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### Asset diversification and its impact in operational efficiency through bank size: An analytical study of a selected sample of commercial banks listed on the Iraq Stock Exchange for the period 2005-2024

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**Abstract:** The research seeks to study and analyze the direct and indirect effects of between asset diversification & operational efficiency by mediating the bank size, The research population is composed of the private commercial banks listed on the Iraq Stock Exchange. However, the research sample consisted of eight banks as follows (Baghdad, National, Middle East, Credit, Sumer, Iraqi Investment, Gulf, Mosul), The research period extended from 2005 to 2024, The researchers used simple linear regression using the Smart PLS 4 statistical program, and also used the Amos vs 23 statistical program to path analysis. One of the most notable findings of the study is that bank size mediates the relationship between asset diversification & operational efficiency. The most notable recommendations the research reached by the study are the need to adopt integrated risk management methods that link asset diversification, bank size, and operational efficiency to ensure the protection of its assets from numerous risks that could negatively impact its performance and efficiency.

## تنويع الموجودات وتأثيرها في الكفاءة التشغيلية من خلال حجم المصرف: دراسة تحليلية لعينة مختارة من المصارف التجارية المدرجة في سوق العراق للأوراق المالية عن المدة 2005-2024

محمد جبار فشاخ كلية الإدارة والاقتصاد جامعة كربلاء	مناف محمد خليل كلية البوليتكنك/كربلاء جامعة الفرات الاوسط التقنية	عباس عبد العالي كريم العبودي كلية الإدارة والاقتصاد جامعة كربلاء
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### المستخلص

يهدف البحث إلى دراسة وقياس التأثير المباشر والتأثير غير المباشر بين تنويع الموجودات والكفاءة التشغيلية من خلال توسيط حجم المصرف، ويتكوّن مجتمع البحث من المصارف التجارية الأهلية المدرجة في سوق العراق للأوراق المالية، وتم اختيار ثمانية مصارف كعينة للبحث من بين المصارف التجارية وهي: (بغداد، الاهلي، الشرق الاوسط، الائتمان، سومر التجاري، الاستثمار العراقي، الخليج، الموصل) امتدت مدة البحث من عام 2005 إلى عام 2024، واستخدم الباحثين الانحدار الخطي البسيط باستخدام البرنامج الاحصائي Smart PLS 4، كما استخدم البرنامج الاحصائي Amos vs 23 لتحليل المسار، ومن ابرز النتائج التي توصل لها البحث ان حجم المصرف يتوسط العلاقة بين تنويع الموجودات والكفاءة التشغيلية، بينما ابرز التوصيات التي توصل لها البحث ضرورة تبني اساليب إدارة مخاطر متكاملة تربط بين تنويع الموجودات وحجم المصرف والكفاءة التشغيلية لضمان حماية موجوداته من مخاطر عديدة التي قد تؤثر سلباً في ادائه وكفاءته. **الكلمات المفتاحية:** تنويع الموجودات MHHI، حجم المصرف، الكفاءة التشغيلية.

### 1. Introduction

Assets diversification in the Iraqi banking system is one of the most key tools for reducing the risks faced by banks, which has a positive impact on improving their financial performance. Therefore, risk management within banks is an urgent necessity to ensure operational efficiency. Hence, the importance of studying the factors that affect the operational efficiency of the bank, such as the bank size and the extent of assets diversification, the bank size is not just a number that reflects the size of its assets. But rather, it is a factor that directly affects the bank's behavior in managing risks and exploiting available opportunities. From this perspective, the following question arises: What is the role played by the bank size in strengthening this relationship between asset diversification and operational efficiency? As is known, the ability of banks to manage asset diversification varies according to the size of the bank, which may indicate the presence of an effect of the bank size on this relationship? From this perspective, the importance of this research becomes clear Understanding how bank size can affect the

relationship of (asset diversification & operational efficiency) is crucial, especially in light of continuous economic changes.

## **2. Methodology**

**2.1 Research problem:** The research topic revolves around the following decline in operational efficiency in some of the banks in the Study sample. The reason for this decline is due to the economic, political, security and health situation that the country went through during the period 2005-2024. Also, the use of some banks of the asset concentration policy which exposes these banks to many risks that affect their operational efficiency. From this standpoint, the following questions arise:

- A. Is there statistically significant variations in asset diversification among the sample banks?
- B. Is there statistically significant variation in the size of the commercial banks in the sample?
- C. Is there statistically significant variation in the operational efficiency levels of the commercial banks in the sample during the research period?
- D. Is there statistically significant effect of asset diversification on operational efficiency?
- E. Is there statistically significant Impact of bank size in operational efficiency?
- F. Does bank size mediate between asset diversification and operational efficiency?

**2.2 Importance of research:** The importance of this research lies in a set of points, which are as follows:

- A. Identifying the reasons for the decline in operational efficiency in some of the banks in the Study sample.
- B. Study the direct impact of asset diversification in operational efficiency, and study the indirect impact between asset diversification & operational efficiency through the mediation of bank size.
- C. The research contributes to bridging the hiatus in the financial literature on the triangular relationship between asset diversification, operational efficiency, & bank size by presenting a model that tests the moderating effect of bank size.
- D. How to improve the operational efficiency of banks in general & in Iraq in particular.

E. The research results provide important information for decision-makers in the banks on how to formulate diversification policies that are proportional to bank size to enhance operational efficiency.

**2.3 Research objectives:** The research objectives were as follows:

A. Analyze (asset diversification) of the research sample banks through the modified Herfindahl-Hirschman index (MHHI).

B. Analyze (operational efficiency) of banks research sample.

C. Analyze of the size of commercial banks research sample.

D. Measuring the direct impact of asset diversification on operational efficiency using simple regression.

E. Measuring the indirect impact of asset diversification on operational efficiency by averaging bank size using path analysis using the statistical program Amos vs 23.

F. Providing recommendations to banks about how to benefit asset diversification based on their size to enhance their operational efficiency.

G. Presentation of the theoretical aspect of the most important topics: asset diversification, bank size, and operational efficiency.

**2.4 Research hypothesis:** Through the Research questions, the hypotheses can be formulated as follows:

A. There is no statistically significant variation in asset diversification among the research sample banks.

B. There is no statistically-significant-variation in the size of the research sample commercial banks.

C. There is no statistically-significant-variation in the levels of operational efficiency of the research sample commercial banks during the research period.

D. There is no-statistically-significant-effect of asset diversification on operational efficiency.

E. There is no-statistically-significant-effect of bank size in operational efficiency.

F. Bank size does not mediate between asset diversification and operational efficiency.

**2.5 Research population and sample:** Represents the Research population in Banks whose shares are listed on the Iraq Stock Exchange, which number (24) banks. But research sample consists of (8) banks, as their data was available during the research period 2005-2024, as shown in Table (1).

Table (1) Research sample banks

No.	banking sector	Bank code	Capital at incorporation
1	Baghdad Bank	BBOB	100.000.000
2	National Bank of Iraq	BNOI	400.000.000
3	Middle East Bank	BIME	400.000.000
4	Credit Bank of Iraq	BROI	200.000.000
5	Sumer Commercial Bank	BSUC	400.000.000
6	Iraqi Investment Bank	BIBI	100.000.000
7	Gulf Bank	BGUC	600.000.000
8	Mosul Investment Bank	BMFI	1.000.000.000

Source: Prepared by researchers

### 3. Literature Review

#### 3.1 assets Diversification:

**3.1.1 The concept of asset diversification:** Asset diversification is an investment strategy through which banks aim to reduce the overall-risks of the investment-portfolio with the aim of achieving returns within the permissible risk margin by combining different asset classes in a well-thought-out manner. This is achieved by distributing assets across multiple classes (such as stocks, bonds, cash, real estate, fixed assets, etc.), So that returns are not highly correlated with each other, which contributes to the stability of the overall performance of the portfolio (Mutege, 2016: 2). Diversifying banks' assets is one of the factors affecting their efficiency. Diversifying assets means diversifying the financial services provided by banks, and any increase in the financial services provided is met with an increase in the efficient management of their operations (Indraswari et al, 2023: 185). Diversification of a bank's assets is a measure used to evaluate diversity among different asset classes and diversification across different sectors. The investment portfolio-theory indicates that banks may be able to-reduce risks by distributing their assets across multiple geographical locations and different sectors or by diversifying their sources of income (Shahriar, et al, 2023:3). Since the primary function of banks is to provide loans to investors, any shift towards non-lending activities may lead to diversification of the asset portfolio, as measured from the perspective of assets, financing, income, and sectoral loan portfolios (Huynh, 2024:5).

**3.1.2 The importance of diversifying bank assets:** Through diversification, banks reduce the traditional risks to which they may be exposed, thus maintaining the stability of their profits. In normal times, banks provide more loans and also maintain the supply of credit through negative shocks at a time when granting credit is of utmost importance. Lending resulting from asset diversification, thanks to its flexibility, contributes to achieving positive indirect effects on the economy (Gelman, Goldstein, & MacKinlay, 2023: 1). Banks can also reduce their risks by adopting diversification strategies in their balance sheets. According to the traditional approach, banks can reduce the risk of failure to a minimum by achieving the highest level of diversification, given their high degree of financial leverage. This means that the diversification strategy works as a means of mitigating the risks that may be caused by high financial leverage, and thus helps the bank avoid failure by reducing the possibility of being exposed to large losses in a single asset or a specific sector (Kocaman, 2022: 96), (Brahmana, et al, 2018: 1). banks need to own assets that generate higher income, especially in this period of increasing reliance on technology-enabled services. Diverse assets show different performance when faced with varying economic situation, and the performance of these assets appears not to be directly related to each other (Lameck & Mrindoko, 2023: 86). Therefore, diversification is an important investment method that helps reduce risks by distributing investments among different financial instruments, sectors, and other classes, and aiming to maximize returns by investing in various domains (Wafula, 2014: 2).

**3.1.3 Measuring the diversification of banking assets:** The Modified-Herfindahl-Hirschman Index (MHHI) is one of the measures of asset diversification in banks, and the equation used to measure asset diversification is as follows (Shi et al., 2016: 18)• (Curi et al, 2014: 10)•(Abbas& Ali, 2021: 4)•(Radojičić & Marinković, 2023: 205), (Rahman & Abbas, 2025: 5):-

$$\text{MHHI} = 1 - ((\text{Cash}/\text{Total Assets})^2 + (\text{Investments}/\text{Total Assets})^2 + (\text{Discounted Commercial Papers}/\text{Total Assets})^2 + (\text{Loans and advances granted}/\text{Total Assets})^2 + (\text{Other Assets}/\text{Total Assets})^2) \dots \dots \dots (1)$$

The index values range between zero and one, with values close to zero indicating that the bank uses an asset concentration strategy, while values close to one indicate that the bank has a high degree of asset diversification (Chu et al., 2021: 39).

**3.2 Bank size:** The bank size is measured by taking the natural-logarithm of its total assets. The larger the size of a bank, the more it has access to diverse external funding sources. It is also assumed that large banks perform better than medium and small banks. This is based on the assumption of the existence of economies of scale, which enhances their competitive capabilities over their counterparts and thus reduces the cost-of collecting and processing information. Large banks also have more professional administrative teams that help them achieve profits (Hassan & Ahmed, 2019: 173), (Khan, 2022: 102), (Ruiz et al., 2022: 2). Larger banks have greater negotiation capacity with their customers (Saraswati & Bernawati, 2020: 152). Larger banks are also more diversified, can meet creditor obligations, are less vulnerable to bankruptcy because they have higher assets, and provide better guarantee for creditors (Gharaibeh & Saqer, 2020: 366). That is, the size of the bank is measured using the size of the assets owned by the banks measured using the natural logarithm, The equation can be written as follows: (Shah& Khan, 2017: 7), (Zixin et al, 2024: 67), (Ponziani& Theola, 2025: 67):-

$$\text{Bank size} = \ln(\text{Total Assets}) \dots (2)$$

### 3.3 Operational efficiency

**3.3.1 The concept and importance of operational efficiency:** Efficiency is defined as an organization's ability to achieve its goals using available resources at the lowest possible cost. As for a bank's operational efficiency, it simply means the bank's capacity to provide all of its banking services using its available resources to achieve its goals and Targets (Rabiu et al, 2019: 142). Operational efficiency is a key financial measure of great importance to both bank management and Regulatory authorities. The higher a bank's operational efficiency, the greater its capacity to compete, improve its profits, increase its market value, and attract more investors (Gauer, 2023: 1), (Siagian, 2023: 154). Operational efficiency is also one of the key factors that determine the competitiveness & sustainability of any bank. Banks that are able to maintain good operational efficiency have a greater chance of survival under dynamic competitive conditions (Aranda& Wardani, 2024: 7274) Therefore, banks with higher levels of efficiency often have a greater market value, as market concentration, in turn, contributes to enhancing this strength and consolidating the bank's competitive position (Istaiteyeh et al. 2024: 3). Creating-value and gaining a competitive advantage requires

raising the level of banking services and improving their operational efficiency. The efficiency of banking services is considered a fundamental factor because it directly affects banking stability, which in turn impacts the economy as a whole. Therefore, bank managers have become increasingly focused on reducing operating expenses and providing more efficient services (Sole & Babu, 2024: 459).

**3.3.2 Operational efficiency measure:** The operational efficiency of (banks) It can be measured by the ratio of operating expenses to operating income (OEIO). The lower this ratio, the higher the operational efficiency in managing expenses and achieving revenue. The equation can be written as follows) Buchory, 2015: 120), (Sasongko & Yusnita, 2023: 146(-

**OEIO = Operating Expenses / Operating Revenues..... (3)**

#### **4. Data analysis:**

**4.1. Financial analysis for asset diversification:** Referring to the theoretical side, specifically to Equation (1), and when using this equation, we see the results shown in Table (2):

- ❖ Gulf Commercial Bank recorded the highest MHHI ratio in 2024, reaching (0.799). This high level of diversification is attributed to the balanced distribution of assets in that year. This may reflect its management policy, which aims to reduce risks by distributing assets across a larger number of categories. Meanwhile, the Iraqi Credit Bank recorded the lowest MHHI ratio in 2020, reaching (0.052), indicating that most of the (bank's assets) are concentrated in a limited number of items, weakening diversification and increasing the risks associated with asset concentration.
- ❖ Gulf Commercial Bank had the highest average MHHI among banks, reaching (0.705), indicating that the bank has adopted an asset diversification approach Compared to- other banks in the sample. While the Iraqi Credit Bank had the lowest average MHHI among banks, reaching (0.453), reflecting the Credit Bank's asset concentration policy.
- ❖ The year 2006 had the highest average, reaching (0.660), indicating that most of the banks in the research sample moved towards diversifying their assets more in this year, while the year 2021 had the lowest average, reaching (0.519), which reflects the policy of concentrating on specific assets in most banks during this year.

Table (2): assets Diversification using the MHHI measure for commercial banks in the research sample for 2005-2024

Year	Baghdad	National	Middle East	Credit	Sumer Commercial	Iraqi investment	Gulf Commercial	Mosul	Average
2005	0.644	0.492	0.633	0.545	0.645	0.700	0.735	0.679	0.634
2006	0.623	0.530	0.664	0.610	0.770	0.688	0.755	0.644	0.660
2007	0.710	0.385	0.664	0.590	0.768	0.390	0.683	0.465	0.582
2008	0.677	0.574	0.703	0.570	0.605	0.253	0.614	0.492	0.561
2009	0.587	0.613	0.553	0.576	0.782	0.332	0.654	0.535	0.579
2010	0.589	0.653	0.576	0.516	0.683	0.518	0.729	0.677	0.618
2011	0.650	0.566	0.601	0.545	0.740	0.616	0.733	0.657	0.639
2012	0.562	0.376	0.608	0.485	0.633	0.595	0.685	0.621	0.571
2013	0.599	0.452	0.616	0.472	0.560	0.579	0.668	0.587	0.567
2014	0.624	0.483	0.640	0.468	0.559	0.506	0.692	0.653	0.578
2015	0.625	0.541	0.686	0.526	0.601	0.515	0.739	0.649	0.610
2016	0.500	0.535	0.665	0.299	0.530	0.421	0.707	0.636	0.537
2017	0.499	0.505	0.627	0.464	0.486	0.501	0.726	0.633	0.555
2018	0.469	0.455	0.603	0.292	0.423	0.595	0.707	0.684	0.528
2019	0.586	0.607	0.684	0.236	0.483	0.588	0.690	0.711	0.573
2020	0.444	0.622	0.690	0.052	0.408	0.544	0.704	0.703	0.521
2021	0.577	0.651	0.661	0.142	0.336	0.632	0.682	0.472	0.519
2022	0.593	0.617	0.691	0.638	0.360	0.660	0.693	0.499	0.594
2023	0.441	0.585	0.737	0.501	0.517	0.626	0.712	0.632	0.594
2024	0.457	0.660	0.737	0.529	0.645	0.651	0.799	0.650	0.641
Average	0.573	0.545	0.652	0.453	0.577	0.545	0.705	0.614	0.583
MAX	0.710	0.660	0.737	0.638	0.782	0.700	0.799	0.711	0.660
MIN	0.441	0.376	0.553	0.052	0.336	0.253	0.614	0.465	0.519
S.D	0.077	0.083	0.049	0.158	0.132	0.116	0.038	0.076	0.040

Source: Preparing researchers using Excel vs.16

When testing the first hypothesis, the results of Table (3) indicate that the (calculated F) value reached (11.26228), which is higher than the (critical

F) value of (2.070311), and the (P\_value) reached (0.000), which is less than the approved significance level (5%). Accordingly, The null hypothesis was rejected & the alternative hypothesis is accepted, which indicates the existence of a statistically significant variance in asset diversification among the banks in the sample.

Table (3): Test of the variance of asset diversification for the research sample banks

Source of Variation	SS	Df	MS	F	P_value	F crit
Between Groups	0.812415	7	0.116059	11.26228	0.000	2.070311
Within Groups	1.56638	152	0.010305			
Total	2.378796	159				

Source: Preparing researchers using Excel vs.16

**4.2 Financial analysis of the bank's size:** Referring to the theoretical aspect, specifically to Equation (2), and when using this equation, we notice the results mentioned in Table (4):

- ❖ The National Bank recorded the highest bank size in 2024, as the natural logarithm of the bank size reached (29,269). This increase is due to the increase in the bank's assets during 2024 compared to previous years and other banks in the sample, while in contrast, the lowest bank size was achieved by Sumer Bank in 2005, as it reached (24,022), which indicates a decrease in the level of the bank's assets during that year, Compared to other banks.
- ❖ The Bank of Baghdad achieved the highest average of (27,717), which reflects the stability of its assets with the possibility of gradual increase over the years. The lowest average was achieved by Sumer Commercial Bank, which reached (25,998), reflecting its relatively limited assets.
- ❖ The highest average annual bank size was recorded in 2024, reaching (27,565), indicating a relative improvement in the banks' assets size in the research sample during that year. In comparison, the lowest average was recorded in 2005, reaching (25,409), indicating a decline in the size of banks' assets at the beginning of the research period.

Table (4): Banks size in the research sample 2005-2024

Year	Baghdad	National	Middle East	Credit	Sumer Commercial	Iraqi investment	Gulf Commercial	Mosul	Average
2005	26.486	24.882	26.490	26.089	24.022	25.655	24.546	25.103	25.409
2006	26.526	24.506	26.425	26.602	24.363	25.846	25.128	25.227	25.578
2007	26.620	24.659	26.732	26.608	24.578	25.599	25.678	25.450	25.740
2008	27.020	24.980	27.068	26.546	25.074	25.787	26.204	26.051	26.091
2009	27.411	25.267	27.047	26.620	25.277	25.978	26.279	26.048	26.241
2010	27.591	25.401	27.087	27.112	25.510	26.229	26.329	25.949	26.401
2011	27.498	25.942	27.228	26.819	25.848	26.515	26.563	26.279	26.586
2012	27.894	26.544	27.431	27.054	26.322	26.664	26.775	26.882	26.946
2013	28.199	27.019	27.375	27.125	26.462	26.978	27.384	27.053	27.200
2014	28.234	27.145	27.250	27.161	26.763	27.049	27.428	26.576	27.201
2015	28.069	27.007	27.238	27.151	26.635	27.036	27.421	26.624	27.148
2016	27.814	27.084	27.175	26.964	26.586	27.083	27.410	26.740	27.107
2017	27.717	27.127	27.371	26.890	26.690	27.075	27.126	26.738	27.092
2018	27.739	26.988	27.409	26.933	26.738	27.132	27.083	26.739	27.095
2019	27.756	27.173	27.213	26.982	26.582	26.996	27.032	26.740	27.059
2020	27.981	27.519	27.197	26.991	26.532	27.071	26.959	26.708	27.120
2021	28.063	28.231	27.186	26.869	26.643	27.202	27.012	27.373	27.322
2022	28.176	28.513	27.402	26.731	26.516	27.346	27.039	27.400	27.390
2023	28.642	29.013	27.246	26.953	26.413	27.588	27.074	27.393	27.540
2024	28.897	29.269	27.068	27.075	26.413	27.332	27.064	27.406	27.565
Average	27.717	26.713	27.132	26.864	25.998	26.708	26.677	26.524	26.792
MAX	28.897	29.269	27.431	27.161	26.763	27.588	27.428	27.406	27.565
MIN	26.486	24.506	26.425	26.089	24.022	25.599	24.546	25.103	25.409
S.D	0.636	1.394	0.275	0.260	0.853	0.613	0.766	0.684	0.641

Source: Preparing researchers using Excel vs.16

When testing the second hypothesis, the results of Table (5) indicate that the Calculated F (value reached (7.955969), which is higher than the (critical F) value of (2.070311), and the (P\_value) reached (0.000), which is less than the approved significance level (5%). Accordingly, the null

hypothesis was rejected and the alternative hypothesis was accepted. which indicates the existence of a statistically significant variance in the size of the commercial banks in the research sample.

Table (5): Test of the variance of the size of banks in the sample

Source of Variation	SS	Df	MS	F	P_value	F crit
Between Groups	34.07243	7	4.86749	7.955969	0.000	2.070311
Within Groups	92.99413	152	0.611804			
Total	127.0666	159				

Source: Preparing researchers using Excel vs.16

**4.3 Financial analysis of operational efficiency:** Referring to the theoretical side, specifically to Equation (3), and when using this equation, we see the results listed in Table (6):

- ❖ The lowest operating efficiency ratio (0.203) was achieved by Mosul Bank in 2013, indicating the bank's strong capacity to control operating expenses and achieving good revenues that year. The highest ratio was achieved by Middle East Bank in 2024, reaching (2.800). This very high ratio means that Operating expenses greatly exceeded operating revenues, reflecting a decline in the bank's operating income that year.
- ❖ In terms of the overall average, Bank of Baghdad recorded the lowest average of (0.450), followed by Bank of Mosul with an average of (0.452), indicating stable and controlled operational efficiency during the research period. But on the other side, Middle East Bank recorded the highest average operational efficiency of (0.807), followed by Sumer Commercial Bank with (0.796), reflecting the ongoing challenges in controlling operating expenses and achieving high revenues for these banks during the research period.
- ❖ The lowest annual average was recorded in 2005, reaching (0.379), reflecting good operational efficiency at the beginning of the period and low operating expenses for banks. Conversely, the highest annual average was recorded in 2021, reaching (0.928), indicating a decline or deterioration in the operational efficiency of commercial banks in recent years.

Table (6): Results of operational efficiency of the research sample banks  
2005-2024

Year	Baghdad	National	Middle East	Credit	Sumer Commercial	Iraqi investment	Gulf Commercial	Mosul	Average
2005	0.496	0.313	0.337	0.437	0.294	0.287	0.556	0.312	0.379
2006	0.448	0.721	0.677	0.562	0.327	0.377	0.530	0.371	0.502
2007	0.301	0.632	0.475	0.390	0.355	0.398	0.587	0.341	0.435
2008	0.410	0.567	0.643	0.495	0.549	0.336	0.445	0.336	0.473
2009	0.518	0.777	0.656	0.628	0.355	0.599	0.609	0.347	0.561
2010	0.386	0.678	0.684	0.519	0.873	0.436	0.690	0.285	0.569
2011	0.498	0.636	0.530	0.507	0.949	0.479	0.537	0.351	0.561
2012	0.498	0.358	0.485	0.419	0.934	0.520	0.363	0.227	0.475
2013	0.451	0.427	0.556	0.534	0.936	0.359	0.348	0.203	0.477
2014	0.525	0.608	0.860	0.362	0.783	0.333	0.462	0.783	0.589
2015	0.448	0.662	0.813	0.336	0.594	0.466	0.723	0.730	0.596
2016	0.434	0.379	0.418	0.505	0.740	0.543	0.525	0.549	0.512
2017	0.498	0.842	0.837	0.449	0.965	0.742	0.634	0.493	0.683
2018	0.737	1.403	0.881	0.515	0.892	0.929	0.739	0.721	0.852
2019	0.624	0.667	0.513	1.841	0.887	0.939	1.160	0.568	0.900
2020	0.405	0.541	0.543	1.740	1.155	0.628	0.783	0.750	0.818
2021	0.307	0.611	0.973	2.015	0.780	0.871	1.560	0.310	0.928
2022	0.277	0.680	0.978	0.429	0.843	0.605	1.403	0.419	0.704
2023	0.386	0.333	1.478	0.320	1.803	0.256	0.694	0.374	0.705
2024	0.362	0.280	2.800	0.219	0.904	0.642	0.873	0.582	0.833
Average	0.450	0.606	0.807	0.661	0.796	0.537	0.711	0.452	0.628
MAX	0.737	1.403	2.800	2.015	1.803	0.939	1.560	0.783	0.928
MIN	0.277	0.280	0.337	0.219	0.294	0.256	0.348	0.203	0.379
S.D	0.106	0.242	0.522	0.516	0.334	0.202	0.314	0.178	0.161

Source: Preparing researchers using Excel vs.16

When testing the third hypothesis, the results of Table (7) indicate that the (calculated F) value reached (3.391925), which is higher than the (critical F) value of (2.070311), and the (P\_value) reached (0.002151), which is less than the approved significance level (5%). Accordingly, the null hypothesis was rejected & the alternative hypothesis was accepted, indicating the presence of a statistically significant variation in the levels of operational efficiency of the commercial banks in the research sample.

Table (7): Testing the variance of operational efficiency levels of commercial banks in the research sample

Source of Variation	SS	df	MS	F	P_value	F crit
Between Groups	2.784576	7	0.397797	3.391925	0.002151	2.070311
Within Groups	17.82618	152	0.117278			
Total	20.610756	159				

Source: Preparing researchers using Excel vs.16

**4.4 Testing impact hypotheses:** In this paragraph, the statistical hypotheses will be tested, which are as follows:

**4.4.1 Testing the fourth hypothesis:** The results shown in Figure (1) indicate that there is a statistically-significant-effect of asset diversification on operational efficiency, as the Sig value reached (0.020), which is less than the significance level of 5%. This indicates the existence of a statistically significant influence relationship between the two variables. The results of the simple linear regression analysis also showed that the model equation came out as follows:  $Y = -2.2781 + 5.503 X$ , where the constant (-2.2781) represents operational efficiency in the non-existence of asset diversification. That is, at the zero value of the independent variable. The negativity of alpha only reflects the position of the regression line that achieves the best fit with the data according to the least squares method. While the regression coefficient (5.503) indicates that with every one-unit increase in asset diversification, there is an increase of (5.503) in the level of operational efficiency, which indicates the existence of a strong direct relationship between the two variables. As for the value of (R-Square), it reached (0.265), which means that asset diversification explains about 26.5% of the changes that occur in operational efficiency, while the remaining percentage is due to other factors that were not addressed by the current model.

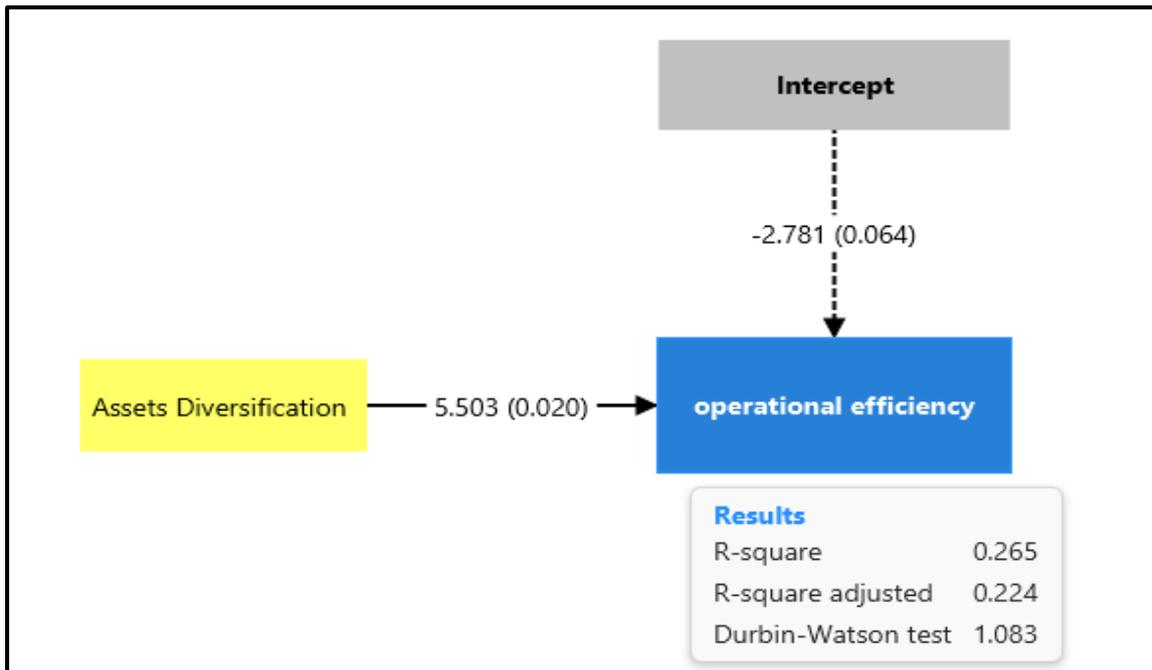


Figure (1): The simple effect of asset diversification on operational efficiency

Source: Prepared by researchers through (Smart Pls 4.)

**4.4.2 Testing the fifth hypothesis:** The results shown in Figure (2) indicate the existence of a statistically significant effect of the bank size on operational efficiency, as the Sig value reached (0.002), which is less than the significance level of 5%, indicating the existence of a statistically significant effect relationship between the two variables. The results of the simple linear regression analysis also showed that the model equation came as follows:  $Y = -5.686 + 0.243X$ , where the constant (-5.686) represents the operational efficiency in the non-existence of the bank size, i.e. at the zero value of the independent variable. The negativity of alpha only reflects the position of the regression line that achieves the best fit with the data according to the least squares method. While the regression coefficient (0.243) indicates that with every one-unit increase in the bank's size, there is an increase of (0.243) in the level of operational efficiency, which indicates the existence of a direct relationship between the two variables. As for the value of (R-Square), it reached (0.421), which means that the bank size explains about 42.1% of the changes that occur in operational efficiency, while the remaining percentage is due to other factors that were not addressed by the current model.

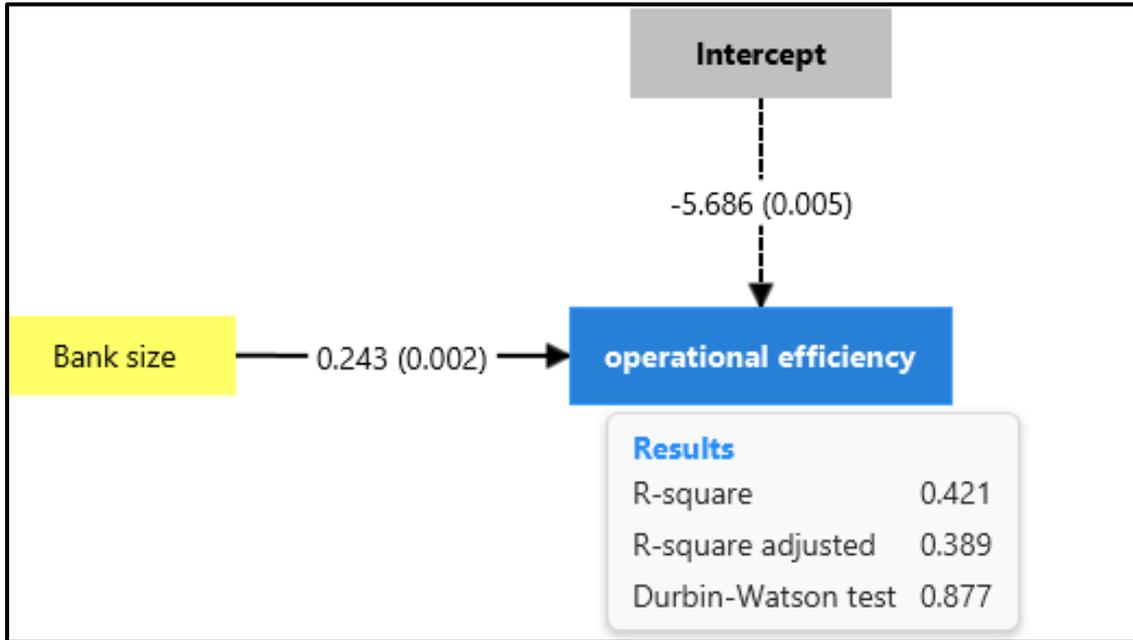


Figure (2): The simple effect of bank size on operational efficiency

Source: Prepared by researchers through (Smart Pls 4.)

**4.4.3 Testing the sixth hypothesis:** According to the sixth hypothesis, the bank size mediates the relationship between asset diversification (explanatory variable) & operational efficiency (Response Variable). The researchers used structural equation models (SEM) to measure the direct, indirect and total impact. As shown in Figure (3) and Table (8), which shows that the direct effect amounted to (**2.614**), which is less than the indirect effect amounting to (**2.89**), and thus the total effect (direct effect + indirect effect) amounted to (**5.504**). That is, the bank size mediates between asset diversification and operational efficiency, which requires rejecting the sixth hypothesis and accepting the alternative hypothesis.

Table (8): Direct and indirect impact paths between asset diversification and operational efficiency through bank size

Paths		Estimate	p-- value	direct - impact	In-direct impact	p-- value	Total impact	p-- value
assets Diversification	→ operational efficiency	2.614	0.160					
assets Diversification	→ Bank size	14.764	0.022	2.614	2.89	0.015	5.504	0.061
Bank size	→ operational efficiency	0.196	0.001					

Source: Prepared by researchers through (AMOS vs.23)

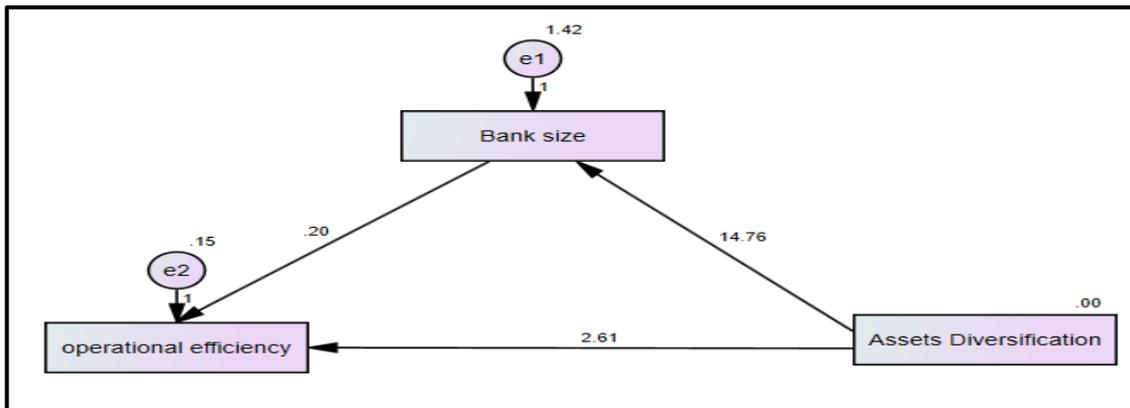


Figure (3): Direct and indirect influence paths between research variables

Source: Prepared by researchers through (AMOS vs.23)

## 5. Conclusion & Recommendations

### 5.1. Conclusion

1. Analysis of the modified Herfindahl-Hirschman Index (MHHI) appear a variation in asset management strategies among banks, with some adopting a balanced diversification policy, while others have tended to concentrate assets in specific items.
2. existence a statistically-significant- variation in the levels of asset diversification among the banks in the research sample during (2005-2024), which reflects the difference in asset management policies among these banks.
3. The asset diversification policy depends on the bank's management's orientations, which are determined within each bank, and does not reflect the existence of a unified approach or binding instructions from the Central Bank regarding asset diversification limits.
4. Existence a statistically significant difference in the size of the banks, as the National Bank recorded the highest value in 2024 (29,269), while the Sumer Bank recorded the lowest value in 2005 (24,022).
5. The indirect effect of asset diversification on operational efficiency through bank size is greater than the direct effect, which proves the existence of a statistically significant mediating role for bank size.
6. The operational efficiency of banks in the sample varied during the research period, with some banks demonstrating a better ability to manage operating expenses relative to their revenues, while others experienced a decline in operational efficiency.
7. The relative stability in the operational efficiency of some banks indicates the existence of more effective administrative and operational methods that help them better withstand economic and political shocks.

8. The interrelationship between asset diversification, bank size, and operational efficiency reflects the importance of balanced and comprehensive management of assets and operational resources to achieve financial stability and promote growth.

## **5.2. Recommendations**

1. The need to establish a regulatory standard to ensure a minimum level of asset diversification to reduce concentration risks.
2. Recognizing that increasing the bank size can enhance the impact of diversification on operational efficiency, growth strategies should therefore be integrated with diversification strategies.
3. The Iraqi Credit Bank, whose assets we have observed are concentrated, should re-evaluate its policies and aim to achieve a balanced distribution of assets.
4. Encouraging banks to diversify their sources of operating income to reduce reliance on limited resources, thus enhancing revenue stability and mitigating the impact of market and Economic environment fluctuations.
5. Banks experiencing weak operational efficiency should work to improve the skills and competencies of management teams through continuous training and development to reduce operating expenses and improve revenues.
6. Improving operational efficiency by reviewing operational policies, improving expense control systems, and enhancing banks' administrative capabilities.
7. Adopting integrated risk management approaches that combine asset diversification, the bank's size, and operational efficiency to ensure that its assets are protected from numerous risks that could negatively impact its efficiency.
8. The need for bank management to periodically review the level of diversification, bank size, and operational efficiency indicators, and link them to bank performance and risks.

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