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Determinants of Credit Growth and Its Impact on Banking Efficiency: An Analytical Study of a Sample of Commercial Banks Listed on the Iraq Stock Exchange from 2005 to 2023

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Abstract: The banking sector in post-conflict and resource-dependent economies faces unique efficiency challenges shaped by institutional fragility, macroeconomic volatility, and structural constraints on credit allocation. In Iraq, commercial banks operate under conditions of persistent political instability, inflationary pressures, and limited financial inclusion, yet systematic evidence on how credit growth determinants affect banking efficiency remains scarce. This study examines the impact of internal determinants (loan quality, capital adequacy, bank size, and loan growth) and external determinants (interest rate, inflation, and exchange rate) on the efficiency of nine commercial banks listed on the Iraq Stock Exchange over the period 2005–2023. Banking efficiency was estimated using an input-oriented Data Envelopment Analysis (DEA) model, with deposits and operating expenses as inputs and net profit as the output. DEA efficiency scores then served as the dependent variable in a backward elimination multiple regression incorporating all seven determinants. Financial data were sourced from Iraq Stock Exchange filings, while macroeconomic indicators were obtained from the Central Bank of Iraq. The results reveal substantial and persistent inefficiency, with a sample-wide average DEA score of 0.41 and sharp temporal fluctuations linked to periods of economic and political instability. The regression model explains 89.9% of the variation in efficiency ($R^2 = 0.899$, $F = 17.878$, $p < 0.001$). Bank size emerged as the strongest negative predictor ($\beta = -1.033$, $p = 0.001$), followed by capital adequacy ($\beta = -0.375$, $p = 0.009$) and loan quality ($\beta = -0.345$, $p = 0.015$), indicating that larger banks, excessive capitalisation, and deteriorating loan portfolios significantly impair efficiency. Among external factors, inflation exerted a significant negative effect ($\beta = -0.572$, $p = 0.017$), while interest rates showed a positive but marginally significant association. The

exchange rate was eliminated as non-significant. These findings demonstrate that both internal banking practices and external macroeconomic conditions jointly shape efficiency in fragile economies, with internal factors exerting the dominant influence. The study contributes to the banking efficiency literature by providing the first comprehensive DEA-based longitudinal assessment of Iraqi commercial banks, offering comparative lessons for other emerging and conflict-affected economies. Policymakers and bank regulators should prioritise improving loan quality management, optimising capital deployment, and adopting flexible monetary frameworks to strengthen banking resilience.

Keywords: banks, data envelopment analysis (DEA), credit growth, Iraq, external determinants.

Introduction

Commercial banks are considered the cornerstone of any economic system, as they play a vital role in mobilising savings and directing them towards productive investments. This contributes to job creation and stimulates economic activity, thus supporting economic growth and achieving financial stability. In developing countries, particularly, the efficiency of the banking sector is doubly important as a key driver of development, contributing to improved resource allocation and increased financial inclusion, while providing the necessary financing for projects of all sizes. However, these banks face a range of structural and operational challenges that may hinder their ability and efficiency to perform their vital functions optimally.

In the context of post-conflict economies, the challenge facing the banking sector is even more complex. Countries recovering from armed conflict often face destroyed infrastructure, heightened economic and political risks, and weak institutions. This negatively impacts the confidence and stability of the banking sector. Therefore, the efficiency of banks becomes a crucial factor in reconstruction and development efforts in such environments. This requires a strong ability to manage risks, provide credit effectively to support economic activities, and contribute to restoring confidence in the financial system. Measuring banks' efficiency in these contexts, identifying the factors influencing it has become a research necessity in providing recommendations that contribute to building a resilient banking sector capable of supporting economic recovery.

Bank credit growth is also a vital indicator of the health and activity of the banking sector and the economy as a whole, as banks' ability to generate credit is influenced by a complex set of internal and external factors. The concept of credit growth determinants refers to the rate of growth in the number of loans granted to third parties, which may lead to improved banking performance and increased profitability. (Ekinci, 2019) Credit growth is also defined as an increase in the amount of money or claims backed by a loan agreement or any other agreement that requires repayment of the debt with interest after a specific period of time between the creditor and the debtor (Hardeo Awang, 2018)

Many studies have addressed the determinants of credit growth and banking efficiency in different contexts. Loissa and Krisnanda (2023) examined the factors affecting long-term credit volume. This study examined deposits, lending interest rates (SBR), non-performing loans (NPL), GDP growth, and inflation as internal and external factors that influence commercial bank lending. The results showed that deposits, loan interest rates, NPL, GDP growth, and inflation significantly influenced the lending volume of commercial banks in Indonesia during the period from 2012 to 2019. Bhowmik and Sarker (2024) also found that banks are highly affected by the development of non-performing loans (NPLs). These factors negatively impact the profitability of financial institutions, which are related to efficiency and lending capacity. The study of Akther et al. (2023) and Salsabila et al. (2024)also showed that the specific factors of banks, which include capital adequacy (CAD), bank branches, asset and deposit management (DEP), and asset quality, and macroeconomic factors such as GDP, inflation rate (IF), and exchange rate (EXR), are critical drivers in ensuring the continuity and stable performance of financial institutions. In a case study

in Kazakhstan, Bekbossinova et al. (2024) found that real wages and inflation affect borrowing costs and the demand for bank credit, with higher wages leading to higher demand for loans. Studies have shown that macroeconomic factors and market policies influence the determinants of credit growth. Dekar et al. (2024) noted that macroeconomic variables such as GDP growth, inflation, and exchange rates affect banks' profitability and lending capacity. However, the impact of inflation may be immaterial in some cases.

In the context of developing countries, a study by the International Monetary Fund (2024) focused on enhancing bank credit to the private sector in Togo, noting that constraints to the provision of bank credit include limited access to financial services, insufficient or asymmetric information for lenders, challenges in banking sector oversight, and high lending to the government. Regarding the impact of crises, a study by Uch et al. (2021) showed that banking crises negatively impact the credit cycle, and that this negative impact is more severe during periods of financial prosperity. We also find that the negative impact of the crisis is exacerbated in countries with a high level of financial development. Bationo and Asses (2025) addressed optimal credit development systems and the impact of foreign capital flows. The study found that the presence of a credit development system enhances growth, as any credit allocation to the economy enhances economic growth. Rizkullah and Suhel (2023) indicated that bank size and third-party funds have a positive and significant impact on credit growth; non-performing loans have a negative and significant impact on credit growth, the loan-deposit ratio has a negative and significant impact on credit growth, and the capital adequacy ratio has a negative and significant impact on credit growth.

Based on the above, the Iraqi banking sector is a unique case study that requires special attention, as it operates in an economic environment characterised by ongoing transformations and structural challenges resulting from decades of political and economic turmoil and conflict. After a long period of restrictions, the banking sector has witnessed remarkable growth in recent years, supported by government reconstruction efforts and the transition to a market economy. However, Iraqi banks still face challenges such as weak infrastructure, limited innovation, and high operational and credit risks (Hasanov et al., 2018).

And the lack of financial inclusion, under these conditions, understanding how the determinants of credit growth (whether internal, related to bank management or external, related to the macroeconomic environment) affect banking efficiency becomes critical (Sarwar et al., 2018). Effective banks are those that manage their resources efficiently to maximise productive loans and reduce risks, thereby contributing to the stability of the financial system and supporting economic development in Iraq.

In light of the above, the lack of a clear and up-to-date understanding of how the internal and external determinants of credit growth interact and impact banking efficiency in the context of post-conflict economies, especially in Iraq's volatile economic environment, Iraqi banks operate under unique circumstances that require a clear and precise analysis of the factors that help them achieve sustainable credit growth and operational efficiency amidst current challenges. This research seeks to fill this knowledge gap by providing a comprehensive analysis of these relationships in a sample of Iraqi commercial banks.

Research Problem

The banking sector is the lifeblood of any economy, due to its pivotal and essential role in providing the necessary financing for investment and spending, and stimulating economic growth. In the Iraqi context, which faces security and economic challenges and rapid technological developments, evaluating banks' performance has become critical. Banking efficiency is considered a key measure of banks' ability to efficiently utilise their resources (capital, deposits, operating expenses) to maximise output (investments,

loans, profits). However, understanding the true determinants of this efficiency in the context of the Iraqi business environment still requires extensive research based on precise quantitative foundations.

Hence, the research problem arises, particularly when linked to credit dynamics, which are considered the core of banking activity. Credit growth and changes in its determinants have a direct impact on banks' profitability and operational risks, and consequently, their efficiency.

Despite the critical importance of understanding the relationship between credit growth and banking efficiency, there is an apparent lack of analytical studies that examine this relationship in detail in Iraqi banks. The particular operating environment in Iraq, which is characterised by economic and political fluctuations, may make the factors affecting credit growth vary. These factors may also have a different impact on the levels of efficiency achieved. The lack of a clear understanding of these dynamics leaves a knowledge gap that prevents decision-makers and bankers from taking informed measures to improve banking performance.

Research Focus

The primary focus of this study is to analyse the determinants of credit growth and their impact on banking efficiency in the private banking sector, specifically commercial banks, for a sample of 9 banks. This was done to provide clear insights into the impact of internal and external determinants of credit growth on banking efficiency, as measured using the data envelopment method. The findings of this research may apply to bank managers, shareholders, and economic policymakers.

Research Aim and Research Questions

This research aims to measure the level of banking efficiency of Iraqi commercial banks during the period under study, determine the extent to which both internal and external determinants of credit growth affect this level of efficiency, and identify the most and least efficient banks. The study focuses on three research questions.

1. To what extent do internal factors (loan quality, capital adequacy, bank size, and loan growth) and external factors (interest rate, inflation, and exchange rate) explain variations in the banking efficiency of Iraqi commercial banks from 2005 to 2023?
2. Do Iraqi commercial banks listed on the Iraq Stock Exchange show statistically significant declines in efficiency levels over the study period?
3. Which internal and external determinants exert the most substantial measurable influence on banking efficiency during 2005–2023?

Literature Review

Bank efficiency is commonly explained by two theories: X-efficiency theory and the profit-efficiency theory. X-efficiency, developed by Leibenstein (1966), attributes performance differences to internal organisational factors such as managerial control, structure, and motivation. In banking, it measures how effectively inputs such as deposits, labour, and capital are transformed into outputs at minimal cost. The profit-efficiency theory extends this view by assessing banks' ability to maximise profits through both cost efficiency and revenue efficiency (Berger & Mester, 1997; Berger & Humphrey, 1997; Koopmans, 1951; Vajda & Jordan, 1957).

While these theories frame the concept of efficiency, the response of banks to monetary policy also depends on credit channels, which function as mechanisms rather than theories. The balance sheet channel links monetary policy to borrowers' net worth and collateral values (Bernanke & Gertler, 1995; Di Maggio & Kermani, 2017). The bank lending channel emphasises how policy actions affect bank reserves and funding conditions, thereby constraining loan supply (Gambacorta & Marques-Ibanez, 2011; Mishkin,

2019). These channels describe the pathways through which monetary policy influences bank behaviour and complement, rather than replace, the efficiency theories. Among the most prominent of these theories are:

- Commercial Loan Theory: This theory is older, but it focuses on the role of banks in providing short-term, self-liquidating loans to finance commercial activities. Although recent research has not focused directly on it as a stand-alone theory, it examines how loan portfolios affect banks' liquidity and asset quality (Andries, 2008). Unlike X-efficiency and profit efficiency theories, which frame efficiency in terms of resource use and profitability outcomes, the Commercial Loan Theory is concerned with liquidity management through lending practices. In this study, banking efficiency is framed primarily within the X-efficiency and profit efficiency perspectives, while credit theories such as the Commercial Loan Theory provide background on how credit supply mechanisms historically shaped banking operations.
- Shiftability Theory and Anticipated Income Theory: These two theories expand the understanding of bank liquidity to include the possibility of selling secondary assets or relying on expected cash flows from loans. In the modern context, these concepts are often integrated into comprehensive liquidity management and asset-liability management, as banks seek to balance generating income with maintaining the ability to meet obligations (Andries, 2008).
- Market power theory states that banks' performance depends solely on market structure. In a concentrated market or with a significant market share and with well-defined products, banks can exert market influence over prices and earnings, thereby increasing their extraordinary profits (Fu & Heffernan, 2009).
- Efficiency Structure Theory: It postulates that the differences between banks' profits are explained by the efficiency of banks that make more profits being the most effective. The relationship between the market structure and the performance of any bank is thus defined by its efficiency (Ferrouhi, 2018).
- Agency Theory: This theory encompasses the relationship between stakeholders (such as shareholders) and managers, and explains how management behaviour and incentives affect bank performance. The theory explains that conflicts of interest can lead to inefficient decisions that negatively impact banking activity (Darayseh & Chazi, 2018).

Studies have often addressed the determinants of credit growth and its impact on banking efficiency. Benbachir (2025) addressed the efficiency of banks in the Middle East and North Africa region, highlighting their critical role in economic growth and financial stability. This research paper examines the efficiency of 59 conventional banks from 11 MENA countries between 2019 and 2023, and identifies the internal and external factors that influence their efficiency. Using data envelopment analysis, the study assesses efficiency based on three inputs and two outputs. A Tobit regression model was then applied to analyse the impact of eight internal and four external factors on efficiency. The results indicate that only 16% of banks in the MENA region are efficient, with Qatari banks outperforming and banks in Morocco and Jordan underperforming. The results also indicate that return on assets and capital adequacy enhance banking efficiency, while liquidity and operating costs negatively impact it. Although liquidity is typically considered a positive indicator, the study found a negative impact on efficiency. The study did not address the impact of the type of bank (Islamic/conventional) or the regulatory environment. Our study differs from the previous study, as it covered a long time series that extended over 19 years and involved 9 banks. The current study did not address the external determinants and focused only on the internal determinants.

Ullah and Popp (2023) explored the internal determinants of the bank's Efficiency as corporate governance, enterprise risk management, ownership structure (state, foreign, and domestic ultimate

owned banks), return on equity, financial leverage, and the size of the bank. The external determinants of the bank's Efficiency include banking structure and macroeconomic conditions from 2011 to 2020. Data Envelopment Analysis Approach (DEA) and Logit and Probit Regression Model showed that corporate governance, ultimate global ownership, and return on equity have a statistically significant and positive impact on the bank's Efficiency. The study of Kamarudin et al. (2019) focused on local and foreign Islamic banks operating in the Malaysian Islamic banking sector during the period 2006-2015. This study examined the potential internal (bank-specific) and external (macroeconomic) determinants that affect the revenue efficiency of Malaysian domestic Islamic banks. The level of revenue efficiency was calculated using the data envelopment analysis (DEA) method.

Furthermore, the study used an ordinary least squares (OLS) regression analysis framework to examine the potential determinants of revenue efficiency. The results indicate that the revenue efficiency of Malaysian domestic Islamic banks is lower than that of their foreign Islamic counterparts. It was found that the strength of the banking market, liquidity and quality of management significantly affect the improvement of the revenue efficiency of local Malaysian Islamic banks. Unlike prior studies using OLS on performance measures, this study applies DEA to derive bounded efficiency scores and then regress them on credit growth determinants, addressing the methodological gap.

Nasim and Downing (2024) examined the effects of the regulatory environment, macroeconomic factors, monetary conditions, and uncertainty on operating efficiency and investment in the banking sector. Using data from G7 and E7 countries from 2001 to 2020, the main findings show that leverage, capital adequacy, monetary conditions, economic growth, price stability, as well as exchange rate stability and uncertainty, have significant impacts on banking efficiency, with notable differences between the impact on operating and investment efficiency in advanced (G7) and developing (E7) economies.

Contradictory results persist in the literature contextually, bank size shows varying effects across countries; theoretically, capital adequacy's impact on efficiency remains ambiguous; and conceptually, the mediating role of loan growth and quality is rarely examined. Methodologically, most prior studies relied on OLS or stochastic Frontier Analysis (SFA), which impose restrictive assumptions. By applying DEA, we capture efficiency more flexibly and account for the Iraqi banking context. Most prior studies on banking efficiency have relied on DEA or SFA techniques to assess cost or profit efficiency, but they largely abstract from the role of monetary policy (Altavilla et al., 2018; Milenković et al., 2022; Zhu et al., 2021). Conversely, research on the credit channel has focused on the transmission of monetary policy through bank lending without integrating efficiency measures at the bank level. This study, Hasanov et al. (2018), bridges the two approaches by employing bank-level panel data to jointly examine efficiency theories and the lending channel of monetary transmission, thereby capturing both the internal performance of banks and their external role in credit supply. By integrating these dimensions, the analysis fills a methodological gap in the literature, offering a more comprehensive framework to understand how monetary policy shapes banking efficiency and credit allocation.

Materials and Methods

Sample and Participants

The banking sector in the State of Iraq contains two types of private banks and government banks. Due to the specificity of banking work within the State of Iraq, data on government banks was not obtained, and it was sufficient to use local private banks, which numbered 24 banks according to the website of the Central Bank of Iraq https://cbi.iq/page/24. However, the data available during the research period from 2005 to 2023 was available for (9) banks only according to the website of the Iraq Stock Exchange, as the research sample was represented by the Baghdad, Commercial, National, Middle East, Credit, Sumer

Commercial, Investment, Gulf, Mosul Bank and the reports were based on the balance sheet and income statement. The dependent variable (banking efficiency) was extracted from the balance sheet and income statement, which represented the inputs (deposits and operating expenses) and the outputs (net profit). In contrast, the (independent variable) represented the determinants of credit growth with two types of determinants, which are the internal determinants, represented by the following: loan quality ratio NPL, capital adequacy CAR, bank size, and loan growth. The annual financial data of the nine banks were used to extract the four internal indicators. At the same time, the external determinants (interest rate, inflation rate, and exchange rate) were obtained from the Central Bank of Iraq reports covering the period 2005–2023.

Instruments and Procedures

The study sample consists of nine Iraqi banks: Baghdad, Commercial, National, Middle East, Credit, Sumer Commercial, Investment, Gulf, and Mosul. Data were extracted from annual financial reports obtained through the Iraq Stock Exchange from 2005 to 2023, while macroeconomic indicators were sourced from the Central Bank of Iraq. A Data Envelopment Analysis (DEA) model was applied to estimate banking efficiency scores. DEA efficiency scores then served as the dependent variable in a multiple regression model that incorporated both internal and external determinants.

Table 1

Variables and their measurements

Variable	Definition	Measurement/Formula	Source
Loan Quality	Extent to which loans are performing	Provision for Loan Losses ÷ Total Loans	Nicoletti (2018)
Capital Adequacy	Bank's capacity to absorb risk	Core Capital ÷ Risk-Weighted Assets	Abobakr (2018)
Bank Size	Scale of bank operations	ln(Total Assets)	Chipeta & Deressa (2016)
Loan Growth	Yearly growth in loans	$(Loans_t - Loans_{t-1}) \div Loans_{t-1}$	Bhowmik & Sarker (2021); Nguyen & Vo (2021)
Banking Efficiency	Relative efficiency of banks	DEA (inputs: deposits, expenses; outputs: net profit)	Own estimation using EMS 1.3
Inflation	Price level changes	Annual CPI (%)	Central Bank of Iraq
Interest Rate	Cost of borrowing	Lending rate (%)	Central Bank of Iraq
Exchange Rate	Currency value	IQD per USD	Central Bank of Iraq

The determinants of credit growth were divided into internal determinants represented by:

1. Quality of loans

Loan quality is measured through the following (Nicoletti, 2018).

$$Quality \text{ of loans} = \frac{\text{Pr}ovision \text{ for load losses}}{Total \text{ loans}} \quad (1)$$

Equation (1) shows that a higher value means banks expect more loans to go bad (weaker loan quality), while a lower value indicates healthier loan portfolios.

2. Capital adequacy

The following equation illustrates the capital adequacy ratio (Abobakr, 2018).

$$\text{Total core capital} = \frac{\textit{Total}\ \text{risk-weighted assets}}{\text{CAP}} \qquad (2)$$

Equation (2) shows that a higher CAR indicates stronger financial stability and resilience, while a lower CAR signals greater vulnerability to shocks and possible regulatory non-compliance.

3. Bank size

The equation for the size of the bank can be explained as follows (Chipeta & Deressa, 2016).

$$\textit{Bank}\ \text{size=natural logarthm of total assets} \qquad (3)$$

Equation (3) defines that a larger bank size, measured as the natural logarithm of total assets, reflects greater resource capacity and market presence, which may enhance efficiency but can also introduce complexity and management challenges.

4. Loan growth

Loan growth is measured as the percentage change in total loans, calculated as [(loans granted in year t – loans granted in year t-1) / loans granted in year t-1] (Bhowmik & Sarker, 2021; Nguyen & Vo, 2021).

The inflation rate, interest rates, and exchange rates represented external determinants. To measure banking efficiency, the Data Envelopment Analysis (DEA) method was used, which is considered one of the essential non-parametric tools in measuring the relative efficiency of homogeneous units. The inputs and outputs were determined for each bank within the sample. The inputs included deposits and operating expenses, and the outputs (net profit) are the annual values of the efficiency factor. As for analysing the impact of independent variables (determinants of credit growth) on the dependent variable (banking efficiency), the multiple linear regression method was followed using the backwards elimination method. The basic principle of this model is to add all the independent variables to the first model, and then gradually delete the variables that do not have statistical significance (p> 0.10) until reaching the optimal model that includes the variables that most influence banking efficiency. The multiple regression equation using the backwards elimination method is as follows:

$$\textit{Banking}\ \text{Efficency}_{it} = \beta_0 + \beta_1 \textit{Loan Quality}_{it} + \beta_2 \textit{Capital Adequacy}_{it} + \beta_3 \textit{Bank Size}_{it} + \beta_4 \textit{Loan Growth}_{it} + \beta_5 \textit{Inflation}_{it} + \beta_6 \textit{Interest Rate}_{it} + \beta_7 \textit{Exchange Rate}_{it} + \varepsilon_{it} \qquad (4)$$

In Equation (4), Banking Efficiency represents the efficiency score of bank *i* at time *t*, β_0 is the intercept, $\beta_1 \ldots \beta_7$ are the coefficients showing the marginal effects of the determinants, and ε is the error term.

Before running the regression analysis, standard diagnostic checks were conducted to ensure the robustness of the results. Normality of variables was tested using the Kolmogorov–Smirnov and Shapiro–Wilk tests. Reliability of the measures was examined using Cronbach's alpha to assess the internal consistency of the banking indicators. Construct validity was evaluated through factor analysis to confirm that the selected indicators measured distinct constructs. In addition, model specification was assessed by

calculating the Variance Inflation Factor (VIF) to detect multicollinearity and the Durbin–Watson statistic to check for autocorrelation in the residuals. These steps ensured that the data satisfied key assumptions for regression analysis.

Results

The research showed that the determinants of credit growth are divided into internal determinants related to the financial performance of banks and external factors that reflect the overall economic environment.

Table 2

Descriptive Statistics

Variable	Mean	Max	Min	SD
Loan Quality Ratio (%)	49.03	299.19	10.28	0.646
Capital Adequacy Ratio (%)	112.23	348.59	55.61	0.650
Bank Size (log assets)	26.73	27.47	25.45	0.606
Loan Growth (%)	104.26	1381.15	–19.43	3.122
Interest Rate (policy rate, %)	7.3	20.0	4.0	—
Inflation Rate (%)	9.4	53.11	–0.2	—
Exchange Rate (IQD/USD)	1246.2	1474	1166	—

Table 2 summarises the descriptive statistics of both internal and external determinants of bank efficiency. On the internal side, loan quality shows a very high mean (49.03 per cent) with extreme dispersion, highlighting the burden of non-performing loans as a critical challenge. Capital adequacy is well above regulatory norms (mean 112.23 per cent), though variability suggests unequal resilience across banks. Bank size remains relatively stable with limited dispersion, while loan growth exhibits sharp fluctuations, reflecting episodes of credit booms and contractions. Externally, Iraq's financial environment was marked by volatile inflation and policy rates, alongside a largely stable exchange rate until it adjusted in 2021. These descriptive patterns contextualise the DEA efficiency results and align directly with the study's aim of examining how internal and external factors shape banking performance.

Table 3

Correlation matrix

		NPL	CAR	Bank Size	Loan growth	Interest Rate	Inflation Rate	Exchange Rate	DEA
NPL	Pearson Correlation	1	-.235	-.175	-.095	-.024	-.148	-.291	.028
	Sig. (2-tailed)		.333	.474	.698	.923	.545	.226	.910
	N	19	19	19	19	19	19	19	19
CAR	Pearson Correlation	-.235	1	.478*	-.033	-.414	-.381	.172	-.654**
	Sig. (2-tailed)	.333		.038	.893	.078	.107	.482	.002
	N	19	19	19	19	19	19	19	19
Bank Size	Pearson Correlation	-.175	.478*	1	.101	-.727**	-.835**	-.146	-.709**
	Sig. (2-tailed)	.474	.038		.680	.000	.000	.550	.001
	N	19	19	19	19	19	19	19	19
	Pearson Correlation	-.095	-.033	.101	1	-.125	-.144	-.169	.222

Loan growth	Sig. (2-tailed)	.698	.893	.680		.610	.556	.489	.361
	N	19	19	19	19	19	19	19	19
Interest Rate	Pearson Correlation	-.024	-.414	-.727**	-.125	1	.728**	.000	.786**
	Sig. (2-tailed)	.923	.078	.000	.610		.000	.999	.000
	N	19	19	19	19	19	19	19	19
Inflation Rate	Pearson Correlation	-.148	-.381	-.835**	-.144	.728**	1	.492*	.510*
	Sig. (2-tailed)	.545	.107	.000	.556	.000		.032	.026
	N	19	19	19	19	19	19	19	19
Exchange Rate	Pearson Correlation	-.291	.172	-.146	-.169	.000	.492*	1	-.298
	Sig. (2-tailed)	.226	.482	.550	.489	.999	.032		.215
	N	19	19	19	19	19	19	19	19
DEA	Pearson Correlation	.028	-.654**	-.709**	.222	.786**	.510*	-.298	1
	Sig. (2-tailed)	.910	.002	.001	.361	.000	.026	.215	
	N	19	19	19	19	19	19	19	19
*. Correlation is significant at the 0.05 level (2-tailed).									
**. Correlation is significant at the 0.01 level (2-tailed).									

Table 3 shows several significant correlations among the study variables. Bank size is strongly and negatively correlated with interest rate ($r = -0.727$, $p < 0.01$) and inflation ($r = -0.835$, $p < 0.01$), suggesting that larger banks face lower macroeconomic pressures. DEA efficiency is positively correlated with interest rate ($r = 0.786$, $p < 0.01$) and inflation ($r = 0.510$, $p < 0.05$), indicating that efficiency improves in tighter monetary conditions. CAR is negatively associated with DEA efficiency ($r = -0.654$, $p < 0.01$), implying that highly capitalised banks may not necessarily operate more efficiently. These results confirm that the explanatory variables are meaningfully related to efficiency, supporting the validity of proceeding with regression analysis.

Table 4

DEA Data Envelope Analysis

Year	Baghdad	Comm-ercial	Al Ahli	Middle East	Credit	Sumer	Investment	Gulf	Mosul	Average
2005	0.10579	0.31542	1.00000	1.00000	0.52201	1.00000	0.71776	0.58215	0.48874	0.63688
2006	0.45122	0.05406	0.00000	0.51031	0.35236	0.78051	0.00242	0.49962	0.38348	0.33711
2007	1.00000	0.06228	0.50363	1.00000	0.68191	0.69241	0.97694	0.44208	0.50409	0.65148
2008	0.67606	0.07224	0.54835	0.73232	0.68290	0.27310	0.74860	0.88634	0.51109	0.57011
2009	0.30892	0.17588	0.09770	0.58255	0.29972	1.00000	0.24229	0.39469	0.47606	0.39753
2010	0.22510	0.65738	0.14521	0.42912	0.37314	0.06739	0.62643	0.28350	0.64165	0.38321
2011	0.37085	0.48817	0.20633	0.85420	0.51726	0.03515	0.54852	0.50047	0.47876	0.44441

2012	0.32389	0.80666	0.89502	0.91953	0.61464	0.08180	0.06535	1.00000	0.84573	0.61696
2013	0.32980	0.40911	0.59664	0.85140	0.34232	0.07995	0.91298	1.00000	1.00000	0.61358
2014	0.26391	0.56696	0.19101	0.22486	0.68612	0.11610	1.00000	0.65189	0.07084	0.41908
2015	0.08563	0.41264	0.07983	0.36376	0.73437	0.29733	0.60326	0.19883	0.00000	0.30841
2016	0.31939	0.72013	0.95937	0.99052	0.25411	0.25468	0.38015	0.19736	0.21938	0.47723
2017	0.10750	1.00000	0.09690	0.00000	1.00000	0.02005	0.14922	0.13009	0.27320	0.30855
2018	0.06435	0.84971	0.00000	0.00000	0.36552	0.06910	0.02033	0.02422	0.10290	0.16624
2019	0.11281	0.24738	0.24552	0.00622	0.00000	0.08531	0.00120	0.00000	0.20205	0.10006
2020	0.24707	1.00000	0.41724	0.00000	0.00000	0.08757	0.35775	0.00000	0.18351	0.25479
2021	0.34578	0.34208	0.31116	0.02237	0.00000	0.16158	0.03868	0.00000	0.37959	0.17792
2022	0.53666	0.37089	0.22687	0.00122	0.93393	0.11043	0.31258	0.00000	0.27217	0.30719
2023	1.00000	0.44762	1.00000	0.00000	1.00000	0.00000	1.00000	0.23084	0.23904	0.54639
MEAN	0.36183	0.47361	0.39583	0.44676	0.49265	0.27434	0.45813	0.36958	0.38275	0.40616
Max	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	0.65148
Min	0.06435	0.05406	0.00000	0.00000	0.00000	0.00000	0.00120	0.00000	0.00000	0.10006
SD	0.26732	0.29178	0.33740	0.39687	0.30683	0.32259	0.35469	0.32728	0.25013	0.16458

Table 4 reports the DEA efficiency scores across banks and years. The overall mean of 0.41 suggests a low average efficiency, with Credit, Iraqi Commercial, and Investment banks performing relatively better, while Sumer recorded the weakest scores. Efficiency declined steadily through the mid-2010s to a trough of 0.10 in 2019, followed by a recovery to 0.55 in 2023. This temporal pattern confirms the second research question by showing statistically visible declines in efficiency. At the same time, the cross-bank variation highlights the objective of identifying the most and least efficient institutions.

Table 5

Normal distribution test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
NPL	.167	19	.171	.901	19	.051
CAR	.165	19	.186	.913	19	.083

Bank Size	.164	19	.193	.933	19	.194
Loan growth	.131	19	.200*	.968	19	.739
Interest Rate	.215	19	.021	.914	19	.088
Inflation Rate	.087	19	.200*	.977	19	.904
Exchange Rate	.128	19	.200*	.981	19	.956
DEA	.165	19	.183	.933	19	.198
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

Table 5 presents the results of the normality test. The Shapiro–Wilk values show that most variables (NPL, CAR, bank size, loan growth, inflation, exchange rate, and DEA efficiency scores) were normally distributed at the 5% significance level. Only the interest rate variable showed marginal deviation from normality (p = 0.021), which is common in macro-financial data. Since regression is generally robust to minor deviations, this was not considered problematic for model estimation.

Table 6

Analysis of the determinants of credit growth and banking efficiency

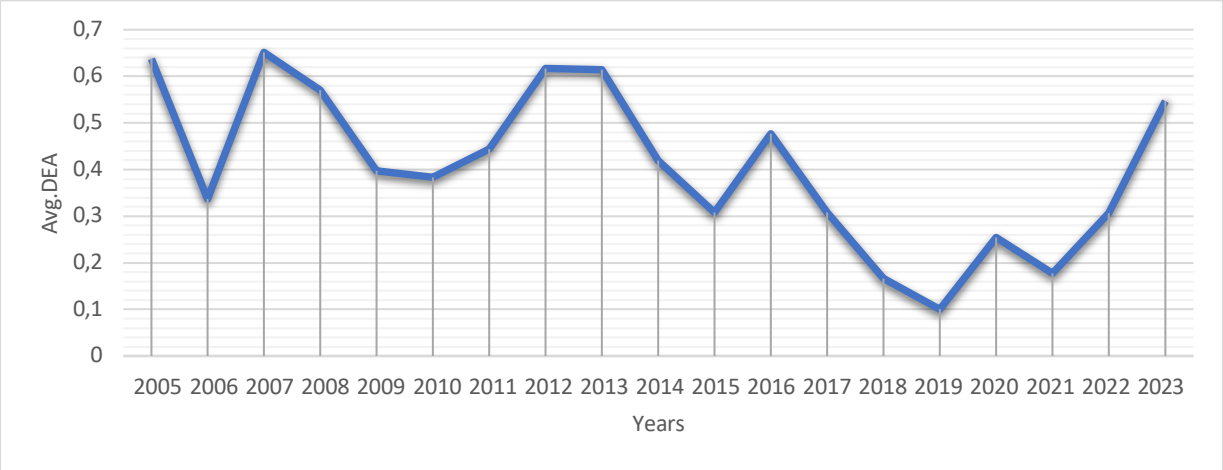
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.644	1.168		4.832	.001
	Loan Quality	-.061	.021	-.345	-2.877	.015
	Capital Adequacy Ratio	-.066	.021	-.375	-3.155	.009
	Bank Size	-.196	.045	-1.033	-4.307	.001
	Loan Growth	.007	.004	.185	1.871	.088
	Interest Rate	.008	.004	.298	1.700	.117
	Inflation Rate	-.005	.003	-.673	-2.060	.064
	Exchange Rates	7.201E-5	.000	.068	.411	.689
2	(Constant)	5.527	1.093		5.058	.000
	Loan Quality	-.060	.020	-.340	-2.956	.012
	Capital Adequacy Ratio	-.063	.019	-.359	-3.316	.006
	Bank Size	-.188	.040	-.993	-4.697	.001
	Loan Growth	.007	.004	.181	1.902	.081
	Interest Rate	.007	.004	.259	1.814	.095
	Inflation Rate	-.005	.002	-.572	-2.760	.017
a. Dependent Variable: Banking efficiency R2 =0.899 F The calculated = 17.878 Sig.=0.000						

The regression analysis in Table 6 confirms that internal factors such as loan quality, capital adequacy, and bank size exert significant adverse effects on banking efficiency. Among these, bank size

shows the most decisive influence, underscoring how larger banks may struggle with efficiency challenges relative to smaller counterparts. Inflation also negatively affects efficiency, while loan growth and interest rates show positive but weaker effects, with their significance levels indicating more marginal contributions. The high R^2 value of 0.899 and a statistically significant F-statistic demonstrate that the model explains nearly 90% of the variation in efficiency, offering strong evidence that both internal and external factors jointly shape the efficiency of Iraqi banks. These findings directly address the research objective by identifying the most impactful determinants and providing evidence of efficiency dynamics during the study period.

Figure 1

Average DEA efficiency of Iraqi Banks

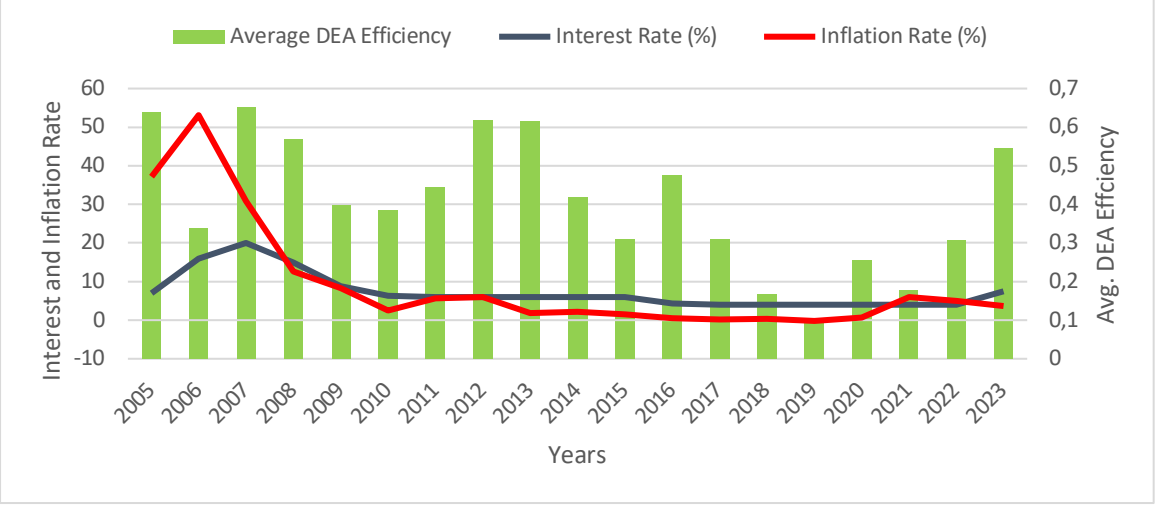


Source: Author's development.

Figure 1 shows that the efficiency of Iraqi banks peaked around 2007 and 2012–2013, declined sharply to its lowest point in 2019, and has partially recovered since 2020, indicating both vulnerability to shocks and signs of resilience in recent years.

Figure 2

Relationship between average efficiency, inflation and interest rate



Source: Author's development.

Figure 2 illustrates that fluctuations in inflation and interest rates correspond with variations in bank efficiency. High inflation and interest rates in the mid-2000s were associated with greater efficiency volatility, while the stabilisation of both indicators after 2010 coincided with relatively lower and more stable efficiency levels.

Discussion

This study set out to address three main research questions: the impact of internal (loan quality, capital adequacy, bank size, loan growth) and external (interest rate, inflation rate, exchange rate) determinants of credit growth on the efficiency of Iraqi commercial banks, the extent to which banks in the sample suffered from declining efficiency levels, and the most influential determinants during the study period. The findings provide valuable insights into the interconnected relationships between these factors and banking efficiency in the Iraqi context.

The results show a negative relationship between loan quality and banking efficiency. A higher share of non-performing loans increased provisions, debt collection costs, and credit losses, which in turn weakened bank performance. This outcome is consistent with the literature, where poor loan quality is widely recognised as a significant impediment to efficiency. At the same time, capital adequacy revealed mixed effects. While maintaining adequate capital provides security, reduces risks, and supports efficient operations, excessively high capital adequacy ratios, observed in some banks, point to conservative capital use and underutilization of resources. This underlines the importance of balancing prudential requirements with effective capital deployment to strengthen efficiency.

Bank size also played a significant role in shaping efficiency. The results showed clear growth in assets across the sample, with the highest levels recorded in 2023, reflecting the expansion of Iraqi commercial banks. Larger banks benefited from economies of scale and improved risk diversification, which enhanced efficiency. However, the findings also suggest that giant banks face potential bureaucratic and administrative challenges, which may offset efficiency gains. These results align with international evidence that size brings advantages, but the benefits are not unlimited.

Loan growth emerged as another important determinant. The study found that during periods of political, economic, and security instability, such as in 2010 and 2018, banks reduced their lending activities as a precautionary measure. While sustainable loan growth was found to improve efficiency by boosting revenues and asset utilisation, uncontrolled and rapid expansion created risks of future non- performing loans. The experience of the Commercial Bank of Iraq illustrates this dynamic, highlighting the balance needed between growth and prudent lending practices.

Among the external factors, inflation had a pronounced impact. Rising inflation in 2005–2006 destabilised the credit environment, while contraction in 2019 reflected weakening aggregate demand and economic slowdown. Moderate inflation can encourage credit demand and support efficiency, but high or volatile inflation increases uncertainty, raises operating costs, and reduces the purchasing power of bank assets, thereby reducing efficiency. Exchange rate movements were relatively stable, but temporary declines in the local currency had implications for liquidity and foreign-currency-exposed banks. A stable exchange rate environment supports efficient banking operations, whereas volatility poses risks to profitability and efficiency, especially for banks with significant foreign-currency obligations (Khan, 2022).

The current findings are broadly in line with related studies but also highlight essential distinctions. Ullah and Popp (2023) analysed the impact of internal and external factors on the efficiency of Pakistani banks using a DEA approach, identifying governance, ownership structure, return on equity, and leverage as significant determinants. While their internal and external variables differed from the Iraqi case, both studies emphasise that bank-specific and macroeconomic factors jointly shape efficiency. Similarly, Nasim

and Downing (2024), using data from G7 and E7 countries and a range of econometric techniques, reported that leverage, capital adequacy, monetary conditions, and exchange rate stability were key drivers of efficiency. Unlike their global sample, this study focused on a local context, but both confirm the relevance of structural and macroeconomic conditions in determining efficiency.

The disparities found among Iraqi banks in terms of efficiency levels, as revealed by the DEA results, point to underlying structural and administrative gaps. This inefficiency suggests the need for institutional reforms to optimise the use of available resources. The statistical analysis further confirmed that loan quality, capital adequacy, and bank size were the most influential determinants, while. In contrast, growth and interest rates had a positive but less significant role. Inflation, in contrast, was a persistent factor reducing efficiency. These results underline the necessity for bank management to closely monitor credit growth determinants to make informed lending decisions and optimise strategies in response to changing conditions.

The policy implications are clear. Banks should strengthen operational efficiency through new technologies and improved risk management. For instance, investment in big data analytics can enhance loan quality by reducing non-performing loans, directly supporting efficiency (Huy et al., 2024). The Central Bank of Iraq and other regulators should adopt flexible monetary and regulatory policies, adjusting interest rates and supervisory frameworks in response to inflation and exchange rate conditions. Balancing capital adequacy, loan quality, and loan growth remains essential for maintaining both financial stability and efficiency.

Finally, while this study sheds light on the determinants of efficiency in Iraqi commercial banks, it also reveals areas for further research. A broader sample including all private and state-owned banks, and comparative studies between the two, would provide a more comprehensive picture of efficiency dynamics in Iraq. This extension could also enrich regional and international discussions on how banks in fragile and developing economies respond to internal and external pressures.

Limitations of the Study

The current study makes a valuable contribution by identifying the determinants that influence banking efficiency. However, it should be noted that some limitations affect the overall results of the study. The most notable of these limitations is that the study relied on the data envelopment method and did not use other methods to measure efficiency and comparison. The study will not address all potential variables that may affect credit growth or banking efficiency in general due to the difficulty of obtaining data, which may affect the strength of the interpretation of the results. Another major limitation was the failure to select government-owned banks for the sample, because they did not disclose their annual financial statements. The study also faced challenges in selecting the sample due to the availability of data for some banks for specific years, which affected the sample size and the time period covered.

While the study was conducted on Iraqi banks and the results may not be directly generalizable to all banking systems worldwide due to differences in regulatory and economic environments, some convergence with international literature was observed. For example, similar to Ullah and Popp (2023), this study found that internal determinants such as loan quality and bank size play a significant role in shaping efficiency. Likewise, consistent with Nasim and Downing (2024), external factors such as inflation and exchange rate volatility were shown to affect efficiency negatively. However, the intensity of these effects differed, given Iraq's specific political and economic conditions. These points of convergence suggest that the determinants of efficiency operate in similar directions across contexts, even though the magnitude and policy implications diverge due to structural differences between the Iraqi banking sector and those of advanced or globally integrated economies.

Conclusions and Implications

This study addresses the determinants of credit growth and their impact on banking efficiency in the private banking sector in Iraq. Several theories were addressed, such as the theory of banking efficiency, credit theories, and theories of banking activity determinants. We concluded that there is a statistically significant impact of the determinants of credit growth on banking efficiency, which supports the importance of these determinants in improving bank efficiency.

There is also a sharp disparity in the efficiency of banks, indicating that their resources are not being utilised efficiently. This indicates structural and administrative gaps between banks that require profound institutional reform to achieve optimal use of available resources.

The most influential determinants, namely, improved loan quality, capital adequacy, and bank size, were linked to improved efficiency. Strong loan growth and interest rates had a positive but less significant impact. Inflation, however, was a factor that reduced bank efficiency.

The research findings can help bank management enhance their banking efficiency by adopting ongoing training and qualification programs to assess and improve banking efficiency, along with activating internal and external oversight tools. This will help narrow the gaps between banks and achieve optimal utilisation of available resources. Commercial banks also need to focus on the determinants of credit growth, particularly loan quality, capital adequacy ratios, bank size, inflation rates, and interest rates, given their direct, significant impact on enhancing banking efficiency. It is also recommended to develop precise regulatory policies that ensure a balance between credit growth and maintaining capital adequacy levels, while improving loan quality.

Suggestions for Future Research

Future research should extend the scope of analysis beyond Iraqi commercial banks to include banks across the Middle East and North Africa (MENA) region. A comparative approach would allow for an examination of how differences in regulatory environments, institutional quality, and macroeconomic stability shape banking efficiency across countries. Such comparisons could reveal whether the determinants of efficiency identified in Iraq converge with or diverge from those observed in neighbouring economies. In addition, the application of more advanced econometric tools, such as market value–adjusted ratio (VAR) models, would enable researchers to capture dynamic relationships and better identify causality between internal and external determinants and efficiency. Further studies could also integrate corporate governance indicators, such as board independence, ownership structure, and transparency practices, to assess how governance quality influences bank performance. Another vital direction would be to investigate the effects of recent shocks, notably the COVID-19 pandemic and geopolitical instability, which have significantly altered financial markets, credit demand, and risk perceptions. Incorporating these factors into future models would provide deeper insights into resilience, adaptability, and the long-term sustainability of banking systems in fragile and transitional economies.

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Conflict of Interest

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