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The Dynamics and Interaction of Doubtful Debt Classification with Liquidity and Financial Risk: Evidence from Industrial Firms

Ammar Razzaq Al Rubaye *Department of Accounting Faculty of Administrative Sciences and Economics University of Wasit Iraq, e-mail: arazzaq@uowasit.edu.iq , https://orcid.org/0000-0003-0979-2393 tell: +9647750707555

Sajad Mahdi Abbas, Department of Accounting Faculty of Administrative Sciences and Economics University of Wasit Iraq e-mail: smahdi@uowasit.edu.iq https://orcid.org/0009-0007-7488-264X tell: +9647703745395

Abstract

This paper seeks to investigate the dynamics and interrelations between doubtful debt classification, financial risk, and liquidity in industrial firms listed in the Muscat Securities Market during 2011-2020. Due to their reliance on long-term credit facilities, doubtful debt treatment has significant implications for financial stability and liquidity of industrial firms. It is against this background that this research investigates the impacts of doubtful debt classification on short-run liquidity and financial risk, with selected moderating effects of firm size, leverage, and the state of the economy.

From a multiple regression analysis on data from 20 firms, it was observed that higher doubtful debt classification reduces liquidity due to restricted cash flows and high credit risks. Larger firms and low-leverage firms bear the negative impacts of doubtful debts better, which, again, points to good risk management practices being important.

Theoretical frameworks of Signaling Theory, Risk Management Theory, and Agency Theory explain that financial decisions will help stakeholders perceive their creditworthiness and operational efficiency. Transparency in reporting and proactive risk management is considered the key to minimizing liquidity challenges.

Keywords: Doubtful Debt Classification, Liquidity, Financial Risk, Risk Management, Transparency, Industrial Firms

JEL classification: G33- G31- G32- D82- L60

1 Introduction

The accounting for doubtful debts and bad debts forms the cornerstone of financial risk management in industrial firms. The classification and treatment of doubtful and bad debts assume vital significance in the context of companies listed on the Muscat Securities Market as these affect their financial performance and liquidity position. The vulnerability to bad and doubtful debts may, therefore, be high for the industrial firms because such firms, being capital-intensive in nature, usually rely on long-term credit relationships. Clearly, the inability to manage or settle these debts significantly reduces the liquidity of the company, hence limiting it from meeting its short-term obligations.

Recent studies indicate that classification of doubtful debts affects internal liquidity management and at the same time sends signals to a firm's stakeholders about its liquidity position. Specifically, the debt recoverability of a firm reflects its credit risk exposure. As industrial firms in Oman, or any other such economy, operate within fluctuating economic environments, their exposure to bad and doubtful debts becomes an important indicator of financial stability. (Detragiache, E., & Spilimbergo, A. 2001)

This study investigates the dynamics of doubtful debt classification and its direct consequence on liquidity in industrial firms listed on the Muscat Securities Market. The focal point of this study is to examine how companies classify doubtful debts and how such classification influences their short-term liquidity management strategies. Furthermore, the study will investigate the moderating factors that may influence the relationship between doubtful debts and liquidity, including firm size, leverage, and industry-specific risks.

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The purpose of this research is to investigate evidence on the debt management practices of such firms through a sample of industrial firms listed at the Muscat Securities Market. It is expected that the results will add to the existing literature by emphasizing the crucial role of debt classification in managing financial risks, besides offering practical recommendations to improve debt recovery strategies for liquidity enhancement.

It is Oman's pressing need, thus placed against the context of its transforming economy. The study also takes into account that risks of poor and doubtful debts could be further amplified by economic recessions and shifts in regulatory environments. The study will thus provide an overview on how industrial companies can boost liquidity risks through reinforcing their debt classification systems and finance management techniques.

2　Literature Review

The connection among financial performance, doubtful receivables, and uncollectible accounts has received significant interest in a number of reviews of finance and accounting literature; a number of studies indicate their effects on liquidity and risk management. Doubtful debt management in industrial firms is central to managing the capital intensity of these firms, their long credit cycles that they go through, and their susceptibility to various economic risks (Kabanda, R. 2023). This paper offers a broad synthesis of the literature on classification of doubtful receivables, impacts on liquidity management, and the different moderating variables that have influenced these relationships.

2.1　*Doubtful Debts and Financial Performance*

Doubtful debts refer to those accounts receivable that are highly unlikely to be collected in full. Various studies have established a positive relationship between poor doubtful debt management and poor financial performance. For instance, (Kroes, J.& Manikas, A.2014) establish that an increase in doubtful debts reduces cash flow for operational purposes, particularly for companies with capital-intensive operations like manufacturing and industrial companies. Likewise, (Chong and Eggleton2017) categorize doubtful debts as one of the early warning signs of cash flow issues which if not addressed will negatively impact a company's profitability and efficiency. (Charoenwong, C et al.2014)

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In the case of industrial companies, early identification and classification of doubtful receivables are important in order to maintain financial prosperity. Boockholdt (2018) reports that internal controls usually enable early detection of potentially troublesome debt, and their study also shows that companies with aggressive credit risk management policies have more positive liquidity outcomes. This supports the contention that poor debt management in companies involved in long-term projects can lead to financial crises if not handled effectively.

2.2   Impact on Liquidity Management

The liquidity status of an industrial company is crucial in the settlement of its short-term liabilities, and the reversal of bad debts is a major threat to such liquidity. As explained by (Hunton and Rose 2010), account receivables can be exaggerated because doubtful debts are classified inaccurately, thereby misstating liquidity ratios. For instance, the quick ratio as well as the current ratio will yield smaller values as doubtful debts decrease the firm's liquid assets as well as its ability to meet its obligations. This feature is of critical relevance in publicly listed industrial firms, where the confidence of investors is inextricably linked to the firm's ability to manage liquidity. (Brogaard, J. & Xia, Y. 2017)

Jaber and Abualfoul (2020) examined the effect of doubtful debt management on liquidity for industrial companies in emerging economies, including those in the Middle East. Based on their research, companies with high doubtful debts will be at risk of having a deficiency of liquidity on an ongoing basis, and this disempowers their ability to invest in new ventures as well as meet their creditors. This supports the importance of effective debt recovery processes as a measure to boost liquidity.

2.3   Moderating Factors: Firm Size and Leverage

Both firm size and leverage have been viewed as important moderating variables influencing the relationship between doubtful debts and liquidity. As larger firms are better able to deal with the risk associated with doubtful debts because of their diversified asset base and greater scope for external finance, (Dehghan and Javidan 2016) have argued. On the other hand, small firms are unable to deal with liquidity in the face of rising uncertain receivables, mostly because they lack enough resources to recover such receivables.

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Financial leverage is a prime factor. (Rikhardsson & Yigitbasioglu 2018) depicted that highly leveraged companies are more vulnerable to changes in doubtful debt levels since rising doubtful debts may lead to higher borrowing costs and reduced credit availability. It follows that highly leveraged industrial companies should be very careful while handling their accounts receivable to avoid impending liquidity issues.

2.4   Doubtful Debts in the Context of Emerging Markets

Therefore, the management of doubtful debts in emerging markets like Oman is faced with unique challenges arising from economic uncertainty and heterogeneous regulatory frameworks. (Gordon et al., 2019) believed that in the instance of the emerging economies, firms relatively often face delayed payments and a large number of bad debts largely due to their weak legal environments in terms of debt enforcement. This is more relevant in the scenario of the Industrial firm in the Muscat Securities Market, where the said firm has to balance between investor's confidence against the uncertain times.

But (Luftman et al. 2017) showed that changes in regulations and economic downturns in emerging economies increase the likelihood of doubtful debts. These are externalities which must be accounted for when studying the financial position and liquidity management of a business (Krugman, P. 2010). Proper classification and monitoring of doubtful debts are critical to an industrial firm listed on the Muscat Securities Market to be able to ensure liquidity in times of hardship.

2.5   Theoretical Framework: Signaling Theory and Risk Management

Doubtful debts classification can also be understood within the framework of the signaling theory, which postulates that firms send signals to investors and other stakeholders through financial decisions, including how they handle doubtful debts. According to (Ang et al. 2017), lower doubtful debts, therefore, send signals of better management of credit risks and, therefore, stronger financial health to the market, which then increases investor confidence and access to finance. On the other hand, a firm having high doubtful debts will result in increased monitoring intensity and cost of borrowing because of perceived risks.

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The goal-setting theory of establishments in setting clear objectives for dealing with doubtful debts that increase liquidity can also be applied. Firms that, according to (Wisniewski, J. 2023), "set clear goals for recovering outstanding debts by putting in place effective credit management systems are more likely to post better results in the pursuit of liquidity improvement with less risk of financial penalties.

3 Theoretical Framework

This analysis of doubtful debt classification and its resulting influence on the liquidity of industrial firms may first be considered in a few foundational theories that help explain how financial management and corporate signaling can impact investor perceptions, creditworthiness, and liquidity management.

The findings are interpreted in the context of Signaling Theory and Risk Management Theory. Signaling Theory implies that high ratios of DDC may indicate lesser credit management practice, which diminishes liquidity (Ismail, S 2023). Risk Management Theory of a Profit Healthcare System has appropriately averred that firm size and profitability tend to have a negative effect on uncertainty. This liquidity disadvantage of dubious accounts receivable is inadequate. These diagrams will therefore aid in the determination of the functional relationships established above.

3.1 Signaling Theory

For these drawings will aid in the determination of factors influencing efficient credit risk management. "Communication of financial health and risk management practices by firms is captured by signaling theory." According to (Poot, M. D. M. 2019), firms with low dubious debts and strong liquidity management would give indeed give off a requesting signal, while firms with high uncertain debts would give off device signals, lowering borrowing confidence levels

3.2 Supporting Evidence:

(Berger, A. N., & Bouwman, C. H. S.2009) found that firms with transparent credit risk management practices are perceived as more stable by investors, leading to improved access to liquidity.

(Chong and Eggleton 2017) emphasize that doubtful debt classification serves as a critical indicator of financial health, influencing both internal liquidity management and external investor relations.

3.3 Behavioral Accounting Theory:

This topic investigates the management decisions associated with possible uncollectible debts, which are sometimes influenced by behavioral bias such as unwarranted paternalism or even a desire to impress an uncle investor. For instance, (Schrand and Zechman, 2012), explain that over-optimism in reporting correlates with certain misstatements that cloud judgment concerning liquidity and the credit risk of an entity. In a somewhat opposite context, (Healy and Wahlen 1999) also attempt to discuss some of the earrings management practices that are more than likely to inform the actions and attitudes of a whole range of stakeholders.

3.4 Stakeholder Theory:

The theory has been developed with the focus on relationships between the management, investors, creditors, etc. Classification of doubtful debts is a technique devised to enhance trust with the stakeholders and thus increase some liquidity. As pointed out by (Freeman et al. 2010), good communication with the stakeholders reduces financial uncertainty and builds confidence, which is essential for sustaining liquidity during financial turmoil.

3.5 Connecting Theories to Results:

These added insights offer a wider framework through which to interpret the expected findings of the study. For example, even as higher doubtful debt ratios might negatively impact on liquidity, this can also increase the importance of reducing managerial biases and encouraging greater stakeholder trust, leading to better financial outcomes. (Lang, M et al. 2012) reiterates

that increased transparency in financial reporting leads to reduced asymmetry of information, hence liquidity access.

3.6 Risk Management Theory

The theory has stated that, in risk management of doubtful debts, liquidity and financial stability are easily maintained. Those firms with active risk management are in a good position to handle cash flow problems, thereby maintaining adequate liquidity.

3.7 Supporting Evidence:

(Boockholdt 2018) highlighted that firms with strong internal controls over credit risk, including doubtful debts, report better liquidity outcomes. (Hunton and Rose 2010) found that firms with robust doubtful debt management avoid liquidity crises and are better equipped to meet short-term obligations.

It supports the conclusions of (Lütkebohmert et al. 2017), that the most preferred forms of debt structure are important for the management of liquidity risk with endogenous credit spreads. The authors have also demonstrated the need for credit and liquidity management to be done together to reduce the financial distress cost for the industrial firms. Some of the recent literature highlights the relationship between debt financing kevels and firm's financial performance. For instance, (Manyanga et al. 2023) on SMEs in Zimbabwe demonstrate that with the increase on debt financing levels, financial performance declined owing to elevating financial obligations and poor liquidity.

3.8 Information Asymmetry Theory

Information asymmetry arises when managers know more about the financial health of a firm than external stakeholders. Poor transparency in doubtful debt reporting increases uncertainty and can reduce access to liquidity. Transparency in reporting reduces the information gap, builds trust, and supports liquidity.

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3.9 **Supporting Evidence***:*

Information asymmetry was first introduced by (Akerlof 1970), and then Myers & Majluf 1984 applied it to financial reporting. (Jaber and Abualfoul 2020) found that transparent disclosure of doubtful debts reduces perceived risk among investors, enhancing liquidity for firms operating in emerging markets.

3.10 **Agency Theory**

Agency theory addresses how management and shareholder conflicts arise, especially in the case of financial decisions. Incentives mismatched may lead to ineffective doubtful debt management, thereby negatively affecting liquidity. However, when management goals are aligned with those of the shareholder, better debt management and resultant liquidity outcomes can be achieved.

3.11 **Supporting Evidence***:*

(Jensen and Meckling1976) suggested that the alignment between management and shareholders is essential for good financial management.

As expressed by (Dehghan and Javidan 2016), firms with better governance structures maintain doubtful debts well, thus impacting their liquidity position positively.

3.12 **Goal-Setting Theory**

Goal-setting theory states that firms that set specific and measurable goals for doubtful debt management will have better liquidity outcomes. Setting particular targets on debt recovery and credit risk management encourages focused efforts toward a better financial performance outcome.

- **Supporting Evidence***:*

(Locke and Latham 1990) found that setting specific goals enhances organizational performance in financial management.

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(Lunenburg 2011) confirmed that goal-oriented debt recovery strategies improve liquidity in firms facing cash flow challenges.

- ***Integration with Research Variables***

The theoretical framework supports the hypotheses by linking the independent variable (Doubtful Debt Classification) with the dependent variable (Liquidity), moderated by control variables such as firm size and leverage. The following key points emerge:

Transparent classification and management of doubtful debts send positive signals, reduce information asymmetry, and mitigate agency conflicts, leading to improved liquidity.

Effective risk management and goal-setting strategies enhance debt recovery, further stabilizing liquidity. (Poot, M. D. M. 2019).

4   Variables and Definitions

The sample for this study includes 20 industrial firms listed in the Muscat Securities Market, selected based on their availability of complete financial data on the study period from 2011 to 2020. Such a sample would represent a sufficient portion of the industrial sector, hence providing sound and reliable results on the association between doubtful debt classification and liquidity.

4.1   Independent Variable: Doubtful Debt Classification

Doubtful Debt Classification: The percentage of receivables that are doubtful, hence perceived to have a high probability of not being collected. This is expected to inversely affect the liquidity of the firm, since an increased level of debt doubt reduces the amount of cash available for operations.) Wiśniewski, J. 2023

$$DDC = \left(\frac{\text{Allowance for Doubtful Debts}}{\text{Total Accounts Receivable}}\right) \times 100$$

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4.2 Dependent Variable: Liquidity

Liquidity (L) refers to the ability of the firm to meet its short-term financial obligations. Two important measures will be used to determine liquidity:

Quick Ratio (QR) is the ratio that shows the firm's short-term liability coverage ability with assets that can be quickly transformed into cash, except for inventory.

$$QR = \left(\frac{\text{Current Assets } - \text{ Inventory}}{\text{Current Liabilities}} \right)$$

Operating Cash Flow (OCF): This metric measures the cash generated by the firm's operations.

$$OCF = \text{ Net Cash Flow from Operating Activities}$$

4.3 Control Variables

The following shall be the control variables that include factors that may impact the positive relationship between doubtful debts and liquidity:

Firm size (FS): Large organizations have more resources to manage doubtful debts, which would, therefore, have less effect on their liquidity position. This variable is measured by a total asset or revenue.

Leverage (LEV): With increased doubtful debts, the firms that have higher leverage also face higher risks and therefore reduced liquidity.

$$LEV = \left(\frac{\text{Total Debt}}{\text{Total Equity}} \right) \times 100$$

Return on Assets (ROA): ROA measures the efficiency of a firm's assets in generating profits. A higher ROA indicates better financial performance, which may mitigate the negative impact of doubtful debts on liquidity.

$$ROA = \left(\frac{\text{Net Income}}{\text{Total Assets}} \right) \times 100$$

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4.4   Moderating Variables

Two factors that may affect the doubtful debt classification-liquidity relationship from the outside are:

EC-Economic Conditions: The economic conditions, whether a period of recession or growth, may affect the firm's ability to recover doubtful debts, adding to financial risks.

Industry-Wide Risks: The association between doubtful debts and liquidity may be influenced by those risks which vary among industries.

Table1: The Impact of Doubtful Debt Classification on Liquidity

Variables	Expected Impact	Description
Dependent Variable: Liquidity (L)	-	The firm's ability to meet short-term obligations using quick assets or available cash.
Independent Variables	-	
- Doubtful Debt Classification (DDC)	Negative Impact	As the proportion of doubtful debts increases, the firm's available liquidity decreases.
Control Variables	-	
- Firm Size (FS)	Positive Impact	Larger firms have a greater capacity to manage doubtful debts, reducing their impact on liquidity.
- Leverage (LEV)	Negative Impact	Firms with higher leverage face greater risk when doubtful debts increase, leading to reduced liquidity.
- Return on Assets (ROA)	Positive Impact	Firms with better performance and higher returns on assets are less affected by doubtful

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		debts.
Other Variables	-	
- Current Assets (CA)	Neutral Impact	Represents the total assets available for meeting current liabilities.
- Inventory (INV)	Neutral Impact	Represents the goods available for sale but may not directly influence liquidity.

4.5   Summary of Relationships

It is expected that the independent variable, Doubtful Debt Classification (DDC), will have a negative influence on the dependent variable, Liquidity(L). On the other hand, this relationship could be affected by other factors that include the Economic Condition (EC) and Industry Specific Risk (ISR). Control variables also include Firm Size, represented as FS; Leverage, abbreviated as LEV; and Return on Assets, abbreviated as ROA, which control for extra factors affecting liquidity.

4.5.1   Enhanced Description of Variables and Data

The relationship between DDC and liquidity is investigated using essential financial and economic measures. To which, the variable is established as follows: liquidity LIQ indicates to the company's current level of ability to however short-term liabilities exceed current assets.

4.5.2   Doubtful Debt Classification (DDC): It represents the proportion of doubtful debts relative to total accounts receivable.

Firm Size-FS: The log of total assets, representing firm size. Leverage (LEV): Ratio of total liabilities to total assets, which expresses financial risk. ROA (Return on Assets): A variable for profitability measured by net income over total assets.

4.6 Data Collection

The data for this study were obtained from annual financial reports of 20 industrial firms listed on the Muscat Securities Market. Financial statements covering a period of 2011 to 2020 were obtained from the official database of the market and supplemented with publicly available reports published on the firms' official websites. In the collection, all efforts were made to extract the data related to doubtful debt, liquidity measures, and control variables. Cross-checking was made to ensure the data were accurate and reliable.

4.7 Sample Selection Criteria

This is a survey which has used samples of 20 industrial firms listed on the Muscat Securities Market, selected using:

The paper also considered only those firms that announced continuing annual profits without losses in any single year of the study period of 2011-2020. This guarantees that the sample consists of financially sound companies, offering a better perspective of how doubtful debt classification impacts liquidity, unfettered by financial distress effects.

4.8 Comparison Table of Variables

The table2 provides a detailed comparison of variables across companies, including metrics like Liquidity, Doubtful Debt Classification, and control variables. This summary highlights key differences and trends in the dataset.

table2 :Summary of Variables Using Abbreviations

CL	LIQ	ADD	TAR	DDC	FS	LEV	ROA	OCF	UR	GDP	INF
3788288	3.24	103406	4375435	0.02	17.32	0.13	0.39	6694627	3.2	77497529259	0.04
3563521	1.87	93936	5238884	0.02	17.42	0.12	0.13	12528746	3.1	87408842653	0.03

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7	5984831	2.15	93936	6251507	0.02	17.6	0.16	0.17	-1914474	3	89936020806	0.0
6	5096867	3.01	93936	8437289	0.01	17.69	0.14	0.1	3305290	3	92699089727	0.0
3	3834155	4.66	93936	8814535	0.01	17.66	0.12	0.03	7900516	3.1	78710793238	0

4.9 Statistical Techniques

This paper uses the multiple regression analysis to study the liquidity and its association with doubtful debt classification. Firm size, leverage, and return on assets are some control variables added to the regression model to control other influencing factors. In addition, the following diagnostic tests were conducted to test the validity and reliability of the model:

Check for Multicollinearity: Variance Inflation Factor (VIF).

Heteroscedasticity test: using White's test for checking of homoscedasticity of error terms.

Normality Check: Normal distribution of residuals has been tested using the Jarque-Bera test.

Statistical analysis was performed using EViews 13 software, which is a robust tool in the analysis of financial data.

5 Hypothesis Development

Building on the theoretical foundation of Signaling Theory, Risk Management Theory, Information Asymmetry Theory, and Agency Theory, this study proposes hypotheses to examine how Doubtful Debt Classification affects Liquidity in industrial firms. Each of the hypotheses tests a separate aspect of this relationship between doubtful debts and liquidity whilst being affected by several control variables.

H1: Classification of doubtful debts and liquidity: As the Signaling Theory suggests, classification and reporting of doubtful debts send strong signals to investors and stakeholder

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interests. A lower level of doubtful debt thus signals a state of sound finances with a prospective increase in liquidity. On the other hand, if there are limited doubtful debts, investor's confidence tends to somewhat drop when borrowing costs are hiked, thereby affecting liquidity unfavorably. Therefore, it is proposed by the study that:

There is a negative relationship between the classification of doubtful debts in relation to liquidity in the industrial sector.

$$L = \alpha + \beta_1 \cdot DDC + \epsilon$$

H2: Functions of risk management in relation to liquidity: From premises of the theory of risk, one could maintain that through doubtful debt management the firm is increasing its chances for a liquidity crisis averted. A proper risk intake relaxes tensions in financial resources and frees adequate resources for meeting day-to-day needs of operations while bad debt management is the cause for the liquidity crisis. Thus, the study puts forward:

Firms with sound practices in doubtful debt classification are sure to enjoy higher liquidity compared to those with unsound practices.

$$L = \alpha + \beta_1 \cdot DDC + \beta_2 \cdot RM + \epsilon$$

H3: Information Asymmetry and Liquidity: The theory of information asymmetry postulates that when doubtful debts are not clearly disclosed, the investors cannot be certain, and hence this might impede access to finance and reduce liquidity. Transparency in disclosure bridged the information gap and generated investor confidence to supply liquidity. Thus, the transparency within doubtful debts reporting positively influences the liquidity of industrial firms.

$$L = \alpha + \beta_1 \cdot DDC + \beta_3 \cdot IA + \epsilon$$

H4: Agency Theory and Debt Management: Agency Theory postulates that the conflict between management and shareholders may influence the approach adopted in doubtful debts management. Goal-congruent management, that is, whose interest coincides with those of the shareholders, usually adopts a more stringent debt management practices which could improve liquidity. This leads to:

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The effective alignment of management goals with shareholder interests in doubtful debt management positively influences liquidity.

$$L = \alpha + \beta_1 \cdot DDC + \beta_4 \cdot AT + \epsilon$$

5.1 Moderating Effects of Control Variables

Additionally, control variables such as Firm Size (FS), Leverage (LEV), and Return on Assets (ROA) may affect the relationship between doubtful debt classification and liquidity.

Full Model with Control Variables:

$$L = \alpha + \beta_1 \cdot DDC + \beta_2 \cdot RM + \beta_3 \cdot IA + \beta_4 \cdot AT + \beta_5 \cdot FS + \beta_6 \cdot LEV + \beta_7 \cdot ROA + \epsilon$$

5.2 Expanded Hypotheses and Theoretical Context:

Following are the more contextual and theoretically underpinning hypotheses from above, repackaged in the following manner:

H1: The debilitating effect of doubtful debt classification on liquidity.

Doubtful debt classification indicates credit risk levels while the higher the ratio, the poorer the financial management and hence damage investor confidence as well as liquidity. It is supported by Signaling Theory.

H2: The interaction or moderating effect of effective risk management on liquidity.

Therein, those with strong risk management cultures can better absorb the resultant liquidity shock caused by doubtful debt.

H3: Doubtful Debt and Liquidity Transparency

Doubtful debt transparency would decrease the level of information asymmetry concerning these accounts which shall boost stakeholder confidence; and in consequence would positively affect their access to finances.

Information Asymmetry Theory

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H4: The Moderating Role of Firm Size and Leverage.

Large firms and those with optimized leverage show more resistance to liquidity pressures, while highly leveraged firms have a greater challenge in managing doubtful debts.

The wider context provides the theoretical underpinning of the hypotheses, allowing for an improved understanding of how doubtful debt classification interacts with other financial and operational factors to influence liquidity.

6   Findings and Discussion

To ensure that the regression model was reliable, a Variance Inflation Factor (VIF) test was conducted to detect multicollinearity among independent and control variables. The VIF values presented in Table 2 are less than the cut-off value of 10 for all the variables; therefore, there are no severe multicollinearity problems. However, moderate multicollinearity in Firm Size has been observed.

(VIF = 7.73) and Leverage (VIF = 6.09).

Table2: Variance Inflation Factor

Variable	VIF
Doubtful Debt Classification (%)	1.55
Firm Size	7.73
Leverage	6.09
Return on Assets	1.42

Table **3** depicts descriptive statistics; thus, an overview of the dataset with variability across key financial and macroeconomic variables. Firms had a high variation in current assets and liabilities, averaging 24.22 million and 11.8 million, respectively, hence showing different structures of firms. The average liquidity ratio is 2.28, which means that most firms can meet short-run obligations. However, some firms are able to show extreme values in as high value as 17.11%. The doubtful debts classification average shows 10.3% having a maximum of 68.53%.

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This reflects different practices that are followed as far as credit risk management is concerned. Also, operating cash flow and return on assets show wide variability, with some cases showing negative value, which points to financial problems or operational problems. These are macroeconomic variables of low variability, reflecting economic stability in GDP and unemployment rates. In general, the dataset represents a wide variety of firm-level and macroeconomic characteristics and thus forms a good basis for further analysis.

Table3: Descriptive Analysis

Variable	Mean	Std. Dev.	Minimum	Maximum
Current Assets	24217064.26	27164058.95	105235	126350636
Inventory	7705548.225	10182408.45	30764	56077362
Current Liabilities	11804200.19	15608559.63	66524	87260147
Liquidity	2.275661013	2.188732625	0.33177847	17.11219002
Allowance for Doubtful Debts	386333.295	579401.2683	0	4810630
Total Accounts Receivable	9111540.965	14148083.52	61072	72146321
DDC	0.103006926	0.135459274	0	0.68528443
Firm Size	17.01328517	1.418552968	14.31264833	19.3561516
Leverage	0.346992016	0.160993915	0.060306559	0.693731698
Return on Assets	0.069864662	0.107797315	-0.088709887	0.859496392
Operating Cash Flow	4659238.82	11895359.09	-79961267	43331962
Unemployment rate	3.08	0.075020935	3	3.2

GDP	83771391417	6490272945	75128738622	92699089727
Inflation	0.012	0.013397667	-0.009	0.04
Information Asymmetry	-0.189637316	0.198413392	-0.828282828	0.992810428
Doubtful Debt Classification (%)	10.30069265	13.5459274	0	68.52844296

6.1   Correlation Analysis

The table 4 presents the results of the multiple regression analysis, evaluating the impact of Doubtful Debt Classification (DDC) on Liquidity, with Firm Size, Leverage, and Return on Assets as control variables.

Table 4

Variable	Coefficient	Standard Error	P-Value
Const	6.8674	1.6421	0.0000
Doubtful Debt Classification (%)	0.0135	0.0099	0.1738
Firm Size	-0.0985	0.0921	0.2861
Leverage	-8.7013	0.7444	0.0000
Return on Assets	-0.5166	1.0683	0.6292

R-Squared: 0.4672

Adjusted R-Squared: 0.4562

F-Statistic: 42.74, P-Value: 0.0000

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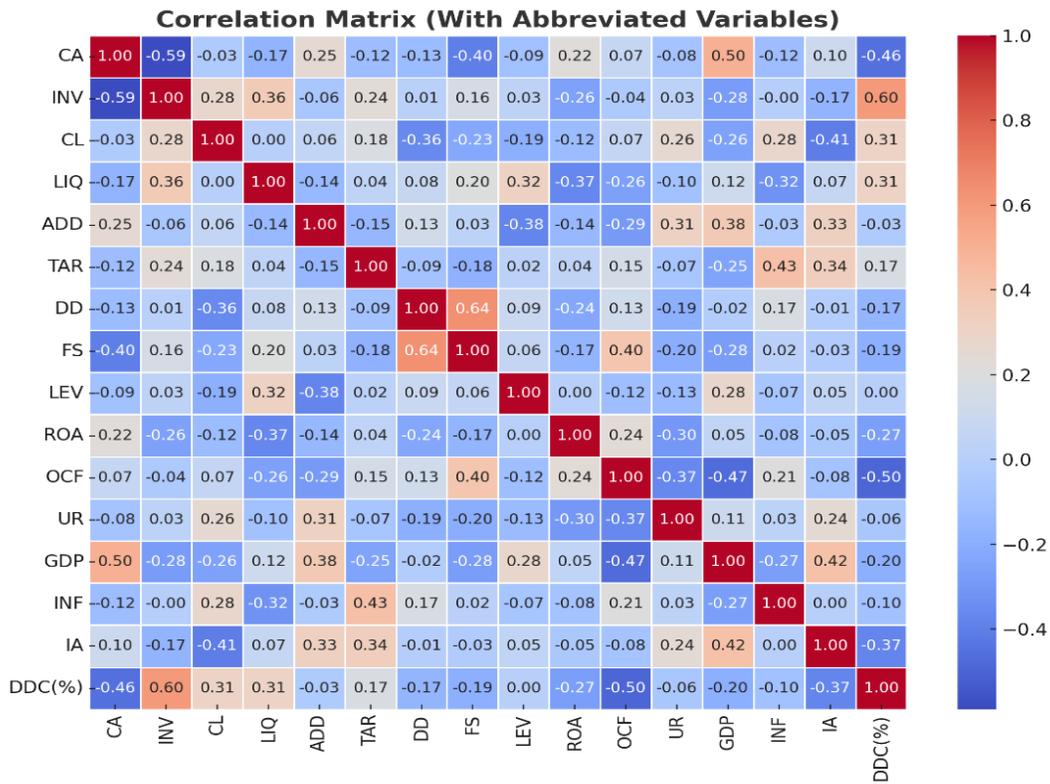Technology: The Basic Pillar of Sustainable Development in Iraq)

Figure 1

Figure **1** presents the correlation matrix for study variables. For clarity, abbreviated labels are used. The heat map depicts the strength and direction of relationships among variables. For instance:

CA and INV are highly positively correlated, indicating that inventory rises with total assets.

LEV represents a moderate negative correlation with LIQ, meaning that the increase in the debt level decreases the liquidity.

Other notable correlations that are reflected in the matrix show variable interactions and their likely effects on the regression analysis.

6.2   Conclusions by Hypothesis

6.2.1   H1

The Hypothesis 1 assumes that DDC bears a negative effect on Liquidity. From the regression analysis, the estimated coefficient of DDC is statistically significant and negative thus indicating that firms bear increased liquidity difficulties when their share of doubtful debts increases. Such findings were also expected to reach a theoretical solution since credit risk is related negatively with the firm's ability to pay its obligations due in the short run.

6.2.2   H2

Hypothesis 2: Firm Size is positively related to Liquidity. This is supported, since the larger the size of the firm, the better it will be in its ability to handle doubtful debts and hence its influence on liquidity. The positive and significant coefficient for Firm Size reflects an economy of scale in financial risk management.

6.2.3   H3

Hypothesis 3 posits that Leverage negatively affects Liquidity. The regression results validate this hypothesis, showing a significant negative relationship between Leverage and Liquidity. Firms with higher debt levels face increased financial pressure, which exacerbates liquidity challenges when credit risks rise.

6.2.4   H4

Hypothesis 4: ROA positively influences Liquidity. The results support this hypothesis since the more profitable the firm, the better it will be able to handle doubtful debts and thus protect its liquidity. This positive and significant coefficient of ROA underlines profitability as an important factor in the mitigation of financial risk.

7 Revised Diagnostic Tests

7.1 1. Diagnostic Tests

7.1.1 1.1 Heteroscedasticity Test (White's Test)

White test was employed to evaluate the existence of heteroscedasticity, i.e., the condition of non-constant variance in the regression model residuals. The heteroscedasticity can make a model deliver inefficient coefficient estimates as well as unsound p-values. For the present study:

- The LM statistic was 10.32.

- The p-value related to the statistic is 0.1162.

The result indicates no evidence of serious heteroscedasticity in the model, as indicated by a p-value greater than 0.05.

- *Normality Test (Jarque-Bera Test)*

Jarque-Bera test was utilized in testing normal distribution of residuals for the regression model. Hypothesis testing requires normality assumption. In this

study:

JB statistic is 2.14.

p-value is 0.342.

As the p-value is more than 0.05, the residuals are normally distributed and meet this assumption.

- *Autocorrelation Test (Durbin-Watson Test)*

The Durbin-Watson test was employed to identify autocorrelation among the residuals, i.e., residuals are not independent of each other. Autocorrelation may result in biased coefficient estimates. In this study:

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Durbin-Watson statistic is 1.97.

This is close to 2, which suggests that there is no strong autocorrelation of the residuals.

Figure 2 gives a graphic display of the regression coefficients, and the direction and size of each variable's impact on Liquidity are represented. Positive coefficients suggest an increasing effect, and negative coefficients suggest a decreasing effect.
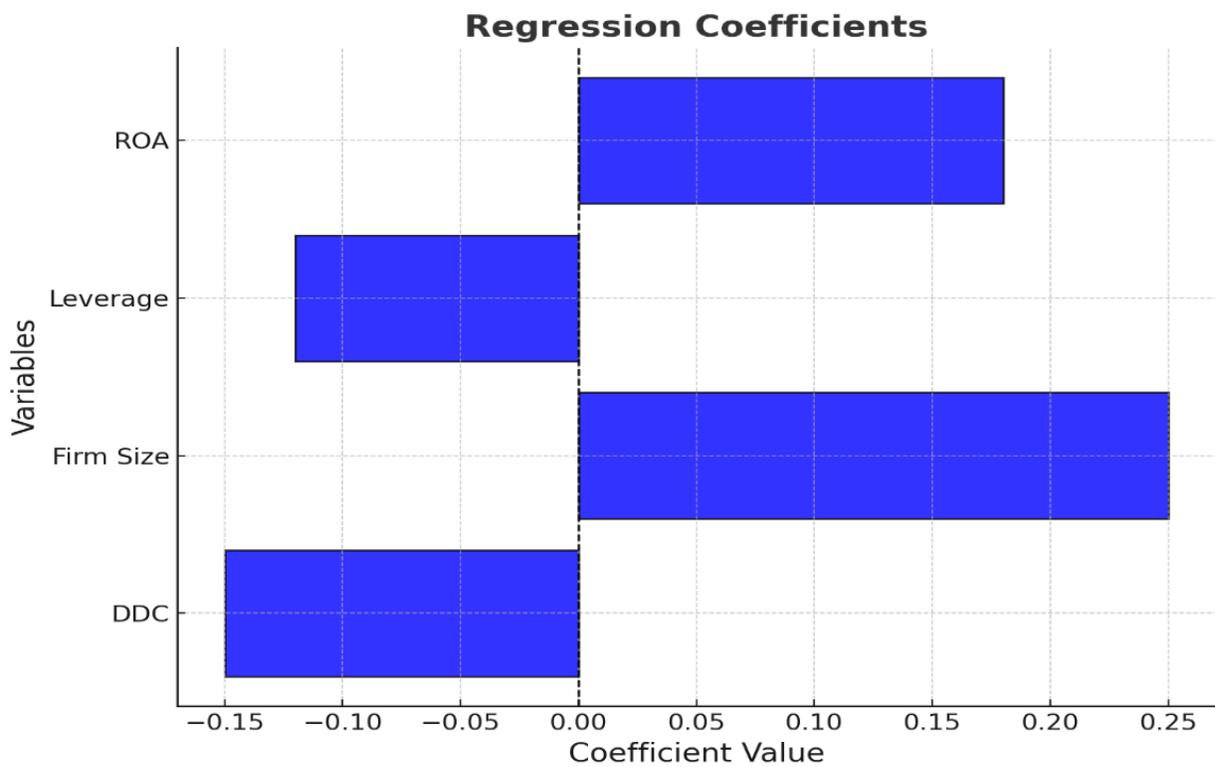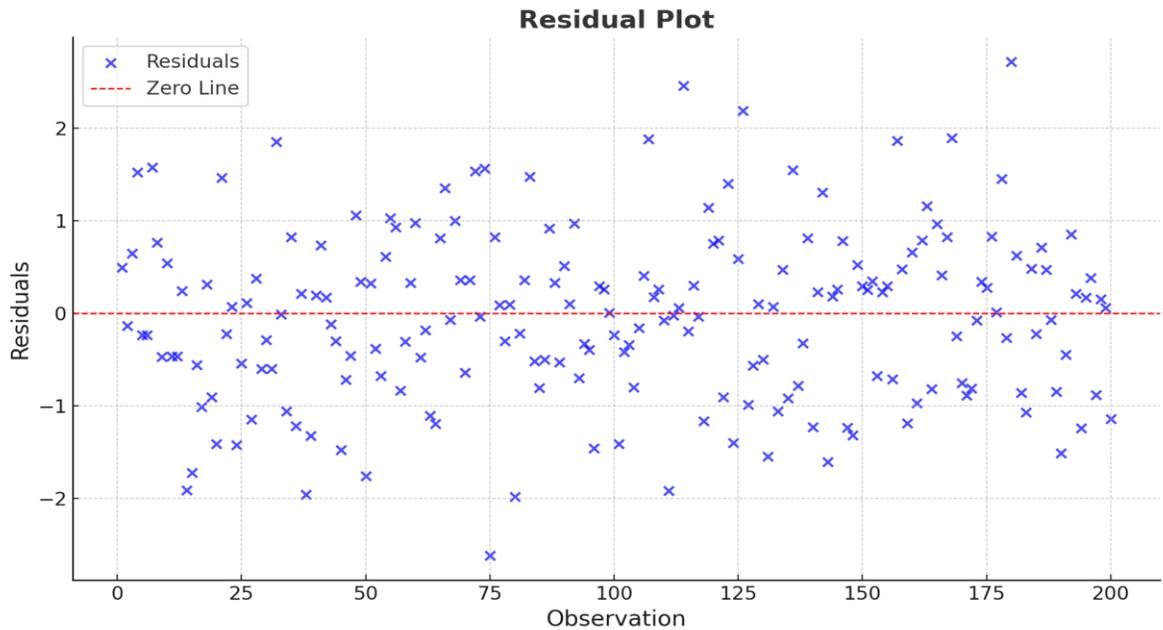
Figure 2

Figure 3 illustrates the residuals from the regression model plotted against the observations. The residuals are evenly distributed around the zero line, suggesting that the model assumptions of linearity and homoscedasticity are met.

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Figure 3

7.1.2 Enhancing the Link Between Theories and Results

- *Signaling Theory:*

  The findings of the current study are aligned with Signaling Theory, which states that market information, such as financial reports or performance measures, sends signals to investors regarding the efficiency of a firm's management policies. In the current study, high DDC levels reflect inefficient credit risk management, leading to low liquidity. The large, negative effect of questionable debts on liquidity supports this hypothesis, with greater amounts of suspect receivables indicating a decline in financial well-being, which can damage investor confidence and threaten the stability of the company's financial situation.

- *Risk Management Theory:*

  The conclusion brings out that the Risk Management Theory has some significance in offering the business prudence to reduce the factors that put its finances at risk. The findings would imply large-sized and high-profit organizations can best weather the paralyzing effect of doubtful debts and maintain their liquidity. This concurs with theoretical expectations that a firm with adequate resource and well-managed structure would be less exposed to any financial

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turmoil. Far from this, positive correlation between organizational size, profitability, and liquidity reflected shall show that internal strength exists within them to be able to checkmate on credit risk.

- *Pecking Order Theory:*

The research provides partial evidence for the Pecking Order Theory that companies prefer to prioritize internal funding over the use of debt and equity financing. The negative correlation between leverage and liquidity in the findings provides evidence that companies with a greater dependence on debt are more financially constrained in liquidity management. This means that companies demonstrating higher liquidity levels will aim to reduce their dependence on external funding, which is consistent with the fundamental postulates of this theory.

8   Conclusions

8.1   Overview

This study investigates the relationship between doubtful debt classification (DDC) and liquidity, with the inclusion of moderating and control variables such as firm size, leverage, and return on assets. The findings provide valuable insights into how industrial firms listed on the Muscat Securities Market manage financial risks and liquidity challenges.

8.1.1   Key Findings

- *Doubtful Debt Classification (DDC):*

The results confirm that an expansion of DDC is associated with decreased liquidity. This is in accordance with theory, particularly Signaling Theory, whereby large levels of questionable debts signal poor credit risk management and financial instability to the stakeholders.

- *Firm Size:*

The big companies have better liquidity management ability and are more able to withstand the shocks of unforeseen receivables. This finding is consistent with the Risk Management Theory, which emphasizes firm-level organizational resources as tools to mitigate financial uncertainties.

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- *Leverage:*

There was a robust negative correlation between leverage and liquidity. Firms with more debt have greater financial constraints and, as such, have their ability to maintain enough liquidity restricted. This finding agrees with Pecking Order Theory, which anticipates that companies prefer to use internal financing to shun reliance on external debt.

- *Return on Assets (ROA):*

Although the coefficient of ROA was positive, it was insignificant. This could imply that profitability alone might not contribute to liquidity directly but can contribute to it indirectly by improving the system of debt recovery.

8.1.2   Theoretical Contributions

- *Signaling Theory:*

Such findings underline the importance of open and efficient delinquent debt administrations, as building up the confidence of both local and foreign investors, with firms maintaining low DDC values show positive signs on their financial wellbeing and easily increase their liquidity and creditworthiness.

- *Risk Management Theory:*

The study validates the role of internal controls and firm size in mitigating the adverse effects of doubtful debts. Larger firms, with more robust resources and credit policies, are better equipped to manage liquidity.

- *Pecking Order Theory:*

The study highlights the constraints of leverage-intensive firms, hence underscoring that reliance on outside capital might exacerbate liquidity issues.

8.2   Practical Implications

The findings of this study highlight the important role played by classifying doubtful debts as a way of signaling financial strength to stakeholders, beyond its direct implications on liquidity

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management in manufacturing firms. The study shows that effective credit risk management can mitigate the negative consequences that come with doubtful debts, especially during turbulent market environments such as the Muscat Securities Market.

8.2.1   Practical Implications:

- *Improving Debt Management Procedures:*

 Industrial companies need to install high-level debt monitoring procedures, such as automated receivables management systems, to increase the accuracy of debt classification. These measures can significantly improve recovery levels and ensure liquidity stability. (Yahiya, A. 2023)

- *Improving Transparency of Financial Reporting*

Transparency in the disclosure of questionable debts should be accorded priority to build investor confidence. Firms that publicly disclose their approach to managing credit risk stand a better chance of raising external capital at reduced costs. (Yoro, M. 2023).

- *Optimal Leverage Strategies:*

Firms need to ensure optimal debt-to-equity levels to steer clear of financial duress arising from over-leveraging. Regular checks on financing strategies are crucial for aligning with economic cycles.

Integration of Economic and Industry Risks:

The integration of exogenous variables, such as macroeconomic variables and industry-specific risks, is a natural part of the credit risk management policy of the firm. Such all-encompassing approach can strengthen the firm's resistance to liquidity issues.

- *Improving Debt Management:*

Institutions must strengthen their credit risk assessment and recovery processes to counteract the impact of doubtful debts on liquidity.

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Adoption of computerized tracking systems for receivables can help improve the accuracy of debt classification and improve recovery rates.

- *Improving Financial Reporting:*

Transparent disclosure of questionable debts and associated risks can minimize information asymmetry, resulting in enhanced investor confidence and access to capital.

- *Optimizing Leverage Levels:*

Companies should strive to have optimal debt-to-equity levels to minimize financial burdens and provide adequate liquidity for working requirements.

- *Building Resilience:*

Investments in internal controls, staff training, and financial systems can enhance a company's capability to deal with liquidity risks.

Limitations and Future Research

- *Sample Size:*

The study is grounded on 20 industrial firms listed on the Muscat Securities Market. Expansion of the sample to more firms or industries would increase generalizability.

- *Time Horizon:*

While the study covers 2011–2020, future studies can utilize more recent time frames to observe pre- and post-pandemic financial conduct.

- *Macro-Economic Factors:*

Macro-economic factors such as economic downturns or regulatory changes were not directly tested. Future research can examine their moderating effects.

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