Capital Structure Determinants in MENA Region Energy Sector*(An Empirical Study)*[1]

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ABSTRACT

This study provides empirical evidence on the determinants of capital structure in energy firms within the Middle East and North Africa (MENA) region, focusing on short-term, long-term, and total debt ratios. Using Pooled Effect Panel Data Regression Models Alongside Weighted Least Squares (WLS) regression to address heteroskedasticity, the research examines the impact of firm-specific, industry-specific, and macroeconomic factors on corporate leverage decisions.

The findings reveal that firm-specific factors, including profitability, tangibility, growth opportunities, and liquidity, play a significant role in shaping capital structure, while industry-specific and macroeconomic factors have limited influence. The study strongly supports the pecking order theory, as profitability negatively correlates with all debt measures, indicating firms in the MENA energy sector prefer internal financing over external borrowing due to high information asymmetry and financial instability. Additionally, the findings align with the trade-off theory, as tangibility positively impacts debt levels, suggesting firms leverage tangible assets as collateral for financing.

Short-term debt decisions are influenced by growth opportunities, firm size, and industry leverage benchmarks, highlighting the role of operational financing needs and sectoral norms. Long-term debt decisions, however, are primarily driven by non-debt tax shields and tangibility, reinforcing the notion that firms with substantial tax shields substitute tax benefits for debt-related advantages. Total debt ratios are shaped by a mix of profitability, growth opportunities, and liquidity, further emphasizing the dominance of internal financial management over external market conditions.

Contrary to expectations, macroeconomic variables such as GDP growth, stock market conditions, and oil prices do not significantly impact capital structure decisions. This contrasts with findings from developed economies, where capital markets and economic cycles strongly affect debt financing. A potential explanation is the heavy reliance of MENA energy firms on government-backed financing, stable oil revenues, and long-term investment strategies, reducing their sensitivity to short-term economic fluctuations.

By highlighting the firm-specific nature of capital structure decisions in energy-intensive economies, this study contributes to the capital structure literature in emerging markets. The results offer practical insights for financial managers, policymakers, and investors, providing a deeper understanding of how MENA energy firms structure their financing under different economic and operational conditions.

Keywords: *Capital Structure, MENA Region, Energy Sector, Short-Term Debt, Long-Term Debt, Total Debt, Pooled Panel Data Regression, WLS Regression, Pecking Order Theory, Trade-Off Theory, Heteroskedasticity.*

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1. INTRODUCTION

Capital structure is a crucial factor in shaping the financial stability and operational efficiency of business entities (Modigliani & Miller, 1958; Myers, 1984). It represents the ratio of debt to equity that a company utilizes to finance its activities (Titman & Wessels, 1988). This financing mix is essential for achieving corporate objectives, managing risk, and maximizing shareholder value (Jensen, 1986). Companies obtain capital either internally through retained earnings or externally via debt or equity markets. The choice between these sources depends on various factors, including cost, control, and risk preferences (Frank & Goyal, 2009). Capital structure decisions are crucial not only for long-term investments but also for maintaining short-term operational stability (Harris & Raviv, 1991).

A company's financial performance is significantly influenced by its capital structure, which affects its ability to meet short- and long-term obligations (Booth et al., 2001). An optimal capital structure seeks to balance debt and equity, minimizing the cost of capital while enhancing profitability and financial stability (Kraus & Litzenberger, 1973). Excessive reliance on debt can increase financial risk due to interest obligations, while excessive reliance on equity can dilute shareholder ownership and reduce returns (Ross, 1977). Thus, understanding the determinants of capital structure is essential for achieving financial flexibility and maintaining competitiveness (Rajan & Zingales, 1995).

The energy sector has long been a cornerstone of economic development, contributing to industrialization and global growth (IEA, 2023). This is particularly true for the Middle East and North Africa (MENA) region, which holds some of the world's largest oil and natural gas reserves (OPEC, 2023). The region includes diverse economies, such as major energy exporters like Saudi Arabia and the UAE, as well as countries like Egypt, which balance increasing production with growing domestic consumption (BP Statistical Review, 2023). These countries face unique challenges and opportunities in developing their energy sectors, shaped by geopolitical dynamics, resource availability, and economic policies (Hafner et al., 2023).

Saudi Arabia is the world's largest petroleum exporter, relying on oil revenues for nearly half of its GDP (Alharbi, 2023; World Bank, 2023). Despite efforts to

diversify its economy through initiatives like "Vision 2030," Saudi Arabia's economic framework remains closely tied to oil price fluctuations (Al Rasasi et al., 2023; IMF, 2023). These fluctuations highlight the importance of strategic financial management in the energy sector to ensure stability and growth (Jaffe et al., 2023). Similarly, the UAE has solidified its position as a key energy producer, investing heavily in oil, natural gas, and renewable energy sources (IRENA, 2023). While its energy exports primarily target Asian markets, the country faces domestic challenges such as rising energy demand and geopolitical tensions (Hafner et al., 2023). The UAE's proactive approach to diversifying its energy mix reflects its commitment to securing a sustainable energy future (IRENA, 2023).

Egypt, which has a long history as an oil producer, has experienced shifts between being a net energy exporter and importer (BP Statistical Review, 2023). The country faces challenges such as declining oil production and rising domestic consumption (Hafner et al., 2023). However, major natural gas discoveries and initiatives like the "Integrated Sustainable Energy Strategy 2035" have strengthened Egypt's position as a key player in the regional energy sector (Hafner et al., 2023; BP Statistical Review, 2023). These developments underscore the interaction between energy policies and financial strategies in shaping the sector's trajectory (IEA, 2023).

The capital structure of energy firms in the MENA region is influenced by multiple factors, including market conditions, regulatory frameworks, and firm characteristics (Booth et al., 2001; Frank & Goyal, 2009). Understanding these factors is essential for enhancing profitability and ensuring operational efficiency (Rajan & Zingales, 1995). This research aims to explore the key determinants affecting capital structure decisions in the region's energy sector, focusing on the UAE, Saudi Arabia, and Egypt. By analyzing these dynamics, the study seeks to contribute to the broader discussion on financial management within the energy industry.

Capital structure decisions play a crucial role in shaping the financial stability and growth prospects of firms. In the energy sector, these decisions are influenced by a complex interaction of firm-specific characteristics, industry-specific conditions, and broader macroeconomic factors. However, despite numerous studies

exploring the determinants of capital structure across various industries and regions (Frank and Goyal, 2009; Drobetz et al., 2013), research focused on the energy sector in the MENA region remains limited. This gap is particularly prominent considering the region's unique economic context, characterized by its reliance on oil, diverse financial markets, and increasing exposure to geopolitical risks (Khaled et al., 2025). These regional factors are likely to shape capital structure decisions in ways that differ from other regions, yet they remain underexplored in the literature.

Previous studies have identified key determinants of capital structure, such as profitability, firm size, tangibility, and growth opportunities, with significant attention to macroeconomic influences such as oil price volatility and economic conditions (Amido and Alajididi, 2020). However, the specific impact of these factors on energy firms in the MENA region remains unclear. This omission is particularly concerning given that oil price volatility and regional political risks are integral to the financial decision-making processes of firms in the energy sector (Amido and Alajididi, 2020). The lack of research addressing the region's unique economic structure calls for further investigation.

Moreover, current studies heavily rely on traditional economic models, which often fail to account for heteroscedasticity and regional differences in panel data (Ali et al., 2023; Barros et al., 2025). As a result, these models may not adequately capture the dynamic relationships between firm-specific, industry-specific, and macroeconomic determinants of capital structure in the MENA energy sector. Advanced methodologies, such as weighted least squares (WLS) regression, which address heteroscedasticity and improve the robustness of results, remain underutilized in this context.

In light of these gaps, this study seeks to answer the following research question:

What are the key determinants of capital structure in energy firms within the MENA region?

The main objective of this study is to examine the determinants of capital structure in energy companies within the MENA region, with a focus on how firm-specific, industry-specific, and macroeconomic factors—particularly oil price

fluctuations and geopolitical risks—affect financial leverage decisions in this unique context. This main objective can be divided into the following five sub-objectives:

- **To identify the key firm-specific factors** (such as profitability, size, tangibility, and growth opportunities) that influence capital structure decisions in energy firms in the MENA region.
- **To assess the impact of macroeconomic factors**, including oil price fluctuations and economic conditions, on the capital structure of energy firms in the MENA region.
- **To explore the role of regional geopolitical risks** in shaping the financial strategies and leverage decisions of energy firms operating within the MENA region.
- **To apply Weighted Least Squares (WLS) panel data regression** to analyze the dynamic relationships between the identified determinants of capital structure and to account for heteroskedasticity and regional variations.
- **To contribute to the literature** by providing region-specific insights into the capital structure decisions of energy firms, thereby filling a gap in the existing research on capital structure determinants in the MENA energy sector.

This study contributes to the theoretical literature on capital structure by exploring the determinants specific to the energy sector in the MENA region, a region that has not been extensively researched in current studies. While the general theory of capital structure, particularly the trade-off theory and pecking order theory, has been widely tested across various industries and regions (Frank & Goyal, 2009; Drobetz et al., 2013), this study extends these theories by examining how region-specific factors—such as oil price fluctuations, economic conditions, and geopolitical risks—interact with firm-specific determinants to shape capital structure in energy companies in the MENA region. The application of advanced methodologies like Weighted Least Squares (WLS) regression strengthens the robustness of the results by addressing heteroskedasticity and regional differences, contributing new methodological insights to the literature. Consequently, this study will enrich the theoretical understanding of capital

structure decisions by providing precise, context-specific insights from a region where oil dependence and political risks play a vital role.

The practical significance of this study lies in its potential to guide policies and managerial decision-making in the energy sector within the MENA region. Given the region's unique economic structure, characterized by oil dependence and geopolitical instability, understanding the key factors influencing capital structure decisions can help policymakers and industry leaders design more effective financial strategies. For energy company managers, insights into how macroeconomic and geopolitical factors, such as oil price fluctuations, affect financial decisions will enable them to make more informed choices in areas like capital budgeting, risk management, and financing decisions. For policymakers, the findings could provide valuable guidance on how to support financial stability and resilience in the energy sector, especially in the face of external shocks such as oil price volatility. Furthermore, this study may contribute to shaping regional economic policies aimed at diversifying financial markets and mitigating risks associated with geopolitical factors, thereby fostering sustainable growth within the energy sector in the MENA region.

2. THEORETICAL FRAMEWORK

2.1 Introduction to Capital Structure

Capital structure refers to the combination of debt, equity, and hybrid securities used by companies to finance their operations and growth. The choice of capital structure significantly impacts the cost of capital, risk, and the overall value of the firm (Myers, 2001). For companies operating in the energy sector in the MENA region, understanding capital structure is crucial due to the unique economic, regulatory, and market conditions in this area.

Companies aim to optimize their capital structure to reduce the weighted average cost of capital (WACC) while increasing the value of the firm. The weighted average cost of capital is a fundamental concept in financial management and is calculated as follows (Modigliani & Miller, 1958):

$$\text{WACC} = \frac{E}{V} r_E + \frac{D}{V} r_D (1 - T)$$

Where:

- **E**: Market value of equity
- **D**: Market value of debt
- **V=E+D**: Total firm value
- r_E: Cost of equity
- r_D: Cost of debt
- **T**: Corporate tax rate

Debt is generally less expensive than equity due to its tax deductibility, but excessive reliance on debt increases financial risk, potentially leading to financial distress (Kraus & Litzenberger, 1973). The leverage ratio, known as **D/E** (debt to equity), is another crucial measure of a company's capital structure and reflects the extent to which a company relies on borrowed funds. This ratio is particularly important in the energy sector due to the high levels of capital investment required (Titman and Wessels, 1988).

The financing decision also impacts the firm's risk profile. Increased debt amplifies financial leverage, which raises the variability of earnings per share (EPS) and the overall risk for shareholders (Jensen & Meckling, 1976). This risk-return trade-off forms the basis for evaluating capital structure decisions. Moreover, the choice of financing sources affects the operational flexibility of a company and its ability to withstand economic shocks, especially in the energy sector, which is characterized by capital intensity and high volatility (Harris and Raviv, 1991).

While **"capital structure"** focuses on long-term financing decisions, **"financial structure"** represents a broader concept that encompasses all financial obligations of a company, including both short-term and long-term liabilities (Brealey, Myers, & Allen, 2020). Understanding the distinction between these two structures is essential for effective financial decision-making:

Table 1: Capital Structure Vs. Financial Structure

Aspect	Capital Structure	Financial Structure
Scope	Long-term financing	Both long-term and short-term financing
Components	Long-term debt, equity	Capital structure + short-term liabilities
Focus	Cost of capital, firm value, leverage	Liquidity, working capital, solvency
Time Horizon	Long-term decisions	Both long-term and short-term decisions
Risk Considerations	Financial risk (debt-equity trade-off)	Liquidity risk, operational stability
Profitability Impact	Affects return on equity (ROE) and cost of capital	Influences short-term financial performance
Strategic Importance	Maximizing firm value through optimal debt-equity mix	Managing short-term obligations effectively

Source: Ross, Westerfield, & Jaffe (2019)

2.2 Measures of Capital Structure

Capital structure in the MENA region energy sector can be evaluated using short-term debt-to-assets (D/A), long-term debt-to-assets (D/A), and total debt-to-assets (D/A) ratios. While capital structure traditionally emphasizes long-term financing decisions, long-term D/A is often considered more relevant due to the capital-intensive nature of the energy sector (Harris & Raviv, 1991). However, short-term D/A plays a crucial role in assessing liquidity and financial flexibility, particularly for firms facing volatile cash flows and operational risks (Titman & Wessels, 1988). The total D/A ratio provides a comprehensive measure of a firm's overall leverage, capturing the combined impact of both short-term and long-term debt on asset financing (Myers, 2001). Given the unique economic and regulatory landscape of the MENA energy sector, firms must carefully balance their reliance on different types of debt to optimize financial stability and profitability (Brealey, Myers, & Allen, 2020).

Capital structure can be expressed through several measures. For example, Titman and Wessels (1988) suggested that capital structure can be measured using long-term debt, short-term debt, and the ratio of convertible debt to both the market value and book value of equity. Studies by Jiahui (2015) and Chen and Chen (2011)

measured capital structure using the ratio of total debt to total assets, while the study by Abor and Biekpe (2009) focused on the ratio of short-term debt and long-term debt. On the other hand, studies by Al-Taani (2013) and Alibor et al. (2015) measured capital structure using the debt-to-total-assets ratio, which was divided into three sub-measures: the ratio of short-term debt to total assets, the ratio of long-term debt to total assets, and the ratio of total debt to total assets, in order to explore the impact of capital structure based on the duration of debt.

These measures help in assessing a company's financial stability, liquidity, and leverage structure. Companies in the energy sector often exhibit unique patterns in these measures due to the capital-intensive nature of their operations and the cyclicality of the industry. A high short-term debt ratio may indicate liquidity pressures, while a large long-term debt ratio may reflect a commitment to stable, long-term projects. Given the MENA region's economic conditions, firms must carefully structure their financing to mitigate risks associated with fluctuating energy prices, regulatory changes, and access to financing sources (Harris & Raviv, 1991). By strategically managing their capital structure across different debt maturities, energy firms can enhance financial resilience while maintaining profitability and investment capacity.

2.3 Capital Structure Theories

2.3.1 Modigliani and Miller (M&M) Theory

M&M (1958) proposed the irrelevance of capital structure in perfect markets, where:

$$V_L = V_U$$

Here, V_L is the value of a levered firm, and V_U is the value of an unlevered firm. This proposition implies that capital structure does not influence firm value under conditions of no taxes, transaction costs, or bankruptcy costs (Modigliani & Miller, 1958). Their later work (1963) introduced taxes, highlighting the benefits of debt through the interest tax shield:

$$\text{Tax Shield} = r_D \times D \times T$$

The value of a levered firm can thus be expressed as:

$$V_L = V_U + \text{Tax Shield}$$

This modification underscores the role of corporate taxes in capital structure decisions, particularly in industries with substantial debt financing, such as energy (Modigliani & Miller, 1963). The interplay between tax benefits and financial distress costs forms the foundation for subsequent theories. However, the assumptions of perfect markets limit the direct applicability of this theory to real-world scenarios (Modigliani & Miller, 1958, 1963).

2.3.2 Trade-Off Theory

Based on the Modigliani and Miller framework (1963), the trade-off theory suggests that companies determine their optimal capital structure by balancing the tax benefits of debt against the costs associated with financial distress (Kraus and Litzenberger, 1973). Specifically, firms aim to identify the optimal level of debt where the marginal tax benefit equals the marginal distress cost. The cost of equity (r_E) for a levered firm is expressed as:

$$r_E = r_U + (D/E)\,(r_U - r_D)$$

Where r_U is the cost of capital for an unlevered firm. This equation highlights how the leverage ratio (D/E) influences the cost of equity because of increased financial risk. In the energy sector, the balance between tax shields and distress costs is particularly significant due to high capital expenditures and volatile cash flows. Additionally, the presence of significant fixed assets in the energy sector provides collateral, which can influence the trade-off decision.

2.3.3 Pecking Order Theory

Myers and Majluf (1984) introduced the Pecking Order Theory, which highlights the role of information asymmetry in corporate financing decisions. According to this theory, companies prioritize their sources of financing in the following order:

- Internal financing (retained earnings)
- Debt issuance
- Equity issuance

The theory suggests that financing costs increase with higher information asymmetry, which drives companies to reduce the adverse selection costs associated with issuing equity. As a result, companies tend to prefer using internal funds first, followed by debt issuance, and finally issuing equity as a last resort. This financing hierarchy is particularly relevant in sectors like energy, where companies typically generate substantial cash flows from operations. However, the need for external financing, especially debt, becomes more pressing during periods of significant capital investment, such as exploratory activities or renewable energy projects (Myers and Majluf, 1984; Frank and Goyal, 2003).

2.3.4 Agency Theory

Jensen and Meckling (1976) highlighted the conflicts between managers, shareholders, and debt holders in the context of agency theory. High leverage can help mitigate managerial agency costs by reducing free cash flow, thereby compelling managers to focus on value-adding activities. Debt financing reduces the agency cost of equity by limiting managerial discretion (Jensen & Meckling, 1976).

However, excessive debt can introduce conflicts between equity holders and debt holders, referred to as the asset substitution effect. In this scenario, equity holders may pursue riskier projects to maximize their returns, often at the expense of debt holders. This dynamic leads to an increase in the cost of debt, which can be modeled as:

$$\text{Cost of Debt} = f(\text{Default Risk, Leverage Ratio})$$

In the MENA energy sector, where large-scale projects require substantial financing, the agency dynamics between stakeholders can significantly influence capital structure decisions, highlighting the need for careful consideration of debt levels to manage conflicts between equity holders and debt holders (Myers, 2001).

2.3.5 Market Timing Theory

Baker & Wurgler (2002) argued that firms issue equity during periods of high stock valuations and rely on debt when equity is undervalued. The relationship between equity issuance and market conditions is expressed as:

$$\Delta E_t = \beta_0 + \beta_1 \times \text{Market Valuation} + \varepsilon_t$$

Where ΔE_t is the change in equity, and β_1 measures sensitivity to market valuation. In the energy sector, market timing decisions are influenced by several factors, including global energy price trends, regional geopolitical dynamics, and the regulatory environment (Baker & Wurgler, 2002; Fama & French, 2005). These external variables shape firms' equity issuance strategies, as companies adjust their capital structure in response to broader market signals and economic conditions.

2.3.6 Free Cash Flow Theory

Jensen (1986) proposed that debt can serve as a control mechanism to limit managerial discretion over free cash flows, thereby aligning managerial actions with shareholder interests. High levels of debt enforce discipline by requiring regular interest payments, reducing the potential for inefficient or suboptimal investments. This theory is especially relevant in capital-intensive industries where substantial free cash flows may lead to poor investment decisions. For example, firms in the MENA energy sector might strategically use debt to control expenditures related to exploration activities or the transition to renewable energy sources (Jensen, 1986; Myers, 2001).

This study adopts a multi-theoretical approach to examine the determinants of capital structure in the MENA energy sector. The integration of the Trade-Off Theory and Pecking Order Theory provides a framework for analyzing firm-specific factors, while the Market Timing Theory and Agency Theory address external and behavioral influences. The equations provided underscore the quantitative relationships between key variables and capital structure outcomes. By combining these perspectives, this framework offers a comprehensive understanding of how firms in the MENA energy sector make financing decisions under varying market and regulatory conditions. This integrated approach also considers the implications of regional economic conditions, global energy demand fluctuations, and the unique regulatory frameworks in MENA countries.

Table (2) outlines the primary predictions of the Trade-Off and Pecking Order Theories, which are widely recognized frameworks for understanding capital structure decision-making. In the subsequent sections, the paper findings will be analyzed and discussed in light of these predictions. It is important to note that while these predictions represent the most commonly accepted perspectives, there

are cases where ambiguous interpretations exist. These will be considered for the relevant determinants.

Table 2: Summary of determinants

Factor	Trade-off Theory	Pecking Order Theory
Profitability	+	-
Non-debt tax shield	-	/
Size	+	-
Tangibility	+	+
Growth opportunities	-	+
Dividend payer	-/+	/
Volatility	-	+
Liquidity	-	-

Source: Riise & Yssen (2022)

3. LITERATURE REVIEW

3.1 General Determinants of Capital Structure

The determinants of capital structure have been widely studied across different regions and industries. In Ghana, Appiah and Biekeb (2009) studied the capital structure of small and medium enterprises (SMEs) from 1998 to 2003. Their results showed that company size, age, and growth had a positive impact on capital structure, while profitability had a negative effect. SMEs in Ghana primarily relied on short-term debt, which accounted for 36% of their financing.

In Mauritius, Audet and Gopardon (2011) analyzed the capital structure of 20 SMEs over six years. Their findings indicated that long-term debt was positively related to asset structure, sales growth, and company size, while profitability and market risk had a negative impact on long-term debt decisions. These results highlighted the reliance of SMEs on short-term financing in emerging markets.

Ibrahim and Masron (2011) studied over 15,000 SMEs in Malaysia and found that company size and asset structure significantly affected the use of long-term debt, while profitability made firms rely more on internal financing. This research

emphasized the importance of company-specific characteristics in financing decisions.

In Eastern and Central Europe, Matyif et al. (2013) analyzed 3,175 SMEs across seven countries. Their results showed that cash flows and growth opportunities were key factors determining capital structure. Larger and older companies showed a decrease in reliance on external financing, highlighting the role of internal financial resources.

Handu and Sharma (2014) studied 870 Indian companies across different industries over nine years. Their study showed that asset structure, tax rates, and debt-servicing ability significantly affected both short-term and long-term debt. These results highlighted the diversity of capital structure determinants across industries within the same economy.

In Lima, Peru, Gomez et al. (2014) studied 64 industrial firms from 2004 to 2008. Their results indicated that long-term debt was positively related to asset structure and profitability. This study contributed to understanding financing behavior in the industrial sector of emerging markets.

Zubaidi and Salama (2014) analyzed the capital structure of public Saudi companies. They found that asset structure and company size had a positive impact on long-term debt, while profitability had a negative effect. This study reflected the financial behavior of firms in a resource-rich economy.

Bhattacharya and Dash (2015) studied 20 firms in India's sugar industry. They found that companies relied on short-term debt and internal financing, with a positive impact of asset structure and profitability on long-term debt. This research provided insights into financing decisions within a capital-intensive sector.

In Portugal, Pacheco and Tavares (2015) analyzed SMEs in the footwear industry. Their results showed a negative relationship between total debt and profitability, indicating that companies in competitive sectors prioritize financial flexibility.

Alipour et al. (2015) studied the determinants of capital structure in Iranian industrial firms. The study highlighted the dominance of short-term debt, driven by company size, growth, and financial flexibility. Anwar and Chin (2016)

expanded on this research in Malaysia, proposing a comprehensive model that highlights growth, asset structure, and liquidity as key factors determining capital structure.

These studies collectively suggest that capital structure decisions are shaped by company-specific factors such as size, profitability, and asset structure, along with contextual factors such as market dynamics and industry characteristics.

Recent studies have expanded our understanding of capital structure by incorporating macroeconomic factors, institutional frameworks, and sustainability considerations.

In Africa, Bodie et al. (2018) analyzed listed industrial companies in Ghana from 2010 to 2016. They found that macroeconomic stability, reflected in inflation and interest rate fluctuations, had a significant impact on leverage decisions. Additionally, company-specific characteristics such as growth opportunities and ownership structure remained important.

In Asia, Nguyen et al. (2019) studied 400 non-financial companies in Vietnam over a decade. Their study emphasized the growing impact of governance structures and managerial ownership on debt levels. Profitability continued to show a negative relationship with leverage, while firms with higher export intensity were more reliant on external financing, reflecting the role of globalization.

In the Middle East, Amidu and Alajideh (2020) studied capital structure decisions in Gulf Cooperation Council (GCC) countries, considering oil price fluctuations as an influencing factor. Their results revealed that companies in resource-dependent economies tended to finance with equity during periods of oil price instability but preferred leverage during boom periods. These findings highlighted the role of major economic cycles in shaping financing decisions.

In Europe, Eriotis et al. (2019) studied SMEs in Greece from 2008 to 2017, focusing on the post-crisis period. Their results showed that companies faced constraints in accessing long-term debt, reinforcing the dominance of short-term financing. Company size, profitability, and asset convertibility became important factors, while regulatory changes following the crisis played a moderate role.

Emerging economies have attracted more attention in recent studies. Zahid et al. (2020) explored the determinants of capital structure in Pakistani textile firms, considering the impact of political instability alongside company-specific factors. Their study found that asset structure and liquidity had a positive impact on leverage, while political risks negatively affected debt capacity.

In Latin America, Contreras et al. (2021) analyzed 300 industrial companies in Chile, Colombia, and Argentina. Their results showed that financial development and access to capital markets had a significant impact on capital structures. Profitability continued to show a negative relationship with debt, consistent with the pecking order theory, while institutional factors such as creditor rights played a significant role.

The COVID-19 pandemic led to unprecedented challenges for capital structure decisions, driving the emergence of new research areas. Studies began exploring the effects of global disruptions, digital transformation, and sustainability practices on financing choices. Goyal et al. (2023) analyzed post-pandemic recovery strategies of SMEs in India and found that firms used government-backed loans to manage liquidity constraints, leading to a temporary increase in short-term debt. However, profitability and asset convertibility remained influential in long-term debt decisions. In Brazil, Almeida et al. (2023) studied 150 companies in the services sector and found that the pandemic increased reliance on equity financing due to cash flows and repayment drawbacks. Similarly, Chin et al. (2022) explored how digitalization adoption affected the capital structure of Chinese technology companies, revealing that investments in digital infrastructure made firms more likely to rely on equity financing due to higher risks. Bal et al. (2024) highlighted the role of adopting financial technology in improving access to short-term debt for SMEs in Bangladesh. Regarding sustainability, Duong et al. (2024) noted that environmental, social, and governance (ESG) considerations were increasingly affecting capital structure decisions. Their analysis of firms across Southeast Asia revealed that companies with higher ESG scores had lower debt levels, as investors favored investments in sustainable companies. In Europe, Schneider and Brown (2025) studied the impact of green financing on the capital

structure of German industrial firms, finding that the issuance of green bonds reduced reliance on traditional debt and increased financial flexibility.

There have also been sector-specific studies, such as Mohan and Devi (2022), who analyzed capital structure trends in India's renewable energy sector. Their results emphasized the importance of project financing and government incentives, with asset convertibility playing a vital role in securing long-term debt. In the Middle East and North Africa region, Khaled et al. (2025) studied financing behavior in energy firms, emphasizing oil price volatility and geopolitical risks as decisive factors. Recent studies have also utilized advanced economic techniques and interdisciplinary approaches to better understand the dynamics of capital structure. For instance, Ali et al. (2023) used the Generalized Method of Moments (GMM) estimators to address the dynamic nature of capital structure decisions and endogeneity issues. Barros et al. (2025) employed machine learning algorithms to predict leverage ratios, capturing non-linear relationships and real-time data to obtain more accurate insights. Additionally, behavioral finance perspectives have gained increasing attention, with researchers like Hassan et al. (2023) exploring the impact of managerial overconfidence and risk preferences on financing decisions.

3.2 Determinants of Capital Structure in the Energy Sector

The capital structure of companies in the energy sector is a multidimensional area influenced by company-specific determinants, industry-specific determinants, and macroeconomic determinants. These determinants, based on fundamental theories such as trade-off theory, pecking order theory, agency theory, and market timing theory, provide a complex understanding of how financial leverage decisions are formed within the sector.

- **Company-Specific Determinants**

  - **Profitability:** Profitability, typically measured using Return on Assets (ROA), has varied implications in capital structure theories. According to the pecking order theory, high profitability leads to higher retained earnings, reducing the need for external financing, particularly debt (Titman and Wessels, 1988; Rajan and Zingales, 1995; Frank and Goyal, 2009). This results in a negative relationship between profitability and leverage (Titman and Wessels, 1988). On

the other hand, the trade-off theory suggests a positive relationship, as higher profits allow firms to benefit from the tax shield on interest and reduce financial distress costs. Empirical studies, such as Rajan and Zingales (1995) and Frank and Goyal (2009), support the pecking order hypothesis, indicating a generally negative correlation between profitability and leverage. More recent studies examining oil and gas companies between 2000 and 2015 confirm that more profitable companies tend to use less debt, further supporting the pecking order theory (Macroeconomic Institute, 2015).

- **Non-Debt Tax Shields:** Non-debt tax shields, such as depreciation and amortization, serve as substitutes for debt-related tax shields. According to Dingell and Masulis (1980), companies with non-debt tax shields may exhibit lower leverage due to the reduced benefits from debt-related tax shields. In capital-intensive industries like energy, non-debt tax shields are significant (Dingell and Masulis, 1980; Baker and Martin, 2011). The trade-off theory predicts a negative relationship between non-debt tax shields and leverage, which is supported by studies in the energy sector.
- **Firm Size:** Firm size significantly affects leverage ratios. Larger firms typically face lower bankruptcy risks and lower transaction costs, resulting in higher leverage, as the trade-off theory suggests (Titman and Wessels, 1988). However, the pecking order theory suggests a negative relationship, as larger firms have the ability to generate internal funds and less information asymmetry (Frank and Goyal, 2009). Research on oil and gas firms in the Gulf Cooperation Council (GCC) countries indicates that larger firms tend to have higher leverage, aligning with the trade-off theory (Economics Journals, 2021).
- **Tangibility:** Tangibility, or the ratio of tangible assets, is used as collateral for debt, reducing financial distress costs. Both the trade-off and pecking order theories generally associate increased tangibility with higher leverage. In energy companies, tangible assets like real estate, factories, and equipment are crucial for securing debt, making tangibility a key determinant of capital structure (Berk and DeMarzo, 2020). Recent findings from oil and gas companies in GCC countries reinforce the positive relationship between tangibility and leverage (Economics Journals, 2021).

- **Growth Opportunities:** Companies with significant growth opportunities face higher agency costs due to potential conflicts between management and bondholders. Thus, the trade-off theory predicts a negative relationship between growth opportunities and leverage (Myers, 1977). However, the pecking order theory predicts a positive relationship when retained earnings are insufficient to fund growth. Empirical studies often use the market-to-book ratio as a proxy for growth opportunities. It is noteworthy that recent research found growth opportunities to be less significant in the oil and gas sector in GCC countries (Economics Journals, 2021).
- **Dividend Policy:** Dividend payments affect leverage through agency costs and information asymmetry. According to agency theory, higher dividends reduce free cash flow, compensating for debt in reducing agency costs, leading to lower leverage. However, the pecking order theory provides mixed predictions, with evidence suggesting that firms paying dividends tend to have lower leverage (Frank and Goyal, 2009).
- **Volatility:** Volatility, representing a risk indicator, negatively affects leverage according to the trade-off theory, as firms with higher volatility face higher bankruptcy risks. However, the pecking order theory predicts a positive relationship, as volatile firms face higher equity issuance costs. Empirical results tend to support the trade-off theory in the energy sector.
- **Liquidity:** Liquidity measures the firm's ability to meet short-term obligations. The pecking order theory suggests a negative relationship between liquidity and leverage, as liquid assets reduce reliance on external financing. On the other hand, the trade-off theory suggests a positive relationship, focusing on reducing bankruptcy costs associated with high liquidity (Desommsac et al., 2004).

- **Industry-Specific Determinants**

- **Industry Average Leverage:** Industry norms influence firms' leverage decisions. Frank and Goyal (2009) suggest that firms tend to align their capital structures with the industry average leverage, which serves as a benchmark for financial risk and debt capacity (Frank and Goyal, 2009; Jaworski and

Cheronka, 2021). In energy industries, where capital intensity is high, industry average leverage has a significant effect.

- Macroeconomic Determinants

- **Stock Market Conditions (MSCI):** The global MSCI index, which reflects stock market conditions, is inversely related to leverage (Frank and Goyal, 2009; MSCI, 2022). Emerging markets reduce leverage, which aligns with market timing theory, advocating equity issuance during favorable market conditions.
- **Debt Market Conditions (Interest Rate Spread):** The spread between long-term and short-term interest rates serves as an indicator of economic performance. Both the trade-off and pecking order theories predict a negative relationship between interest rate spreads and leverage, especially during recessions, where lower spreads indicate higher bankruptcy risks.
- **GDP Growth:** Economic cycles significantly affect leverage decisions (Gertler and Gilchrist, 1993; Halling et al., 2016). During expansion periods, firms tend to increase capital due to higher profitability and reduced bankruptcy risks, while recessions lead to reduced leverage. The pecking order theory supports a negative relationship between GDP growth and leverage, as internal funds increase during periods of economic growth.
- **Oil Prices (Brent):** Fluctuations in oil prices directly affect the capital structures of energy firms. Rising oil prices lead to increased revenues and reduced financial distress, enhancing leverage according to the trade-off theory (Dropits et al., 2013; Holm-Hadula and Hoprich, 2017). On the other hand, the pecking order theory predicts a negative relationship due to higher retained earnings during price hikes.

✓ **Researcher's Comment on Literature Review and Research Gap**

The determinants of capital structure in the energy sector are influenced by a complex interplay of firm-related, industry-related, and macroeconomic factors. While theoretical models offer conflicting predictions, empirical research highlights key determinants such as profitability, non-debt tax shields, tangibility, and broader macroeconomic conditions. Recent studies emphasize how these

factors uniquely affect energy firms, providing valuable insights for policymakers and managers aiming to improve financial strategies within the sector.

Current literature on the determinants of capital structure covers diverse regions and industries, with key factors such as profitability, firm size, tangibility, growth opportunities, and macroeconomic influences like oil price fluctuations and economic conditions (Frank & Goyal, 2009; Drobetz et al., 2013; Amidu & Alagidede, 2020). However, studies focusing specifically on the energy sector in the MENA region remain limited. This is a notable point given the region's unique economic structure, characterized by oil dependence, diverse financial markets, and vulnerability to geopolitical risks (Khaled et al., 2025). Existing research often overlooks how regional factors, such as oil price fluctuations, affect financial leverage decisions in resource-rich economies like those in the MENA region (Amidu & Alagidede, 2020).

Another limitation in previous research is the heavy reliance on traditional economic models, which tend to overlook issues like heteroskedasticity and regional differences when analyzing panel data (Ali et al., 2023; Barros et al., 2025). These models often fail to capture the dynamic relationships between firm-specific, industry-specific, and macroeconomic factors, particularly in the energy sector within the MENA region. Advanced methodologies such as Weighted Least Squares (WLS) regression, which address heteroskedasticity and enhance the robustness of results, remain underutilized in studies within this context.

In light of these gaps, this research aims to apply panel data analysis using Weighted Least Squares (WLS) regression to examine the determinants of capital structure for energy firms in the MENA region. By leveraging this advanced methodology, the research offers more accurate and region-specific insights, contributing to the existing literature by bridging regional and methodological gaps. This approach is crucial for understanding the complex financial behavior of firms in the energy sector in the MENA region and for guiding policy and management decisions (Khaled et al., 2025; Ali et al., 2023).

Figure (1) shows the main empirical model used to test 3 main alternative hypotheses of this research with 13 sub-hypotheses for each one, as shown below:

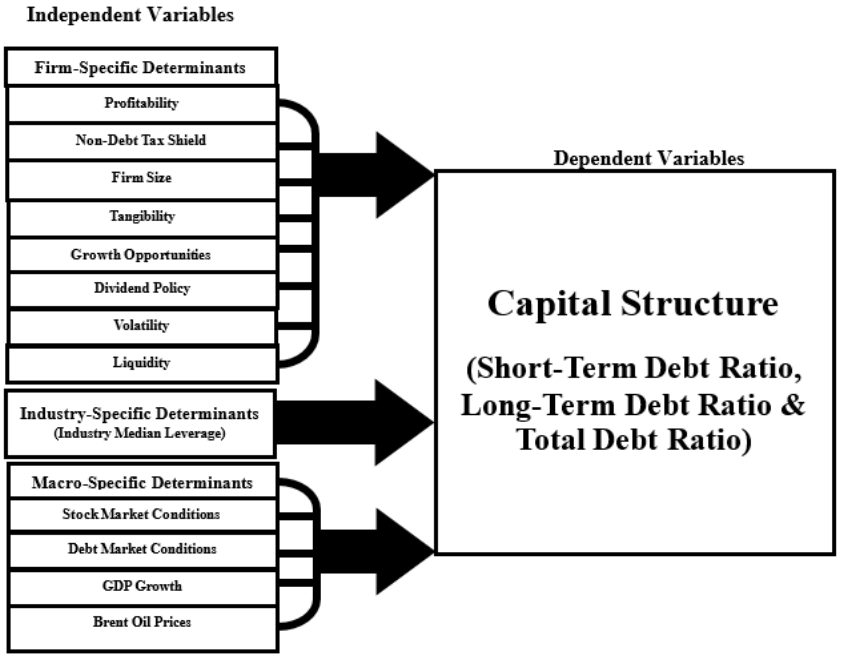

Figure 1: The General Empirical Model

Source: prepared by the researcher

Based on all the above, the following 3 main alternative hypotheses with 13 sub-hypotheses for each one have been formulated to achieve the research objective:

H1: There is a significant impact of capital structure determinants on capital structure measured by short-term debt ratio.

H1_1: There is a significant impact of profitability capital structure determinant on capital structure measured by short-term debt ratio.

H1_2: There is a significant impact of non-debt tax shield capital structure determinant on capital structure measured by short-term debt ratio.

H1_3: There is a significant impact of firm size capital structure determinant on capital structure measured by short-term debt ratio.

H1_4: There is a significant impact of tangibility capital structure determinant on capital structure measured by short-term debt ratio.

H1_5: There is a significant impact of growth opportunities capital structure determinant on capital structure measured by short-term debt ratio.

H1_6: There is a significant impact of dividend policy capital structure determinant on capital structure measured by short-term debt ratio.

H1_7: There is a significant impact of volatility capital structure determinant on capital structure measured by short-term debt ratio.

H1_8: There is a significant impact of liquidity capital structure determinant on capital structure measured by short-term debt ratio.

H1_9: There is a significant impact of industry median leverage capital structure determinant on capital structure measured by short-term debt ratio.

H1_10: There is a significant impact of stock market conditions capital structure determinant on capital structure measured by short-term debt ratio.

H1_11: There is a significant impact of debt market conditions capital structure determinant on capital structure measured by short-term debt ratio.

H1_12: There is a significant impact of GDP growth capital structure determinant on capital structure measured by short-term debt ratio.

H1_13: There is a significant impact of brent oil prices capital structure determinant on capital structure measured by short-term debt ratio.

H2: There is a significant impact of capital structure determinants on capital structure measured by long-term debt ratio.

H2_1: There is a significant impact of profitability capital structure determinant on capital structure measured by long-term debt ratio.

H2_2: There is a significant impact of non-debt tax shield capital structure determinant on capital structure measured by long-term debt ratio.

H2_3: There is a significant impact of firm size capital structure determinant on capital structure measured by long-term debt ratio.

H2_4: There is a significant impact of tangibility capital structure determinant on capital structure measured by long-term debt ratio.

H2_5: There is a significant impact of growth opportunities capital structure determinant on capital structure measured by long-term debt ratio.

H2_6: There is a significant impact of dividend policy capital structure determinant on capital structure measured by long-term debt ratio.

H2_7: There is a significant impact of volatility capital structure determinant on capital structure measured by long-term debt ratio.

H2_8: There is a significant impact of liquidity capital structure determinant on capital structure measured by long-term debt ratio.

H2_9: There is a significant impact of industry median leverage capital structure determinant on capital structure measured by long-term debt ratio.

H2_10: There is a significant impact of stock market conditions capital structure determinant on capital structure measured by long-term debt ratio.

H2_11: There is a significant impact of debt market conditions capital structure determinant on capital structure measured by long-term debt ratio.

H2_12: There is a significant impact of GDP growth capital structure determinant on capital structure measured by long-term debt ratio.

H2_13: There is a significant impact of brent oil prices capital structure determinant on capital structure measured by long-term debt ratio.

H3: There is a significant impact of capital structure determinants on capital structure measured by total debt ratio.

H3_1: There is a significant impact of profitability capital structure determinant on capital structure measured by total debt ratio.

H3_2: There is a significant impact of non-debt tax shield capital structure determinant on capital structure measured by total debt ratio.

H3_3: There is a significant impact of firm size capital structure determinant on capital structure measured by total debt ratio.

H3_4: There is a significant impact of tangibility capital structure determinant on capital structure measured by total debt ratio.

H3_5: There is a significant impact of growth opportunities capital structure determinant on capital structure measured by total debt ratio.

H3_6: There is a significant impact of dividend policy capital structure determinant on capital structure measured by total debt ratio.

H3_7: There is a significant impact of volatility capital structure determinant on capital structure measured by total debt ratio.

H3_8: There is a significant impact of liquidity capital structure determinant on capital structure measured by total debt ratio.

H3_9: There is a significant impact of industry median leverage capital structure determinant on capital structure measured by total debt ratio.

H3_10: There is a significant impact of stock market conditions capital structure determinant on capital structure measured by total debt ratio.

H3_11: There is a significant impact of debt market conditions capital structure determinant on capital structure measured by total debt ratio.

H3_12: There is a significant impact of GDP growth capital structure determinant on capital structure measured by total debt ratio.

H3_13: There is a significant impact of brent oil prices capital structure determinant on capital structure measured by total debt ratio.

4. METHODOLOGY

4.1 Data and Sample Selection

This research divides the sample into three subregions: The Gulf, which includes the six GCC countries along with Iran; the Levant, which includes Egypt, Iraq, Israel, Jordan, Lebanon, Palestine, and Syria; and the Maghreb, covering Algeria, Libya, Morocco, and Tunisia (Hafner et al., 2023).

For hypothesis testing, the study uses data from 14 companies based in the UAE, Saudi Arabia, and Egypt, covering the period from 2018 to 2022. These countries are selected as representatives of the energy sector in the MENA region, as they collectively account for half of the expected energy investments in the region. Between 2019 and 2023, the MENA region is expected to need an additional 88 GW of power, requiring an estimated investment of around $142 billion in generation and $68 billion in transmission and distribution (T&D). Currently, around 87 GW of generation capacity is under development, with 74 GW expected to be operational in the next five years. The UAE leads this expansion (19%), followed by Saudi Arabia (17%) and Egypt (16%) (www.apicorp.org).

To confirm the reliability of the data, the study follows the methodology of Elgayar et al. (2024) and uses data from 14 specific companies: UAE (TAQA, ADNOC, Borouge, and Dana Gas), Saudi Arabia (Bahri, Saudi Aramco, ACWA Power, Ma'aden, Marafiq, and SABIC), and Egypt (National Drilling Company, Marine Petroleum, EGAS, and TransGlobe). The annual data is constructed using financial data obtained from Bloomberg's database.

This study examines the determinants of capital structure in the energy sector of the MENA region, with a focus on capital structure as the dependent variable and a set of firm-related, industry-related, and macroeconomic factors as independent variables. The chosen variables and their measurement methods are based on theoretical and empirical literature.

The study uses three measures to assess capital structure: the short-term debt-to-total-assets ratio, the long-term debt-to-total-assets ratio, and the total debt-to-total-assets ratio. The short-term debt ratio is important for loan acquisition, as Nguyen and Ramachandran (2006) note that lenders check the level of short-term debt before extending credit. The long-term debt ratio is used due to its stability and frequent use as a component of capital structure (Holmes & Kasar, 2003). The total debt ratio represents the primary measure of financing policy and capital structure. Drobetz and Fix (2003) point out that, although studies differ on the most suitable measure for capital structure evaluation, the total debt ratio is widely used in many studies.

The first independent variable, profitability, is measured using Return on Assets (ROA), which is net income divided by total assets. This variable is crucial for testing the Pecking Order Theory, which predicts a negative relationship between profitability and leverage, and the Trade-Off Theory, which predicts a positive relationship (Titman & Wessels, 1988; Baker & Martin, 2011).

The second independent variable, firm size, is measured as the natural logarithm of total assets. This variable assesses the relationship between firm size and leverage, as larger companies are expected to have higher leverage due to lower bankruptcy risk and transaction costs (Frank & Goyal, 2009; Ozkan, 2001).

Tangibility, another key determinant, is defined as the ratio of net property, plant, and equipment (PPE) to total assets. Tangible assets are considered collateral for debt, and are expected to positively affect leverage according to the Trade-Off Theory (Titman & Wessels, 1988; Berk & DeMarzo, 2020).

Growth opportunities are represented by the market-to-book ratio, which is the market value of equity divided by the book value of equity. High-growth companies are generally associated with lower leverage due to agency costs linked to debt financing (Myers, 1977).

Non-debt tax shields (NDTS) are measured as the ratio of depreciation and amortization to total assets. This measure examines the substitution effect between non-debt tax shields and the interest tax shield, as described by DeAngelo and Masulis (1980).

Volatility is also a determinant and is calculated as the standard deviation of daily stock returns over three years. Companies with higher volatility are expected to have lower leverage due to increased bankruptcy risks, in line with the Trade-Off Theory (Frank & Goyal, 2009).

Liquidity is measured as the ratio of current assets to current liabilities. The Pecking Order Theory predicts a negative relationship between liquidity and leverage, as companies with high liquidity tend to rely more on internal financing (Deesomsa et al., 2004).

Industry-specific and macroeconomic factors are also integrated into the analysis. The average industry leverage ratio within the energy sector is calculated as the debt-to-capital ratio and serves as a reference for the leverage of firms, reflecting industry financial standards (Frank & Goyal, 2009; Rajan & Zingales, 1995). Among the macroeconomic factors, GDP growth is measured as the annual change in GDP, representing macroeconomic stability (Frank & Goyal, 2009; World Bank, 2023). The Brent oil price is measured as the annual change in the price of Brent crude oil to capture external shocks in the energy market (Drobots et al., 2013; U.S. Energy Information Administration, 2023).

Additionally, MSCI returns represent the stock market conditions (MSCI, 2022; Pagano et al., 2001), while the difference between the 10-year and 1-year government bond yields is used to assess debt market conditions (Barro et al., 2008; Federal Reserve Economic Data, 2023). By integrating these variables, the study ensures a comprehensive analysis that accounts for industry-specific and general macroeconomic influences.

4.2 Analytical Framework

Panel data, as defined in econometrics, consists of observations gathered across multiple variables over different time periods for the same individuals, entities, or units. This type of multidimensional data allows for the analysis of changes over time. Panel data analysis is a common tool in fields like social sciences and economics, as it provides a robust statistical framework for studying data that involves repeated measurements of the same subjects (Adefemi, 2017).

In this study, secondary panel data collected from 2018 to 2022 is analyzed. The methodology includes descriptive statistics and statistical models based on panel data to extract insights.

4.2.1 Descriptive Analysis

Descriptive analysis is a statistical approach used to summarize and visualize data patterns and distributions. It provides an overview of the dataset's characteristics using tools such as charts, graphs, and frequency distributions. Common metrics, including the mean, median, and standard deviation, help assess central tendency and variability (Anggraeni et al., 2021). This method is crucial for uncovering key trends and features in the data.

4.2.2 Panel Data Regression Analysis

A general panel data regression model can be expressed as follows (Adefemi, 2017):

$$Y_{it} = a + bX_{it} + \varepsilon_{it}$$

Where:

- Y_{it} denotes the dependent variable,
- X_{it} represents the independent or explanatory variable,
- **a** and **b** are coefficients to be estimated,
- **i** and **t** correspond to the individual and time indices, respectively,
- ε_{it} is the error term.

Three primary approaches for panel data regression analysis are commonly used (Adefemi, 2017):

- **Independently Pooled OLS Regression Model**

  This method pools data across time and units, treating observations as independent. While straightforward, it assumes homogeneity and does not account for unit-specific or time-related effects, which can result in biased estimates (Ramadan, 2017; Wooldridge, 2010). Consequently, it is

less suitable for complex data structures compared to fixed or random effects models.

- **Fixed Effects Model (FEM)**

  FEM accounts for heterogeneity by assigning unique intercepts to each unit, effectively isolating the influence of time-invariant factors on the dependent variable. This approach focuses on within-unit variations and controls for unobserved characteristics, providing unbiased estimates when individual-specific effects are significant (Amer, 2015; Wooldridge, 2010).

- **Random Effects Model (REM)**

  REM assumes that individual-specific effects are uncorrelated with explanatory variables and accounts for variability across both units and time periods. This method is efficient when the assumption of no correlation holds (Baltagi, 2008). The choice between FEM and REM depends on whether individual-specific effects correlate with independent variables (Wooldridge, 2010).

Statistical tests guide model selection:

- **Breusch-Pagan Test**: Assesses the significance of individual effects to decide between pooled and random effects models. Significant effects favor the REM (Breusch & Pagan, 1980; Greene, 2020).
- **Hausman Test**: Compares FEM and REM. A p-value below 0.05 indicates correlation between individual effects and explanatory variables, favoring FEM (Wooldridge, 2010; Baltagi, 2014).

These tests ensure the chosen model aligns with the dataset's structure, enhancing analytical reliability (Le, 2015).

Addressing Heteroskedasticity

Heteroskedasticity refers to non-constant variance in error terms, which can bias estimates and distort hypothesis testing in regression models. In pooled models,

this issue arises from assuming uniformity across units despite differences in residual variances (Greene, 2020).

The **White Test** (White, 1980) detects heteroskedasticity by analyzing the relationship between independent variables and squared residuals. A small p-value suggests rejecting the null hypothesis of homoscedasticity. While flexible, the test may over-reject the null in small samples or when autocorrelation or model specification issues exist (Davidson & MacKinnon, 1993).

To address heteroskedasticity, the **Weighted Least Squares (WLS)** method is often recommended. WLS adjusts for varying error variances, providing more efficient and unbiased estimates by assigning weights based on error variance (Gujarati & Porter, 2009; Greene, 2018). For more complex scenarios, such as when both heteroskedasticity and autocorrelation are present, **Generalized Least Squares (GLS)** offers a more comprehensive solution (Baltagi, 2013; Greene, 2018).

5. RESULTS AND DISCUSSION

5.1 Descriptive Analysis

Based on Table (3), the descriptive statistics in Panel A provide valuable insights into the variables that affect capital structure in energy companies in the Middle East and North Africa (MENA) region. The average profitability is 0.12 with a standard deviation of 0.13, indicating significant variation across the sample. This aligns with previous studies that highlight the diversity in operational efficiency and profitability within the energy sector (Titman and Wessels, 1988). Company size, with an average of 9.60 and a standard deviation of 3.00, suggests the dominance of large companies in the sample, possibly due to their ability to access capital markets. This result supports the pecking order theory, which assumes that large companies tend to prefer internal financing over debt due to reduced asymmetric information (Myers and Majluf, 1984). Tangibility, with an average of 0.56, underscores the important role of tangible assets in energy companies, as these assets are used as collateral to reduce borrowing costs, in line with the trade-off theory (Rajan and Zingales, 1995).

The descriptive statistics also show moderate growth opportunities, with an average of 0.26 and a standard deviation of 0.17, in line with theories suggesting that companies with high growth prospects avoid excessive debt to reduce financial distress (Jensen, 1986). The average value of 1 for dividend policy indicates that many companies distribute dividends regularly, reducing their reliance on external financing. Economic-specific variables such as crude oil price growth show an average of 69.88 with significant variation (standard deviation = 18.99), reflecting the exposure of the energy sector to global oil price fluctuations, a critical factor affecting financial decisions (Bashir et al., 2012). Debt ratios—short-term debt to assets (average = 0.19), long-term debt to assets (average = 0.31), and total debt to assets (average = 0.50)—indicate that companies in the sector adopt a balanced approach to leverage, using a mix of short- and long-term debt.

The correlation matrix in Panel B shows the relationships between the variables, but it does not show their causal effects, which require regression analysis. Profitability is negatively correlated with all three leverage measures: short-term debt to assets (r = -0.24), long-term debt to assets (r = -0.17), and total debt to assets (r = -0.32). This aligns with the pecking order theory, which suggests that profitable companies rely more on internal funds and less on external debt (Myers and Majluf, 1984). On the other hand, growth opportunities show a strong positive correlation with short-term debt to assets (r = 0.69) but a negative correlation with long-term debt to assets (r = -0.28), indicating that companies with high growth potential prefer short-term debt to meet immediate financing needs while avoiding long-term obligations to maintain financial flexibility (Jensen, 1986).

It is important to note that none of the correlations in the matrix exceed 0.80, which alleviates immediate concerns about multicollinearity, which could undermine the credibility of regression results (Kothari et al., 2004). Tangibility is positively correlated with the long-term debt to assets ratio (r = 0.40), confirming its role in securing long-term debt through collateral (Rajan and Zingales, 1995). Crude oil price growth shows a strong negative correlation with industry-specific variables, such as stock market conditions (r = -0.83),

highlighting the sector's sensitivity to macroeconomic shocks (Bashir et al., 2012). Negative correlations between liquidity and all three leverage measures suggest that companies with higher liquidity prefer internal financing, reducing their reliance on debt, consistent with the trade-off theory's focus on reducing financial distress costs (Kraus and Litzenberger, 1973).

In summary, the descriptive statistics and correlation analysis provide valuable preliminary insights into the relationships between variables that affect capital structure in energy companies in the MENA region. However, regression analysis is necessary to determine the causal effects of these variables. The data suggests that profitability, tangibility, and growth opportunities are important factors, while macroeconomic variables such as oil price growth add another layer to financial decisions in this sector. Future analysis should also consider potential outliers and explore segmented or dynamic trends to better capture the precise determinants of capital structure across the region.

Table (3): Describing Research Variables

Panel A: Descriptive Statistics

	Independent Variables												*Dependent Variables*		
	Firm-Specific Determinants							*Industry-Specific Determinants*	*Macro-Specific Determinants*						
	Profitability	*Non-Debt Tax Shield*	*Firm Size*	*Tangibility*	*Growth Opportunities*	*Dividend Policy*	*Volatility*	*Liquidity*	*Industry Median Leverage*	*Stock Market Conditions*	*Debt Market Conditions*	*GDP Growth*	*Brent Oil Price Growth*	*Short-Term D/A Ratio*	*Long-Term D/A Ratio*	*Total D/A Ratio*
Mean	0.12	0.07	9.60	0.56	0.26	0.53	1.61	1.97	1.87	-0.09	0.76	1.53	69.88	0.19	0.31	0.50
Median	0.09	0.03	10.01	0.65	0.21	1	0.58	1.64	0	-2.54	0.87	1.68	70.86	0.12	0.34	0.53
Standard Deviation	0.13	0.12	3.00	0.24	0.17	0.50	3.76	1.50	2.18	16.22	0.46	2.73	18.99	0.18	0.20	0.24
Count	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70

(Source: Excel 2019)

Panel B: Correlations Matrix

			Independent Variables													*Dependent Variables*		
			Firm-Specific Determinants								*Industry-Specific Determinants*	*Macro-Specific Determinants*						
			Profitability	*Non-Debt Tax Shield*	*Firm Size*	*Tangibility*	*Growth Opportunities*	*Dividend Policy*	*Volatility*	*Liquidity*	*Industry Median Leverage*	*Stock Market Conditions*	*Debt Market Conditions*	*GDP Growth*	*Brent Oil Price Growth*	*Short-Term D/A Ratio*	*Long-Term D/A Ratio*	*Total D/A Ratio*
Independent Variables	**Firm-Specific Determinants**	**Profitability**	1															
		Non-Debt Tax Shield	-0.04	1														
		Firm Size	0.53	0.10	1													
		Tangibility	0.17	0.26	0.11	1												
		Growth Opportunities	0.01	-0.18	0.08	-0.56	1											
		Dividend Policy	0.21	-0.17	0.42	-0.42	0.36	1										
		Volatility	0.23	0.10	-0.02	0.05	0.03	0.05	1									
		Liquidity	0.19	-0.15	-0.06	0.06	0.06	0.07	0.01	1								
	Industry-Specific Determinants	**Industry Median Leverage**	0.18	0.35	0.57	0.12	-0.17	0.18	-0.09	-0.11	1							
	Macro-Specific Determinants	**Stock Market Conditions**	-0.04	0.02	0.08	0.17	-0.07	0.00	0.07	-0.14	0.000	1						
		Debt Market Conditions	0.07	0.02	-0.02	-0.07	0.05	-0.04	-0.01	0.10	0.000	-0.66	1					
		GDP Growth	0.09	0.00	-0.02	-0.10	0.09	0.02	-0.05	0.15	0.000	-0.70	0.58	1				
		Brent Oil Price Growth	0.05	-0.01	-0.05	-0.15	0.09	0.04	-0.09	0.14	0.000	-0.83	0.35	0.83	1			
Dependent Variables		**Short-Term D/ A Ratio**	-0.24	-0.13	-0.03	-0.35	0.69	0.08	-0.08	-0.41	-0.298	-0.01	0.09	0.07	0.03	1		
		Long-Term D/ A Ratio	-0.17	0.45	0.17	0.40	-0.28	-0.12	-0.20	-0.17	0.394	-0.06	0.07	0.00	0.01	-0.19	1	
		Total D/ A Ratio	-0.32	0.28	0.12	0.07	0.28	-0.04	-0.22	-0.45	0.107	-0.05	0.12	0.05	0.03	0.58	0.69	1

(Source: Excel 2019)

5.2 Panel Data Regression Analysis

5.2.1 Comment on WLS Model for Short-Term Debt to Assets Ratio

Using table (4), the Breusch-Pagan test suggests that the pooled OLS model is appropriate since the test is not significant (p-value > 0.10), meaning that there is no strong evidence for random effects. However, the White test indicates the presence of heteroscedasticity (p = 0.0162). In such cases, using the WLS (Weighted Least Squares) model is necessary to obtain efficient and unbiased estimates (Gujarati & Porter, 2009). WLS corrects heteroscedasticity by assigning weights to different observations based on variance structures, improving the reliability of coefficient estimates.

The results from the WLS model indicate a significant impact of certain firm-specific and industry-specific determinants on the short-term debt-to-assets ratio, while macroeconomic factors show a limited role.

- Firm-Specific Determinants

- **Profitability (H1_1):** The coefficient remains negative and significant (-0.1583, p = 0.0157), confirming that more profitable firms tend to rely less on short-term debt, aligning with the pecking order theory (Myers & Majluf, 1984).
- **Non-Debt Tax Shield (H1_2):** Not significant in both models, suggesting that depreciation and tax deductions do not influence short-term debt decisions (Titman & Wessels, 1988).
- **Firm Size (H1_3):** While insignificant in the pooled model, it becomes marginally significant in the WLS model (p = 0.0822), suggesting that larger firms may have better access to short-term financing, consistent with Rajan & Zingales (1995).
- **Tangibility (H1_4):** Becomes significant in WLS (0.0883, p = 0.0498), indicating that firms with more tangible assets have greater access to short-term credit, aligning with trade-off theory.

- **Growth Opportunities (H1_5):** Highly significant in both models ($p < 0.0001$), showing that growing firms rely more on short-term debt to finance expansion.
- **Dividend Policy (H1_6):** Remains insignificant, implying that dividend payments do not strongly affect short-term borrowing decisions.
- **Volatility (H1_7):** Becomes significant and negative in WLS (-0.00546, $p = 0.0036$), suggesting that firms with higher earnings volatility prefer lower short-term debt levels, in line with risk-averse behavior (Booth et al., 2001).
- **Liquidity (H1_8):** Remains highly significant and negative (-0.05276, $p < 0.0001$), reinforcing that firms with higher liquidity rely less on short-term debt (Ozkan, 2001).

- Industry-Specific Determinants

- **Industry Median Leverage (H1_9):** More significant in WLS (-0.02467, $p < 0.0001$), suggesting firms benchmark their short-term leverage to industry norms, supporting institutional theories of capital structure.

- Macro-Specific Determinants

- **Stock Market Conditions (H1_10) & Debt Market Conditions (H1_11):** Insignificant, implying external financial conditions do not strongly impact short-term debt choices.
- **GDP Growth (H1_12) & Brent Oil Prices (H1_13):** Remain non-significant, indicating macroeconomic factors play a minor role in short-term capital structure adjustments.

✓ The R^2 of WLS (90.7%) is significantly higher than the pooled model (81.9%), suggesting better explanatory power.

✓ The adjusted R^2 **(88.5%)** indicates that the WLS model explains a large proportion of variance in short-term debt.

✓ The F-statistic is highly significant ($p < 0.0001$), confirming strong overall model validity.

The WLS model effectively addresses heteroscedasticity and provides more reliable estimates. Key determinants such as **profitability, firm size, tangibility, growth opportunities, volatility, liquidity, and industry median leverage** significantly influence short-term debt usage. The findings align with major capital structure theories, reinforcing the validity of WLS in this study.

Table 4: Panel Data Regression Analysis Models (Short-Term D/ A Ratio)

Variables/ Model		Pooled Effects				Weighted Least Squares (WLS)			
		Coefficient	T	Sig. T	Result	Coefficient	T	Sig. T	Result
C		−0.108431	−0.6320	0.5300	Not Significant	0.0232306	0.2158	0.8299	Not Significant
Firm-Specific Determinants	Profitability	−0.264995	−2.672	0.0098	Significant Negative	−0.158303	−2.492	0.0157	Significant Negative
	Non-Debt Tax Shield	−0.0574037	−0.5913	0.5567	Not Significant	−0.0209942	−0.4476	0.6561	Not Significant
	Firm Size	0.00893531	1.610	0.1129	Not Significant	0.00756537	1.770	0.0822	Significant Positive
	Tangibility	0.0923806	1.563	0.1237	Not Significant	0.0883267	2.005	0.0498	Significant Positive
	Growth Opportunities	0.781924	10.33	<0.0001	Significant Positive	0.829526	13.94	<0.0001	Significant Positive
	Dividend Policy	−0.0275748	−1.028	0.3083	Not Significant	−0.00994044	−0.5792	0.5648	Not Significant
	Volatility	−0.00336460	−1.159	0.2513	Not Significant	−0.00546322	−3.039	0.0036	Significant Negative
	Liquidity	−0.0552022	−7.565	<0.0001	Significant Negative	−0.0527645	−9.299	<0.0001	Significant Negative
Industry-Specific Determinants	Industry Median Leverage	−0.0215245	−3.372	0.0014	Significant Negative	−0.0246656	−4.935	<0.0001	Significant Negative
Macro-Specific Determinants	Stock Market Conditions	0.00241914	1.196	0.2367	Not Significant	0.000840450	0.6777	0.5007	Not Significant
	Debt Market Conditions	0.0797009	1.557	0.1250	Not Significant	0.0289489	0.9171	0.3630	Not Significant
	GDP Growth	0.000788024	0.07687	0.9390	Not Significant	0.00326437	0.5180	0.6065	Not Significant
	Brent Oil Price Growth	0.00151953	0.7295	0.4687	Not Significant	−8.20719e-05	−0.06393	0.9493	Not Significant
R^2		81.9%				90.7%			
Adjusted R^2		77.8%				88.5%			
F		19.55258				41.77054			
Sig. F		3.06e-16				5.18e-24			
Sig. Breusch-Pagan Test		>0.10							
Appl. Model		Pooled Effects Model is Appropriate							
Sig. White Test		0.0161595							
Decision		Heteroscedasticity is Present							

(Source: Gretl 2024)

5.2.2 *Comment on Pooled Panel Data Regression Model for Long-Term D/A Ratio*

Moving to table (5), the Breusch-Pagan test indicates that the pooled model is appropriate (p-value > 0.10), meaning that there is no strong evidence of random effects, making the pooled OLS method a valid choice. Additionally, the White test confirms the absence of heteroscedasticity (p = 0.3476), ensuring that standard OLS estimates remain unbiased and efficient (Gujarati & Porter, 2009). Based on these results, the use of a panel data regression model is statistically appropriate for analyzing the determinants of the long-term debt-to-assets ratio (D/A).

The findings highlight the significant role of profitability, non-debt tax shields, and tangibility in determining the long-term debt ratio. In contrast, other firm-specific factors and macroeconomic factors do not show a significant impact.

- Firm-Specific Determinants

- **Profitability (H2_1):** The coefficient is negative and significant (-0.4399, p = 0.0224), confirming that more profitable firms rely less on long-term debt. This aligns with the pecking order theory (Myers & Majluf, 1984), which suggests that firms prefer internal financing over external debt due to lower costs and asymmetric information.
- **Non-Debt Tax Shield (H2_2):** The coefficient is positive and significant (0.4461, p = 0.0182), indicating that firms with higher non-debt tax shields (e.g., depreciation, amortization) tend to use more long-term debt. This finding is consistent with DeAngelo & Masulis (1980), who argue that firms with greater tax shields substitute them for debt-related tax benefits.
- **Firm Size (H2_3):** Insignificant (p = 0.5084), suggesting that larger firms do not necessarily have higher long-term debt reliance. This contrasts with prior studies that often find a positive correlation (Rajan & Zingales, 1995).
- **Tangibility (H2_4):** Positive and significant (0.3540, p = 0.0025), indicating that firms with more tangible assets tend to have higher long-term debt levels. This supports the trade-off theory, which posits that firms with more collateral can secure long-term debt at lower costs (Harris & Raviv, 1991).
- **Growth Opportunities (H2_5):** Insignificant (p = 0.9775), suggesting that firms' growth prospects do not influence long-term debt financing decisions. This is consistent with agency theory, which states that firms with high growth opportunities may avoid long-term debt to reduce agency costs (Jensen & Meckling, 1976).
- **Dividend Policy (H2_6):** Insignificant (p = 0.3988), indicating that dividend payments do not affect long-term debt decisions.
- **Volatility (H2_7):** Insignificant (p = 0.1314), implying that earnings fluctuations do not significantly deter firms from using long-term debt.

- **Liquidity (H2_8):** Insignificant (p = 0.3403), meaning higher cash reserves do not strongly influence long-term debt choices, possibly due to firms' strategic cash management policies (Ozkan, 2001).

- Industry-Specific Determinants

- **Industry Median Leverage (H2_9):** Insignificant (p = 0.1346), indicating that industry norms do not significantly impact long-term debt levels, contrary to previous findings (Booth et al., 2001).

- Macro-Specific Determinants

- **Stock Market Conditions (H2_10) & Debt Market Conditions (H2_11):** Insignificant, implying that external financial conditions do not significantly impact long-term debt decisions.

- **GDP Growth (H2_12) & Brent Oil Prices (H2_13):** Insignificant, suggesting that macroeconomic factors do not directly affect firms' long-term debt ratios in the MENA energy sector.

✓ R^2 = **49%**, meaning that nearly half of the variation in long-term D/A ratio is explained by the model.

✓ **Adjusted R^2 = 37.2%**, indicating a moderate explanatory power.

✓ **F-statistic = 4.138 (p = 0.0001)** confirms that the model is statistically significant overall.

The pooled regression model provides **statistically valid** and **economically meaningful** insights into long-term debt determinants in MENA energy firms. The findings highlight that:

- **Profitability negatively affects long-term debt**, supporting the **pecking order theory.**
- **Non-debt tax shields positively impact long-term debt**, consistent with **tax substitution effects.**
- **Tangibility is a key determinant**, reinforcing the **trade-off theory.**

- Other factors, including **firm size, growth opportunities, and macroeconomic conditions, do not significantly influence long-term debt decisions.**

These results offer valuable implications for financial managers and policymakers in optimizing capital structure strategies.

Table 5: Panel Data Regression Analysis Model (Long-Term D/ A Ratio)

Variables/ Model		Pooled Effects			
		Coefficient	T	Sig. T	Result
C		0.126059	0.3891	0.6987	Not Significant
Firm-Specific Determinants	Profitability	−0.439883	−2.349	0.0224	Significant Negative
	Non-Debt Tax Shield	0.446101	2.434	0.0182	Significant Positive
	Firm Size	0.00697294	0.6656	0.5084	Not Significant
	Tangibility	0.353999	3.172	0.0025	Significant Positive
	Growth Opportunities	−0.00404467	−0.02830	0.9775	Not Significant
	Dividend Policy	0.0430591	0.8502	0.3988	Not Significant
	Volatility	−0.00839142	−1.531	0.1314	Not Significant
	Liquidity	−0.0132504	−0.9617	0.3403	Not Significant
Industry-Specific Determinants	Industry Median Leverage	0.0182985	1.518	0.1346	Not Significant
Macro-Specific Determinants	Stock Market Conditions	−0.00313525	−0.8210	0.4152	Not Significant
	Debt Market Conditions	0.00297165	0.03075	0.9756	Not Significant
	GDP Growth	−0.00121663	−0.06286	0.9501	Not Significant
	Brent Oil Price Growth	−0.00113033	−0.2874	0.7749	Not Significant
R^2		49%			
Adjusted R^2		37.2%			
F		4.138397			
Sig. F		0.000091			
Sig. Breusch-Pagan Test		>0.10			
Appr. Model		Pooled Effects Model is Appropriate			
Sig. White Test		0.34756			
Decision		No Heteroscedasticity			

(Source: Gretl 2024)

5.2.3 Comment on Pooled Panel Data Regression Model for Total D/A Ratio

The Breusch-Pagan test confirms that the pooled model is appropriate (p-value > 0.10), indicating that random effects are not present. Additionally, the White test shows no heteroscedasticity (p = 0.3476), suggesting that the Ordinary Least Squares (OLS) estimates remain efficient and unbiased (Gujarati & Porter, 2009). Based on these results, the use of the pooled regression model is the most appropriate for analyzing the determinants of the debt-to-assets ratio (D/A).

The results indicate that profitability, non-debt tax shield, tangibility, growth opportunities, volatility, and liquidity significantly affect the total debt ratio, while industry-specific determinants and macroeconomic factors do not play a significant role.

- Firm-Specific Determinants

  - **Profitability (H3_1):** Negative and significant (-0.7053, p = 0.0005), indicating that more profitable firms use less total debt. This supports the pecking order theory (Myers & Majluf, 1984), which suggests that firms prioritize internal financing over external debt to minimize financing costs and asymmetric information issues.
  - **Non-Debt Tax Shield (H3_2):** Positive and significant (0.3886, p = 0.0428), implying that firms with greater tax shields (e.g., depreciation) tend to use more debt. This finding aligns with DeAngelo & Masulis (1980), who argue that tax shields act as substitutes for interest tax deductions, encouraging higher debt levels.
  - **Firm Size (H3_3):** Insignificant (p = 0.1431), suggesting that larger firms do not necessarily rely more on total debt. While previous research (Rajan & Zingales, 1995) suggests a positive relationship, this result indicates that size may not be a crucial determinant in MENA energy firms.
  - **Tangibility (H3_4):** Positive and highly significant (0.4464, p = 0.0003), confirming that firms with more tangible assets secure higher levels of debt. This is consistent with the trade-off theory, which posits that tangible assets serve as collateral, reducing lenders' risks and facilitating debt financing (Harris & Raviv, 1991).
  - **Growth Opportunities (H3_5):** Positive and highly significant (0.7778, p < 0.0001), suggesting that firms with higher growth prospects tend to use more debt. This aligns with dynamic capital structure models, where firms leverage debt to finance expansion (Titman & Wessels, 1988).
  - **Dividend Policy (H3_6):** Insignificant (p = 0.7658), implying that dividend payments do not significantly impact total debt levels.
  - **Volatility (H3_7):** Negative and significant (-0.0118, p = 0.0405), indicating that firms with greater earnings volatility use less total debt, consistent with the risk aversion perspective (Booth et al., 2001).

- **Liquidity (H3_8):** Negative and highly significant (-0.0684, $p < 0.0001$), reinforcing that firms with higher cash reserves rely less on debt (Ozkan, 2001).

- Industry-Specific Determinants

- **Industry Median Leverage (H3_9):** Insignificant ($p = 0.7945$), indicating that peer firms' leverage ratios do not strongly influence total debt levels in MENA energy firms.

- Macro-Specific Determinants

- **Stock Market Conditions (H3_10) & Debt Market Conditions (H3_11):** Insignificant, suggesting that capital market fluctuations do not directly affect total debt decisions.
- **GDP Growth (H3_12) & Brent Oil Prices (H3_13):** Insignificant, indicating that macroeconomic conditions do not significantly drive firms' capital structure choices.

✓ **$R^2 = 63.4\%$**, meaning that the model explains a substantial portion of the variation in total D/A ratio.

✓ **Adjusted $R^2 = 55\%$**, indicating moderate explanatory power.

✓ **F-statistic = 7.475 ($p < 0.0001$)** confirms that the model is statistically significant.

The pooled regression model provides **robust and reliable** insights into the determinants of total debt in MENA energy firms. The key takeaways are:

- **Profitability negatively affects total debt**, supporting the **pecking order theory**.
- **Non-debt tax shields and tangibility positively impact debt usage**, reinforcing the **trade-off theory**.
- **Growth opportunities significantly increase debt reliance**, consistent with capital expansion theories.

- **Volatility and liquidity negatively affect total debt**, suggesting risk management considerations.
- **Industry and macroeconomic factors do not significantly influence total debt decisions.**

These findings provide valuable implications for corporate financial managers and policymakers in the energy sector.

Table 6: Panel Data Regression Analysis Model (Total D/ A Ratio)

Variables/ Model		Pooled Effects			
		Coefficient	T	Sig. T	Result
C		0.0180464	0.05447	0.9568	Not Significant
Firm-Specific Determinants	Profitability	−0.705251	−3.683	0.0005	Significant Negative
	Non-Debt Tax Shield	0.388641	2.073	0.0428	Significant Positive
	Firm Size	0.0159115	1.485	0.1431	Not Significant
	Tangibility	0.446414	3.911	0.0003	Significant Positive
	Growth Opportunities	0.777813	5.320	<0.0001	Significant Positive
	Dividend Policy	0.0155029	0.2993	0.7658	Not Significant
	Volatility	−0.0117555	−2.097	0.0405	Significant Negative
	Liquidity	−0.0684416	−4.857	<0.0001	Significant Negative
Industry-Specific Determinants	Industry Median Leverage	−0.00322663	−0.2617	0.7945	Not Significant
Macro-Specific Determinants	Stock Market Conditions	−0.000715455	−0.1832	0.8553	Not Significant
	Debt Market Conditions	0.0827274	0.8370	0.4061	Not Significant
	GDP Growth	−0.000380782	−0.01924	0.9847	Not Significant
	Brent Oil Price Growth	0.000381417	0.09483	0.9248	Not Significant
R^2		63.4%			
Adjusted R^2		55%			
F		7.474869			
Sig. F		3.06e-08			
Sig. Breusch-Pagan Test		>0.10			
Appr. Model		Pooled Effects Model is Appropriate			
Sig. White Test		0.34756			
Decision		No Heteroscedasticity			

(Source: Gretl 2024)

6. CONCLUSION, RECOMMENDATIONS, & SUGGESTIONS

6.1 CONCLUSION

This study provides empirical evidence on the determinants of capital structure for energy companies in the MENA region, focusing on short-term, long-term, and total debt ratios. Using regression models for cross-sectional data, the results reveal that firm-specific factors such as profitability, tangibility, growth opportunities, and liquidity play a crucial role in shaping financial leverage decisions, while the impact of industry-specific and macroeconomic factors is limited.

The findings strongly support the pecking order theory (Myers & Majluf, 1984), as profitability consistently shows a negative relationship with all measures of debt,

indicating that companies in the energy sector in the MENA region prefer internal financing over external borrowing. This preference may be due to significant information asymmetry, financial instability, and heavy reliance on retained earnings in emerging economies (Booth et al., 2001). The results also align with the trade-off theory (Harris & Raviv, 1991), where tangibility is positively related to debt levels, suggesting that firms use tangible assets as collateral to secure debt financing.

Short-term debt decisions appear to be influenced by growth opportunities, firm size, and industry-specific leverage norms, highlighting the role of operational financing needs and industry benchmarks in short-term borrowing (Titman & Wessels, 1988). In contrast, long-term debt decisions are primarily driven by tax shields and asset tangibility, reinforcing the idea that firms with non-debt tax shields replace tax benefits with the advantages of debt-related taxes (DeAngelo & Masulis, 1980). For total debt, a combination of firm-specific factors, including profitability, growth opportunities, and liquidity, determines overall leverage, emphasizing the dominance of internal financial management strategies over external market conditions (Rajan & Zingales, 1995).

Despite the theoretical expectations of macroeconomic influences on capital structure, the study finds that factors such as GDP growth, stock market conditions, and oil prices do not significantly impact capital structure decisions in MENA energy firms. This result contrasts with findings from developed economies, where capital markets and economic cycles significantly affect debt financing (Baker & Wurgler, 2002). A potential explanation is that energy firms in the MENA region rely heavily on government-backed financing, stable oil revenues, and long-term investment strategies, making them less responsive to short-term economic fluctuations (Ben Hamouda et al., 2023).

These findings contribute to the capital structure literature in emerging markets, particularly in energy-intensive economies, by demonstrating that corporate financial decisions are largely firm-specific and less influenced by external economic conditions. The results also offer practical insights for financial managers, policymakers, and investors seeking to understand how MENA energy

firms structure their financing under different economic and operational conditions.

6.2 Recommendations

Financial managers in MENA energy firms should carefully optimize their capital structure strategies by balancing short-term and long-term debt in line with their operational and investment needs. Since profitability reduces reliance on external debt, firms should prioritize internal financing by utilizing retained earnings and internal funds before turning to external borrowing. Additionally, firms with substantial tangible assets should leverage them as collateral to secure long-term debt under favorable terms, ensuring sustainable capital structure management. Given the negative relationship between liquidity and debt usage, firms should adopt effective liquidity management practices by maintaining adequate cash reserves to minimize excessive dependence on short-term debt. Furthermore, short-term debt decisions should be aligned with industry leverage benchmarks to maintain competitive capital structure positioning and enhance financial stability.

Governments and financial institutions should support the diversification of capital structure options by expanding access to alternative funding sources, such as corporate bonds, venture capital, and Islamic finance. Policymakers should refine tax and regulatory policies to encourage optimal capital structure decisions, introducing tax incentives and credit market regulations that reduce excessive debt reliance. Financial regulators should enhance market transparency and efficiency to strengthen investor confidence and facilitate smoother access to capital markets. Additionally, firms should integrate environmental and social responsibility considerations into their capital structure decisions to improve long-term financial sustainability and corporate reputation. Lastly, companies should develop robust debt risk management strategies to mitigate financial distress and enhance resilience against market fluctuations, ensuring a more stable and adaptable capital structure in an increasingly dynamic economic landscape.

6.3 Suggestions

Future research should analyze capital structure differences across various industries by conducting comparative sectoral studies. Examining energy firms alongside manufacturing, services, and technology sectors can provide a broader

understanding of how industry-specific factors influence the choice between debt and equity financing. Additionally, further studies should explore how environmental, social, and governance (ESG) factors shape firms' capital structure decisions, particularly in terms of debt preferences and leverage adjustments, as sustainability considerations increasingly impact financial strategies.

Given the weak impact of macroeconomic variables in this study, future research should investigate how inflation, exchange rates, and oil price volatility affect capital structure dynamics. Moreover, examining the behavioral aspects of capital structure decisions, including managerial risk preferences, investor sentiment, and corporate governance structures, could offer deeper insights into firms' leverage choices. Longitudinal studies should also assess how firms adjust their capital structure over time, particularly during financial crises, pandemics, or periods of geopolitical instability, to understand how external shocks influence leverage management.

The role of digital financial innovations in shaping capital structure decisions warrants further exploration. Research should examine how fintech solutions, blockchain-based financing, and digital lending platforms impact firms' reliance on debt and equity financing in the MENA energy sector. Furthermore, investigating the relationship between debt restructuring strategies and corporate performance could provide valuable insights into optimizing leverage levels for financial stability and growth.

Ownership structure also plays a critical role in capital structure decisions. Future studies should explore how family-owned, state-owned, and privately held firms differ in their use of debt and equity financing. Additionally, cross-country comparative analyses could help identify region-specific determinants of capital structure by comparing MENA energy firms with firms in both emerging and developed economies. Finally, research should evaluate how economic reforms, including policy changes, financial deregulation, and tax reforms, impact capital structure adjustments in the MENA region, offering insights into the long-term effects of regulatory shifts on firms' leverage decisions.

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محددات هيكل رأس المال في قطاع الطاقة بمنطقة الشرق الأوسط وشمال أفريقيا (دراسة تطبيقية)

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ملخص البحث باللغة العربية

تقدم هذه الدراسة أدلة تطبيقية حول محددات الهيكل الرأسمالي في شركات الطاقة بمنطقة الشرق الأوسط وشمال أفريقيا(MENA) ، مع التركيز على نسب الديون قصيرة الأجل، طويلة الأجل، وإجمالي الديون. باستخدام نماذج انحدار البيانات المقطعية المجمع، إلى جانب انحدار المربعات الصغرى المرجحة (WLS) لمعالجة مشكلة التباين غير المتجانس، تبحث الدراسة في تأثير العوامل الخاصة بالشركات، والعوامل الخاصة بالصناعة، والعوامل الاقتصادية الكلية على قرارات الرفع المالي للشركات.

تكشف النتائج أن العوامل الخاصة بالشركات، مثل الربحية، وقابلية الأصول للرهن، وفرص النمو، والسيولة، تلعب دورًا رئيسيًا في تشكيل الهيكل الرأسمالي، في حين أن العوامل الخاصة بالصناعة والعوامل الاقتصادية الكلية لها تأثير محدود. وتدعم الدراسة بقوة نظرية ترتيب التمويل، حيث ترتبط الربحية سلبًا بجميع مقاييس الديون، مما يشير إلى أن شركات قطاع الطاقة في منطقة الشرق الأوسط وشمال أفريقيا تفضل التمويل الداخلي على الاقتراض الخارجي بسبب ارتفاع درجة عدم تماثل المعلومات وعدم الاستقرار المالي. بالإضافة إلى ذلك، تتماشى النتائج مع نظرية المبادلة، حيث تؤثر قابلية الأصول للرهن إيجابيًا على مستويات الديون، مما يشير إلى أن الشركات تستخدم الأصول الملموسة كضمان للحصول على التمويل.

تتأثر قرارات الديون قصيرة الأجل بفرص النمو، وحجم الشركة، ومعايير الرفع المالي في القطاع، مما يبرز دور احتياجات التمويل التشغيلي والمعايير القطاعية. أما قرارات الديون طويلة الأجل، فتُحدد بشكل أساسي من خلال الدروع الضريبية غير المتعلقة بالديون وقابلية الأصول للرهن، مما يعزز الفكرة القائلة بأن الشركات التي تتمتع بدروع ضريبية كبيرة تستبدل فوائد الضرائب بمزايا الديون. وتتشكل نسب إجمالي الديون من مزيج من الربحية، وفرص النمو، والسيولة، مما يؤكد بشكل أكبر هيمنة الإدارة المالية الداخلية على ظروف السوق الخارجية.

وعلى عكس التوقعات، لم تؤثر المتغيرات الاقتصادية الكلية، مثل نمو الناتج المحلي الإجمالي، وأوضاع سوق الأسهم، وأسعار النفط، بشكل كبير على قرارات الهيكل الرأسمالي. وهذا يتناقض مع النتائج التي توصلت إليها الدراسات في الاقتصادات المتقدمة، حيث تؤثر أسواق رأس المال والدورات الاقتصادية بشكل قوي على قرارات التمويل بالديون. ويُعزى ذلك إلى اعتماد شركات الطاقة في منطقة الشرق الأوسط وشمال أفريقيا بشكل كبير على التمويل المدعوم من الحكومات، والإيرادات النفطية المستقرة، واستراتيجيات الاستثمار طويلة الأجل، مما يقلل من حساسيتها للتقلبات الاقتصادية قصيرة الأجل.

من خلال تسليط الضوء على الطبيعة الخاصة بالشركات في قرارات الهيكل الرأسمالي داخل الاقتصادات كثيفة الطاقة، تساهم هذه الدراسة في إثراء الدراسات السابقة للهيكل الرأسمالي في الأسواق الناشئة. وتقدم النتائج رؤى عملية للمديرين الماليين وصناع السياسات والمستثمرين، مما يوفر فهمًا أعمق لكيفية هيكلة شركات الطاقة في منطقة الشرق الأوسط وشمال أفريقيا لتمويلها في ظل ظروف اقتصادية وتشغيلية مختلفة.

الكلمات الدالة : الهيكل الرأسمالي، منطقة الشرق الأوسط وشمال أفريقيا، قطاع الطاقة، الديون قصيرة الأجل، الديون طويلة الأجل، إجمالي الديون، انحدار البيانات المقطعية المجمع، انحدار المربعات الصغرى المرجحة، نظرية ترتيب التمويل، نظرية المبادلة، التباين غير المتجانس.

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