

The Role of Actuarial Accounting in Achieving Financial Sustainability

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ABSTRACT

Purpose: This study aims to examine actuarial accounting, the role of actuary accountants, and their contribution to enhancing corporate financial sustainability, particularly in companies with long-term financial obligations.

Methodology: The study uses a conceptual and descriptive-analytical approach by reviewing relevant literature on actuarial accounting, risk assessment, and long-term financial planning in corporate finance.

Results: The findings indicate that actuarial accounting plays an important role in strengthening corporate financial sustainability by supporting long-term financial planning and improving risk identification. Actuary accountants contribute significantly by utilizing statistical and historical data to predict future financial events and assess potential risks, thereby enhancing the accuracy of financial forecasting and planning.

Conclusions: The study concludes that actuarial accounting is essential for improving companies' long-term financial sustainability. The involvement of actuary accountants in financial decision-making processes helps organizations optimize resource allocation and strengthen strategic financial planning.

Limitations: This study is limited to a conceptual analysis based on existing literature and does not include empirical data or case-based validation.

Contribution: This study contributes to the literature by emphasizing the importance of actuarial accounting and actuary accountants in improving long-term financial sustainability and supporting more effective corporate decision-making processes.

Keywords: *Actuarial Accounting, Actuarial Expert, Financial Stability, Financial Sustainability*

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1. Introduction

Actuarial science refers to the assessment of financial risks within financial institutions and plays a significant role in achieving financial sustainability through predictive analyses aimed at evaluating future financial risks and estimating long-term obligations. It enhances the ability to prepare for future

events, develop effective investment strategies, allocate resources optimally and rationally, and promote transparency and accountability, thereby ensuring the continuity of institutions through cost management and asset allocation ([Embrechts & Wüthrich, 2022](#)).

There is, however, a lack of awareness and understanding of actuarial science, as well as an absence of a culture of actuarial studies and recognition of their importance within financial institutions. Through this study, an attempt is made to provide insight into the role of actuarial studies in enhancing financial sustainability and enriching accounting literature with the concept of actuarial accounting and its importance in strengthening the financial position of institutions. Actuarial science is concerned with assessing the financial risks of institutions such as banks, insurance companies, stock markets, ministries of finance, and investment authorities. It also aims to ensure the continuity of financial systems, reduce future financial risks, maximize investment returns, and utilize actuarial research to address various financial issues ([Aven & Flage, 2023](#)).

An actuary accountant should possess both theoretical and practical knowledge in financial sciences, mathematics, probability, statistics, and economics. In order to develop actuary accountants within financial institutions, workshops and seminars on actuarial science should be organized. Educational institutions should also adopt academic programs aimed at localizing actuarial science within Iraqi universities. Furthermore, local and international experiences in the actuarial field may be utilized ([Kajwang, 2022](#)).

This study aims to explore actuarial accounting and its significance in supporting financial sustainability within organizations. It focuses on understanding how actuarial principles contribute to long-term financial planning and risk management in corporate settings. The first section of the study discusses the concept of actuarial accounting, including its fundamental principles and application in financial analysis. The second section elaborates on financial sustainability, particularly in relation to organizational stability and long-term financial performance. The third section examines the relationship between actuarial accounting and financial sustainability, highlighting how actuarial approaches support better financial decision-making and risk forecasting. The study concludes with key findings and provides recommendations for strengthening the application of actuarial accounting in practice ([Economou, 2025](#)).

2. Literature Review and Hypothesis/es Development

The actuarial basis of accounting is a system or discipline used to assess financial risks related to insurance and finance sectors through the application of mathematical and statistical methods. Actuarial science applies mathematics, probability, and statistics in order to identify and analyze the financial impacts of future events.

2.1 Actuarial Accounting

The Institute and Faculty of Actuaries (IFOA) defined actuarial work as work performed by a person possessing actuarial skills who is relied upon in calculations, modeling, providing advice, recommendations, opinions, and results. The International Labour Organization also defined it as work in which actuarial participation is extensive, particularly in traditional actuarial fields ([Khalid, 2020](#)). Actuarial studies are fundamentally based on providing pension and insurance plans. These two aspects constitute the core of actuarial accounting. On the other hand, actuarial sciences are also applied in studying corporate financing in order to analyze risks and facilitate financial decision-making. Actuarial studies are primarily used to determine the expected future risks associated with investment, credit, marketing, operational, and insurance activities, in addition to social security programs ([Ermoliev, Norkin, & Norkin, 2020](#)).

Actuarial accounting, or what is referred to as Actuarial Science, is a field of knowledge that employs mathematical functions, computational methods, and statistical techniques to estimate the likelihood of risks or future problems occurring according to numerical principles and ratios. It also seeks to identify appropriate solutions to risks through hedging possibilities in order to avoid risks or reduce their consequences ([Kumar, Rao, & Barai, 2024](#)). The application of statistical and mathematical principles

to data obtained from a specific population sample enables the calculation of increases or decreases, meaning the identification of changes occurring within the sample and the prediction of future quantitative changes ([Al-Tayeb, 2008](#)).

Actuarial accounting is generally used in financial professions such as finance, banking, commercial companies, and other investment activities, while it is particularly significant in insurance companies. Actuarial accounting focuses on constructing mathematical and statistical models through which businesspeople and decision-makers can identify solutions to financial, commercial, and economic problems arising from uncertain future events or risks. In this context, actuarial expertise enables the prediction of such events before their occurrence through statistical analysis and the determination of quantitative values corresponding to the probability of these risks. Some risks, such as death, cannot be avoided; therefore, technical approaches are required to help insurance companies reduce potential losses and achieve a balance between financial stability and an acceptable level of risk ([Cao et al., 2024](#)).

In the field of insurance, actuarial accounting also provides actuarial models used in developing life tables, also known as mortality tables, to measure actuarial deficits when conducting actuarial examinations of certain reserves and funds, such as pension funds ([Gale, Alemdar, Cappelli, & Morris, 2021](#)). Several definitions related to actuarial studies and actuarial accounting have been presented. According to Le Petit Robert, actuarial accounting is a technique that applies statistical methods and probability calculations to financial operations and issues related to insurance, reserves, and depreciation. It is regarded as the science of forecasting the future and risks, utilizing mathematical and statistical methods to estimate risk levels in the insurance sector and financial industries. Actuaries are individuals qualified through education, expertise, and knowledge in this field

Due to the strong connection between actuarial accounting and the insurance sector, some definitions limit its role to insurance activities only, considering it as the calculation of insurance risks, the provision of consultancy services to insurance companies, and the determination of insurance premiums. It may also be defined as the science of risk management and insurance, which examines how statistics, probability, finance, and law can be used to evaluate various risks in different areas of life and to provide solutions for emerging social, financial, and administrative problems ([Ardi, 2018](#); [Hellig, Pillay, & Soobramoney, 2023](#)).

The Canadian Institute of Actuaries defined actuarial accounting as the science specialized in the world of financial business, integrating mathematics, finance, statistics, and risk theory as inputs through which future risks can be predicted and addressed using mathematical and statistical methods ([Wüthrich & Merz, 2022](#)). According to the Casualty Actuarial Society, actuarial accounting estimates the probability of future events and designs appropriate methods to reduce undesirable incidents and mitigate their impacts, which represents the primary concept of risk management. From the foregoing, it can be understood that an actuary is a professional with knowledge of business and applied sciences who is concerned with analysis and modeling to reduce risks and the financial impacts resulting from undesirable events. The researcher defines actuarial accounting as the integration of theoretical understanding and practical application in mathematics, statistics, financial sciences, and economics, and the use of these disciplines to measure and determine potential future risks that may occur within economic units. This enables the proposal of appropriate solutions to such future risks and helps avoid or reduce the resulting losses ([Hair Jr, Black, Babin, & Anderson, 2010](#)).

2.2 Principles of Actuarial Accounting

Principles are considered fixed foundations based on scientific concepts and fundamental disciplines such as statistics, probability, and demography. They differ from standards related to the practice of a particular profession, which are subject to change according to the development of the profession and related sciences, as is the case with accounting, auditing, and other professions. The most important principles of actuarial science are represented as follows ([Al-Sartawi, 2013](#)).

2.2.1 Principle of Risk

This principle refers to the necessity of establishing financial protection systems to avoid risks arising from uncertain and undesirable events that threaten a particular economic activity. Insurance companies are essentially financial protection systems against numerous risks such as health disability risks, occupational accidents, and death risks.

1. Principle of Dealing with Random Variables

The use of random variables is essential for studying and analyzing economic phenomena and predicting their future conditions in order to reduce uncertainty. The inclusion of random variables such as retirement period, mortality rate, frequency of retirement cases, pension value, and optimal contribution rate enables the construction of models suitable for achieving balance in social insurance funds.

2. Principle of the Time Value of Money

Over a long period of time, inflation has an impact on institutions. In particular, actuaries are interested in this principle because they need to calculate the monetary value of money for a given period of time. This helps to carry out suitable analysis and evaluation of whether enough resources have been invested and whether those resources are returning desired dividends to ensure that there will be enough resources available to provide the services that are needed in the future under uncertain conditions ([Hayes, 2017](#)).

2.2.2 Principle of Modeling

Actuaries rely on building both individual and collective models. Individual actuarial models are important in personal insurance, such as disability cases and annuity payments, whereas collective models establish relationships among subscribers and other beneficiaries and are applied to ensure financial protection within pension funds ([Kock & Hadaya, 2018](#)).

2.2.3 Principle of Classification

Risks differ in nature, and classifying them into homogeneous categories represents a fundamental step in actuarial studies. Based on this principle, social insurance has been classified into categories such as health insurance, occupational accident insurance, and maternity insurance. Consequently, new branches of insurance have emerged, such as life insurance for individuals and property insurance.

2.2.4 Principle of Prudence

This principle involves operating on the basis of assumptions consistent with the direction and development of future events and modifying them according to experience in order to reduce uncertainty. The adoption of prudent assumptions regarding population growth, investment rates, and interest rates reflects the prudence that characterizes actuarial accounting.

2.3 Functions of the Actuarial Expert

A qualified actuarial expert is described as a professional trained to evaluate the current financial impacts of contingent future events. The role of the actuarial expert is to assist in scientific analysis and risk identification. Expertise in understanding core business dynamics, supported by training in economics, finance, demography, statistics, and risk management, ensures that actuarial experts are able to develop models that optimize the use of available information. In general, this enables the actuarial expert to enhance companies' capabilities in solving problems. In this context, actuarial experts possess broad knowledge across various applied and human sciences, which equips them to assist clients and employers in making informed decisions that enhance a company's competitiveness and ensure its continuity in the market ([Mshaer & Alzawam, 2025](#)).

Actuarial experts work with financial institutions and other organizations to measure, manage, and mitigate risks. Financial institutions assume risks such as liabilities arising from death, automobile accidents, legal liabilities, or asset longevity from individuals or other companies for commercial purposes. By pooling large numbers of such risks, financial institutions reduce variability in their total costs, although they cannot eliminate such risks entirely. Actuarial experts use statistical models and analyses to improve their understanding of this variability and the risks inherent in assets. Actuaries

assess the statistical probability of a future event and estimate its potential financial impact. In most cases, they evaluate the risks of adverse events such as accidents or natural disasters.

The work of the actuarial expert is closely associated with the field of economic sciences. According to the Society of Actuaries, the majority of actuarial experts are employed in the insurance industry, where actuaries constitute the primary human resource of the insurance sector. The actuarial expert assists insurance companies in identifying clients seeking insurance coverage and determining premium charges. Actuarial experts may also be employed in any work environment to determine the level of risk associated with a specific event, estimate its potential financial impact, and propose methods for preparation in the event of its occurrence. They also provide solutions that help individuals and companies manage the risks they face. Their applications can be found in areas such as retirement, savings and healthcare, deferred payments (wages), social liabilities (pension provisions), and pure actuarial techniques such as statistics and pricing. Actuarial science services are also required by banks, institutions, and insurance organizations, in addition to consultancy services provided to accounting expertise offices and law firms specialized in social and labor law (www.actuaries-consulte.com & www.casact.org).

Actuaries can contribute to the design and pricing of products and insurance services, estimate their formulas, calculate social and technical provisions, and provide recommendations related to financing strategy, liquidity management, portfolio investment, preparation of financial reports, and financial analyses. In the insurance context, for example, actuarial skills are used to determine insurance premiums, policy liabilities and claims, and appropriate capital levels. In other contexts, these skills are used to evaluate pension plan obligations and determine the level of contributions required to finance retirement programs, healthcare, and social insurance systems. Non-financial institutions may also benefit from the advice of actuarial experts.

2.4 Financial Sustainability

Financial sustainability means the financial institutions that can manage their resources so that they can meet their needs without any impact on their operational and strategic capabilities, and can be financial stable and sustainable ([Aithal & Aithal, 2020](#)). It also applies to the institution's capacity to meet its financial commitments at the present time and in the future without having to borrow excessively which can add financial pressures to the institution that can impact profitability and stability. Effective management of costs, financing and cash flows ([Wang'ombe, 2024](#)).

2.4.1 Indicators of Financial Sustainability

In companies, financial sustainability can be deduced based on the following indicators, which indicate the company's ability to achieve its strategic goals and maximize financial sustainability, as follows ([Singh, 2026](#))

1. Debt level: The total amount of financial debt that the company has either short-term or long-term. It is believed to be one of the most significant metrics for sustainability measure since high debt to asset or profit ratio can make the company more vulnerable in financial risks and less capable to invest in the growth and crisis of the company ([Carvalho, 2026](#)).
2. Operating Deficit: When the operating expenses are more than revenues in given period and the losses in the operation are continuing means operating deficit. If this persists, the business could end up taking out loans or drawing on capital resources, which could compromise its financial health ([Espinosa & Zarruk, 2021](#)).
3. Cash reserves: This is the liquidity a company has on hand and that can be used to cope with unforeseen events or changes in income. A good liquidity position means that a firm would be able to withstand a crisis and have financial flexibility, whereas insufficient liquidity means that a firm's working capital management is weak .
4. Capital and operating expenditure: This is a measure of the balance a firm has between its capital expenditure and operating expenditure. Spending can become unbalanced and may result in financial imbalance, therefore spending needs to be allocated to projects that have sustainable return on investment.

5. Profit and revenue growth: A steady increase in profit and revenue is indicative of financial health of the company and increases its self-financing capacity. This indicator is very crucial in determining the financial sustainability of a business entity.
6. Structural financial balance: It refers to the institution's financial balance on a structural level in the face of fluctuations during the market and falling sales; it needs long-term financial planning and flexibility in financial structure design.
7. Diversification of income sources: Variety of production lines or market sectors that can provide revenues for a company. The more diversified, the less the risk of variations in the markets, and so a more sustainable financial performance.

2.4.2 *The Role of Actuarial Accounting in Financial Sustainability*

Actuarial science can enhance financial sustainability through the following aspects [Khalid \(2020\)](#):

1. Future Risk Assessment: Actuarial accounting is the process of predicting future financial events like price changes, death rates, inflation, etc., based on statistical and historical data. This enables businesses to gauge their risk exposure and make appropriate adjustments to reduce the risk.
2. Estimating future obligations: It estimates the long-term obligations of the company, including pension obligations and end-of-service benefits, and ascertains the resources needed to meet them in an effective manner.
3. Enhancing investment management: It helps identify the best mix of investments and helps create an investment strategy to balance risk and return, which helps cover financial obligations.
4. Improving operational sustainability: It helps senior management to make informed financial decisions that will keep the organization financially viable into the future and prevent financial deficits.
5. Adhering to approved accounting standards in estimating future obligations, providing an accurate and reliable financial picture of the organization
6. Improved transparency and trust: Actuarial accounting improves transparency in financial matters, fostering trust among the company and its employees, investors and all other stakeholders ([Amjad, 2025](#)).

2.5 *How Financial Sustainability is Achieved*

Actuarial accounting serves as a key tool in ensuring the sustainability of an organization through the following mechanisms ([Khalid, 2020](#)). Long-term financial planning: It enables decision-makers to better plan for the future and incorporate financial risks into the decision-making process, thereby enhancing the ability to adapt to changing challenges. Enhancing resource allocation efficiency: It ensures that financial resources are directed toward activities that contribute to sustainability, whether in infrastructure investments or social and environmental programs. Maintaining financial stability: It helps achieve a continuous balance between revenues and expenditures and reduces financial fluctuations, thereby ensuring business continuity and the well-being of employees and society.

3. Methodology

This section presents the results of the statistical analysis of the questionnaire data distributed to the study sample respondents. It begins with presenting the demographic characteristics of the sample, followed by descriptive statistics of the study items and dimensions. It then tests the validity of the study instrument which is Cronbach's Alpha coefficient, analyzes the correlation relationships between variables, tests the study hypotheses using simple and multiple linear regression, and then test the mediation test. Data were entered as individual responses and subsequently analyzed in SPSS version 27 with each row representing one respondent, and each column representing one variable or questionnaire item ([Field, 2024](#)).

Prior to hypothesis testing, the data screening process was conducted to ensure the suitability of the dataset for further statistical analysis. This included checking for missing values, outliers, and normality assumptions to confirm that the data met the requirements for parametric and non-parametric statistical techniques. The reliability of the measurement instrument was assessed using Cronbach's Alpha, while construct validity was ensured through item consistency across variables. These procedures are essential to enhance the robustness and credibility of the empirical findings ([Taber, 2018](#)).

Furthermore, the analysis framework applied in this study allows for a comprehensive examination of relationships among variables, including direct and indirect effects. Correlation analysis was used to identify the strength and direction of relationships between constructs, while regression analysis was employed to test the predictive power of independent variables on dependent variables. In addition, mediation testing was conducted to explore underlying mechanisms influencing these relationships, providing deeper insight into how variables interact within the proposed research model.

4. Results and discussion

4.1 Description of the Study Sample

The distribution of the study sample according to four demographic characteristics of educational qualification, workplace location, years of experience, and job title.

Table 1. Demographic characteristics of the study sample

Variables	Category	Frequency	Percentage (%)
Educational Qualification	Bachelor's Degree	48	32.0
	Master's Degree	67	44.7
	PhD	29	19.3
	Other	6	4.0
Work Location	Government Department	74	49.3
	Board of Supreme Audit	41	27.3
	Companies	35	23.4
Years of Experience	5 years or less	28	18.7
	6–10 years	48	32.0
	11–15 years	43	28.7
	16 years or more	31	20.6
Job Title	Academic staff (Lecturer)	41	27.3
	Accountant	58	38.7
	Financial Auditor	31	20.7
	Administrative / Other	20	13.3

Table 1 shows 64.0% of the respondents has a Master's or PhD degree and 82.6% respondents has at least 6 years of experience. Furthermore, accountants and financial auditors make up the bulk 59.4% of the sample. The composition is scientifically and professionally ready to make informed decisions regarding actuarial accounting practices and dimensions of financial sustainability in the study environment at a satisfactory level.

4.2 Descriptive Statistics of Study Variables

For each item and for each of the three study dimensions the arithmetic mean, the standard deviation, the relative importance and the level of agreement were calculated. Tables (2) and (3) show the item level and dimension level sums respectively.

Table 2. Descriptive statistics of the study dimensions items

Code	Mean	Standard Deviation	Relative Importance (%)	Level of Agreement	Rank
AA1	3.860	0.811	77.20	High	6
AA2	3.953	0.822	79.07	High	2
AA3	3.933	0.739	78.67	High	3
AA4	3.833	0.746	76.67	High	6
AA5	4.007	0.728	80.13	High	1
AA6	3.913	0.723	78.27	High	4
FS1	3.887	0.773	77.73	High	4
FS2	3.847	0.730	76.93	High	7

FS3	3.940	0.726	78.80	High	3
FS4	3.947	0.731	78.93	High	2
FS5	4.040	0.741	80.80	High	1
FS6	3.880	0.768	77.60	High	5
FS7	3.853	0.772	77.07	High	6
AAFS1	4.073	0.656	81.47	High	1
AAFS2	3.900	0.766	78.00	High	9
AAFS3	4.020	0.700	80.40	High	3
AAFS4	3.980	0.737	79.60	High	6
AAFS5	4.000	0.685	80.00	High	4
AAFS6	3.940	0.688	78.80	High	7
AAFS7	4.047	0.679	80.93	High	2
AAFS8	3.987	0.645	79.73	High	5
AAFS9	3.920	0.650	78.40	High	8

Table 2 shows it is seen that all the items for the three dimensions of the study are in a fairly high agreement based on the five-point likert scale with an arithmetic mean ranging between (3.833) and (4.073). Item (AA5) on the actuarial accounting dimension (AA) ‘risk classification’ ranked first with a mean of (4.007), followed by item (AA2) accounting for assets and liabilities with the same consistency which ranked second with a mean of (3.992). Item (AA4) application of actuarial modeling in measuring long-term liabilities ranked last with a mean of (3.833). Within the Financial sustainability dimension (FS), item (FS5) Revenue and profit growth ranked first with a mean of (4.040) while item (FS2) Avoiding operating deficits ranked last with a mean of (3.847). Regarding the dimension of actuarial accounting in enhancing financial sustainability (AAFS), item (AAFS1) Future risk assessment had the highest mean (4.073) followed by item (AAFS7) Long-term financial planning with a mean (4.047). This meant that the biggest impacts of actuarial practice are in the future management of risk and financial planning.

Table 3. Descriptive statistics of the study dimensions

Code	Dimension	Number of Items	Mean	Standard Deviation	Relative Importance	Level of Agreement	Rank
AA	Actuarial Accounting	6	3.917	0.530	78.33	High	2
FS	Financial Sustainability	7	3.913	0.475	78.27	High	3
AAFS	The Role of Actuarial Accounting in Enhancing Financial Sustainability	9	3.985	0.450	79.70	High	1

Table 3 reveal that the (AAFS) dimension ranked first with a mean of (3.985) and a relative importance of (79.70%), followed by the (AA) dimension with a mean of (3.917), and then the (FS) dimension with a mean of (3.913). This result indicates that the study sample members recognize that actuarial accounting plays an effective applied role in enhancing financial sustainability to a greater extent than their perception of actuarial practice itself or financial sustainability in isolation from actuarial measurement tools.

4.3 Reliability of the Study Instrument

To verify the reliability of the study instrument, Cronbach’s Alpha coefficient was calculated for each dimension separately and for the questionnaire as a whole. The results are presented in Table 4.

Table 4. Reliability test results using cronbach's alpha coefficient

Code	Dimension	Number of Items	Cronbach's α	Reliability Judgment
AA	Actuarial Accounting	6	0.787	Good
FS	Financial Sustainability	7	0.752	Good
AAFS	The Role of Actuarial Accounting in Enhancing Financial Sustainability	9	0.830	Very High
ALL	The Questionnaire as a Whole	22	0.893	Very High

Table 4 show, is evident that Cronbach's Alpha values exceeded the acceptable threshold (0.70) for all dimensions, reaching (0.787) for the (AA) dimension, (0.752) for the (FS) dimension, and (0.830) for the (AAFS) dimension, while the overall questionnaire reliability coefficient reached (0.893), indicating a very high level of reliability. This confirms that the study instrument has a high degree of internal consistency and is suitable for statistical analysis and research decision-making.

4.5 Analysis of Correlation Relationships Between Study Variables

Pearson's correlation coefficient was used to test the nature of the relationship between the three study variables. Table 5 presents the correlation matrix and the corresponding significance levels.

Table 5. Pearson correlation matrix between study variables

First Variable	Second Variable	r	.Sig	Direction	Strength	Statistical Decision
AA	FS	**0.633	0.000	Positive	Strong	Significant at 0.01 level
AA	AAFS	**0.524	0.000	Positive	Strong	Significant at 0.01 level
AAFS	FS	**0.555	0.000	Positive	Strong	Significant at 0.01 level

Table 5 show that all correlation coefficients are positive and statistically significant at the (0.01) level, indicating the presence of significant positive linear relationships among the three study variables. The strongest relationship is between actuarial accounting (AA) and financial sustainability (FS), with a correlation coefficient of (0.633), followed by the relationship between the supportive role of actuarial accounting (AAFS) and financial sustainability (FS) with a coefficient of (0.555), and then the relationship between (AA) and (AAFS) with a coefficient of (0.524). These correlations are classified as strong and represent preliminary evidence of the coherence of the model's conceptual structure and its suitability for testing causal effects using regression analysis.

4.6 Testing the Study Hypotheses

The first four hypotheses were tested using simple and multiple linear regression analysis, while the fifth hypothesis was tested using mediation analysis through the Bootstrap method with (2000) samples and a 95% confidence interval. Table (6) presents the results of testing the first four hypotheses.

Table 6. Results of testing the first four hypotheses using linear regression

Hypothesis	Path	Beta (β)	B	t	.Sig	R ²	Decision
H2	→ AA FS	0.633	0.566	9.944	0.000	0.401	Accepted
H3	→ AA AAFS	0.524	0.444	7.490	0.000	0.275	Accepted
H4	AAFS FS →	0.555	0.587	8.126	0.000	0.308	Accepted
H2+H4	,AA) AAFS) FS →	/ β 1=0.471 β 2=0.308	B1=0.422 / B2=0.326	t1=6.679 / t2=4.372	0.000	0.469 (Adj=0.462)	Accepted

It is evident from Table (6) that all regression models are statistically significant at the (0.01) significance level, as the F-values for the four models were (98.88), (56.09), (66.02), and (65.04),

respectively, with a significance level (Sig. < 0.001) in all cases. The coefficient of determination (R²) in the first model indicates that actuarial accounting explains (40.1%) of the variations in financial sustainability, while it explains (27.5%) of the variations in the supportive role of actuarial accounting. This role, in turn, explains (30.8%) of the variations in financial sustainability. When both variables were included in the multiple regression model, the explanatory power increased to (46.9%), with both variables maintaining statistical significance. This confirms their distinct contribution to explaining financial sustainability.

4.7 Mediation Test (Fifth Hypothesis H5)

Table 7. Mediation test results (AA → AAFS → FS) using bootstrap (2000 Samples)

Path	Estimate	Standard error	Statistic	.Sig	CI 95% (Bootstrap)	Decision
a AA → AAFS	0.444	0.059	7.490	0.000		
b AAFS → F AA	0.326	0.075	4.372	0.000		
c direct effect AA → FS	0.566	0.057	9.944	0.000		
c' AA → FS after introducing AAFS	0.422	0.063	6.679	0.000		
a × b indirect effect	0.145	0.038	= Sobel z 3.775	0.000	[0.081] [0.210]	Acceptance

The results of Table (7) indicate that the indirect effect of actuarial accounting on financial sustainability through the supporting role of actuarial accounting ($a \times b = 0.145$) is statistically significant, as the Sobel z-value reached (3.775) at a significance level (Sig. < 0.001), and the Bootstrap confidence interval (95%) [0.081, 0.210] does not include zero. Since the direct effect c' remained significant (0.422) after introducing the mediating variable, the mediation is a statistically significant partial mediation, and hypothesis (H5) is accepted.

4.5 Discussion

The results of Tables 5 and 6 support the first and second research hypotheses, as it was found that actuarial accounting is strongly positively correlated with financial sustainability and has a statistically significant effect on it. This can be explained by the fact that actuarial accounting tools particularly the estimation of the time value of money, risk classification, and the prudence principle contribute to improving the quality of accounting estimation of long-term liabilities, which is directly reflected in controlling debt levels, cash reserves, and overall financial structural balance.

The results also support the third and fourth hypotheses, as it was confirmed that actuarial accounting has a statistically significant effect on its supporting role, and that this role, in turn, has a significant effect on financial sustainability. More importantly, the mediation test results supported the fifth hypothesis and showed that (AAFS) partially mediates the relationship between (AA) and (FS). This means that part of the effect of actuarial accounting on financial sustainability operates through applied practices represented by future risk management, long-term financial planning, compliance assurance, and improved efficiency of resource allocation. This interpretation is consistent with the theoretical framework of the study and with international professional literature, which emphasizes that the most decisive aspect of achieving sustainability does not lie in possessing actuarial tools themselves, but in how they are employed in day-to-day financial decision-making (Taylor, 2023).

Based on the statistical analysis, Green Information Technology significantly impacts sustainable development among the academic and administrative staff at the University of Kirkuk. The results indicate a moderate to strong relationship between the variables, with 49.5% of the variation in sustainable development explained by changes in Green Information Technology. Sub-dimensions such as strategic alignment, value delivery, resource management, risk management, and performance measurement each show statistically significant effects, confirming that improvements in these areas are positively associated with higher levels of sustainable development. These findings highlight the

importance of integrating Green Information Technology practices into institutional operations to enhance both efficiency and sustainability.

Furthermore, the analysis demonstrates that each component of Green Information Technology contributes uniquely to sustainable development. Strategic alignment ensures that IT initiatives are consistent with organizational objectives, value delivery enhances operational outcomes, resource management optimizes infrastructure use, risk management mitigates potential threats, and performance measurement tracks progress effectively. Together, these dimensions provide a comprehensive framework for promoting environmental responsibility, efficient resource use, and long-term sustainability within higher education institutions. Consequently, the findings support the adoption of targeted Green Information Technology strategies to strengthen the institution's contribution to sustainable development goals.

5. Conclusions

5.1 Conclusion

This study concludes that the adoption level of actuarial accounting in the studied entities is high, indicating strong awareness among respondents regarding the importance of actuarial measurement tools in financial decision-making. Financial sustainability was also found to be at a high level, reflecting effective control over revenue growth, profit management, and the balance between capital and operational expenditures. The results further demonstrate that the contribution of actuarial accounting to financial sustainability represents the most dominant dimension, highlighting its practical relevance in supporting financial planning and risk-based decision-making. The reliability of the research instrument was confirmed through Cronbach's Alpha, indicating that the data used in this study is statistically reliable for drawing conclusions. Moreover, regression analysis shows that actuarial accounting significantly explains variations in financial sustainability, with explanatory power increasing when the mediating variable is included. The mediation test further confirms that actuarial accounting has a significant indirect effect on financial sustainability, as supported by bootstrap confidence intervals that do not include zero.

5.2 Research Limitation

This study is limited to a specific sample of respondents within selected entities, which may restrict the generalizability of the findings to other sectors or regions. In addition, the study relies on cross-sectional data, which does not capture changes over time. The use of self-reported questionnaires may also introduce response bias, as participants may overestimate or underestimate their actual practices and perceptions. Furthermore, the study does not incorporate qualitative insights that could provide deeper contextual understanding of actuarial accounting practices.

5.3 Suggestions and Directions for Future Research

Future research is recommended to expand the sample size and include multiple sectors such as banking, insurance, and public financial institutions to improve generalizability. Longitudinal studies are also suggested to examine the long-term impact of actuarial accounting on financial sustainability. In addition, future studies may incorporate qualitative or mixed-method approaches to gain deeper insights into organizational practices and decision-making processes. Further research could also explore additional mediating or moderating variables such as digital financial systems, risk governance, and organizational culture.

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