IFRS) are considered the most important catalyst for Iraqi banks and economic units to adopt advanced electronic systems to audit operations and deal with exchange rate differences with accuracy, with the aim of avoiding heavy fines.
4. Board members are hesitant to fully embrace current cloud solutions for fear of breaches or responsibility. Field results demonstrate gaps in law/legislation in cloud data security and AI usage limitations.
5. "Resource leakage" is a consequence of the traditional manual application of hedge accounting under IFRS, where control capacities are consumed in the documentation of derivatives, thus reducing control over general operations. Electronic audit platforms provide a very effective solution to this problem through continuous low-cost automation.

Recommendations

The study, on the basis of the conclusions, offers the following strategic recommendations:

1. Regulation Frameworks for Technology and Cloud Data Governance: Form joint technical committees to develop binding legal standards/manuals for IT governance, cloud data encryption/privacy, legal liability of artificial intelligence algorithms and automated trading, and distinct standards for IFRS 9 implementation and expected credit loss modelling using local data.
2. Establishing independent budgets and investing in technological infrastructure: The board of directors in economic units must understand that the financial investment in upgrading technological infrastructure, acquiring original licenses for advanced auditing software and integrated treasury management systems is a preventive strategic investment that reduces losses, not an operational expense.
3. Phasing in Continuous Electronic Audit Systems. Urge external audit offices, independent regulatory authorities and banks to transition from traditional post-annual reviews to continuous auditing/control techniques that can serve as early warning platforms to identify money laundering risks, monitor escrow accounts/margin requirements and safeguard entities from forced liquidation.
4. Development and Qualification of Human Capital ("Electronic Accountant"): Continuous professional training, specialised workshops for accountants and auditors in advanced software, NLP and machine learning to create a generation that can combine professional judgement and programming skills, filling the training gap to achieve international professional fellowships.
5. Updating Educational Curricula and Academic Education The Ministry of Higher Education and Scientific Research and Iraqi universities should expedite the updating of curricula in all departments, by adding specialised courses in electronic auditing, derivative accounting, data governance systems and artificial intelligence in the core academic programs to fill the gaps in knowledge and meet the needs of the contemporary market.

References

- [1] Al-Fadhil, Haider Ali,, and Hashem, Muhammad Abdul, The role of artificial intelligence in achieving audit quality under electronic transformation: An exploratory study of academic and professional opinions in Iraq. *Iraqi Journal of Administrative Sciences*, 21(4), 112–130. 2025.
- [2] Abboud, Faraj Ghani,, and Jassim, Baidaa Fadhil, Accounting for financial derivatives and its role in reducing financial risks: An applied study on a sample of banks listed on the Iraq Stock Exchange. *Journal of the College of Administration and Economics for Economic, Administrative and Financial Studies*, 12(3), 88–104. 2023.
- [3] Omar, Khalil Ibrahim, The impact of applying International Financial Reporting Standard (IFRS 9) on improving disclosure levels in financial reporting: An applied study on Jordanian commercial banks. *Jordanian Journal of Business Administration*, 18(2), 215–234. 2022.
- [4] Yurchenko, O.,, and Prymak, S, Digitalization of accounting and digital auditing in the system of using financial instruments to hedge price risks. *International Journal of Digital Accounting*, 14(1), 45–62. 2025.
- [5] Jones, A, The impact of financial derivatives and hedge accounting relationships on audit risk and internal control weaknesses. *Journal of Accounting and Economics*, 68(2), 102–125. 2025.
- [6] Abdul-Redha, Dhirgham Ahmed, Abdul-Redha, Duaa Ahmed, Al-Ghazzi, Muhammad Abdul-Amir Hassouni,, and Abdul-Redha, Islam Ahmed, The impact of using artificial intelligence techniques on improving audit quality and achieving sustainability. *Supplement of the Iraqi University Journal for Proceedings of the 4th Conference*, Vol. 22, 18–33. 2025.
- [7] Al-Jaboori, Ahmed Ali, Artificial intelligence and its applications in management. Baghdad: Dar Al-Yazouri. 2021.
- [8] Russell, S.,, and Norvig, P, Artificial Intelligence: A Modern Approach (3rd ed.). Pearson. 2010.

- [9] Al-Jaboory, Mohsin Khaddar,, and Al-Azzawi, Haider Kareem, The role of artificial intelligence techniques in improving institutional performance. *Journal of Management and Economics*, University of Baghdad, 14(4), 15–35. 2022.
- [10] Al-Azzawi, Muhammad Abdullah, Intelligent information systems and their role in supporting decision-making. Baghdad: Dar Al-Doctor. 2022.
- [11] Kareem, Ali Abdul-Amir, The impact of smart technologies on improving institutional performance. *Journal of Management and Economics*, 15(2), 55–72. 2023.
- [12] Goodfellow, I., Bengio, Y.,, and Courville, A, Deep Learning. MIT Press. 2016.
- [13] Russell, S.,, and Norvig, P, Artificial Intelligence: A Modern Approach (4th ed.). Pearson. 2021.
- [14] Mahmoud, A, Artificial intelligence applications in financial accounting systems. *Academic Journal of Accounting Research*, 8(1), 40–52. 2022.
- [15] Al-Dhanibat, Ali Abdul-Qader, Auditing in light of international standards: Theory and practice (3rd ed.). Amman, Jordan: Dar Wael Publishing. 2010.
- [16] Samour, Nabil Ibrahim Ismail, The role of electronic auditing in improving audit service quality: A field study on audit offices in the Gaza Strip. The Islamic University, Gaza. 2014.
- [17] Aziz, Tavga Mehdi, The role of compliance with electronic auditing application in curbing creative accounting practices: An exploratory study of legal accountants and university professors in Erbil Governorate - Kurdistan Region / Iraq. *Iraqi University Journal*, 51(2). 2017.
- [18] Marei, Ahmed Zuhair Muhammad, Electronic auditing and its impact on audit quality among audit offices and firms operating in Jordan (A field study) (Master's thesis). Zarqa University, Jordan. 2015.
- [19] Hameed, Abdul-Rahman Jithe'a,, and Al-Tamimi, Nazim Shaalan, The role of artificial intelligence techniques in supporting audit quality from auditors' perspectives (A field study in audit offices in Iraq). Research paper presented at a scientific conference. 2020.
- [20] Taher, Nejoom Arar, The Benefit of Implementing Electronic Auditing in Iraq - Practical Study using IDEA Program. *Al Kut Journal of Economics and Administrative Sciences*, 12, 258. 2020.
- [21] Rachmad, Y. E., Rusman, H., Anantadjaya, S. P. D., Hernawan, M. A.,, and Metris, D, The role of computer assisted audit techniques, professional skepticism, and remote auditing on quality of audit in public accountant office. *Journal of Economic, Business and Accounting*, 6(2), 2180. 2023.
- [22] Safiya, Yakhlef,, and Muhammad, Torshi, The role of electronic auditing in improving internal audit profession practice quality and its impact on maximizing value for beneficiaries of economic unit governance. *Economic Journal*, 6(2), 764–771. 2020.
- [23] Fouad, Anoun T. D.,, and Maryam, Bouamama, Practicing the accounting and auditing profession in an electronic environment – Reality, prospects, and challenges. Paper presented at the National Symposium, Blida University, Algeria. 2023.
- [24] Marei, Ahmed Zuhair, The role of electronic auditing in improving audit quality (An exploratory study from auditors' perspective). *Journal of the Association of Arab Universities for Research in Higher Education*, 43(1). 2023.
- [25] Baker, H. K.,, and Filbeck, G. (Eds.), Investment Risk Management. Oxford University Press. 2015.
- [26] IFRS Foundation, IFRS 9 Financial Instruments. International Financial Reporting Standards. 2021.
- [27] Boyer, M. M.,, and Marin, M, How Risk Management Adds Value. In H. K. Baker & G. Filbeck (Eds.), Investment Risk Management (pp. 42–59). Oxford University Press. 2015.
- [28] Chincarini, L. B, Trading Futures to Manage Risk. In H. K. Baker & G. Filbeck (Eds.), Investment Risk Management (pp. 482–507). Oxford University Press. 2015.
- [29] Salman, Amer Muhammad,, and Muhammad, Muhammad Jassim, A proposed mechanism for applying hedge accounting for foreign currency fluctuation risk per IFRS and its reflection

on accounting information quality in the Iraqi environment. *Journal of Economic and Administrative Sciences*, University of Baghdad. 2018.

[30] Jorion, P, *Financial Risk Manager Handbook* (7th ed.). Wiley. 2022.

[31] Hamza, Hamza Mahmoud, *Financial risk management and hedging in commercial banks*. Baghdad: Dar Al-Yazouri, pp. 142–145. 2019.

[32] Ross, S. A., Westerfield, R., Jaffe, J., and Jordan, B. D, *Corporate Finance* (13th ed.). McGraw-Hill Education, pp. 750–752. 2020.

[33] Chance, D. M., and Brooks, R, *An Introduction to Derivatives and Risk Management* (10th ed.). Cengage Learning. 2015.

[34] Brealey, R. A., Myers, S. C., and Allen, F, *Principles of Corporate Finance* (13th ed.). McGraw-Hill Education. 2020.

[35] Eun, C. S., and Resnick, B. G, *International Financial Management* (9th ed.). McGraw-Hill Education. 2021.

[36] Hull, J. C, *Options, Futures, and Other Derivatives* (11th ed.). Pearson. 2022.

[37] Romney, M. B., Steinbart, P. J., Summers, S. L., and Wood, D. A, *Accounting Information Systems* (15th ed.). Pearson, pp. 145–148. 2023.

[38] Hall, J. A, *Accounting Information Systems* (11th ed.). Cengage Learning, pp. 202–205. 2024.

[39] Institute of Internal Auditors, *Artificial intelligence: Applications and auditing global perspectives*. The IIA Research Foundation, pp. 12–14. 2022.

[40] International Federation of Accountants, *Technology and the future of audit quality: Enhancing transparency and reliability*. IFAC, pp. 34–36. 2023.

[41] Al-Mashhadani, Bushra Najm, *Applications of artificial intelligence in accounting and auditing: Prospects and challenges*. *Journal of Economic and Administrative Sciences*, University of Baghdad, 27(123), 85–98. 2021.

[42] Al-Ani, Omar Ali, *The impact of electronic auditing techniques on enhancing the quality of financial reports: An exploratory study*. *Anbar Journal of Economic and Administrative Sciences*, 14(2), 105–120. 2022.

[43] Al-Saadi, Haider Jassim, *The role of electronic auditing in mitigating financial manipulation risks in commercial banks*. *Journal of Management and Economics*, Al-Mustansiriya University, (132), 40–55. 2022.

[44] Abdul-Kareem, Raed, *Monetary policy and hedging against exchange rate fluctuations*. Beirut: Dar Al-Kotob Al-Ilmiyah, pp. 55–60. 2020.

[45] Al-Shammari, S, *Financial engineering and derivative valuation models in emerging markets*. *Journal of Financial Studies*, 10(2), 40–58. 2017.

[46] Hull, J. C, *Risk Management and Financial Institutions* (6th ed.). Wiley, p. 90. 2021.

[47] Jorion, P, *Value at Risk: The New Benchmark for Managing Financial Risk* (3rd ed.). McGraw-Hill, p. 283.