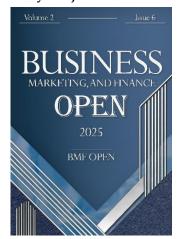# The Impact of Earnings Quality on the Probability of Bankruptcy in Companies Listed on the Iraq Stock Exchange: An Instrumental Variables Approach

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Abstract: A company faces the risk of financial distress when it is unable to secure sufficient financial resources to sustain its business operations and encounters difficulties in managing its affairs. Decision usefulness theory suggests that high earnings quality is considerably more beneficial for investment decisions, whereas low earnings quality is less effective in the decision-making process. Consequently, high earnings quality reflects earnings sustainability, which, based on signaling theory, indicates signs of operational health and fewer threats to the company's future viability. Given that previous studies on the relationship between earnings quality and the probability of bankruptcy have not addressed the endogeneity issue of earnings quality, the present study aims to investigate the effect of earnings quality on the probability of bankruptcy using an instrumental variables approach and applying the two-stage least squares (2SLS) estimator. The study population includes all companies listed on the Iraq Stock Exchange from 2013 to 2022. The findings reveal that an increase in earnings quality reduces the probability of bankruptcy among companies listed on the Iraq Stock Exchange.

Keywords: Earnings Quality, Bankruptcy, Instrumental Variable Approach.

1. Introduction

Bankruptcy sometimes originates from internal factors within the company and the policies implemented by managers. The research literature has repeatedly examined the reasons behind the distortion of financial statement items from this perspective, as financial statements are subject to managerial manipulation according to agency theory. Managers' competition for reputation and higher income, along with gaps in accounting standards and procedures, has led them toward accounting manipulation practices. These practices undermine the intended objectives of preparing and publishing financial statements and fail to provide an accurate picture of a company's performance and financial position [1], while the allocation of corporate resources suffers due to the lack of accurate financial information from reported accounting figures [2].

Reported earnings quality is a multidimensional concept and can be measured through various factors including the quality of discretionary accruals, earnings smoothing, earnings predictability, earnings persistence, earnings

timeliness, and value relevance [3]. Earnings have high quality when they accurately reflect the intrinsic value of the company. Therefore, earnings are considered high-quality when they mirror the current operational performance of the company and thus serve as a good indicator of future operating performance and a useful benchmark for assessing firm value [4]. Earnings quality becomes threatened when managers engage in opportunistic earnings manipulation. Hence, it can be stated that earnings quality stems from agency costs and the manager-owner conflict of interest [5].

Decision usefulness theory indicates that high earnings quality is significantly more useful for investment decisions, whereas low earnings quality is less helpful in the decision-making process. The theory of earnings attributes defines earnings quality based on precise characteristics such as sustainability, predictability, relevance, and timeliness. Consequently, high earnings quality refers to earnings stability, which, according to signaling theory, conveys signs of operational soundness and fewer threats to the future viability of the company [6-8]. Signaling theory is also based on the assumption that managers of financially constrained companies, by increasing accruals in financial reporting, aim to divert stakeholders' attention away from the firm's financial difficulties, as market participants mostly focus on earnings figures. Managers, through earnings management, inflate profits and temporarily shield themselves from shareholder criticism [9].

The reviewed literature underscores the multifaceted relationship between earnings quality, financial distress, and bankruptcy prediction. Mattos and Shasha (2024) found that low-quality financial reports significantly limit the explanatory power of traditional financial ratios in predicting default among Brazilian firms undergoing restructuring [10]. Similarly, Thu (2023) demonstrated that in Vietnamese firms, accrual-based earnings management increases financial distress risk, whereas real earnings manipulation tends to mitigate it, especially when firms adopt competitive business strategies [11]. In contrast, Hundal et al. (2023) observed no systematic use of financial reporting manipulation in Northern European banks and no direct impact on bankruptcy probability [12]. Mohammed (2023), focusing on Iraqi banks, reported a significant positive relationship between income smoothing and bankruptcy prediction accuracy [13]. Faghih Karimi et al. (2022) highlighted the behavioral dimension by linking managerial narcissism to decreased earnings quality and increased bankruptcy risk in Iranian firms. Ghatbi et al. (2024) further showed that incorporating accrual-based earnings management variables into bankruptcy models significantly enhances their predictive power [14]. Rouintan et al. (2024) explored innovative financial engineering tools, suggesting that resilience-based modeling can improve distress detection accuracy over traditional methods [15]. Finally, Anvari Rostami (2024) provided a comprehensive review of bankruptcy prediction theories and models, identifying an increasing trend of research in Iran and advocating for the adoption of intelligent, evolutionary computation-based techniques to improve predictive precision, especially for SMEs and dynamic market environments [5]. Together, these studies highlight the importance of contextual, behavioral, and methodological dimensions in accurately assessing corporate financial distress.

In summary, it can be inferred that earnings quality can reduce the likelihood of bankruptcy through two mechanisms. On one hand, earnings quality reduces information asymmetry and ensures a healthy flow of information for internal and external users, enabling them to make economic decisions with greater confidence. Under such circumstances, managers can make better decisions and conduct a more comprehensive and accurate analysis of the current situation while forecasting future conditions. When earnings possess higher quality, they exhibit objectivity and high reliability, indicating the quality of financial statements. As a result, the appropriate management of resources and rational decision-making, based on earnings with high quality and complete informational content, minimize managerial errors and, through improved corporate performance, lower the

probability of bankruptcy. On the other hand, earnings quality, according to agency theory, reflects lower agency costs in the firm. Hence, in such conditions, there is greater alignment between the objectives of managers and owners, and management will devote all efforts to creating value for shareholders. It is natural that when such a philosophy prevails in a company, and macroeconomic factors remain stable, the likelihood of the firm encountering bankruptcy diminishes. The present study introduces earnings quality as a solution for reducing the probability of bankruptcy. In fact, although earnings manipulation may temporarily obscure managerial weaknesses in the short run, it cannot indefinitely prevent the dissemination of negative information. Eventually, such information—accumulated behind the barrier of managerial self-interest—will enter the market suddenly and generate a wave of mistrust toward the company. Moreover, high earnings quality can enhance the informational content of reported figures, enabling information users to forecast future conditions with greater certainty. In economic and commercial systems, managers are more successful when they can accurately anticipate future events and convert threats into opportunities. Earnings quality offers this capability to managers and other information users. Therefore, despite the considerable emphasis in the literature on the necessity of improving earnings quality, this study intends to demonstrate that earnings quality may, in fact, serve as a savior of the company, preventing it from sinking into the swamp of bankruptcy.

2.   Methodology

Since this study examines the relationship between multiple variables, it is categorized as a descriptive-correlational research. Given its use in decision-making processes, it also qualifies as applied research. Furthermore, in terms of data type, it is documentary, and in terms of the time of implementation, it is ex post facto. The theoretical foundations of the research were compiled through a review of valid domestic and international books, articles, dissertations, databases, and websites. To test the research hypotheses, panel data (year–firm) with retrospective nature were used. The required data were collected from the website of the Research, Development, and Islamic Studies Center affiliated with the Iraq Stock Exchange.

The study population includes all companies listed on the Iraq Stock Exchange from 2013 to 2022, totaling 133 companies, of which 41 were selected as the statistical sample through a systematic elimination method. The sampling criteria required that the company had been listed on the Iraq Stock Exchange prior to 2013 and had not been delisted by the end of 2022. To ensure data homogeneity, companies operating in banking, financial institutions, insurance, and leasing sectors were excluded. For comparability, the fiscal year-end of the companies had to coincide with the calendar year-end, and no fiscal year change could occur during the research period. Additionally, information on the selected variables must be accessible.

Definition and Measurement of Variables

Dependent Variable Definition and Measurement

The dependent variable of this study is the probability of bankruptcy of companies listed on the Iraq Stock Exchange. To calculate this variable, Altman's Z-score model (1968), as shown in Equation (1), is employed:

Equation (1)

$Z = 1.2 * X1 + 1.4 * X2 + 3.3 * X3 + 0.6 * X4 + 1.0 * X5$

Where:

Z = Altman Z-score

X1 = Working capital / Total assets

X2 = Retained earnings / Total assets

X3 = Earnings before interest and tax (EBIT) / Total assets

X4 = Book value of equity / Book value of total debt

X5 = Sales / Total assets

If the Z-score is greater than 2.9, the firm is considered healthy; if less than 1.23, it is considered bankrupt; and scores between these values represent a gray area (Altman, 1968). In other words, the lower the Z-score, the higher the probability of bankruptcy.

Independent Variable Definition and Measurement

The independent variable in this study is earnings quality (AQ), measured using the earnings management model. In the earnings quality literature, many researchers have used discretionary accruals as a valid proxy for earnings quality. Yaghoubi-Nejad et al. (2012) evaluated several earnings quality models to determine the most suitable one for hypothesis testing, using time series by sector and significance indicators such as R-squared, F-statistic, and Durbin-Watson statistic. The results indicated that the Kaznik model (1999) was optimal due to higher R-squared and adjusted R-squared values across industries, demonstrating stronger predictive ability.

Accordingly, earnings quality is measured by the discretionary accruals index using the Kaznik (1999) model, as outlined in Equation (1). First, total accruals are extracted using the following equation:

Model (1)

$TA\_it / A\_it\text{-}1 = \alpha + \beta1 * (\Delta REV\_it - \Delta REC\_it) / A\_it\text{-}1 + \beta2 * PPE\_it / A\_it\text{-}1 + \beta3 * \Delta CFO\_it / A\_it\text{-}1 + \varepsilon\_it$

Where:

TA_it = Total accruals (difference between operating income and operating cash flows)

A_it-1 = Total assets of firm i at the beginning of year t

ΔREV_it = Change in net sales revenue between year t and t−1

ΔREC_it = Change in trade receivables between year t and t−1

PPE_it = Gross property, plant, and equipment of firm i at year t

ΔCFO_it = Change in cash flows from operations between year t and t−1

ε_it = Error term of Model (1), and the negative absolute value of ε_it is used as the proxy for earnings quality (AQ) in this study.

Control Variables Definition and Measurement

The control variables in this study include:

1. DEBTR = Total debt / Total equity
2. EBITR = Operating profit / Total debt
3. CFOR = Operating cash flow / Total debt

Instrumental Variables Definition and Measurement

To address potential endogeneity bias in the two-stage least squares (2SLS) method used in this study, we apply the instrumental variables approach. Effective instrumental variables must be highly correlated with the endogenous variable while being uncorrelated with the error term. Since earnings quality is assumed to be endogenous, valid instruments should influence AQ but not correlate with the error term of the regression model. This requires initial testing of the endogeneity of AQ. Only if endogeneity is confirmed, the 2SLS method and IV approach can be employed.

The following instrumental variables are used in this study:

1. **Firm Performance (ROA):** Prior studies show that firms with poor performance tend to use aggressive accounting practices to boost reported earnings, resulting in lower earnings quality (Doyle et al., 2007).

However, DeAngelo et al. (1994) argue that long-term poor performance may limit earnings management opportunities. Chan et al. (2006) also found a negative relationship between firm performance and earnings quality. ROA is calculated as net income / total assets. Given its influence on AQ, ROA serves as a suitable instrument.

2. **Leverage Ratio (Lev):** The debt hypothesis posits that firms may engage in earnings management to meet contractual debt obligations, such as maintaining certain leverage ratios. This can lower earnings quality. Leverage is calculated as total debt / book value of assets.

3. **Board Size (BSize):** Beekes et al. (2004) found that firms with larger boards are more likely to adopt conservative earnings reporting. Board size is the number of directors on the company's board. This variable is operationalized using the number of board members.

4. **Board Independence (Ind):** Dee (2005) found a positive and significant relationship between board independence and earnings quality, especially in firms with high agency costs. Afendi et al. (2007) noted that CEO-duality increases the likelihood of earnings restatement. Board independence is measured as the number of independent (non-executive) directors divided by the total number of board members.

5. **Auditor Size (Ac_Size):** Teoh and Wong (1993) and DeAngelo (1981) suggest that larger audit firms provide higher quality audits due to greater market reputation and less dependency on individual clients. Kim et al. (2003) and Francis & Wang (2008) found that firms audited by larger firms have higher earnings quality and investor protection. In this study, audit firm size is measured by assigning 1 to firms with employee counts above the sample median, and 0 otherwise.

6. **Auditor Industry Expertise (Ac_Exp):** Auditor expertise includes providing innovative solutions and valuable insights for clients. Krishnan (2003) found that clients without expert auditors exhibit higher discretionary accruals. Reynolds & Francis (2000) and Jenkins et al. (2006) found that industry specialists are better at detecting earnings management and maintaining audit quality. In this study, auditor expertise is measured by the market share of the audit firm.

Data Analysis

To examine the relationship between earnings quality and bankruptcy probability among companies listed on the Iraq Stock Exchange, the model by Charitou et al. (2004) is applied as shown below:

Model (2)

$Z = \beta_0 + \beta_1 * AQ + \beta_2 * DEBTR + \beta_3 * EBITR + \beta_4 * CFOR + \varepsilon$

Where:

Z = Probability of bankruptcy

AQ = Earnings quality

DEBTR = Total debt / Equity

EBITR = Operating profit / Total debt

CFOR = Operating cash flow / Total debt

To estimate Model (2), given the possibility that AQ is endogenous, the instrumental variables approach is used. If AQ is endogenous, ordinary least squares (OLS) estimation will produce biased results. Therefore, 2SLS estimation is preferred for more reliable and consistent results (Aflatooni, 2016).

In this study, the instrumental variables are ROA, Lev, BSize, Ind, Ac_Size, and Ac_Exp. The following system of equations is used with the IV approach:

Model (2)

$$Z = \beta_0 + \beta_1 * AQ + \beta_2 * DEBTR + \beta_3 * EBITR + \beta_4 * CFOR + \varepsilon_1$$

Model (3)

$$AQ = \alpha_0 + \alpha_1 * ROA + \alpha_2 * Lev + \alpha_3 * BSize + \alpha_4 * Ind + \alpha_5 * Ac\_Size + \alpha_6 * Ac\_Exp + \varepsilon_2$$

Where:

ROA = Return on assets

Lev = Leverage ratio

BSize = Board size

Ind = Board independence

Ac_Size = Auditor size

Ac_Exp = Auditor industry expertise

ε_1 and ε_2 = Error terms of Models (2) and (3), respectively

In this system, Model (2) is the main regression and Model (3) is the first-stage regression. Since a higher Altman Z-score implies lower bankruptcy probability, if β_1 is positive and statistically significant, the hypothesis that increased earnings quality reduces the probability of bankruptcy is confirmed. This is because a higher AQ leads to a higher Z-score and thus a lower likelihood of bankruptcy.

3. Findings and Results

The results of the descriptive statistics are presented in Table (1). The findings show that the mean value of the Altman Z-score is 5.374, and the mean of the earnings quality variable is -0.024. The average financial leverage of the sample companies is 0.299, indicating that approximately 30 percent of assets are financed through debt.

On the other hand, dispersion parameters serve as indicators of the variability of data points either from one another or from the mean. One of the most important dispersion parameters is the standard deviation. The standard deviation of the variable "operating cash flow to total debt" is 0.046, while the standard deviation of the Altman Z-score is 15.184, indicating that the "operating cash flow to total debt" ratio exhibits the least dispersion and the Altman Z-score shows the greatest dispersion.

Table 1. Descriptive Statistics of Variables

Variable	Symbol	Mean	Std. Dev.	Minimum	Maximum
Altman Z-score	Z	5.374	15.184	-35.841	145.034
Earnings Quality	AQ	-0.024	0.276	-0.551	3.037
Total Debt to Equity	Debtr	0.987	2.774	0.002	34.272
EBIT to Total Debt	Ebitr	0.129	2.134	-19.179	11.520
Operating Cash Flow to Total Debt	Cfor	0.007	0.046	-0.112	0.596
Return on Assets	ROA	-0.032	0.367	-4.338	0.337
Leverage Ratio	Lev	0.299	0.240	0.002	0.971
Board Size	BSize	6.975	1.069	5.000	11.000
Board Independence	Ind	0.500	0.187	0.000	0.857
Auditor Size	Ac_Size	0.553	0.497	0.000	1.000
Auditor Industry Expertise	Ac_Exp	0.658	0.474	0.000	1.000

Table 2. Frequency Distribution of Binary Variables

Variable	Symbol	Number of Firms		Percentage	
		One		Zero	
Auditor Size	Ac_Size	227		183	
Auditor Industry Expertise	Ac_Exp	270		140	

Based on the results of Table (2), which shows the frequency distribution of binary variables, it can be inferred that in 55.37% of the observations, the auditor was classified as large, and approximately 65.85% of the total 410 observations involved industry-specialist auditors.

Given that the data used in this research are panel data (year–firm), prior to model estimation and hypothesis testing, the nature of the data (pooled vs. panel) and classical regression assumptions must be examined. The results of the F-Limer and Hausman tests are provided in Table (3). As observed, the data are panel in nature, and the fixed effects model is more appropriate than the random effects model.

Table 3. F-Limer and Hausman Test Results for Data Type Determination

Description	F-Limer Test	Hausman Test
	F-statistic	p-value
Model (2–3)	8.33	0.000

To test the hypothesis that increasing earnings quality reduces the probability of bankruptcy among companies listed on the Iraq Stock Exchange, Models (2) and (3) were estimated simultaneously using the two-stage least squares (2SLS) method. The results of this system of equations with the instrumental variable approach are shown in Table (4).

Table 4. Simultaneous Estimation Results of Models (2) and (3) via 2SLS

Variable	Symbol	First Stage Regression	Main Regression
		Coefficient (t-statistic)	p-value
Earnings Quality	AQ	–	–
Total Debt to Equity	Debtr	-0.011 (-1.74)	0.082
EBIT to Total Debt	Ebitr	0.016 (1.73)	0.084
Operating Cash Flow to Total Debt	Cfor	-0.402 (-1.13)	0.261
Return on Assets	ROA	-0.187 (-3.19)	0.002
Leverage Ratio	Lev	0.024 (0.17)	0.868
Board Size	BSize	-0.024 (-0.37)	0.714
Board Independence	Ind	0.203 (2.20)	0.029
Auditor Size	Ac_Size	0.009 (0.31)	0.756
Auditor Industry Expertise	Ac_Exp	0.164 (1.99)	0.048

Durbin–Wu–Hausman Endogeneity Test (p-value): 9.546 (0.002)

Sanderson–Windmeijer Instrument Relevance Test (p-value): 3.12 (0.009)

Sargan Overidentification Test (p-value): 4.206 (0.378)

Pagan–Hall Heteroscedasticity Test (p-value): 4.278 (0.892)

Cumby–Huizinga Serial Correlation Test (p-value): 8.587 (0.003)

These results confirm the appropriateness and reliability of the instrumental variable approach and support the hypothesis that higher earnings quality significantly reduces the probability of bankruptcy among listed companies.

In this study, the Durbin–Wu–Hausman test was used to assess and confirm the endogeneity of the earnings quality variable. According to the results in Table (4), the chi-square statistic of the Durbin–Wu–Hausman test is 9.546 and is statistically significant at the 1% level. Therefore, the endogeneity of the earnings quality variable is confirmed. In other words, to assess the endogeneity of the earnings quality variable, the correlation between earnings quality and the error term of Model (2) was examined. Since the null hypothesis of no correlation between earnings quality and the error term of Model (2) is rejected, a significant correlation exists between them, indicating

that earnings quality is an endogenous variable. Under these circumstances, the ordinary least squares (OLS) estimator is inefficient, and the use of the instrumental variables approach with the two-stage least squares (2SLS) estimator for estimating Model (2) is justified.

Based on Table (4), the Sanderson–Windmeijer chi-square statistic is 3.12 and is statistically significant at the 1% level with a p-value of 0.009. The significance of the Sanderson–Windmeijer statistic indicates that there is a strong relationship between the instrumental variables and the endogenous variable (earnings quality). In other words, the instrumental variables possess the relevance property. The Sargan test was used to examine the validity of the instrumental variables. The chi-square statistic for the Sargan test is 4.206 with a p-value of 0.378, which is greater than the 5% significance level. Hence, the null hypothesis of no correlation between the instruments and the error term is not rejected, indicating that the instrumental variables are valid.

To test the assumption of homoscedasticity, the Pagan–Hall test was employed. Given that the p-value of the test statistic is 0.892, which is above 5%, the null hypothesis of homoscedasticity is not rejected. On the other hand, the Cumby–Huizinga test was used to examine the assumption of no serial correlation in the error terms. The significance of the Cumby–Huizinga statistic with a p-value of 0.003 indicates that the null hypothesis of no serial correlation is rejected. To address autocorrelation in the error terms, the kernel Bartlett method was applied.

Table (4) reports the estimation results for the first-stage regression (Model 3) and the main regression (Model 2). The positive and statistically significant coefficient of the earnings quality variable (AQ), equal to 31.228 in the main regression model, indicates that an increase in earnings quality leads to a higher Altman Z-score. Since a higher Z-score corresponds to a lower probability of bankruptcy, it can be concluded that increasing earnings quality reduces the likelihood of bankruptcy. Thus, the study hypothesis is supported.

4.   Discussion and Conclusion

The results of the hypothesis test indicate that an increase in earnings quality reduces the probability of bankruptcy in companies listed on the Iraq Stock Exchange. These findings are consistent with the prior results [12, 13, 16]. When earnings possess higher quality, they reflect greater objectivity and reliability, which in turn signifies the overall quality of financial statements. Consequently, the effective management of resources and rational decision-making based on earnings with high quality and complete informational content minimizes managerial errors and improves company performance, thereby reducing the likelihood of bankruptcy.

Furthermore, earnings quality, based on agency theory, reflects lower agency costs within the firm. In such conditions, greater alignment exists between the goals of managers and owners, leading management to make every effort to create value for shareholders. Naturally, when such a philosophy governs the organization, and macroeconomic conditions are stable, the probability of bankruptcy is significantly reduced.

Therefore, one of the key strategies for reducing bankruptcy risk and agency costs is to enhance investor confidence in earnings quality through supervision over managerial behavior and corporate performance. The development of targeted standards and regulatory constraints to guide and control firms in a way that protects the interests of all stakeholders will lead to reduced costs and risk while safeguarding stakeholder value. These conditions encourage firms to consistently take measures to enhance earnings quality and reduce risk, thereby shielding themselves from financial distress and crises.

Investors can use the results of this study to make optimal investment decisions and ensure that companies with poor earnings quality and potentially high bankruptcy risk are excluded from their investment portfolios. Similarly, creditors can use these findings to extend credit to firms that exhibit better earnings quality and lower risk.

However, generalizing the findings requires consideration of the study's limitations. The exclusion of banks, investment companies, and other leasing firms due to the unique nature of their operations, as well as the omission of political risk factors and political affiliations, are among the limitations of the study. Moreover, the spatial and temporal constraints in data collection warrant caution when generalizing the results across different periods and locations.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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