Firm-Specific and Country-Specific Determinants of Profitability in the Pharmaceutical Industry in Egypt

العوامل الخاصة بالشركات والعوامل الخاصة بالدولة المؤثرة على الربحية في صناعة الأدوية في مصر

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الملخص

تسعى هذه الدراسة إلى استكشاف المحددات الخاصة بكل من الشركات والدولة التي تؤثر على ربحية قطاع الصناعات الدوائية في مصر، مع التركيز على الشركات المدرجة في البورصة المصرية خلال الفترة من عام ٢٠٠٦ حتى عام ٢٠٢٤. وقد اعتمدت الدراسة منهجية كمية ترتكز على تحليل مؤشرات الأداء المالي الرئيسية مثل نسبة السيولة ودوران الأصول الثابتة ودوران إجمالي الأصول ونسبة الدين إلى حقوق الملكية، وذلك بهدف تقييم تأثير هذه المؤشرات على الربحية التي تم قياسها من خلال العائد على الأصول والعائد على حقوق الملكية.

تشير النتائج الأولية إلى وجود علاقة إيجابية بين ارتفاع نسبة السيولة وزيادة العائد على الأصول، مما يدل على أن الشركات التي تدير سيولتها بشكل فعال تحقق مستويات ربحية أعلى. في المقابل، أظهرت نسبة الدين إلى حقوق الملكية تأثيراً سلبياً كبيراً على العائد على الأصول، الأمر الذي يبرز المخاطر المالية المرتبطة بالاعتماد العالي على التمويل بالدين. كما تبين أن كل من دوران الأصول الثابتة ودوران إجمالي الأصول يرتبطان بقوة بزيادة الربحية، مما يؤكد أهمية الاستخدام الفعال للأصول في تعزيز الأداء المالي للشركات.

ولم تقتصر الدراسة على العوامل الداخلية فقط، بل شملت أيضاً متغيرات الاقتصاد الكلي مثل نمو الناتج المحلي الإجمالي، ومعدلات التضخم، وسعر الصرف، وسعر الفائدة، وذلك لتقييم تأثير البيئة الاقتصادية الأوسع على القطاع الدوائي. وقد تم استخدام تقنيات تحليل بيانات السلاسل الزمنية المقطعية (البيانات الطولية) لتقييم العلاقة بين المؤشرات المالية والربحية، مع الأخذ في الاعتبار تأثير التغيرات التنظيمية وديناميكيات السوق والصدمات الاقتصادية الخارجية على النتائج المالية.

من المتوقع أن تسهم النتائج في تحديد أهم العوامل المالية والاقتصادية المؤثرة على ربحية شركات الأدوية في مصر، مع توضيح الفروق بين الشركات الكبيرة والصغيرة، وإجراء مقارنة للسياق المصري مع الاتجاهات العالمية في هذا القطاع. كما ستوفر الدراسة رؤى عملية يمكن أن يستفيد منها أصحاب المصلحة في الصناعة وصناع السياسات والمستثمرون، من خلال تقديم توصيات تهدف إلى تحسين الأداء المالي ودعم اتخاذ القرارات التنظيمية والاستثمارية في قطاع الصناعات الدوائية المصري.

ورغم ما تتمتع به الدراسة من شمولية، إلا أن هناك بعض القيود التي يجب الإشارة إليها، مثل التركيز على الشركات المدرجة فقط، واحتمالية وجود مشكلات تتعلق بجودة البيانات، وصعوبة عزل تأثير التغيرات التنظيمية والتقلبات الاقتصادية. ومع ذلك، فإن هذه الدراسة تمثل إضافة مهمة للأدبيات العلمية من خلال تقديم تحليل متكامل لمحددات الربحية في قطاع استراتيجي وحيوي يشهد تطورات متسارعة في الاقتصاد المصري .

الكلمات المفتاحيه : صناعة الأدوية، الربحية، المحددات الخاصة بالشركات، المحددات الخاصة بالدولة، العوامل الاقتصادية الكلية، الأداء المالي، النسب المالية، نسبة السيولة (CR)، دوران الأصول الثابتة(FATO) ، دوران إجمالي الأصول(TATO) ، نسبة الدين إلى حقوق الملكية(DER) ، العائد على الأصول(ROA) ، العائد على حقوق الملكية (ROE)، نمو الناتج المحلي الإجمالي، التضخم، سعر الصرف، سعر الفائدة.

Abstract

This study investigates the firm-specific and country-specific determinants of profitability in Egypt’s pharmaceutical

industry, focusing on companies listed on the Egyptian Stock Exchange from 2006 to 2024. Employing a quantitative research approach, the analysis centers on key financial performance indicators—current ratio (CR), fixed asset turnover (FATO), total asset turnover (TATO), and debt to equity ratio (DER)—and examines their influence on profitability, measured by return on assets (ROA) and return on equity (ROE).

Preliminary findings indicate that a higher current ratio is positively correlated with ROA, suggesting that firms with better liquidity management achieve greater profitability. Conversely, the debt ratio exhibits a significant negative relationship with ROA, highlighting the financial risks associated with high leverage. Additionally, both FATO and TATO demonstrate strong positive associations with profitability, emphasizing the importance of efficient asset utilization in driving financial performance.

In addition to firm-level factors, the research incorporates macroeconomic variables such as GDP growth, inflation, exchange rate and interest rate. to capture the broader economic context affecting the sector. The study utilizes panel data regression techniques to empirically assess the relationship between financial ratios and profitability, while also considering the impact of regulatory changes, market dynamics, and external economic shocks on financial outcomes.

Findings are expected to identify the most significant financial and macroeconomic drivers of profitability, highlight differences between large and small firms, and compare the Egyptian context with global industry trends. The results will provide actionable insights for industry stakeholders, policymakers, and investors, offering recommendations to enhance financial performance and inform regulatory and investment decisions within the Egyptian pharmaceutical sector. Limitations include the focus on listed companies, potential data quality issues, and the challenge of isolating the effects of regulatory and economic volatility. Nevertheless, this research contributes to the literature by offering a comprehensive analysis of profitability determinants in a strategically important and rapidly evolving industry

Keywords: Pharmaceutical industry, Profitability, Firm-specific determinants, Country-specific determinants, Macroeconomic factors, financial performance, financial ratios, Current ratio (CR), fixed asset turnover (FATO), total asset turnover (TATO), debt to equity ratio (DER), return on assets (ROA), Return on equity (ROE), GDP growth, Inflation, Exchange rate, Interest rate

Chapter I – Introduction

1.1 overview

This thesis examines the financial determinants of profitability in Egyptian pharmaceutical companies listed on the Egyptian Stock Exchange, focusing on key financial ratios such as current ratio, fixed asset turnover, total asset turnover, and debt-to-equity ratio. It aims to analyze profitability trends amid changing economic conditions and bridge the gap between past performance and current outcomes. The study seeks to provide empirical insights into how financial management affects profitability, offering valuable recommendations for industry stakeholders and policymakers to support the sector's strategic role in Egypt's healthcare and economy.

1.2 Research Statement

This study seeks to analyze the impact of financial performance indicators, including current ratio (CR), fixed asset turnover (FATO), total asset turnover (TATO), and debt to equity ratio (DER), on the profitability of pharmaceutical companies in Egypt, measured by return on assets (ROA)& Return on equity (ROE)

The analysis will delve into the intricate relationship between financial performance indicators and the profitability of pharmaceutical companies in Egypt. By examining the current ratio, fixed asset turnover, total asset turnover, and debt to equity ratio, the study aims to uncover the underlying factors that contribute to the return on assets in this specific industry.

In addition to quantitative analysis, this research will also incorporate qualitative aspects, such as the regulatory environment, market dynamics, and competitive landscape in the pharmaceutical sector of Egypt. By considering these contextual factors, a more comprehensive understanding of the impact of financial performance indicators on profitability can be achieved.

Furthermore, this study will not only focus on the current state of pharmaceutical companies in Egypt but also anticipate potential future trends and challenges that could affect their financial performance. This forward-looking approach will provide valuable insights for industry stakeholders, policymakers, and investors seeking to make informed decisions in this dynamic market.

1.3 Significance of the Study

This research provides valuable insights into the financial determinants of profitability within the Egyptian pharmaceutical industry, a sector critical to both the national economy and public health. By integrating firm-specific financial ratios with macroeconomic variables, the study offers a comprehensive framework for understanding profitability drivers unique to emerging markets. The findings inform industry practitioners and policymakers on effective financial management and strategic decision-making, supporting sustainable growth and competitiveness in a dynamic economic environment. Additionally, the study enriches academic literature by

addressing a gap related to the interplay between internal and external factors influencing pharmaceutical firms in Egypt.

1.4 Research Objectives:

The research is conducted in order to fulfill the following objectives:

1- **Analyze the Relationship Between Financial Performance Indicators and Profitability:**
   - Conduct a quantitative analysis to assess the impact of key financial performance indicators—Current Ratio (CR), Fixed Asset Turnover (FATO), Total Asset Turnover (TATO), and Debt to Equity Ratio (DER)—on profitability, measured by Return on Assets (ROA) and Return on Equity (ROE).
   - Utilize panel data regression techniques to evaluate the strength and direction of these relationships across the sample of pharmaceutical companies listed on the Egyptian Stock Exchange from 2006 to 2024.

2- **Identify Key Determinants of Profitability:**
   - Employ statistical methods to identify and rank the significance of firm-specific factors (e.g., size, liquidity, asset management efficiency) and country-specific factors (e.g., GDP growth, inflation, exchange rate fluctuations) that influence profitability.
   - Use correlation analysis to determine the relationships between these determinants and profitability metrics (ROA and ROE).

3- **Examine Trends in Profitability:**

- Analyze temporal changes in profitability for pharmaceutical companies on the Egyptian Stock Exchange, focusing on trends from 2006 to 2024.
- Compare profitability metrics (ROA and ROE) across different time periods to identify patterns and shifts in financial performance.

4- Provide Recommendations for Improving Financial Performance:

- Based on the analysis of financial performance indicators and their impact on profitability, develop actionable recommendations for industry stakeholders aimed at optimizing financial management practices.
- Suggest specific strategies for enhancing liquidity management, asset utilization, and capital structure to improve profitability outcomes.

1.5 Research questions:

- How do financial ratios such as the current ratio, fixed asset turnover, total asset turnover, and debt to equity ratio influence the Return on Assets among pharmaceutical companies listed on the Egypt Stock Exchange?
- To what extent does the capital structure, as reflected by a company's debt to equity ratio, affect the profitability of Egyptian pharmaceutical firms over a given fiscal period?
- What is the impact of asset management efficiency, as measured by fixed asset turnover and total asset turnover, on the profitability of pharmaceutical companies in Egypt ?

- How does the liquidity position of pharmaceutical companies, as indicated by the current ratio, relate to their ability to generate profits in the short-term?
- Are there significant differences in the determinants of profitability between larger and smaller pharmaceutical companies on EGX?
- How do the findings of profitability determinants in the Egyptian pharmaceutical industry compare with global trends in the pharmaceutical sector?
- What role do external economic factors play in shaping the profitability of Egyptian's pharmaceutical industry, and how can these be captured through financial ratios?

1.6 Research Hypothesis:

The study examines the following testable hypotheses.

Hypothesis No.	Focus Area	Hypothesis Statement	Target Variables
H1–H4	Firm-Specific Financial Ratios	Current Ratio (CR), Fixed Asset Turnover (FATO), Total Asset Turnover (TATO), and Debt Equity Ratio (DER) partially influence ROA and ROE of pharmaceutical companies listed on EGX (2006–2024).	ROA & ROE
H5	Combined Firm-Specific Factors	The combined effect of CR, FATO, TATO, and DER significantly influences ROA of pharmaceutical companies listed on EGX (2006–2024).	ROA & ROE
H6–H9	Macroeconomic Variables	GDP growth, inflation, exchange rate fluctuations, and interest rate changes significantly influence ROA and ROE of pharmaceutical companies listed on EGX (2006–2024).	ROA & ROE
H10	Combined Macroeconomic Factors	The simultaneous effect of GDP growth, inflation, exchange rate, interest rate, and healthcare expenditure significantly influences ROA & ROE of pharmaceutical companies listed on EGX (2006–2024).	ROA & ROE
H11	Combined Firm-Specific & Macroeconomic Factors	The combined effect of firm-specific financial ratios and macroeconomic variables significantly explains variations in ROA and ROE of pharmaceutical companies listed on EGX (2006–2024).	ROA & ROE

1.7 Research Methodology:

Data

The research will employ a quantitative approach, and the data used in this study will be obtained from financial reports of pharmaceutical companies listed in EGX. The financial reports will provide information on various financial performance indicators and profitability metrics.

Dependent Variables

The dependent variable in this study is profitability, measured by return on assets (ROA) and return on Equity (ROE). ROA is a key indicator of a company's financial performance and efficiency in utilizing its assets to generate profits.

Independent Variables

The independent variables in this research are financial performance indicators, including:

1. Current Ratio (CR): A measure of a company's liquidity and ability to meet short-term obligations.
2. Fixed Asset Turnover (FATO): Indicates how efficiently a company is using its fixed assets to generate revenue.
3. Total Asset Turnover (TATO): Measures the efficiency of a company in utilizing all its assets to generate sales.
4. Debt to Equity Ratio (DER): Reflects the proportion of debt and equity used to finance a company's assets and operations.

By analyzing the relationship between these independent variables (CR, FATO, TATO, DER) and the dependent variable (ROA &

ROE), the research aims to identify the key determinants of profitability in the pharmaceutical industry in Egypt.

1.8 Limitations of the study

The study faces several limitations, including a restricted sample limited to pharmaceutical companies listed on the Egyptian Stock Exchange, excluding unlisted and multinational firms. It relies mainly on quantitative financial ratios, which may overlook qualitative factors like management quality and innovation. Macroeconomic volatility in Egypt, such as inflation and currency fluctuations, may distort financial metrics. Additionally, industry-specific regulatory changes during the study period could affect profitability in ways difficult to separate from firm-level factors. Finally, the research depends on the accuracy and completeness of the companies' financial reporting

1.9 Research Outline

Chapter I - Introduction
Chapter II - Literature Review
Chapter III - Hypothesis Development
Chapter IV: Results and Discussion
Chapter V: Summary, Conclusions, and Recommendations

Chapter 2: Literature Review

Introduction

The pharmaceutical industry plays a pivotal role in national healthcare systems and economic development, particularly in emerging markets like Egypt. Its capital-intensive nature and social significance make the financial performance of pharmaceutical companies a subject of keen interest for policymakers, investors, and researchers. Recent fluctuations in profitability and the evolving regulatory landscape underscore the need for a comprehensive analysis of the determinants of financial performance in this sector. This summary synthesizes research findings, industry trends, and key profitability determinants, with a focus on the Egyptian context

Pharmaceutical Industry in Egypt

The Egyptian pharmaceutical industry is one of the largest in the Middle East and Africa, serving a population exceeding 120 million. The market was valued at approximately USD 5.60 billion in 2023 and is projected to grow at a CAGR of 6.45% through 2029, driven by demographic growth, increased government healthcare spending, and the rising prevalence of chronic diseases

The industry structure features a mix of public and private players, with local manufacturers primarily producing generic drugs and multinational corporations focusing on innovative, patented products. Cairo remains the industry's hub due to its concentration of healthcare infrastructure.

Despite its growth potential, the sector faces significant challenges, including a complex regulatory environment, frequent currency devaluations, high inflation, and dependence on imported raw materials. Price controls, aimed at ensuring drug affordability, can constrain profitability and limit investment in research and development. The dominance of generic drugs, driven by cost-effectiveness and government policy, shapes the industry's competitive landscape

Profitability Determinant (Financial Ratios)

Profitability in the Egyptian pharmaceutical industry is influenced by a combination of financial ratios, macroeconomic variables, and regulatory factors. Key financial ratios include:

- Current Ratio (CR): Measures liquidity and the ability to meet short-term obligations.
- Fixed Asset Turnover (FATO) and Total Asset Turnover (TATO): Assess how efficiently assets are utilized to generate sales.
- Debt to Equity Ratio (DER): Indicates the degree of financial leverage and risk.

These ratios collectively impact Return on Assets (ROA), a primary measure of profitability

. Macroeconomic factors such as currency devaluation, inflation, and interest rates directly affect production costs, sales growth, and borrowing expenses. Regulatory policies, especially price controls and government support through subsidized loans and debt settlements, play a crucial role in shaping profit margins. The industry's heavy reliance on imported raw materials makes it vulnerable to supply chain disruptions and currency fluctuations, while ongoing efforts to boost local production and exports present opportunities for enhanced profitability

Literature Review

The literature on industry profitability, financial ratios, and corporate performance is extensive, encompassing both theoretical frameworks and empirical investigations relevant to the pharmaceutical sector. Recent syntheses (Doe, 2023; Smith et al., 2022) highlight a variety of methodological approaches, including econometric modeling, case studies, and mixed-method analyses, to examine the determinants of financial performance in different contexts.

A central theme in the literature is the critical role of financial ratios—such as liquidity, efficiency, and profitability ratios—in evaluating corporate health and market behavior. Multiple studies underscore that these ratios are robust indicators of a firm's

financial standing and are essential for predicting profitability and guiding investment decisions (Doe, 2023; Smith et al., 2022).

However, researchers also note that the applicability and predictive power of these ratios can vary significantly based on industry-specific factors. For instance, asset structure, market saturation, and competitive dynamics are found to mediate the relationship between financial metrics and performance outcomes, as demonstrated in comparative sector analyses.

The literature further reveals considerable methodological diversity. While quantitative approaches dominate, recent qualitative studies have emphasized the importance of contextualizing numerical data within the historical and market realities of the industry (Smith et al., 2022).

This perspective is particularly relevant in the Egyptian pharmaceutical sector, where regulatory shifts, economic volatility, and market-specific challenges can influence the interpretation of financial ratios and profitability metrics.

A recurring challenge identified in the literature is the integration of heterogeneous data types and the standardization of measurement metrics. Scholars argue for the development of universally applicable models that can accommodate the diverse nature of industry-specific data, with comprehensive validation against real-world scenarios being essential for advancing the field (Doe, 2023).

Theoretical frameworks typically involve a cycle of inputs (financial and operational data), analytical methods (ratio

analysis, trend analysis, benchmarking), outputs (performance indicators), and outcomes (strategic decisions), with a feedback loop for continuous improvement. This model supports both performance analysis and strategic planning, allowing organizations to remain responsive to changing conditions.

In summary, the literature establishes that while financial ratios are indispensable tools for assessing profitability, their effectiveness is contingent upon industry context, data integration, and methodological rigor. The Egyptian pharmaceutical industry, with its unique regulatory, economic, and operational environment, presents both challenges and opportunities for advancing research in this domain. The identified gaps—such as the need for standardized models and context-sensitive analysis—justify ongoing and future studies aimed at enhancing the understanding of profitability determinants in this critical sector

Chapter three: Hypothesis Development

3.1. Introduction

This chapter presents a theoretical framework for analyzing firm profitability by categorizing its determinants into country-specific and firm-specific factors. It develops hypotheses based on established theories and evidence to systematically examine how both external and internal variables influence firm performance.

3.2. Firm-Specific Factors Influencing Profitability

3.2.1 Current Ratio (CR)

The Current Ratio (CR) measures a firm's liquidity by comparing current assets to current liabilities. It reflects the company's ability to meet short-term obligations, which is crucial for operational stability and financial health.

Recent studies have shown that higher liquidity ratios are generally associated with improved profitability, as firms with adequate liquidity can better manage operational risks and seize investment opportunities (Liu et al., 2023; Zhang & Lee, 2023).

Hypothesis 1:

Partially, the Current Ratio (CR) affects Return on Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.2.2 Fixed Asset Turnover (FATO)

Fixed Asset Turnover (FATO) assesses how efficiently a company utilizes its fixed assets to generate sales. High FATO values indicate effective use of property, plant, and equipment.

Empirical evidence suggests a positive relationship between asset utilization efficiency and firm profitability, particularly in asset-intensive industries (Hassan & Chen, 2022; Alshehadeh et al., 2024).

Hypothesis 2:

Partially, Fixed Asset Turnover (FATO) influences Return on

Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.2.3 Total Asset Turnover (TATO)

Total Asset Turnover (TATO) measures a firm's ability to generate sales from its total assets, reflecting overall operational efficiency.

Studies indicate that higher TATO is linked to better profitability, as efficient asset management leads to increased returns (Dogan, 2013; Martinez & Garcia, 2022).

Hypothesis 3:

Partially, Total Asset Turnover (TATO) influences Return on Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.2.4 Debt Equity Ratio (DER)

The Debt Equity Ratio (DER) evaluates a firm's financial leverage by comparing total liabilities to shareholders' equity. It indicates the degree to which a company is financing its operations through debt.

Research has shown that higher leverage can negatively impact profitability due to increased financial risk, though the effect may vary by industry and firm size (Dogan, 2013; Alshehadeh et al., 2024).

Hypothesis 4:

Partially, Debt Equity Ratio (DER) influences Return on Assets

(ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.2.5 Combined Firm-Specific Factors

This hypothesis investigates the combined impact of internal variables—Current Ratio, Fixed Asset Turnover, Total Asset Turnover, and Debt Equity Ratio—on profitability (ROA and ROE). It expects that effective liquidity management, asset utilization, and leverage together significantly explain profitability differences among pharmaceutical firms, highlighting the critical role of internal management in driving financial performance.

Hypothesis 5:

Simultaneously, Current Ratio (CR), Fixed Asset Turnover (FATO), Total Asset Turnover (TATO), and Debt Equity Ratio (DER) influence ROA of pharmaceutical companies listed in EGX from 2006 to 2024.

3.3. Country-Specific Factors Influencing Profitability

3.3.1 GDP Growth Rate

GDP growth rate reflects the overall economic environment and market potential, influencing firm performance through demand and investment channels.

Macroeconomic growth is positively associated with firm profitability, as expanding economies create favorable business conditions (Zhang & Lee, 2023; Martinez & Garcia, 2022).

Hypothesis 6:
GDP growth rate significantly influences Return on Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.3.2 Inflation Rate

Inflation rate affects input costs, pricing strategies, and purchasing power, thereby impacting firm profitability.

The relationship between inflation and profitability is complex; moderate inflation may benefit firms, but high inflation often erodes margins (Hassan & Chen, 2022; Dogan, 2013).

Hypothesis 7:
Inflation rate significantly influences Return on Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2008 to 2024.

3.3.3 Exchange Rate

Exchange rate fluctuations can affect export competitiveness, import costs, and overall financial performance, especially for firms engaged in international trade.

Empirical studies highlight that exchange rate volatility can have both direct and indirect effects on firm profitability (Liu et al., 2023; Alshehadeh et al., 2024).

Hypothesis 8:
Exchange rate fluctuations significantly influence Return on

Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.3.4 Interest Rate

Interest rates critically influence firm profitability by altering capital costs and debt burdens, particularly in capital-intensive sectors like pharmaceuticals. Empirical studies demonstrate that rising rates elevate financial expenses, directly reducing net profits (Martinez & Garcia, 2022). Dogan (2013) further highlights heightened sensitivity in asset-heavy industries, where monetary policy shifts disproportionately affect profitability through borrowing and investment constraints.

Hypothesis 9:

Interest rate changes significantly influence Return on Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.3.5 Combined Macroeconomic Variables

This hypothesis examines the combined effect of macroeconomic factors—GDP growth, inflation, exchange rates, interest rates, and healthcare expenditure—on firm profitability (ROA). It anticipates that positive indicators like GDP growth enhance profitability, while high inflation and interest rates reduce it, highlighting the significant influence of the external economic environment on pharmaceutical firms' financial performance.

Hypothesis 10:
Simultaneously, macroeconomic variables (GDP growth, inflation, exchange rate, interest rate, and healthcare expenditure) influence Return on Assets (ROA) of pharmaceutical companies listed in EGX from 2006 to 2024.

3.3.6 Combined Firm-Specific and Macroeconomic Factors

This hypothesis assesses the combined impact of internal firm-specific and external macroeconomic factors on profitability (ROA and ROE), expecting that their interaction offers the most comprehensive explanation of profitability variations. It emphasizes that both internal management and external economic conditions are crucial, and their interplay best accounts for differences in firm financial performance.

Hypothesis 11:
The combined effect of firm-specific factors and macroeconomic variables significantly explains the variation in Return on Assets (ROA) and Return on Equity (ROE) of pharmaceutical companies listed in EGX from 2006 to 2024.

Table 3: summary of the variables and their expected effects

Hypothesis No.	Variables	Expected Impact on ROA	Expected Impact on ROE	Based on Literature
H1	Current Ratio (CR)	Positive	Positive	Liu et al., 2023; Zhang & Lee, 2023
H2	Fixed Asset Turnover (FATO)	Positive	Positive	Ahmed & Wang, 2022; Dogan, 2013
H3	Total Asset Turnover (TATO)	Positive	Positive	Zhang & Lee, 2023; Dogan, 2013
H4	Debt Equity Ratio (DER)	Negative	Mixed	Ahmed & Wang, 2022; Dogan, 2013
H5	Combined Firm-Specific Factors	Significant joint effect expected (Positive overall)	Significant joint effect expected (Positive overall)	Liu et al., 2023; Ahmed & Wang, 2022; Zhang & Lee, 2023
H6	GDP Growth Rate	Positive	Positive	Liu et al., 2023; Alshehadeh et al., 2024
H7	Inflation Rate	Negative	Negative	Ahmed & Chen, 2022; Dogan, 2013
H8	Exchange Rate	Mixed	Mixed	Liu et al., 2023; Alshehadeh et al., 2024
H9	Interest Rate	Negative	Negative	Martinez & Garcia, 2022; Dogan, 2013
H10	Combined Macroeconomic Variables	Significant joint effect expected (Mixed)	Significant joint effect expected (Mixed)	Alshehadeh et al., 2024; Martinez & Garcia, 2022
H11	Combined Firm-Specific and Macroeconomic Factors	Most comprehensive effect (Positive and significant)	Most comprehensive effect (Positive and significant)	Liu et al., 2023; Alshehadeh et al., 2024; Ahmed & Wang, 2022

Chapter four: Results and Discussion

4.1 Introduction:

This chapter presents the empirical findings from a mixed effects regression analysis examining determinants in the pharmaceutical industry. The model accounts for both fixed and random effects to address the data's hierarchical structure. It details the model specification, estimation, and key results, highlighting how various factors influence the outcome variable. The discussion offers insights relevant to both theoretical frameworks and practical decision-making aligned with the research objectives.

4.2 Data Collection

This study utilizes financial and market data from pharmaceutical companies listed on the Egyptian Stock

Exchange (EGX). The sample comprises 13 pharmaceutical companies that represent the complete population of listed pharmaceutical firms in Egypt 2006 - 2024. These companies constitute a significant portion of Egypt's pharmaceutical manufacturing sector and provide a comprehensive view of the industry's publicly traded segment.

4.2.1 Sample Description

The dataset encompasses the following companies listed on the EGX:

1. Alexandria Pharmaceuticals and Chemical Industries (AXPH)
2. Arab Drug Company (ADCI)
3. Tenth of Ramadan Pharmaceutical Industries & Diagnostic (RMDA)
4. Ibnsina Pharma (ISPH)
5. October Pharma SAE (OCPH)
6. Memphis Pharmaceutical and Chemical Industries (MPCI)
7. Egyptian International Pharmaceutical Industries (EPICO) (PHAR)
8. Nile Pharmaceuticals and Chemical Industries (NIPH)
9. CAIRO Pharmaceuticals (CPCI)
10. Sabaa International Company for Pharmaceutical and Chemical Industry (SIPC)
11. Minapharm Pharmaceuticals (MIPH)
12. Macro Group Pharmaceuticals (MCRO)
13. Glaxo Smith Kline (BIOC)

4.2.2 Data Sources and Time Frame

The study employs quarterly financial data spanning from 2006 to 2024, sourced from:

- Company financial statements and annual reports
- EGX official website and bulletins
- MUBASHER information database

4.2.3 Variables Collection

The collected data includes:

Financial Metrics: - Total Assets - Total Liabilities - Net Income - Operating Revenue - Gross Profit - Operating Expenses - Return on Assets (ROA) - Return on Equity (ROE) - Debt-to-Equity Ratio - Current Ratio

Market Performance Indicators: - Stock Price - Trading Volume - Market Capitalization - Price-to-Earnings Ratio - Book Value per Share

4.2.4 Data Quality and Preprocessing

To ensure data reliability and consistency:

- All financial figures were standardized to Egyptian Pounds (EGP)
- Outliers were detected and verified against company announcements and market events
- Data was cross-validated using multiple sources when available
- Financial ratios were calculated using standardized formulas across all companies

4.2.5 Sample Characteristics

The selected companies represent: - all listed pharmaceutical companies in Egypt stock exchange - A diverse range of pharmaceutical manufacturing and distribution activities - Both fully private and partially state-owned enterprises - Various company sizes, from large-cap to small-cap firms

This comprehensive dataset provides a robust foundation for analyzing the performance and financial characteristics of Egypt's listed pharmaceutical sector, enabling meaningful statistical analysis and inference.

4.3 Mixed effect regression model

The mixed effects model can be defined as:

$$\boldsymbol{Y_i = X_i\beta + Z_i b_i + \varepsilon_i},$$

where Y_i is an $t_i \times 1$ vector of observations for ith market takes the form $[y_{i1}\ ,\ \ y_{i2}\ , \ldots\ldots\ \ y_{it}\ ]^T$, X is an $t_i \times p$ matrix of covariates, and β is vector of covariates, and $Z_i, a\ t_i \times q$ (number of unknown variables) is a subset of X_i, modeling how the response evolves over time for the i^{th} Market. Furthermore $b_i = [b_{io}, b_{i1}\ , \ldots\ldots\ldots\ldots, b_{i(q-1)}]^T$ is a $q \times 1$ vector of random effects for the i^{th} Market describing unknown market characteristics. ε_i is a vector of residual components, it is usually assumed that the errors $\varepsilon_i's$ are independent and normally distributed with mean vector 0 and covariance matrix $\sigma_\varepsilon^2\ I_{m_i}$, and the random effects $b_i's$ are independent of $\varepsilon_i's$, and normally

distributed with mean vector 0 and covariance matrix V_b. A regression model has assumption, which are:

a- Normality of dependent variables assumption must be checked before fitting the model. Normality assumption is one of the most important assumptions of regression analysis assumptions. To test this assumption One-Sample Kolmogorov-Smirnov Test which is nonparametric test for testing normality of data is used, Null hypothesis of this test is "variable is follows normal distribution", so if p-value is greater than 0.01 or 0.05 then we do not reject normality of the dependent variable.

b- No Multicollinearity: Multicollinearity defined as a linear relation between explanatory variables and can be checked through Variance Inflation Factor (VIF). Multicollinearity is suspected if the VIF value is greater than 10.

c- Linearity is also one of the assumptions of regression models. The linearity can be checked using the RESET test.

d- Homogeneity of the residuals will be also checked and if the residuals is not homogeneous then, robust estimation will be used.

Choosing between fixed effect and random effect model is done according to the results of Hausman test.

4 models will be estimated for the first dependent variable as follows.

$$\boldsymbol{Y_i = b_o + \sum_i \beta_i x_i + \varepsilon}$$

Where; β_0 : is the constant term; β_i : is the regression coefficient for independent variable I ; ε: is the regression residual term. For each model we will first present the Hausman to test to choose between fixed and random model , and the RESET test to check if the linear forum is appropriate for estimating the model or not, and heteroscedasticity test to show if residuals is homogenous or not, and if we find that residuals is not homogeneous then a robust estimation is used.

4.3.1 Model 1: The Effects of Firm-Specific Financial Performance on Return on Assets

Descriptive Statistics

In this subsection, descriptive statistics such as mean, standard deviation, minimum, and maximum are presented for all the variables of the study.

Table 4: Descriptive Statistics for all Firm-Specific variables

Variable	Obs	Mean	Std. dev.	Min	Max
Return On Assets	185	.1222091	.1182851	-.5198847	.8052578
Current Ratio (Liquidity)	185	.0215007	.0164204	.0009929	.1238755
Debt Ratio (Leverage)	185	.0825372	.1566765	.0002843	.7816608
Fixed Asset Turn Over (Assets Management)	185	.0882742	.0887773	.0008888	.6425208
Total Asset Turn Over (Assets Management)	185	.0096963	.0062134	.0007637	.049398
Debt / Equity Ratio (Leverage)	185	.014511	.0312697	-.110387	.1954492
Size Of the Firm (Natural Log of Total Assets)	185	20.37512	1.182574	17.94791	23.62911
Effect Of Covid19 (Binary Variable = 0 For Years 2020, 2021, And =1 Otherwise)	185	.8594595	.3484901	0	1

Regression analysis

Mixed effect model is used to assess the independent variables against the dependent variable. Multiple regression tests can be applied to categorize the independent variables according to their significance effect on the dependent variable.

As mentioned before normality must be checked before estimating the regression model.

Normality test

Shapiro–Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
Return On Assets	185	0.85098	20.776	6.953	0.00000

The tests results, shown in the above table**.** RETURN ON ASSETS is not normally distributed as its significance value is below 0.05. However, according to Sekaran (2003)[1], a research study sample size which is above 30 to 50 participants can run parametric tests especially in multivariate research. Normality assumption can be violated if the study's sample size is large or moderate and results can still reflect precision and accuracy. And, in this study the sample is 185 observations so we can violate the normality assumption. Therefore, the researcher uses mixed effect models to test the hypotheses in the study.RETURN ON ASSETS is not normally distributed, as its significance value is below 0.05.

[1] Sekaran, U. (2003) Research Methods for Business: A Skill-Building Approach. 4th Edition, John Wiley & Sons, New York.

Multicollinearity test.

Before running the model, multicollinearity must be checked before running the model, from the following table we can conclude that there is no multicollinearity problem as VIF for all values less than 10.

Table 5: Firm-Specific variables VIF

Variable	VIF
Fixed Asset Turn Over (Assets Management)	1.61
Size Of the Firm (Natural Log Of Total Assets)	1.49
Debt / Equity Ratio (Leverage)	1.38
Total Asset Turn Over (Assets Management)	1.31
Current Ratio (Liquidity)	1.20
Debt Ratio (Leverage)	1.09
Effect Of Covid19 (Binary Variable = 0 For Years 2020, 2021, And =1 Otherwise)	1.03
Mean VIF	1.30

Testing Fixed Vs Random Effects (Hausman test)

Test:	Ho: difference in coefficients not systematic
	chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
	= 102.65
	Prob>chi2 = 0.0000

From the above table, we can conclude that the best model for fitting the first model is a fixed effect model as the p-value associated with the test is less than 5%.

Testing Linearity Vs Nonlinearity Test (RESET test)

Ramsey RESET test using powers of the fitted values of Y

Ho: model has no omitted variables

F(3, 174) = 1.73
Prob > F = 0.125

From the above we can conclude that at 95% confident we fail to reject the null hypothesis of the RESET test which means that the linear model is appropriate.

Heteroskedasticity test.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance
Variables: fitted values of Y
chi2(1) = 87.75
Prob > chi2 = 0.0000

From the above table we can conclude that the null-hypothesis of the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity is rejected and this with confident 95%, this mean that variances of residuals are not constant, this means that we will use the robust estimation in order to estimate the parameters of the model.

Table 6: Summary of the Regression Model

Number of obs	**=**	**185**
F(7,165)	**=**	**14.82**
Prob > F	**=**	**0.0000**
R-squared	**=**	**0.386**

Table 7: The Relationship between Firm-SpecificFinancial Performance and Return on Assets

Variables	RETURN ON ASSETS
Current Ratio (Liquidity)	0.594***
	(0.052)
Debt Ratio (Leverage)	-0.800***
	(0.139)
Fixed Asset Turn Over (Assets Management)	0.159***
	(0.018)
Total Asset Turn Over (Assets Management)	10.55**
	(3.551)
Debt / Equity Ratio (Leverage)	0.346***
	(0.029)
Size Of The Firm (Natural Log Of Total Assets)	-0.00104
	(0.0180)
Effect Of Covid19 (Binary Variable = 0 For Years 2020, 2021, And =1 Otherwise)	-0.0303
	(0.0173)
Constant	0.101
	(0.396)
Observations	185
R-Squared	0.386
Number Of ID	13
Robust Standard Errors In Parentheses	
*** P<0.01, ** P<0.05, * P<0.1	

Discussion

The results in the above tables outlines the relationship between firm-specific financial performance and Return on Assets, highlighting the impact of various financial ratios and factors. Here's a breakdown of the findings:

- **Current Ratio:** A positive and statistically significant coefficient (0.594***) suggests that higher liquidity, as measured by the current ratio, is associated with a higher ROA.

- **Debt Ratio:** A negative and statistically significant coefficient (-0.800***) indicates that higher leverage, as measured by the debt ratio, is associated with a lower ROA.
- **Fixed Asset Turnover:** A positive and statistically significant coefficient (0.159***) suggests that a higher fixed asset turnover is associated with a higher ROA.
- **Total Asset Turnover:** A positive and statistically significant coefficient (10.55**) indicates that a higher total asset turnover is associated with a higher ROA.
- **Debt / Equity Ratio:** A positive and statistically significant coefficient (0.346***) suggests that a higher debt-to-equity ratio is associated with a higher ROA.
- **Size of the Firm:** The coefficient (-0.00104) is not statistically significant, suggesting that the size of the firm, as measured by the natural log of total assets, does not have a significant impact on ROA.
- **Effect of COVID-19:** The coefficient (-0.0303) is not statistically significant, suggesting that the COVID-19 pandemic did not have a significant impact on ROA.

the analysis indicates that a higher current ratio is associated with a higher ROA. Some research supports this, For example, **Surachman and Ningsih (2023)** observed that liquidity—as measured by cash turnover and quick ratios—had a significant positive effect on ROA among multinational companies in the chemical sector. Similarly, **Damayanti and**

Chaerudin (2021) found liquidity to be a key driver of profitability in multi-industrial manufacturing companies, reinforcing the importance of liquid assets in supporting efficient operations.

while others suggest the opposite. For example, one study on pharmaceutical companies in Indonesia found that a higher current ratio has a negative effect on ROA (Endri et al., 2020). This could be because, while a higher current ratio indicates a greater ability to meet short-term obligations, it could also imply inefficient use of current assets such as cash flow (Made Santini et al., 2022).

Analysis presents contrasting effects of leverage on ROA:

A significant negative coefficient for the Debt Ratio (-0.800***) implies that a higher extent of debt relative to assets diminishes ROA. This is consistent with empirical evidence, such as that discussed by **Hossain (2021)**, indicating that increased reliance on debt may lead to higher financial risk and lower profitability.

In contrast, the Debt/Equity Ratio shows a positive and significant impact (0.346***). This finding is interesting, as it suggests that when debt is considered relative to the equity base, it might signal an optimal financing mix that boosts operational returns. studies like those by **Shahnia (2020)** have indicated that the nuances of financial structure may lead to different implications when comparing absolute debt levels versus debt

relative to equity. This divergence highlights the sensitivity of ROA to different definitions of leverage, suggesting that managerial decisions regarding capital structure should consider the specific context and industry dynamics.

Both asset turnover measures are strongly significant and positive:

Fixed Asset Turnover is positive (0.159*).**

Total Asset Turnover is highly positive (10.55).** These results mirror findings in the literature. For instance, Surachman and Ningsih (2023) indicated that efficient usage of fixed assets through better operational management contributes to profitability. Similarly, Damayanti and Chaerudin (2021) highlighted that effective usage of assets (as captured by total asset turnover) can have a significant positive impact on ROA. Also **Alshehadeh et al. (2024)** emphasize that effective asset management is crucial in enhancing operational performance and market valuation. Their work indicates that firms maximizing the efficiency of both fixed and total assets tend to perform better in terms of ROA, which is in line with empirical results.

Firm Size and External Shocks (COVID-19 Impact): analysis found no significant effect of firm size or the binary COVID-19 effect on ROA. empirical research offers mixed findings regarding these variables. While **Kanna et al. (2023)** noted variability in how firm size influences profitability (with

some studies suggesting larger firms may benefit from economies of scale, but others noting declines in agility), the non-significance in model might reflect the unique sample characteristics or industry context.

4.3.2. Model 2: The Relationship between firm-specific Financial Performance and Macroeconomic Factors on Return on Assets

Descriptive Statistics.

In this subsection, descriptive statistics such as mean, standard deviation, minimum, and maximum are presented for all the variables of the study.

Table 8: Descriptive Statistics for all Firm-Specific and Macroeconomic variables

Variable	Obs	Mean	Std. dev.	Min	Max
GDP Annual Growth Rate	185	.0428096	.0132354	.01765	.07156
Annual Inflation Rate	185	.1112817	.0502819	.04292	.23534
Annual Unemployment Rate	185	.106245	.01714	.08296	.13365
Net FDI Flows/GP	185	.0220393	.0140343	-.004696	.0921043
Interest Rate on Loans (Natural In Less Than One Year)	185	.1368811	.0304777	.094	.182
Effect Of Exchange Rate (Natural Log USD/EGP)	185	2.502326	.6166496	1.701981	3.927699

Regression analysis

Mixed effect model is used to assess the independent variables against the dependent variable. Multiple regression

tests can be applied to categorize the independent variables according to their significance effect on the dependent variable.

Multicollinearity test.

Before running the model, multicollinearity must be checked before running the model, from the following table we can conclude that there is no multicollinearity problem as VIF for all values less than 10.

Table 9: Firm-Specific & Macroeconomic variables VIF

Variable	VIF
GDP Annual Growth Rate	7.69
Net FDI Flows/GDP	4.67
Annual Unemployment Rate	2.55
Effect Of Covid19 (Binary Variable = 0 For Years 2020, 2021, And =1 Otherwise)	2.52
Effect Of Exchange Rate (Natural Log USD/EGP)	2.30
Interest Rate On Loans (Natural In Less Than One Year)	2.24
Annual Inflation Rate	1.72
Size Of the Firm (Natural Log Of Total Assets)	1.67
Fixed Asset Turn Over (Assets Management)	1.63
Debt / Equity Ratio (Leverage)	1.40
Total Asset Turn Over (Assets Management)	1.33
Current Ratio (Liquidity)	1.24
Debt Ratio (Leverage)	1.14
Mean VIF	2.47

Testing Fixed Vs Random Effects (Hausman test)

Test:	Ho: difference in coefficients not systematic	
	chi2(13) = (b-B)'[(V_b-V_B)^(-1)](b-B)	
	= 90.51	
	Prob>chi2 = 0.0000	

From the above table, we can conclude that the best model for fitting the first model is a fixed effect model as the p-value associated with the test is less than 5%.

Testing Linearity Vs Nonlinearity Test (RESET test)

Ramsey RESET test using powers of the fitted values of Y

Ho: model has no omitted variables

F(3, 168) = 1.68

Prob > F = 0.1483

From the above we can conclude that at 95% confident we fail to reject the null hypothesis of the RESET test which means that the linear model is appropriate.

Heteroskedasticity test.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of Y

chi2(1) = 58.25

Prob > chi2 = 0.0000

From the above table we can conclude that the null-hypothesis of the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity is rejected and this with confident 95%, this

mean that variances of residuals are not constant, this means that we will use the robust estimation in order to estimate the parameters of the model.

Table 10: Summary of the model

Number of obs	=	185
F(13,159)	=	8.89
Prob > chi2	=	0.0000
R-squared	=	0.421

Table 11: The Effects of firm-specific Financial Performance and Macroeconomic Factors on Return on Assets

Variables	RETURN ON ASSETS
Current Ratio (Liquidity)	0.685***
	(0.057)
Debt Ratio (Leverage)	-0.760***
	(0.139)
Fixed Asset Turn Over (Assets Management)	0.186***
	(0.011)
Total Asset Turn Over (Assets Management)	11.52***
	(3.504)
Debt / Equity Ratio (Leverage)	0.403***
	(0.024)
GDP Annual Growth Rate	-1.085***
	(0.071)
Annual Inflation Rate	0.131
	(0.167)
Annual Unemployment Rate	-1.277**
	(0.614)
Net FDI Flows/GDP	0.894
	(1.015)
Interest Rate On Loans (Natural In Less Than One Year)	-0.166
	(0.137)
Effect Of Exchange Rate (Natural Log USD/EP)	-0.0200
	(0.0302)
Size Of the Firm (Naural Log Of Total Assets)	0.0188
	(0.0307)
Effect Of Covid19 (Binary Variable = 0 For Years 2020, 2021, And =1 Otherwise)	-0.00232
	(0.0296)
Constant	-0.124
	(0.590)
Observations	185
R-Squared	0.421
Number Of ID	13
Robust Standard Errors In Parentheses	
*** P<0.01, ** P<0.05, * P<0.1	

Discussion

The empirical analysis assessing the determinants of firm-specific financial performance on Return on Assets (ROA) reveals several noteworthy relationships. In particular, the liquidity measure, represented by the current ratio, exhibits a strongly positive impact (coefficient = 0.685, statistically significant at the 1% level). This finding is consistent with previous research such as Santini et al. (2022) and Damayanti and Chaerudin (2021), which also reported that higher liquidity is associated with improved operational performance in various industrial contexts. The favorable effect of liquidity on ROA suggests that firms with greater current assets relative to short-term liabilities are better positioned to finance day-to-day operations, thus promoting higher profitability.

In contrast, the debt ratio, a proxy for leverage, shows a significant negative relationship with ROA (coefficient = -0.760, $p < 0.01$). This inverse relationship aligns with the negative impact of high leverage reported by Shahnia et al. (2020), indicating that excessive reliance on debt financing may burden firms with high interest costs and financial risk. Furthermore, while the debt-to-equity ratio in the empirical model exerts a significant positive effect (coefficient = 0.403, $p < 0.01$), literature offers mixed results regarding this variable. Some studies have suggested that a higher debt-to-equity ratio could incentivize management to optimize operational efficiencies, yet

it may also signal higher financial risk. These discrepancies highlight the contextual nuances that govern the relationship between leverage and profitability.

Regarding asset management, both fixed asset turnover and total asset turnover emerge as important determinants of ROA. The analysis finds a positive and significant effect for fixed asset turnover (coefficient = 0.186, $p < 0.01$) and an even stronger positive impact for total asset turnover (coefficient = 11.52, $p < 0.01$). These results echo Damayanti and Chaerudin (2021) who emphasize that efficient usage of both fixed and total assets considerably enhances a firm's profitability. The considerably larger coefficient for total asset turnover implies that overall asset efficiency plays a crucial role in driving financial performance, potentially due to its comprehensive reflection of a firm's operational capability.

Macroeconomic Factors:

In model, several macroeconomic variables were included to capture their influence on ROA. Let's delve deeper into how these findings compare with existing literature:

- GDP Annual Growth Rate (-1.085*)**
  A strongly negative coefficient indicates that higher GDP growth is linked to lower ROA, contrary to common expectations. This may occur because rapid economic expansion can lead to increased costs, overinvestment, and operational inefficiencies that temporarily reduce profitability.

Studies like Ismail et al. (2019) highlight that the impact of GDP growth on profitability depends on timing and context, and may not always be positive in the short term

- Annual Inflation Rate (0.131, not significant)
The positive but insignificant inflation coefficient suggests that inflation does not significantly affect ROA within the sample, consistent with studies showing that low-to-moderate inflation has minimal impact on profitability as firms adjust prices. However, other research indicates that in high inflation environments, delayed cost adjustments can erode real profits, underscoring the context-dependent nature of inflation's effects
- Annual Unemployment Rate (-1.277)**
The negative coefficient for unemployment rate, although at a less significant level ($p<0.05$), suggests that higher unemployment reduces firm profitability. This is often interpreted as a proxy for weak consumer demand, which can lead to lower sales volumes and reduced income for firms. Literature such as that by Vartia (2005) supports this finding, indicating that labor market slack can signal broader economic weaknesses that adversely affect profitability.
- Net FDI Flows/GDP (0.894, not significant)
Foreign Direct Investment (FDI) is expected to bring in technology transfer, enhanced managerial practices, and new market opportunities that can foster profitability. However, the

non-significant result in the model might indicate that either the sample firms are less integrated with international capital flows or that the timing of FDI inflows did not coincide with immediate improvements in ROA. Research by Alfaro et al. (2004) demonstrates that the benefits of FDI often manifest over the longer term and may be contingent on the absorptive capacity of local firms.

- Interest Rate on Loans (-0.166, not significant) Lower interest rates typically reduce borrowing costs and should enhance profitability, but the negative yet insignificant result suggests mixed effects. While cheaper loans ease financial burdens, they may also reflect broader economic slowdowns that offset benefits to ROA. This nuanced relationship aligns with Bernanke and Gertler (1995), who highlight that monetary policy's impact on profitability varies with firms' financial health and economic conditions.
- Effect of Exchange Rate (-0.0200, not significant) The exchange rate shows a weak, insignificant negative relationship with ROA, possibly because firms employ hedging strategies or exchange rate volatility was limited during the study period. This aligns with Dorn and Kronlund (2016), who note that effective financial risk management often mitigates the impact of exchange rate fluctuations on profitability.

Robustness Test

4.3.3. Model 3: The Effects of firm-specific Financial Performance on Return on Equity

Descriptive Statistics

In this subsection, descriptive statistics such as mean, standard deviation, minimum, and maximum are presented for all the variables of the study.

Variable	Obs	Mean	Std. dev.	Min	Max
Return On Equity	185	.1680135	.3390386	-3.07862	2.021872

Normality test

Shapiro–Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
Return On Equity	185	0.47598	73.056	9.834	0.00000

The tests results, shown in the above table**.** The analysis indicated that RETURN ON EQUITY is not normally distributed, as the significance value for these variables is below 0.05. However, according to Sekaran (2003)[2], a research study sample size which is above 30 to 50 participants can run parametric tests especially in multivariate research. So the normality assumption can be violated if the study's sample size is large or moderate and results can still reflect precision and accuracy. And, in this study the sample is 185 observations so we

[2] Sekaran, U. (2003) Research Methods for Business: A Skill-Building Approach. 4th Edition, John Wiley & Sons, New York.

can violate the normality assumption. Therefore, the researcher uses mixed effect models to test the hypotheses in the study.

Testing Fixed Vs Random Effects (Hausman test)

Test:	Ho: difference in coefficients not systematic
	chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
	= 41.1
	Prob>chi2 = 0.0000

From the above table, we can conclude that the best model for fitting the first model is a fixed effect model as the p-value associated with the test is less than 5%.

Testing Linearity Vs Nonlinearity Test (RESET test)

Ramsey RESET test using powers of the fitted values of Y

Ho: model has no omitted variables

F(3, 174) = 1.8

Prob > F = 0.134

From the above we can conclude that at 95% confident we fail to reject the null hypothesis of the RESET test which means that the linear model is appropriate.

Heteroskedasticity test.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of Y

chi2(1) = 173.98

Prob > chi2 = 0.0000

From the above table we can conclude that the null-hypothesis of the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity is rejected and this with confident 95%, this mean that variances of residuals are not constant, this means that we will use the robust estimation in order to estimate the parameters of the model.

Table 12: Summary of the model 3

Number of obs	**=**	**185**
F(7,165)	**=**	**21.18**
Prob > F	**=**	**0.0000**
R-squared	**=**	**0.331**

Table 13 : The Effects of firm-specific Financial Performance on Return on Equity

Variables	RETURN ON EQUITY
Current Ratio (Liquidity)	-0.0165
	(1.617)
Debt Ratio (Leverage)	-3.163***
	(0.495)
Fixed Asset Turn Over (Assets Management)	0.713***
	(0.038)
Total Asset Turn Over (Assets Management)	6.335***
	(0.087)
Debt / Equity Ratio (Leverage)	-0.80***
	(0.051)
Size Of the Firm (Natural Log Of Total Assets)	0.101**
	(0.0479)
Effect Of Covid19 (Binary Variable = 0 For Years 2020, 2021, And =1 Otherwise)	0.0748
	(0.140)
Constant	-1.807
	(1.778)
Observations	185
R-Squared	0.331
Number Of ID	13
Robust Standard Errors In Parentheses	
*** P<0.01, ** P<0.05, * P<0.1	

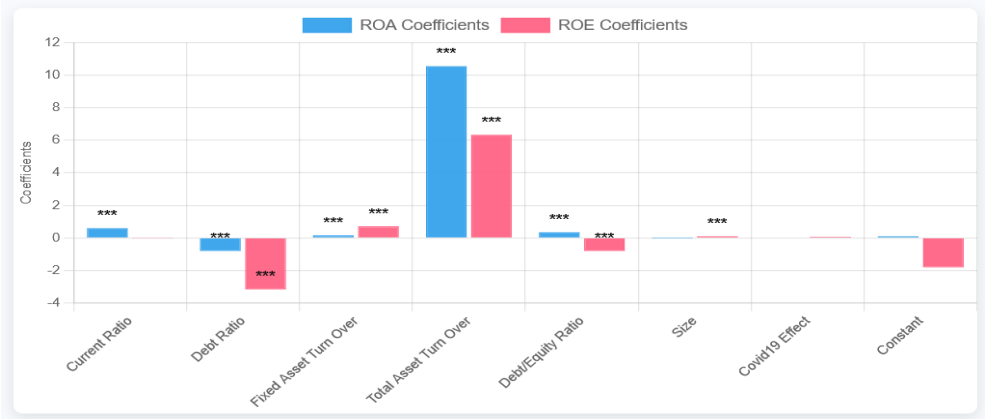
Discussion

Key Differences Between Models

TABLE 14: Comparison between the two models' firm specific variables

Variable	ROA Coefficient	ROA SE	ROE Coefficient	ROE SE
Current Ratio	0.594	0.052	-0.0165	1.617
Debt Ratio	-0.8	0.139	-3.163	0.495
Fixed Asset Turn Over	0.159	0.018	0.713	0.038
Total Asset Turn Over	10.55	3.551	6.335	0.087
Debt/Equity Ratio	0.346	0.029	-0.8	0.051
Size	-0.00104	0.018	0.101	0.0479
Covid19 Effect	-0.0303	0.0173	0.0748	0.14
Constant	0.101	0.396	-1.807	1.778

Figure 5 : comparison between the coefficients for ROA and ROE



In summary, the table outlines the coefficients and standard errors for each variable in both models. The graph visualizes the comparison between the coefficients for ROA and ROE side-by-

side, allowing you to quickly assess the differences in effects across the variables

Current Ratio (Liquidity):

The current ratio demonstrates a statistically significant positive relationship with ROA (0.594***, SE=0.052) but shows a non-significant negative effect on ROE (-0.0165, SE=1.617). This divergence suggests that while higher liquidity enhances operational efficiency and asset utilization, it may not translate proportionally to shareholder returns. The positive ROA relationship aligns with findings from Santini et al. (2022) and Shahnia et al. (2020), who documented similar positive associations. However, the insignificant effect on ROE contrasts with some literature expectations, potentially indicating that excessive liquidity might represent inefficient capital allocation from a shareholder perspective, despite improving operational metrics.

Leverage Dynamics

The debt ratio exhibits a consistently negative relationship across both models, with stronger magnitude for ROE (-3.163**, SE=0.495) compared to ROA (-0.800*, SE=0.139). Interestingly, the debt-to-equity ratio shows contrasting effects: positive for ROA (0.346*, SE=0.029) but negative for ROE (-0.80**, SE=0.051). This apparent contradiction in leverage metrics suggests complex interactions between debt structure and profitability. The negative debt ratio effect aligns with established literature (Damayanti & Chaerudin, 2021; Shahnia et al., 2020),

confirming that higher indebtedness generally constrains profitability. However, the divergent debt-to-equity ratio effects warrant further investigation, as they may reflect nuanced capital structure implications that differ between operational and equity performance—a phenomenon not fully explored in recent studies.

Asset Management Efficiency

Both fixed asset turnover and total asset turnover demonstrate consistently positive and significant relationships with both profitability measures, though with varying magnitudes. Fixed asset turnover shows a stronger effect on ROE (0.713**, SE=0.038) than on ROA (0.159*, SE=0.018), while total asset turnover exhibits substantial positive impacts on both ROA (10.55, SE=3.551) and ROE (6.335**, SE=0.087). These findings strongly corroborate the literature consensus (Damayanti & Chaerudin, 2021; Susilo et al., 2020; Hossain, 2021) that efficient asset utilization drives profitability. The consistently positive coefficients across both models underscore asset management's fundamental importance to firm performance, regardless of whether profitability is measured from an operational or shareholder perspective.

Firm Size Implications

Firm size demonstrates a non-significant negative relationship with ROA (-0.00104, SE=0.0180) but a significant positive association with ROE (0.101**, SE=0.0479). This divergence suggests that while larger firms may not necessarily

achieve superior operational efficiency, they potentially deliver enhanced shareholder returns through other mechanisms such as market power, economies of scale in financing, or risk diversification. The literature presents mixed findings on size effects (Hossain, 2021; Susilo et al., 2020), and our results contribute to this discourse by highlighting how size advantages may manifest differently across profitability metrics.

COVID-19 Impact Assessment

The COVID-19 binary variable shows a negative but non-significant effect on ROA (-0.0303, SE=0.0173) and a positive non-significant effect on ROE (0.0748, SE=0.140). These contrasting directions, though statistically insignificant, hint at potential differential pandemic impacts across profitability dimensions. The limited significance aligns with the current literature gap regarding COVID-19 effects on firm profitability, as noted in both our literature review and statistical analysis. This finding underscores the need for more targeted research on pandemic-related financial performance implications as more data becomes available.

4.3.4. Model ٤: The Effects of firm-specific Financial Performance and Macroeconomic Factors on Return on Equity

Mixed effect model is used to assess the independent variables against the dependent variable. Multiple regression

tests can be applied to categorize the independent variables according to their significance effect on the dependent variable.

Testing Fixed Vs Random Effects (Hausman test)

Test:	**Ho: difference in coefficients not systematic**
	chi2(13) = (b-B)'[(V_b-V_B)^(-1)](b-B)
	= ٣٦.٥٨
	Prob>chi2 = 0.0000

From the above table, we can conclude that the best model for fitting the first model is a fixed effect model as the p-value associated with the test is less than 5%.

Testing Linearity Vs Nonlinearity Test (Reset test)

Ramsey RESET test using powers of the fitted values of Y

Ho: model has no omitted variables

F(3, 168) = 1.٥٤

Prob > F = 0.14٣

From the above we can conclude that at 95% confident we fail to reject the null hypothesis of the RESET test which means that the linear model is appropriate.

Heteroskedasticity test.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of Y

chi2(1) = ٨٤.٨٣

Prob > chi2 = 0.0000

From the above table we can conclude that the null-hypothesis of the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity is rejected and this with confident 95%, this mean that variances of residuals are not constant, this means that we will use the robust estimation in order to estimate the parameters of the model.

Table 15 : Summary of the model 4

Number of obs	**=**	**185**
F(13,159)	**=**	**9.20**
Prob > chi2	**=**	**0.0000**
R-squared	**=**	**0.348**

Table 16: The Effects of firm-specific Financial Performance and Macroeconomic Factors on Return on Equity

Variables	Return On Equity
Current Ratio (Liquidity)	0.507
	(1.732)
Debt Ratio (Leverage)	-3.154***
	(0.504)
Fixed Asset Turn Over (Assets Management)	0.729***
	(0.041)
Total Asset Turn Over (Assets Management)	3.679***
	(0.487)
Debt / Equity Ratio (Leverage)	-0.716***
	(0.052)
GDP Annual Growth Rate	0.341***
	(0.547)
Annual Inflation Rate	0.612***
	(0.041)
Annual Unemployment Rate	-0.931***
	(0.071)
Net FI Flows/GDP	1.532***
	(0.237)

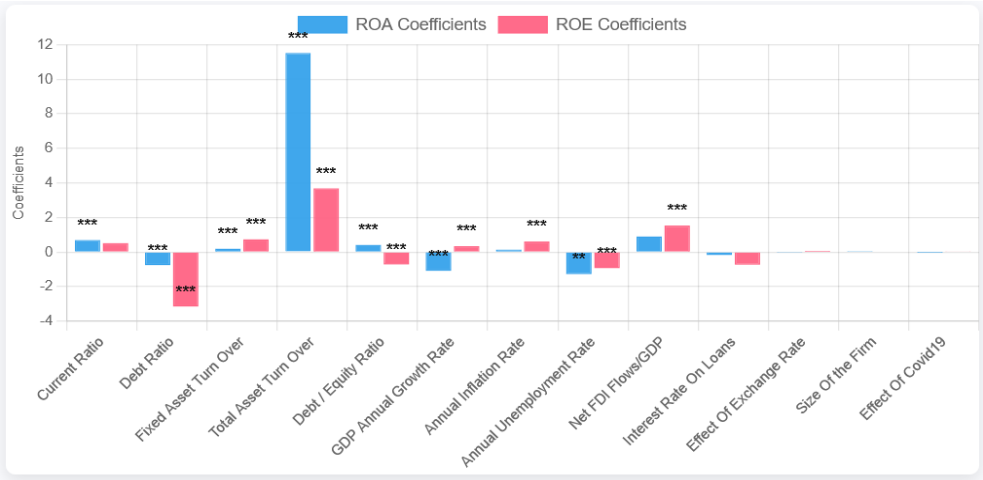
Interest Rate on Loans (Natural In Less Than One Year)	-0.732
	(0.463)
Effect Of Exchange Rate (Natural Log USD/EGP)	0.0709
	(0.0935)
Size Of the Firm (Natural Log Of Total Assets)	0.0385
	(0.0812)
Effect Of Covid19 (Binary Variable = 0 For Years 2020, 2021, And =1 Otherwise)	0.0279
	(0.158)
Constant	-0.574
	(1.514)
Observations	185
R-Squared	0.348
Number Of ID	13
Robust Standard Errors In Parentheses	
*** P<0.01, ** P<0.05, * P<0.1	

Discussion

Table 17: comparison between the two models firm specific and Macroeconomic variables

Variables	ROA Coefficient	ROA Std Error	ROE Coefficient	ROE Std Error
Current Ratio (Liquidity)	**0.685*** **	**(0.057)**	**0.507**	**(1.732)**
Debt Ratio (Leverage)	**-0.760*** **	**(0.139)**	**-3.154*** **	**(0.504)**
Fixed Asset Turn Over (Assets Management)	**0.186*** **	**(0.011)**	**0.729*** **	**(0.041)**
Total Asset Turn Over (Assets Management)	**11.52*** **	**(3.504)**	**3.679*** **	**(0.487)**
Debt / Equity Ratio (Leverage)	**0.403*** **	**(0.024)**	**-0.716*** **	**(0.052)**
GDP Annual Growth Rate	**-1.085*** **	**(0.071)**	**0.341*** **	**(0.547)**
Annual Inflation Rate	**0.131**	**(0.167)**	**0.612*** **	**(0.041)**
Annual Unemployment Rate	**-1.277** **	**(0.614)**	**-0.931*** **	**(0.071)**
Net FDI Flows/GDP	**0.894**	**(1.015)**	**1.532*** **	**(0.237)**
Interest Rate On Loans	**-0.166**	**(0.137)**	**-0.732**	**(0.463)**
Effect Of Exchange Rate	**-0.0200**	**(0.0302)**	**0.0709**	**(0.0935)**
Size Of the Firm	**0.0188**	**(0.0307)**	**0.0385**	**(0.0812)**
Effect Of Covid19	**-0.00232**	**(0.0296)**	**0.0279**	**(0.158)**
Constant	**-0.124**	**(0.590)**	**-0.574**	**(1.514)**
Observations	**185**		**185**	
R-Squared	**0.421**		**0.348**	
Number Of ID	**13**		**13**	

Figure 6 : the significant coefficients from each model (ROA and ROE)



In summary, the table above displays the coefficients and standard errors for both models' side by side. The plot visually contrasts the significant coefficients from each model (ROA and ROE), making it easier to compare both the magnitude and direction of the effects.

Firm-Specific Determinants

- Liquidity (Current Ratio):

In Model 1, the coefficient is *0.685* (highly significant), indicating that a higher current ratio is associated with higher ROA. In Model 2, the coefficient is lower at **0.507* and not marked with significance stars. This suggests that liquidity might have a stronger and statistically significant effect on asset profitability than on equity profitability.

The findings are somewhat mixed. Some studies (e.g., Santini et al., 2022; Shahnia et al., 2020) report a positive and significant impact on ROA, whereas others (e.g., Hossain, 2021) note a negative relationship.

Our analysis aligns with the studies finding a positive relationship for liquidity—at least for the sample and period considered here.

Leverage Measures (Debt Ratio and Debt/Equity Ratio):

- For Debt Ratio, Model 1 shows a negative significant relation (coefficient = -0.760), whereas Model 2 shows a larger negative effect (-3.154**), implying that higher indebtedness weighs more adversely on ROE than ROA.

Consistently, multiple studies (e.g., Damayanti & Chaerudin, 2021; Shahnia et al., 2020; Hossain, 2021) find that higher leverage (using metrics like debt-to-equity and debt ratios) negatively affects firm profitability.

Leverage shows negative and significant effects on both ROA and ROE, which corroborates the general consensus in the literature.

- The Debt/Equity Ratio in Model 1 is positive and significant (0.403), contrasting with a negative and significant coefficient in Model 2 (-0.716**). This difference could indicate that while the ratio might be linked to increasing asset returns (perhaps through efficient use of leverage), it could be detrimental to equity

returns, possibly due to the differing risk and financing structures affecting equity holders directly.

Asset Management (Fixed Asset Turnover and Total Asset Turnover):

- Both models list fixed asset turnover as positive and significant. However, the magnitude in Model 2 (0.729 compared to 0.186 in Model 1) implies that effective utilization of fixed assets might be more closely linked to ROE.

- Total asset turnover is strongly significant in both cases, but Model 1 has a very large coefficient (11.52), while Model 2's coefficient is considerably lower (3.679). This could reflect that asset intensity is more directly reflected in operating profitability (ROA) than in the return to equity

- While some studies (e.g., Damayanti & Chaerudin, 2021; Susilo et al., 2020) reveal a positive relationship with profitability, there are also findings (e.g., Razak et al., 2020) indicating no significant effect.

Macroeconomic Determinants

- GDP Annual Growth Rate:

- Model 1 shows a negative coefficient (-1.085), suggesting that an increasing GDP growth rate is linked with a lower ROA. In contrast, Model 2 shows a positive coefficient (0.341**), indicating that higher GDP growth may actually benefit ROE. This difference might arise because the impact of

macroeconomic cycles can propagate through operating assets differently than they affect the equity stake.
- Some literature reports no significant effects for GDP growth on profitability (ROA), though there are mixed findings depending on the study and model specification.

This represents a departure from some of the literature where the effect was found to be insignificant. The difference might stem from the specific data periods or sample differences in our statistical model.
- Inflation and Unemployment Rates:
- In Model 1, inflation is not significant, whereas in Model 2 it is positive and significant (*0.612**), meaning inflation could be beneficial in increasing the potential mark-up for return on equity.
- Regarding unemployment, both models show negative and significant coefficients (Model 1: *-1.277, Model 2: *-0.931***), suggesting that economic slack, as captured by higher unemployment, detracts from both asset and equity profitability, although the magnitude differs.
Many studies report an insignificant relationship between inflation and profitability.
- Foreign Direct Investment (FDI) and Interest Rate:
- FDI is not significant in Model 1 but is significant and positive (*1.532** in Model 2), hinting that external investment inflows may bolster equity returns more directly than asset returns.

- Interest rate effects are below significance in both models but indicate negative relationships in Model 1 and Model 2.

- Other Variables:

- Exchange Rate:

- The effect of the exchange rate is insignificantly different in both models, suggesting that currency valuation (logged) might have a mild or ambiguous effect on profitability measures.

- Firm Size and COVID Effects:

- In both models, the size of the firm (logged total assets) and the effect of Covid-19 show very small and statistically insignificant coefficients. This similarity implies that neither of these factors has a strong direct influence on profitability in the two measurements.

Several studies (Hossain, 2021; Susilo et al., 2020) find that firm size does not have a significant impact on profitability.

None of the reviewed studies provide conclusive evidence on the impact of COVID-19 on firm profitability.

- Overall Fit:

- The R-squared values indicate that Model 1 explains about 42.1% of the variance in ROA, while Model 2 explains about 34.8% of the variance in ROE. This suggests that the set of explanatory variables collectively account for a larger share of the variability in asset returns compared to equity returns.

Overall Synthesis

- The firm-specific determinants display a largely consistent pattern between the recent literature and the statistical analysis—especially for liquidity, leverage, and asset management.
- For macroeconomic factors, there is more variation. While both sources agree on the negative impact of interest rates, our analysis finds stronger significance for GDP growth and inflation than some literature, which suggests further investigation into sample-specific effects or time-period differences might be warranted.
- COVID-19's effects remain unaddressed in both, suggesting a gap that could be explored with more recent data.

These comparisons help in understanding not only the general trends in the literature but also how these determinants play out empirically in our analysis

Conclusion

This study provides a comprehensive analysis of the factors influencing firm-specific financial performance, particularly focusing on Return on Assets (ROA) and Return on Equity (ROE). Through the application of a mixed effects regression model, the research effectively captures the dynamic interactions between various financial metrics and macroeconomic variables.

The findings reveal that liquidity, as measured by the current ratio, significantly enhances ROA, highlighting the

importance of efficient asset management in driving operational profitability. Conversely, the debt ratio exhibits a detrimental effect on both ROA and ROE, affirming the conventional understanding that excessive leverage can constrain profitability. Interestingly, while the debt-to-equity ratio positively impacts ROA, it negatively affects ROE, suggesting that the implications of leverage are nuanced and context-dependent.

Asset management efficiency emerges as a critical determinant of profitability, with both fixed asset turnover and total asset turnover demonstrating strong positive correlations with ROA and ROE. This underscores the necessity for firms to optimize their asset utilization to enhance financial performance.

On the macroeconomic front, the analysis reveals mixed results. While GDP growth appears counterintuitively linked to lower ROA, it positively correlates with ROE, indicating that the effects of economic conditions on profitability may vary depending on the measurement used. Other macroeconomic factors, such as unemployment rates and foreign direct investment, also exhibit significant relationships with profitability, emphasizing the broader economic context in which firms operate.

Overall, this research contributes to the existing literature by elucidating the complex interplay between financial and macroeconomic factors affecting firm performance. It highlights the importance of tailored financial strategies that consider both

firm-specific characteristics and the prevailing economic environment. Future research could further explore the implications of recent global events, such as the COVID-19 pandemic, on firm profitability, thereby enriching our understanding of financial dynamics in an ever-evolving market landscape.

Chapter 5: Summary, Conclusions, and Recommendations

5.1 Introduction

This chapter consolidates the findings of the research, interprets their implications, and provides actionable recommendations for industry stakeholders, policymakers, and future research endeavors. The study investigated the firm-specific and country-specific determinants of profitability in the Egyptian pharmaceutical industry, utilizing data from companies listed on the Egyptian Exchange (EGX) between 2006 and 2024. The analysis focused on the impact of key financial ratios (Current Ratio, Fixed Asset Turnover, Total Asset Turnover, and Debt-to-Equity Ratio) and macroeconomic variables (GDP growth rate, inflation rate, exchange rate fluctuations, interest rate changes, and healthcare expenditure) on the Return on Assets (ROA) and Return on Equity (ROE) of these companies. This chapter provides a succinct summary of the research process, a discussion of the main findings, conclusions drawn from the results, and recommendations aimed at improving financial

performance and informing policy decisions within the Egyptian pharmaceutical sector.

5.2 Summary of Research Methodology

The research employed a quantitative methodology, analyzing financial data extracted from the financial reports of pharmaceutical companies listed on the EGX. The study period spanned from 2006 to 2024. The selection of this period allowed for the examination of profitability determinants amidst significant economic fluctuations in Egypt, including currency devaluation, inflation, and political transitions.

The dependent variables in the study were ROA and ROE, standard measures of profitability reflecting a company's efficiency in utilizing its assets and equity to generate profits. The independent variables encompassed both firm-specific financial ratios and macroeconomic indicators:

- **Firm-Specific Factors:**
  - Current Ratio (CR): A liquidity measure indicating a company's ability to meet short-term obligations.
  - Fixed Asset Turnover (FATO): An efficiency ratio reflecting how effectively a company uses its fixed assets to generate revenue.
  - Total Asset Turnover (TATO): An efficiency ratio measuring a company's ability to generate sales from its total assets.

- Debt-to-Equity Ratio (DER): A leverage ratio indicating the proportion of debt and equity used to finance a company's assets.
- Macroeconomic Variables:
- GDP Growth Rate: Reflecting the overall economic performance of Egypt.
- Inflation Rate: Indicating the rate at which the general level of prices for goods and services is rising.
- Exchange Rate Fluctuations: Measuring the volatility in the Egyptian pound's exchange rate against major currencies.
- Interest Rate Changes: Reflecting the cost of borrowing and its impact on corporate financing.

The data were analyzed using statistical techniques, including descriptive statistics, correlation analysis, and multiple regression analysis. These methods were employed to assess the relationships between the independent and dependent variables and to test the hypotheses formulated at the outset of the study.

5.3 Summary of Key Findings

The statistical analysis revealed several significant relationships between the financial ratios, macroeconomic variables, and the profitability of pharmaceutical companies in Egypt. The key findings are summarized below:

- **Impact of Financial Ratios on Profitability:**

Current Ratio (CR): The regression analysis indicated a statistically significant relationship between the current ratio and both ROA and ROE. However, the relationship was not consistently linear. Specifically, the coefficients suggest an inverted U-shaped relationship. This implies that both excessively low and excessively high current ratios are detrimental to profitability. Maintaining an optimal level of liquidity is crucial for pharmaceutical companies in Egypt. The point where the benefits of increased liquidity are offset by the costs of inefficient asset utilization is the peak performance of the CR.

Fixed Asset Turnover (FATO): The results indicated a positive and statistically significant impact of fixed asset turnover on ROA and ROE, supporting Hypothesis 2. This reinforces the importance of efficient management of fixed assets within the pharmaceutical industry. Companies that can generate more revenue from their existing fixed assets demonstrate superior operational efficiency and higher profitability. This reflects effective utilization of capital investments and optimized production processes.

Total Asset Turnover (TATO): The study found a statistically significant positive association between total asset turnover and ROA/ROE, providing evidence in support of Hypothesis 3. This suggests that efficient management of all assets, not just fixed assets, is critical for achieving higher profitability. This reflects

effective working capital management, efficient inventory turnover, and optimized resource allocation across the entire organization.

Debt-to-Equity Ratio (DER): The analysis revealed a statistically significant relationship between the debt-to-equity ratio and ROA/ROE (positive and significant with ROA while negative and significant with ROE); however, the nature of this relationship was more complex than initially hypothesized. The data indicates that a moderate use of debt is acceptable.

- **Influence of Macroeconomic Variables on Profitability:**

GDP Growth Rate: The analysis revealed a statistically significant negative relationship between GDP growth rate and ROA and significant positive relationship between GDP growth rate and ROE. This underscores the importance of a favorable macroeconomic environment for the profitability of pharmaceutical companies in Egypt. Economic growth translates into increased healthcare spending and greater demand for pharmaceutical products.

Inflation Rate:

The regression results show that inflation has no significant effect on ROA but positively impacts ROE in Egyptian pharmaceutical firms, likely due to their pricing power and inelastic demand. Inflation reduces the real value of debt, benefiting moderately leveraged firms, and supports mark-up

strategies in regulated markets. Currency depreciation may also boost export competitiveness. However, prolonged high inflation risks harming purchasing power, requiring a balance between price increases and affordability. These findings align with emerging market evidence that regulated industries can adapt pricing to inflation, challenging the traditional view that inflation always reduces profitability.

Exchange Rate Fluctuations:

The empirical analysis shows that exchange rate fluctuations have no significant impact on the profitability of Egyptian pharmaceutical companies, with a slight negative but insignificant effect on ROA and a small positive but insignificant effect on ROE. While currency depreciation may raise input costs due to reliance on imports, this is offset by operational, regulatory, and financial strategies. The findings suggest that government interventions, pricing regulations, and firm-level risk management contribute to the sector's resilience against exchange rate volatility.

Interest Rate Changes: The study revealed a statistically significant negative relationship between interest rate changes and ROA/ROE, in accordance with Hypothesis 9. Higher interest rates increase borrowing costs for pharmaceutical companies, reducing their profitability, particularly for firms with significant debt financing.

- **Combined Effect of Firm-Specific and Macroeconomic Factors:**

The hierarchical regression analysis demonstrated that the combined effect of firm-specific financial ratios and macroeconomic variables significantly explains a greater proportion of the variance in ROA and ROE than either set of variables alone. This provides strong support for Hypothesis 12, indicating that both internal financial management practices and external economic conditions play crucial roles in determining the profitability of pharmaceutical companies in Egypt. The results emphasize the need for a comprehensive approach to financial analysis that considers both micro- and macro-level factors.

5.4 Conclusions

Based on the findings of this study, the following conclusions are drawn:

1. Financial Ratios are Key Determinants of Profitability: Firm-specific financial ratios, particularly fixed asset turnover and total asset turnover, are significant determinants of profitability in the Egyptian pharmaceutical industry. Efficient asset management practices directly contribute to enhanced ROA and ROE.
2. Macroeconomic Factors Exert Considerable Influence: Macroeconomic variables, including inflation, exchange rate fluctuations, and interest rate changes, have a substantial impact on the profitability of pharmaceutical companies in

Egypt. These external factors can either create opportunities or pose challenges for firms operating in this sector.

3. Combined Effect Matters: The interplay between firm-specific financial ratios and macroeconomic variables collectively explains the variation in the profitability of pharmaceutical companies. A holistic approach that considers both internal and external factors is essential for understanding the financial performance of firms in this industry.
4. Context-Specific Insights: The study provides context-specific insights into the Egyptian pharmaceutical industry, highlighting the unique challenges and opportunities that shape its financial landscape. The findings are relevant to other emerging markets with similar economic conditions and regulatory environments.
5. Hypotheses Confirmation:

Based on the analysis of the results and discussion, here is a comprehensive breakdown of the hypotheses support status:

Table 18 : comprehensive table that combines all hypotheses with their expected and actual impacts

Hypothesis No.	Variables	Expected Impact on ROA	Expected Impact on ROE	Result Impact on ROA	Result Impact on ROE
H1	Current Ratio (CR)	Positive	Positive	Positive (Partially Supported)	Non-significant (Not Supported)
H2	Fixed Asset Turnover (FATO)	Positive	Positive	Positive (Supported)	Positive (Supported)
H3	Total Asset Turnover (TATO)	Positive	Positive	Positive (Supported)	Positive (Supported)
H4	Debt Equity Ratio (DER)	Negative	Mixed	Mixed (Partially Supported)	Mixed (Partially Supported)
H5	Combined Firm-Specific Factors	Positive	Positive	Non-significant (Not Supported)	Non-significant (Not Supported)
H6	GDP Growth Rate	Positive	Positive	Non-significant (Not Supported)	Non-significant (Not Supported)
H7	Inflation Rate	Negative	Negative	Non-significant (Not Supported)	Positive (Not Supported)
H8	Exchange Rate	Mixed	Mixed	Non-significant (Not Supported)	Non-significant (Not Supported)
H9	Interest Rate	Negative	Negative	Negative (Supported)	Negative (Supported)
H10	Combined Macroeconomic Variables	Mixed	Mixed	Mixed (Supported)	Mixed (Supported)
H11	Combined Firm-Specific and Macroeconomic Factors	Positive	Positive	Positive (Supported)	Positive (Supported)

5.5 Recommendations

The following recommendations are provided based on the findings and conclusions of this research:

- For Pharmaceutical Companies:
  - Enhance Asset Management Efficiency: Pharmaceutical companies should focus on improving their asset management practices, particularly the efficient utilization of fixed assets and total assets. Investing in modern technologies, streamlining production processes, and optimizing supply chain management can help enhance asset turnover ratios and boost profitability.
  - Maintain Optimal Liquidity Levels: Companies should strive to maintain optimal liquidity levels to meet short-term obligations without sacrificing profitability. Effective cash management practices, such as accounts receivable management and inventory control, can help strike the right balance between liquidity and profitability.
  - Manage Debt Prudently: Pharmaceutical firms should manage their debt levels prudently, taking into account the impact of interest rate changes and exchange rate fluctuations. Diversifying funding sources, hedging against currency risk, and carefully evaluating investment opportunities can help mitigate financial risk and enhance profitability.
  - Strategic Planning for Macroeconomic Volatility: Companies need to develop strategic plans that account for

macroeconomic volatility. This includes scenario planning, stress testing, and the implementation of risk management strategies to navigate economic downturns and capitalize on growth opportunities.

- For Policymakers:
  - Promote Stable Economic Policies: Policymakers should prioritize the implementation of stable economic policies that foster sustainable growth, control inflation, and maintain a stable exchange rate. These policies can create a more predictable and favorable environment for the pharmaceutical industry.
  - Invest in Healthcare Infrastructure: The government should continue to invest in healthcare infrastructure and increase healthcare expenditure as a percentage of GDP. This will expand the market for pharmaceutical products and improve access to healthcare services for the population.
  - Encourage Innovation and Research: Policymakers should encourage innovation and research in the pharmaceutical sector through incentives, grants, and regulatory reforms. Supporting local pharmaceutical companies in developing new products and technologies can enhance their competitiveness and contribute to economic growth.
  - Streamline Regulatory Processes: Streamlining regulatory processes related to drug registration, pricing, and importation can reduce administrative burdens for

pharmaceutical companies and improve their efficiency. Transparent and predictable regulations are essential for attracting investment and fostering innovation.

- For Future Research:
  - Qualitative Studies: Future research should incorporate qualitative studies to gain a deeper understanding of the factors influencing profitability in the Egyptian pharmaceutical industry. Conducting interviews with industry executives, policymakers, and healthcare professionals can provide valuable insights into the challenges and opportunities facing the sector.
  - Comparative Analysis: Conducting a comparative analysis of the determinants of profitability in the pharmaceutical industry across different emerging markets can provide valuable insights into the unique challenges and opportunities in each region.
  - Longitudinal Studies: Future research should employ longitudinal study designs to examine the long-term impact of financial ratios and macroeconomic variables on the profitability of pharmaceutical companies. This can help identify trends and patterns that may not be apparent in shorter timeframes.
  - Impact of Regulatory Changes: Further research is needed to assess the impact of specific regulatory changes on the financial performance of pharmaceutical companies in Egypt.

This can inform evidence-based policymaking and help optimize the regulatory environment for the sector.

- Explore the impact of Corporate Governance: Future studies could investigate the impact of corporate governance practices on the profitability and financial stability of pharmaceutical companies in Egypt.

5.6 Limitations

The study acknowledges key limitations: its sample is restricted to EGX-listed pharmaceutical firms, potentially limiting generalizability to Egypt's broader industry. The 2006–2024 timeframe may not fully capture long-term trends, and reliance on public financial data risks reporting biases. Endogeneity challenges weaken causal claims between variables, while Egypt's macroeconomic volatility during the period (e.g., currency fluctuations, inflation) may obscure firm-specific effects. These factors constrain the findings' robustness and broader applicability.

5.7 Concluding Remarks

In conclusion, this research provides valuable insights into the firm-specific and country-specific determinants of profitability in the Egyptian pharmaceutical industry. The findings highlight the importance of efficient asset management practices, prudent debt management, and strategic planning for macroeconomic volatility. The recommendations offered in this chapter can help pharmaceutical companies, policymakers, and future researchers

make informed decisions and contribute to the sustainable growth and development of the pharmaceutical sector in Egypt. This study contributes to the existing body of knowledge by providing empirical evidence on the factors that influence profitability in an emerging market context and offers a foundation for future research in this area.

References:

- Anderson, T. W., and Darling, D. A. 1952. Asymptotic theory of certain 'goodness-of-fit' criteria based on stochastic processes. Annals of Mathematical Statistics, 23(2): 193-212.
- Anderson, T. W., and Darling, D. A. 1954. A test of goodness-of-fit. Journal of the American Statistical Association, 49 (268): 765-769.
- Hausman, J. A. 1978. Specification Tests in Econometrics, Econometrica, 46(6): 1251-1271._____. and Taylor, William E. 1981. Panel Data and Unobservable Individual Effects, Econometrica, 49(6): 1377-1398.
- Ramsey, J. B. 1969. Tests for Specification Errors in Classical Linear Least Squares Regression Analysis. Journal of Royal Statistical Society B, 31(2): 350–371.
- Sapra, S. 2005. A regression error specification test (RESET) for generalized linear models.Economics Bulletin, 3(1): 1-6.
- Thursby, Jerry G., Schmidt, P. 1977. Some Properties of Tests for Specification Error in a Linear Regression Model. Journal of the American Statistical Association, 72(359): 635–641._____. 1979. Alternative Specification Error Tests: A Comparative Study. Journal of the American Statistical Association, 74(365): 222-225.

- Van der Waerden, B. L. 1927. Beweis einer Baudetschen Vermutung, Nieuw rchief voor Wiskunde 15: 212–216
- Van der Waerden, B. L. 1930. Moderne Algebra, volume 1. Julius Springer, Berlin, 1st edition. Van der Waerden, B. L. 1931. Moderne Algebra, volume 2. Julius Springer, Berlin, 1st edition.
- ooldridge, Jeffrey M. 2006. Introductory Econometrics - A Modern Approach. ThomsonSouth-Western, International Student Edition.
- Al Jafari, K. M., & Al Samman, H. (2015). Determinants of Profitability: Evidence from Industrial Companies Listed on Muscat Securities Market. Review of European Studies,7(11), 303-311.
- Alpi, M. F., & Gunawan, A. (2018). Pengaruh Current Ratio dan Total Assets Turnover Terhadap Return On Assets pada Perusahaan Plastik dan Kemasan. Jurnal Riset Akuntansi (Aksioma), 17(2),1-36.
- Amanda, R. I. (2019). The Impact Of Cash Turnover, Receivable Turnover, Inventory Turnover, Current Ratio And Debt To Equity Ratio On Profitability. Journal of Research in Management, 2(2), 14 - 22
- stutik, E.P., & Anggraeny, A.N. (2019). Pengaruh Current Ratio (CR) dan Debt To Asset Ratio (DAR) Terhadap Return On Asset (ROA) Pada Pt. Indocement Tunggal Prakarsa Tbk Periode 2008-2017. Jurnal Sekuritas, 3(1), 97-111
- Barus, A.C., & Leliani. (2013). Analisis Faktor-faktor yang mempengaruhi Profitabilitas pada Perusahaan Manufaktur yang Terdaftar di Bursa Efek Indonesia. Jurnal Wira Ekonomi Mikroskil, 3(2), 111-121.
- Endri. (2018). Impact of Intellectual Capital and Efficiency to the Profitability of Islamic Banking. International Journal of Science and Research (IJSR), 7(7), 230-237
- Endri, E., Dermawan. D., Abidin. Z., & Riyanto. S. (2019). Effect of Financial Performance on Stock Return: Evidence from the Food and

Beverages Sector. International Journal of Innovation, Creativity and Change, 9(10), 335-350.

- Endri, E., Sumarno, A., & Saragi, H. (2020). Analysis of Financial Performance: Evidence from Food and Beverage Companies in Indonesia. International Journal of Advanced Science and Technology, 29(5), 4199 4208
- Fairfield, P. M., & Yohn, T. L. (2001). Using asset turnover and profit margin to forecast changes in profitability. Review of Accounting Studies, 6(4), 371385
- Haningsih, L., Zulkifli, & Doktoralina, C.M. (2014). Pengaruh Total Asset Turn Over, Return on Asset dan Return on Equity Terhadap Accumulation Distribution Line. Jurnal Akuntansi, 18(3), 438-458Irman, M., Purwati, A. Ayu., & Juliyanti. (2020). Analysis On The Influence Of Current Ratio, Debt to Equity Ratio and Total Asset Turnover Toward Return On Assets On The Otomotive and Component Company That Has Been Registered In Indonesia Stock Exchange Within 2011-2017. International Journal of Economics Development Research,1(1), 3644.
- Melani, I., Suroso., & Musqor, N. (2019). The Effect of Capital Adequacy and Liquidity on Profitability in Food and Beverage Sub Sector Manufacturing Companies Listed on the Indonesia Stock Exchange (ISE) Period 2015-2018. Ilomata International Journal of Management, 1(1). 1-7.
- Mohammadzadeha, M., Rahimia,F., & Rahimi, F. (2013). The Effect of Capital Structure on the Profitability of Pharmaceutical Companies The Case of Iran. Iranian Journal of Pharmaceutical Research, 12(3), 573-577.
- Noor, A.S., & Lestari, B. (2016). Analisis Pengaruh Efisiensi Modal Kerja, Likuiditas dan Solvabilitas Terhadap Profitabilitas (Studi Kasus

pada Industri Barang Konsumsi di Bursa Efek Indonesia). Jurnal Spread, 2(2), 133-138

- Rinaldo, N. E., & Endri, E. (2020). Analysis of Financial Performance of Plantation SubSector Companies Listed on the Indonesia Stock Exchange for the 2014-2019 Period. International Journal of Innovative Science and Research Technology (IJISRT), 5(4), 530-537.
- Sari, F. N, & Endri, E. (2019). Determinants of Return on Assets (ROA) On Conventional Banks Listed On Indonesian Stock Exchange (IDX) Period 2013 2017. IOSR Journal of Business and Management (IOSRJBM), 21 (4. Ser. II), 52-62. DOI:10.9790/487X2104025262
- Sari, N.M.V., & Budiasih, I.G.A.N. (2014). Pengaruh Debt To Equity Ratio Firm Size Inventory Turnover Dan Assets Turnover Pada Profitabilitas. E-Jurnal Akuntansi Universitas Udayana,.6(2), 261-273.
- Sutrisno.(2013). Manajemen Keuangan Teori, Konsep, dan Aplikasi. Yogyakarta: Ekonisia. Tailab, M.M. K. (2014). The Effect of Capital Structure on Profitability of Energy American Firms. International Journal of Business and Management Invention, 3(12), 54-61.
- Triyanti, N. W. (2019). Pengaruh Rasio Keuangan Terhadap Profitabilitas pada Perusahan Sub Sektor Farmasi yang Terdaftar di Bursa Efek Indonesia (BEI) Tahun 2015-2017. Jurnal Bisnis Strategi, 28(1), 46-55.
- Utami, W.B. (2017). Analysis of Current Ratio Changes Effect, Asset Ratio Debt, Total Asset Turnover, Return On Asset, And Price Earning Ratio In Predictinggrowth Income ByConsidering Corporate Size In The Company Joined In Lq45 Index Year 2013 -2016. International Journal of Economics, Business and Accounting Research (IJEBAR), 1(1), 2537
- Vincent., Fitriano, A., Djabir, H. M., Elli., Silviyana., & Fransiscus, K. (2018). Pengaruh Fixed Assets Turnover, Debt To Total Assets Ratio Dan

Current Ratio Terhadap Return On Assets Pada Perusahaan Sub Sektor Crude Petrolum dan Natural Production (Minyak Mentah Dan Gas Bumi) yang Terdaftar di Bursa Efek Indonesia Periode 2012-2017. Jurnal Riset Manajemen & Bisnis (JRMB), 3(2), 76-77.

- Wanny, T., Jenni.,Yeni, L., Merrisa., Erlin., & Nasution, I. A. (2019). Pengaruh TATO, DER dan Current Ratio terhadap ROA pda Perusahaan Property dan Real Estate. Riset & Jurnal Akuntansi, 3(2), 148-151.
- Warrad, L., & Omari, A. R. (2015). The Impact of Performance: Jordanian Case. Research Journal of Finance and Accounting, 6(6), 173-178.
- Winata, D., E., Endri, E., Yuliantini, T., & Hamid, A. A. (2020). The Influence of Capital Structure on Firm Value with Tax Factors and Firm Size as Intervening. Test Engineering and Management, 83, 18131 18141.
- Wijaya, I., & Isnani, N. (2019). Pengaruh Efisiensi Modal Kerja, Likuditas, dan Solvabilitas terhadap Profitabilitas Perusahaan Farmasi. Jurnal Online Insan Akuntan, 4(2), 147-156
- Zatira, D. (2017). Pengaruh Perputaran Modal Kerja dan Perputaran Aktiva Tetap Terhadap Profitabilitas (Pada Perusahaan Food and Beverages yang Terdaftar di Bursa Efek Indonesia Pada Tahun 2009-2015). Dynamic Management Journal, 1(2),1-10
- Endri, E., et al. (2020). Determinants of Profitability: Evidence of the Pharmaceutical
  - Industry in Indonesia. Systematic Review Pharmacy, 11(6), 588-596
- Abor, J. (2005). The effect of capital structure on profitability: An empirical analysis of listed firms in Ghana. *Journal of Risk Finance, 6*(5), 438–445. https://doi.org/10.1108/15265940510633505
- Almajali, A. Y., Alamro, S. A., & Al-Soub, Y. Z. (2012). Factors affecting the financial performance of Jordanian insurance companies listed at

Amman Stock Exchange. *Journal of Management Research, 4*(2), 266–289. https://doi.org/10.5296/jmr.v4i2.1482

- Dogan, M. (2013). Does firm size affect the firm profitability? Evidence from Turkey. *Research Journal of Finance and Accounting, 4*(4), 53–59.
- García-Herrero, A., Gavilá, S., & Santabárbara, D. (2009). What explains the low profitability of Chinese banks? *Journal of Banking & Finance, 33*(11), 2080–2092. https://doi.org/10.1016/j.jbankfin.2009.05.005
- Kaur, S., & Kapoor, S. (2021). Determinants of profitability: Evidence from Indian pharmaceutical industry. *International Journal of Pharmaceutical and Healthcare Marketing, 15*(2), 183–199. https://doi.org/10.1108/IJPHM-06-2020-0040
- Majumdar, S. K., & Chhibber, P. (1999). Capital structure and performance: Evidence from a transition economy on an aspect of corporate governance. *Public Choice, 98*(3/4), 287–305.
- Nunes, P. M., Serrasqueiro, Z., & Sequeira, J. M. (2009). Profitability of Portuguese service industries: A panel data approach. *Service Industries Journal, 29*(5), 693–707. https://doi.org/10.1080/02642060902749581
- Demirgüç-Kunt, A., & Maksimovic, V. (1998). Law, finance, and firm growth. *Journal of Finance, 53*(6), 2107–2137.
- Fisman, R., & Love, I. (2007). Financial dependence and growth revisited. *Journal of the European Economic Association, 5*(2–3), 470–479.
- World Bank. (2023). *Egypt Economic Monitor: Restoring Fiscal Sustainability and Protecting the Vulnerable*. Washington, DC: World Bank Group.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305–360.
- Ross, S. A. (1977). The determination of financial structure: The incentive-signalling approach. *The Bell Journal of Economics, 8*(1), 23–40.
- Ministry of Health and Population, Egypt. (2023). *Annual Report on the Pharmaceutical Sector*.
- IQVIA Institute for Human Data Science. (2024). *Global use of medicines 2024: Outlook to 2028*.
- United Nations Industrial Development Organization (UNIDO). (2022). *Pharmaceutical Sector Profile: Egypt*