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Structural Impacts of the Resource Curse: Economic Challenges and Reform in Saudi Arabia

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Abstract : This study examines the dynamic relationship between macroeconomic variables and economic growth in Saudi Arabia from 1990 to 2022, focusing on oil revenues and key indicators such as stock market progression, the Human Development Index (HDI), the Consumer Price Index (CPI), and unemployment. Employing Johansen cointegration and Vector Error Correction Models (VECM), the analysis captures both short- and long-term interactions. The findings reveal that stock market progression has a marginal effect on long-term economic growth. At the same time, oil revenues exhibit a negative long-term correlation with GDP, reinforcing the presence of a resource curse in oil-dependent economies. Surprisingly, Human development shows a negative correlation with GDP, reflecting job market inefficiencies that hinder the translation of advancements in health and education into economic productivity. The job market imbalances and the dominance of the oil sector limit the utilization of human capital. Control variables like CPI and unemployment significantly influence economic growth, with unemployment demonstrating a robust negative relationship with GDP. These findings emphasize the need for financial market reforms and diversification efforts aligned with Vision 2030 to mitigate oil dependency and promote sustainable growth. This study contributes to the literature by highlighting the paradoxical relationship between human development and economic growth in an oil-dependent economy and addressing the structural challenges associated with the resource curse.
Keywords: Economic diversification, oil dependency, stock market progression, resource curse, Saudi Vision 2030, Human Development Index (HDI).

الآثار الهيكلية للعنة الموارد: التحديات الاقتصادية والإصلاح في المملكة العربية السعودية

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المستخلص: تتناول هذه الدراسة العلاقة الديناميكية بين متغيرات الاقتصاد الكلي والنمو الاقتصادي في المملكة العربية السعودية خلال الفترة من 1990 إلى 2022، مع التركيز على دور عائدات النفط ضمن متغيرات رئيسية تشمل تطور سوق الأسهم، مؤشر التنمية البشرية، مؤشر سعر المستهلك، والبطالة. باستخدام تقنيات الاقتصاد القياسي المتقدمة، مثل التكامل المشترك لجوهانسن ونماذج تصحيح الأخطاء، تم تحليل التفاعلات القصيرة والطويلة الأجل بين هذه المتغيرات. تشير النتائج الي أن تطور سوق الأوراق المالية له تأثير هامشي فقط على النمو الاقتصادي على المدى الطويل، بينما تظهر عائدات النفط علاقة سلبية طويلة الأجل الناتج المحلي الإجمالي، مما يعزز مفهوم لعنة الموارد في الاقتصادات المعتمدة على النفط. بشكل غير متوقع، تبين أن التنمية البشرية ترتبط سلبيا بالناتج المحلي الإجمالي، مما يعكس تشوهات سوق العمل التي تعيق استغلال رأس المال البشري بشكل كامل في المملكة. بالإضافة إلى ذلك، تفسر متغيرات التحكم مثل مؤشر أسعار المستهلك والبطالة تقلبات النمو الاقتصادي، حيث تظهر البطالة علاقة سلبية قوية مع الناتج المحلي الإجمالي. تؤكد النتائج على ضرورة اجراء إصلاحات شاملة للأسواق المالية وتعزيز جهود التنويع وفق رؤية 2030. تسلط الدراسة الضوء على العلاقة المتناقضة بين التنمية البشرية والنمو الاقتصادي، مع ابراز التحديات الهيكلية التي تفرضها لعنة الموارد.

الكلمات المفتاحية: التنويع الاقتصادي؛ الاعتماد على النفط؛ تطور سوق الأسهم؛ لعنة الموارد؛ رؤية السعودية 2030؛ مؤشر التنمية البشرية.

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Introduction

The dynamic interplay between macroeconomic variables and economic growth in oil-dependent economies, such as Saudi Arabia, has been a central focus of economic research. While financial markets in diversified economies typically contribute to economic development through mechanisms like capital mobilization and risk management, the dominance of oil revenues in countries like Saudi Arabia creates unique challenges. The "resource paradox" framework is frequently used to explain these challenges, where an over-reliance on a single natural resource—oil—hampers long-term economic growth and diversification efforts.

This dependence is further exacerbated during periods of oil price volatility, as demonstrated by the dramatic price collapse during the COVID-19 pandemic, which highlighted the fiscal vulnerabilities of oil-dependent economies (Lashitew, Ross, & Werker, 2020).

Saudi Arabia has been heavily reliant on oil rents for decades. Despite implementing significant economic reforms, including those outlined in Vision 2030, the economy continues to face structural imbalances. The oil sector's dominance has introduced volatility, which distorts the traditional dynamics of economic growth and hinders the development of other productive sectors, such as financial markets and human capital.

To address these issues, this study has the following objectives:

1. To examine the relationship between oil rents and economic growth in Saudi Arabia over the period 1990–2022.
2. To investigate the role of stock market progression in influencing economic performance within an oil-dependent economy.
3. To assess the impact of key macroeconomic variables, including the Human Development Index (HDI), Consumer Price Index (CPI), and unemployment rate, on economic growth.
4. To analyse the paradox of human development in Saudi Arabia, where advancements in education and health have not translated into proportional economic productivity, highlighting inefficiencies in the job market.
5. To explore the implications of economic reforms, notably Vision 2030, for reducing oil dependency and promoting economic diversification.

To guide the analysis, this study tests the following hypotheses:

H1: Oil revenues have a significant negative long-term impact on economic growth.

H2: Stock market progression has a limited effect on economic growth in an oil-dependent economy.

H3: Macroeconomic variables (HDI, CPI, and unemployment rate) have a significant influence on economic growth.

H4: The job market inefficiencies prevent advancements in human development from contributing to economic productivity.

By addressing these objectives and hypotheses, the study Arabia and offers a deeper understanding of the structural challenges faced by oil-dependent economies, such as Saudi Arabia, and explores pathways toward achieving sustainable economic growth.

The remainder of the paper is organized as follows: Section 2 reviews the relevant literature on resource dependence, financial market development, and economic growth. Section 3 outlines the methodology and data used in the study. Section 4 presents the empirical results and analysis, while Section 5 discusses the findings in the context of previous research. Finally, Section 6 concludes the study and offers policy recommendations.

Literature Review

The relationship between stock market development and economic growth has been extensively explored in economic literature. Foundational works by Levine and Zervos (1996) and Beck and Levine (2004) argue that robust financial markets facilitate economic expansion through improved capital allocation, risk diversification, and investment mobilization. These studies consistently demonstrate that well-developed stock markets positively contribute to economic growth by

lowering capital costs and enhancing investment efficiency. However, this body of research primarily focuses on diversified economies, where financial markets are central to economic activity and growth.

In contrast, oil-dependent economies such as Saudi Arabia face unique structural challenges, as their financial markets are deeply intertwined with the volatility and imbalances created by oil rents (Auty, 2001; Sachs & Warner, 2001). The overwhelming dependence on oil revenues often hampers the traditional roles that financial markets play in promoting growth. This dynamic can be understood through the lens of the "resource curse" theory, which suggests that countries rich in natural resources frequently experience slower long-term growth due to their over-reliance on a single export commodity. Sachs and Warner (2001) argue that oil dependency can crowd out other productive sectors, limiting the growth potential of financial markets and obstructing economic diversification.

In the context of Saudi Arabia, the resource paradox manifests as a long-term negative impact of oil rents on GDP growth. Existing studies suggest that poorly managed oil revenues and the over-reliance on oil rents can suppress financial market development, limiting its role in promoting broader economic growth (Sachs & Warner, 2001; Auty, 2001). Moreover, stock market progression in oil-dependent economies is often constrained by structural inefficiencies, reducing its impact on long-term growth. These dynamics underscore the importance of diversifying revenue sources and implementing reforms to address the structural challenges posed by oil dependency.

Despite the extensive literature on the resource paradox, few studies have explicitly examined its interaction with financial market , such as Saudi Arabia. Most existing studies focus either on the overall economic impact of oil dependency or on financial market development in more diversified economies. This leaves a significant gap in understanding how oil rents specifically affect stock market development and macroeconomic variables over time in oil-rich nations. For instance, while Rosser (2006) and Olayungbo (2019) explore the resource curse in various contexts, limited empirical research has been conducted to assess the specific long-term effects of oil rents on financial markets in Saudi Arabia.

While the resource paradox provides a strong framework for explaining the structural challenges posed by oil dependency, alternative theories can offer complementary perspectives on the observed economic phenomena. For instance, Dutch disease theory highlights how oil dependency can lead to an overvalued currency, reducing competitiveness in non-oil sectors and hindering economic diversification. Additionally, the rentier state theory suggests that economies reliant on resource revenues often face weakened institutions and limited incentives for economic reform, further exacerbating the underdevelopment of financial markets. For Saudi Arabia, these theories, alongside the resource paradox, provide a comprehensive framework for understanding the unique economic dynamics shaped by oil rents and their impact on financial markets and macroeconomic variables.

Building upon this, the dynamics of SMP in oil-dependent economies, particularly in Saudi Arabia, are a crucial area of study, especially in the context of ongoing economic diversification efforts, such as Vision 2030. Research has explored how economies heavily reliant on a single resource, such as oil, encounter unique challenges in developing their financial markets. Scholars like Rosser (2006) and Auty (2001) have analysed these economies, arguing that their stock markets are shaped by the oil sector, resulting in growth dynamics that differ from those of more diversified economies. This literature review examines various perspectives on SMP's role in economic expansion, with a focus on the distinct challenges faced by oil-dependent economies in achieving diversified growth.

In advanced economies, SMP has been linked to economic growth. Foundational studies by Atje and Jovanovic (1993), Demirguc-Kunt and Levine (1996), and King and Levine (1993) established a positive link between well-structured equity markets and economic expansion. These scholars highlighted that efficient financial markets lower capital costs and foster sustained growth by facilitating investment and more efficient capital allocation. Beck and Levine (2004)

expanded on this, assessing the contribution of both stock markets and banking sectors to economic growth. Using generalized-method-of-moments techniques, they found that both financial sectors significantly contribute to development, which is critical for understanding the interconnectedness of financial markets and economic performance in diverse contexts. While these findings applicable to advanced economies, oil-dependent countries like Saudi Arabia may not experience the same benefits due to the disproportionate influence of oil on the economy, which limits the traditional roles of financial markets in driving growth.

In oil-dependent economies, stock market dynamics are shaped in unique ways by the dominance of the oil sector. Rosser (2005) and Auty (2001) argue that these economies often face challenges in fostering diversified financial markets, as prices, which heavily influence capital and market activity. This dynamic is further explored by Li, J., Li, H., & Jiang (2023), whose analysis of financial markets in oil-dependent economies highlights how fluctuations in these markets significantly affect both the real economy and international crude oil markets. This reinforces the idea that the financial markets in countries like Saudi Arabia are inherently tied to the oil sector, complicating diversification efforts. Al-Malkawi and Abdullah (2011) and Al-Yousif (2002) provide fragmented views on the interplay between stock market growth and economic development in oil-dependent economies, underscoring the complexity of these relationships, particularly in countries where oil dominates the economic landscape.

Recent research emphasizes the interconnectedness of financial markets, commodity prices, and macroeconomic stability in oil-dependent economies. Li and Du (2024) investigate the asymmetric relationship between oil price volatility and financial market fluctuations, highlighting that external price shocks significantly influence commodity markets, such as gold, and broader economic performance. Their findings suggest that oil price volatility, particularly in resource-dependent economies, impacts market dynamics non-uniformly under varying market conditions. This research underscores the need to consider financial market volatility when assessing oil price impacts, as these fluctuations can disrupt market stability and complicate economic diversification efforts.

Empirical evidence suggests that stock market progression in resource-dependent economies is closely linked to diversification strategies and macroeconomic stability. For example, Azam et al. (2023) find that renewable energy growth contributes to both financial market development and broader economic gains in Asian economies.

Liquidity is a critical component of efficient financial markets, as it ensures smooth capital flows and reduces transaction costs. Levine and Zervos (1996, 1998) identified liquidity as essential for effective capital allocation and risk distribution, showing that liquid markets positively influence economic expansion by facilitating investments and lowering financing costs. However, in oil-dependent economies like Saudi Arabia, the relationship between liquidity and growth is more complex. Naceur and Ghazouani (2007) found that in the Middle East and North Africa (MENA) region, financial development, including liquidity, did not always lead to positive economic outcomes. This suggests that the volatility of oil-dependent markets, driven by external factors such as oil price fluctuations, may disrupt financial stability and weaken the impact of liquidity on long-term growth. However, Arestis et al. (2001) raised concerns about increased liquidity, suggesting that while it may enhance market performance, it can also lead to instability, especially in oil-dependent economies where fluctuations. This point is particularly relevant for Saudi Arabia, where oil market volatility influences financial markets, complicating efforts to develop a stable and diversified economy.

Recent studies highlight that while increased market liquidity can support capital flows, it may also amplify instability in resource-dependent economies (Arestis et al., 2001; Li et al., 2023). This is particularly relevant given the oil market volatility observed in Saudi Arabia.

The broader economic and institutional context is also crucial for understanding the role of financial markets in oil-dependent economies. Rajan and Zingales (1998) emphasized the importance of strong institutional frameworks and sound economic

policies in driving sustainable growth. They argue that effective institutions are essential for fostering diversified and resilient financial markets, particularly in economies that rely heavily on natural resources. In Saudi Arabia, institutional reforms play a key role in Vision 2030's objectives, which aim to diversify the economy and reduce oil dependency. Strengthening institutional quality is critical to ensuring that financial sector development positively influences long-term growth. Bayraktar et al. (2023) further highlight the importance of institutional quality, noting that in emerging markets, robust institutions enhance the positive effects of financial development on economic expansion.

Recent empirical findings, including those of Li et al. (2023) and Bayraktar et al. (2023), underscore the interconnectedness of oil rents, financial market efficiency, and institutional quality in oil-dependent economies. These studies provide updated perspectives that complement foundational theories, highlighting the evolving challenges and opportunities for achieving sustainable economic growth in Saudi Arabia.

Recent studies emphasize the importance of sustainable energy policies in achieving economic diversification and long-term growth in Saudi Arabia. For instance, Islam and Ali (2024) highlight the Kingdom's ambitious goal to achieve net-zero greenhouse gas emissions by 2060 and reduce CO_2 emissions by 278 million tonnes annually by 2030, as outlined in Vision 2030. Key initiatives such as the Saudi Energy Efficiency Centre's Action Plan, which targets a 30% reduction in power intensity, and the NEOM green hydrogen project, showcase Saudi Arabia's commitment to technological innovation and renewable energy development. However, Islam and Ali (2024) note that the absence of a comprehensive state-of-the-art energy policy framework remains a barrier to achieving a smooth and sustainable energy transition. Their study develops a conceptual policy framework that incorporates strategies like regional collaboration, human capital development, technological research, and environmental conservation, aligning these efforts with Vision 2030's social, economic, and environmental goals.

These insights offer critical policy implications for advancing Saudi Arabia's green energy transition, addressing key structural challenges such as oil dependency, institutional reforms, and human capital inefficiencies.

This study addresses the identified gaps by focusing on Saudi Arabia's financial market dynamics and analysing how oil rents interact with key financial and macroeconomic variables, including market capitalization, liquidity, HDI, CPI, and unemployment. Unlike prior studies that emphasize short-term economic relationships (Al-Moneef, 2006; Alkhareif & Alsadoun, 2017), this research applies advanced econometric techniques, such as Johansen cointegration and Vector Error Correction Models (VECM), to examine both short-term and long-term interactions. This approach enables a deeper understanding of the structural challenges impeding Saudi Arabia's financial markets in achieving sustained economic growth.

In summary, while existing literature offers valuable insights into the resource paradox, stock market development, and economic growth, notable gaps persist, particularly for oil-dependent economies like Saudi Arabia. Foundational studies (Auty, 2001; Sachs & Warner, 2001) highlight the negative effects of oil dependency on economic diversification and financial market progress. However, limited empirical research specifically investigates the long-term interplay between oil rents, stock market development, and macroeconomic variables—such as HDI, CPI, and unemployment—in Saudi Arabia. Furthermore, most studies provide generalized findings applicable to diversified economies, overlooking the unique structural challenges faced by oil-rich nations.

This study bridges these gaps by comprehensively analysing Saudi Arabia's financial markets using robust econometric methods to capture short-term and long-term interactions. The findings will provide critical insights for policymakers, aiding efforts to reduce oil dependency, foster economic diversification, and achieve sustainable long-term growth.

Methodology

1. Data Sources and Variables

This study employs a time-series econometric approach to investigate the relationship between stock market progression (SMP), oil rents, and economic growth in Saudi Arabia from 1990 to 2022. The dependent variable in this analysis is GDP per capita (GDPPC), while the independent variables include stock market size (SIZE), oil rents (OILRENT), Human Development Index (HDI), Consumer Price Index (CPI), stock market liquidity (LIQUIDITY), and unemployment (UN).

Data Sources and Quality:

The data used in this study were sourced from reliable and widely recognized databases to ensure accuracy and credibility. GDP per capita, CPI, and unemployment data were obtained from the World Bank and Saudi Central Bank (SAMA) publications. Data on oil rents as a percentage of GDP were sourced from the World Development Indicators (WDI) database. Stock market data, including SIZE (measured by market capitalization) and LIQUIDITY, were collected from the Saudi Stock Exchange (Tadawul) reports and SAMA bulletins. The HDI data were obtained from the United Nations Development Programme (UNDP) Human Development Reports. Each source provides verified and publicly accessible data, ensuring high-quality, consistent, and comparable datasets over time.

2. Econometric Model Specification

The econometric model used in the analysis is as follows:

$$GDPPC_i = \beta_0 + \beta_1 SIZE_i + \beta_2 OilRent_i + \beta_3 HDI_i + \beta_4 CPI_i + \beta_5 Liquidity_i + \beta_6 UN_i + \varepsilon_i$$

Where:

- SIZE represents stock market size, measured by market capitalization.
- Oil Rent captures oil rents as a percentage of GDP, reflecting the country's reliance on oil revenues.
- HDI measures human capital development, incorporating health, education, and income.
- CPI controls for inflationary pressures within the economy.
- LIQUIDITY represents the stock market's ability to facilitate transactions without significant price changes.
- UN represents the unemployment rate, capturing, job market inefficiencies.

These variables are selected based on both theoretical and empirical literature, reflecting key drivers of economic growth in oil-dependent economies. The inclusion of control variables, such as HDI, CPI, and UN, allows the model to isolate the specific effects of stock market progression and oil rents on GDP per capita, while controlling for other macroeconomic factors.

3. Justification for Johansen Cointegration and VECM

This study employs the Johansen cointegration test and the Vector Error Correction Model (VECM) to examine the dynamic relationships between oil rents and macroeconomic variables, including GDP, stock market performance, and unemployment. The decision to use these methods is grounded in their suitability for studying both long-term equilibrium relationships and short-term dynamics in economic systems characterized by volatility.

Following the framework established by Apergis and Miller (2009), the Johansen cointegration test is employed to determine whether a stable, long-term relationship exists among the variables. This approach is particularly well-suited for non-stationary time-series data, where variables become stationary only after differencing. Preliminary tests, including the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, confirm that the variables in this study are integrated of order one, I (1). The Johansen test extends this analysis by identifying cointegrating vectors that capture the long-term associations among GDP per capita, stock market progression, and oil rents, even in systems with multiple endogenous variables.

When cointegration is established, the VECM provides an effective tool for modelling both the short-term dynamics and long-term adjustments. The VECM is particularly valuable in this context because it captures deviations from the long-term equilibrium and estimates the speed of adjustment back to equilibrium following short-term shocks. This dual capability makes the VECM highly relevant for oil-dependent economies like Saudi Arabia, where external shocks and structural imbalances frequently disrupt economic stability.

Together, these methods create a robust analytical framework for examining the interplay between oil rents, stock market dynamics, and key macroeconomic indicators. By addressing both long-term structural relationships and short-term fluctuations, this approach offers a comprehensive understanding of the economic challenges and opportunities faced by oil-dependent economies.

4. Justification for Control Variables

- Human Development Index (HDI) is included to capture the importance of human capital in driving long-term economic growth. HDI measures a country's achievements in health, education, and income levels—critical indicators of sustainable development. In oil-rich economies like Saudi Arabia, advancements in human development often do not directly translate into corresponding gains in economic productivity due to structural inefficiencies (Lucas, 1988). This study aims to evaluate whether improvements in human capital, as reflected in HDI, have a positive effect on GDP growth or whether deeper structural reforms are required to unlock the potential of human capital.

- Consumer Price Index (CPI) is incorporated as a control variable to account for inflationary dynamics. Inflation, measured by CPI, can distort investment decisions, erode purchasing power, and impact economic stability. In oil-dependent economies, inflation tends to be volatile due to external shocks, such as fluctuations in oil prices (Naceur & Ghazouani, 2007). By including CPI in the model, we aim to isolate the effects of SMP and oil rents on GDP per capita from inflation-related distortions.

- Unemployment (UN) is included to reflect the job market's efficiency and its impact on economic growth. Despite high levels of economic growth fuelled by oil revenues, Saudi Arabia has struggled with persistent unemployment (Alotaibi, 2017). This study examines how unemployment, as a measure of job market inefficiency, affects GDP growth and how these inefficiencies align with the broader goals of Vision 2030's economic diversification and job market reforms.

5. Econometric Approach and Diagnostic Tests

To ensure the robustness and validity of the econometric model used in this study, several key assumptions were tested through diagnostic checks. These tests are essential to ensure that the results are reliable and provide meaningful interpretations of the relationship between stock market progression, oil rents, and economic growth in Saudi Arabia.

First, the model assumes a linear relationship between GDPPC and the independent variables. This assumption was confirmed by visually inspecting scatterplots of the independent variables against GDP growth. The linearity of these relationships is critical for the validity of the model's structure.

The normality of the residuals was assessed using the Jarque-Bera test, which evaluates whether the residuals follow a normal distribution. The test confirmed that the residuals are approximately normally distributed, with a high p-value indicating no significant deviation from normality. Ensuring residuals follow a normal distribution is key for making valid statistical inferences and confirming the reliability of the model's estimates.

Multicollinearity was checked to ensure that the independent variables were not highly correlated, as multicollinearity can inflate standard errors and distort estimates. The Variance Inflation Factor (VIF) was calculated for each independent variable, and all values were well below the threshold of 10, that multicollinearity is not a significant issue in this model.

Autocorrelation, or the presence of correlation between a variable and its past values, was tested using the Breusch-Godfrey

Serial Correlation Lagrange Multiplier (LM) Test. Autocorrelation can bias standard errors and reduce the efficiency of the model's estimates. The test detected potential autocorrelation at lag 2, which may affect the efficiency of the forecast, although there was no significant serial correlation at lag 1.

Finally, the presence of heteroscedasticity was tested using the Breusch-Pagan-Godfrey test. Heteroscedasticity, where the variance of the residuals is not constant across observations, can lead to inefficient estimates and affect the model's validity. The test showed no significant evidence of heteroscedasticity, indicating that the residuals exhibit constant variance, which strengthens the reliability of the model's results.

The diagnostic tests confirm that the model meets the necessary assumptions for valid statistical inference. The stationarity of the data was ensured using the ADF and PP tests, confirming that the variables become stationary after differencing. The Johansen cointegration test established the existence of long-term relationships between stock market size, oil rents, and GDPPC, affirming the long-term equilibrium dynamics in the model.

The tests for multicollinearity, autocorrelation, and heteroscedasticity validate that the model's estimates are not distorted by these issues, ensuring the reliability of the regression results. The VECM captures both short-term adjustments and long-term relationships, with the error correction term indicating the speed of adjustment toward equilibrium when deviations occur.

Results and Discussion

This section presents the empirical analysis of the relationship between stock market progression, oil rents, and economic growth in Saudi Arabia from 1990 to 2022. It also Human Development Index, Consumer Price Index, liquidity, and unemployment, providing both short-term and long-term insights.

Descriptive Statistics

The descriptive statistics in Table 1 offer valuable insights into key economic indicators over the observed period. The GDP per capita (GDPPC) shows a nearly symmetrical distribution, reflecting relatively stable and consistent economic growth in Saudi Arabia. This stability is crucial for long-term financial planning.

SIZE exhibits moderate variability, suggesting that market conditions have been stable without extreme fluctuations, which contributes to maintaining investor confidence. However, liquidity demonstrates high variability, indicating periodic surges in financial activity, possibly driven by government intervention or speculation. This highlights the need for careful financial regulation to mitigate risks.

The HDI shows a narrow range, reflecting consistent improvements in human development, while CPI reveals right-skewness, indicating occasional spikes in inflation likely influenced by oil price fluctuations. Oil rent displays high variability, underscoring the importance of diversifying the economy to reduce reliance on oil revenues and mitigate external shocks. Finally, unemployment exhibits moderate skewness, pointing to fluctuations in employment stability over time, emphasizing the need for the job market reforms.

Table 1: Descriptive Statistics for Key Variables

Statistic	GDPPC	SIZE	HDI	CPI	Oil Rent	Liquidity	Unemployment
Mean	9.504291	31.22906	0.785273	1.982472	34.00201	103.1398	5.783455
Median	9.605661	31.22221	0.787000	2.068840	31.34245	65.26532	5.640000
Maximum	10.32339	33.21964	0.875000	9.870248	54.08580	372.2599	7.450000
Minimum	8.877573	29.53568	0.678000	-2.093333	15.97891	12.10563	4.350000
Std. Dev.	0.494567	0.962302	0.066106	2.548843	10.40181	101.9128	0.739820
Skewness	0.030244	0.321263	-0.050982	0.857617	0.252179	1.545479	0.312040
Kurtosis	1.343835	3.317614	1.556157	3.982217	1.920283	4.164093	2.912360
Jarque-Bera	3.776496	0.706364	2.880734	5.371821	1.952730	15.00005	0.546089
Probability	0.151337	0.702449	0.236841	0.068159	0.376678	0.000553	0.761059
Observations	33	33	33	33	33	33	33

Data Source: Table compiled and prepared by the author, 2024.

Correlation Matrix

The correlation matrix in Table 2 sheds light on the relationships among key economic variables. A strong positive correlation between HDI and GDPPC underscores the link between improvements in education, health, and economic prosperity. Conversely, the weak correlations of oil rent and liquidity with GDPPC suggest limited direct influence on income levels. This reinforces the importance of diversifying revenue sources beyond oil.

Table 2: Correlation Matrix of Key Variables

	GDPPC	SIZE	HDI	CPI	Oil Rent	Liquidity	UN
GDPPC	1	0.636478	0.961261	0.356172	0.032228	-0.284813	0.061518
SIZE	0.636478	1	0.658352	0.095486	-0.396885	0.086387	0.277385
HDI	0.961261	0.658352	1	0.204333	-0.133751	-0.335710	-0.017385
CPI	0.356172	0.095486	0.204333	1	0.379387	0.011982	0.200394
Oil Rent	0.032228	-0.396885	-0.133751	0.379387	1	0.249519	-0.149295
LIQUIDITY	-0.284813	0.086387	-0.335710	0.011982	0.249519	1	0.306183
UN	0.061518	0.277385	-0.017385	0.200394	-0.149295	0.306183	1

Data Source: Table compiled and prepared by the author, 2024.

Stationarity Test

The stationarity tests at level, presented in Table 3, assess whether the time series variables exhibit unit root behaviour, which could indicate non-stationarity. Most variables, such as CPI and liquidity, were found to be non-stationary at level I (0), as they do not reject the null hypothesis. This suggests the need for further differencing to achieve stationarity.

Table 3: Stationarity Test Results (At Level) for Key Variables

Variable	ADF (p-value)	PP (p-value)	Decision	Critical Value (5%)	Stationary
GDP PC	0.2426 (0.9712)	0.9196 (0.9945)	Non-Stationary	-2.9571	No
SIZE	-0.0156 (0.9502)	0.0793 (0.9590)	Non-Stationary	-2.9571	No
HDI	-1.6094 (0.4663)	-1.2696 (0.6313)	Non-Stationary	-2.9571	No
CPI	-3.2496 (0.0261)	-3.2583 (0.0256)	Stationary	-2.9571	Yes
Oil Rent	-2.1735 (0.2193)	-2.1961 (0.2115)	Non-Stationary	-2.9571	No
Liquidity	-3.9391 (0.005)	-2.5293 (0.1182)	Non-Stationary	-2.9571	No
UN	-2.1730 (0.2194)	-2.2391 (0.1972)	Non-Stationary	-2.9571	No

Data Source: Table compiled and prepared by the author, 2024.

In Table 4, the First Difference Unit Root Test confirms that most key variables become stationary when differenced, achieving integration at order one, I(1). This ensures the reliability of the subsequent econometric modelling, including cointegration testing.

Table 4: Stationarity Test Results (At First Difference) for Key Variables

Variable	ADF (p-value)	PP (p-value)	Decision	Critical Value (5%)	Stationary
GDPPC	-4.5268 (0.0012)	-3.7022 (0.0091)	Stationary	-2.9639	Yes
SIZE	-5.7211 (0.0000)	-5.7211 (0.0000)	Stationary	-2.9639	Yes
HDI	-3.9425 (0.0025)	-4.2115 (0.0025)	Stationary	-2.9639	Yes
CPI	-9.3298 (0.0000)	-9.2137 (0.0000)	Stationary	-2.9639	Yes
Oil Rent	-6.2032 (0.0000)	-6.6211 (0.0000)	Stationary	-2.9639	Yes
Liquidity	-3.3539 (0.0208)	-3.2156 (0.0286)	Stationary	-2.9639	Yes
UN	-3.7919 (0.0074)	-5.0072 (0.0003)	Stationary	-2.9639	Yes

Data Source: Table compiled and prepared by the author, 2024.

Lag Selection and Information Criterion

The VAR Lag Order Selection Criteria, shown in Table 5, helps determine the optimal lag length for time series analysis. Selecting an appropriate lag length is critical, as it ensures the model captures the underlying dynamics of the variables while avoiding overfitting or model inefficiency. Based on the Akaike Information Criterion (AIC), Final Prediction

Error (FPE), and Hannan-Quinn Criterion (HQ), a lag length of 2 was selected as the most suitable for the model. This choice balances model complexity with the ability to capture underlying data patterns.

Based on these criteria, a lag length of 2 was selected as the most suitable for the model. The AIC, FPE, and HQ criteria consistently indicated by the asterisk (*) in Table 5. This choice strikes a balance between capturing the temporal relationships in the data and maintaining model parsimony. Selecting the correct lag length is essential for ensuring robust estimates, particularly when analyzing both short-term and long-term relationships in a Vector Autoregression (VAR) framework.

Table No. 5: VAR Lag Order Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-316.0430	NA	5.318730	21.53620	21.86315	21.64079
1	-139.7955	258.4964	0.001207	13.05303	15.66860	13.88978
2	-60.71996	79.07553*	0.000295*	11.04800*	15.95219*	12.61689*
3	89.07391	79.89006	3.05e-06	4.328406	11.52122	6.629449

Data Source: Table compiled and prepared by the author, 2024.
** Indicates lag order selected by the criterion.*

Johansen Cointegration Test

The Johansen Cointegration Test results in Figure No. 6 identify the presence of multiple cointegrating equations, indicating stable long-term relationships between key variables, such as GDP per capita (GDPPC), oil rents, and SIZE. The trace test identifies up to four cointegrating equations, while the maximum eigenvalue test suggests the presence of four cointegrating equations at the 5% significance level. These results confirm that while short-term fluctuations occur, the variables move together over time, reflecting the interconnectedness of the Kingdom's economy and the impact of oil dependency on its long-term growth.

Table 6: Johansen Cointegration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (0.05)	Prob.
None *	0.898261	219.4339	125.6154	0.0000
At most 1 *	0.802785	148.5883	95.75366	0.0000
At most 2 *	0.691127	98.26099	69.81889	0.0001
At most 3 *	0.590780	61.84143	47.85613	0.0014

Data Source: Table compiled and prepared by the author, 2024.

Notes: *- The trace test indicates the presence of 7 cointegrating relationships at the 5% significance level.*
- *The maximum eigenvalue test identifies four cointegrating equations at the 5% level.*
- *indicates rejection of the null hypothesis at the 5% significance level.*

Vector Error Correction Model (VECM)

The VECM results, detailed in Table 7, provide insights into the long-term equilibrium relationships. Surprisingly, SIZE shows a negative relationship with GDPPC(-0.044663), suggesting that financial market expansion does not necessarily contribute to economic growth. This may be due to structural inefficiencies, which aligns with Saudi Vision 2030's goal of reforming the financial sector.

Similarly, oil rents also display a negative long-term relationship with GDPPC (-0.013027), reinforcing the risks associated with over-reliance on oil revenues. These results highlight the necessity of diversifying the economy to mitigate the negative long-term effects of oil dependency. Another unexpected finding is the negative relationship between HDI and GDPPC (-7.470617), suggesting that improvements in human development have not yet translated into proportional economic growth. This points to structural challenges in integrating human capital into the productive sectors.

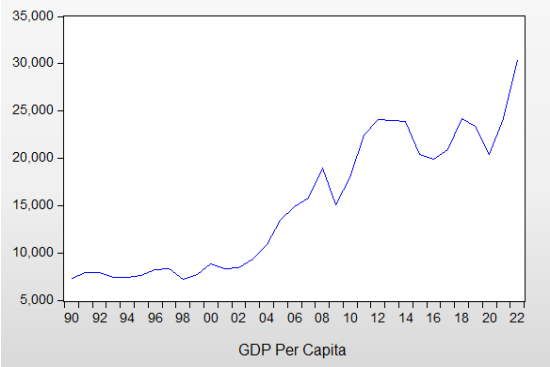
Economic Growth Trends

Figure No. 1 shows the trend in GDPPCin Saudi Arabia from 1990 to 2022, highlighting significant periods of growth, stagnation, and volatility. The sharp increases in GDPPC post-2003 are reflective of oil price

booms and growing government revenues during this time. However, the subsequent fluctuations in GDP per capita, particularly between 2015 and 2020, are indicative of the Kingdom's vulnerability to external shocks, such as the decline in global oil prices and economic impacts of the COVID-19 pandemic.

The overall upward trajectory in GDPPC demonstrates the Kingdom's resilience and efforts to foster economic growth. However, as noted in the empirical results, this growth has been heavily influenced by the volatility of oil rents, and the long-term sustainability of GDP growth remains uncertain without further diversification of the economy. This figure visually supports the findings that, while Saudi Arabia's economy has experienced periods of strong growth, its reliance on oil revenues has led to fluctuations, reinforcing the need for comprehensive economic reforms as outlined in Vision 2030.

Figure No. 1: GDP Per Capita in Saudi Arabia (1990–2022)

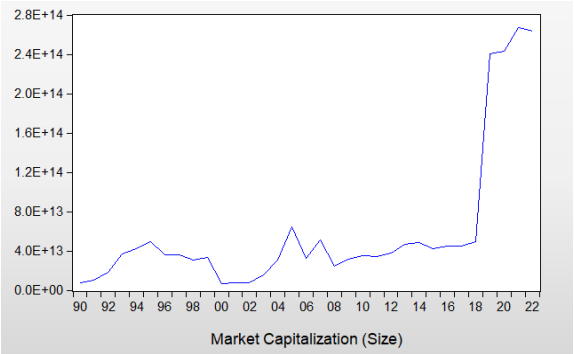


Stock Market Progression and Economic Growth

Figure No. 2 illustrates the evolution of Market Capitalization in Saudi Arabia from 1990 to 2022, providing key insights into the stock market's role in the Kingdom's broader economic landscape. The sharp increase observed after 2016 is particularly noteworthy, coinciding with the Kingdom's Vision 2030 reforms aimed at expanding the financial markets and diversifying the economy. Before this period, market capitalization exhibited periods of volatility and stagnation, reflecting the Kingdom's dependence on oil revenues and its vulnerability to external shocks such as global financial crises and fluctuations in oil prices.

The post-2016 surge in market capitalization underscores the effectiveness of recent financial reforms, suggesting a growing investor confidence and a more competitive financial market. This trend aligns with the findings of this study, which show that while SIZE has a modest impact on short-term GDP growth, it plays a more significant role in enhancing financial liquidity and attracting investment. However, the negative long-term correlation between SIZE and GDP, as indicated in the VECM analysis, suggests that structural inefficiencies remain, preventing the full potential of financial market expansion from contributing to sustainable economic growth.

Figure No. 2: Market Capitalization (Size) in Saudi Arabia (1990–2022)



Unexpected Findings: The HDI-GDP Relationship

One of the surprising results is the negative correlation between HDI and GDP per capita, contradicting traditional theories like those of Lucas (1988), which emphasize the positive role of human capital in economic growth. This could be due to the resource curse, where reliance on oil hinders the full utilization of human capital, leading to job market distortions. Moreover, a mismatch between the skills produced by the educational system and the needs of the economy might explain this unexpected result. Dutch disease and currency appreciation could also reduce the competitiveness of non-oil sectors, limiting the impact of human development on overall economic growth.

Marginal Impact of Inflation on Long-Term Economic Growth

The Consumer Price Index (CPI), with a small positive coefficient of 0.009968, suggests that inflation has only a marginal impact on long-term GDP growth. While inflation management remains essential for maintaining economic stability, its relatively

minor influence on GDP in the long run implies that price stability alone is not a major driver of economic growth. This finding is consistent with studies in other oil-dependent economies, such as Nigeria, where Chimobi (2010) also found that inflation did not exhibit a significant long-term relationship with GDP growth. The study demonstrated that while inflation impacts growth in the short term, its effect diminishes over time, indicating that other structural factors—such as investment, productivity, and economic diversification—play a more critical role in fostering sustained economic expansion.

The Role of Liquidity in Economic Growth

The stock market liquidity, with a modest coefficient in this study, suggests a limited role in driving long-term GDP growth in Saudi Arabia. While Levine & Zervos (1998) initially posited that stock market liquidity could significantly promote economic development, subsequent research by Zhu, Ash, & Pollin (2004) challenged this view. Their study showed that once outliers, particularly the contributions of the Asian Tigers, were controlled for, stock market liquidity no longer exerted any statistically observable influence on GDP growth. This aligns with the results in Saudi Arabia, indicating that liquidity alone may not be sufficient to drive significant long-term economic expansion in an oil-dependent economy. Structural factors, such as investment in diversified sectors and institutional reforms, may play a more critical role in fostering sustainable growth.

Unemployment and Economic Growth

The relationship between unemployment and GDP growth in Saudi Arabia, as highlighted in this study, reflects challenges commonly seen in other developing economies, particularly those that rely heavily on a single sector. In line with Okun's Law, the findings indicate a strong negative correlation between unemployment and GDP growth in Saudi Arabia, suggesting that reducing unemployment is vital for improving economic performance. A similar dynamic was found in Nigeria, where both short- and long-term relationships between unemployment and output growth were demonstrated, as noted by Akeju and Olanipekun (2014). Their research emphasizes the necessity of job market reforms in oil-dependent economies, where economic diversification and sectoral development are essential to absorbing new job market entrants and addressing joblessness.

In Saudi Arabia, rising unemployment continues to undermine economic growth, underscoring that economic expansion alone is insufficient for job creation. As noted in the Nigerian context, targeted fiscal policies and incentives to attract foreign direct investment (FDI) are critical to promoting employment and alleviating the structural constraints that hinder job creation. Similarly, in Saudi Arabia, these findings reinforce the need for job market reforms and comprehensive employment strategies aligned with the goals of Vision 2030, which seeks to reduce oil dependency and foster sustainable economic growth through diversification.

Unemployment in Saudi Arabia shows a strong negative long-term relationship with GDP, with a coefficient of -0.247517. This result aligns with established economic theory, which posits that higher unemployment rates typically hamper economic growth. Therefore, reducing unemployment and improving job market efficiency is crucial for long-term economic performance. The high significance of this relationship, as indicated by the large t-statistic, underscores the critical importance of job market reforms in supporting sustainable growth in the kingdom. In the short term, the positive coefficient associated with reductions in unemployment suggests that immediate improvements in employment levels have a positive impact on GDP growth.

Table 7: Vector Error Correction Model (VECM) Estimates for Economic Variables Cointegrating Equation

Variable	Coefficient	t-Statistic
SIZE (-1)	-0.044663	[-2.43216]
HDI (-1)	-7.470617	[-33.1377]
CPI (-1)	0.009968	[1.93935]
Oil Rent (-1)	-0.013027	[-8.06111]
LIQUIDITY (-1)	0.000431	[3.19949]
UN (-1)	-0.247517	[-14.2601]
C	-0.428132	-

Data Source: Table compiled and prepared by the author, 2024.

Short-Term Dynamics of the VECM

The short-run dynamics of the VECM, as shown in Table 8, provide key insights into how shocks to various economic variables affect the economy before the system adjusts back to its long-term equilibrium. These effects shed light on the interactions among key indicators such as SIZE, oil rents, liquidity, CPI, and unemployment, and their influence on the broader economic landscape.

SIZE plays a significant role in the short run, particularly in its relationship with oil rents, liquidity, and unemployment. The positive effect of SIZE on oil rents (coefficient 6.990477*) indicates that increases in financial market activity enhance oil sector revenues, indicating strong structural interdependence between these sectors. However, the positive relationship between SIZE and unemployment (coefficient 0.557755*) highlights potential structural inefficiencies, where financial market growth does not immediately translate into job creation. This underscores the need to align financial market expansion with job market reforms to address this disconnect.

Oil rents show a complex relationship with economic variables. The significant negative short-run relationship between oil rents and SIZE (coefficient -0.011416*) supports the resource curse hypothesis, as highlighted by Rosser (2006) and Auty (2001), where the dominance of oil revenues crowds out financial market development by diverting resources and attention. While the relationship between oil rents and GDPPC (coefficient 0.001472) is positive, its weak significance indicates minimal direct impacts on short-term economic growth. These findings underscore the structural challenges faced by oil-dependent economies in developing diversified financial markets. Additionally, oil rents exhibit no significant effects on unemployment or HDI, reinforcing their limited influence on job market outcomes and human development in the short run.

Inflation (CPI) exhibits a notable self-correcting dynamic in the short term, as reflected by its significant negative coefficient (-0.442292*). While inflation stabilizes over time, its short-run influence on GDPPC and other key variables remains limited. However, consistent with Ahmad, Afzal, and Khan (2017), who find CPI negatively impacts economic growth in Pakistan, the need for effective inflation management is underscored. While their study attributes CPI's adverse effects to macroeconomic instability, our findings suggest that, in the Saudi context, inflation's short-term dynamics are less disruptive but still critical for maintaining long-term investment confidence and macroeconomic stability.

Unemployment (UN) demonstrates strong persistence in the short term, with a significant positive coefficient (0.51632*). This persistence reflects structural challenges in quickly reducing joblessness, such as job market inefficiencies or mismatches between skills and demand. Addressing these challenges requires comprehensive job market reforms, including education and training programs aligned with market needs.

In summary, the VECM's short-term dynamics reveal that while SIZE influences financial variables, such as oil rents and liquidity, it does not significantly affect GDPPC. Oil rents negatively impact SIZE, reflecting resource curse dynamics, but their effects on GDPPC and unemployment are minimal. Consistent with the findings of Rosser (2006), Auty (2001), and Heidarian and Green (1989), this underscores the persistent challenges of structural inefficiencies in economies heavily reliant on oil. Inflation tends to stabilize, and unemployment persists, emphasizing the need for targeted policies to address job market inefficiencies and enhance the connection between financial market growth and employment outcomes.

Table 8: Short-Term Dynamics:

Dependent Variable	Independent Variable	Coefficient	Std. Error	t-Statistic
D(GDP_PC)	CointEq1	-0.254983	0.21487	-1.18668
D(SIZE)	SIZE (-1)	-0.236881	0.2548	-0.92969
D(SIZE)	Oil Rent (-1)	6.990477*	3.3392	2.09346
D(LIQUIDITY)	SIZE (-1)	77.55234*	27.471	2.82307

Dependent Variable	Independent Variable	Coefficient	Std. Error	t-Statistic
D(UN)	SIZE (-1)	0.557755*	0.20726	2.69115
D(SIZE)	Oil Rent (-1)	-0.011416*	0.02609	-0.43755
D(GDP_PC)	CPI (-1)	-0.442292*	0.1928	-2.29404
D(UN)	UN (-1)	0.516320*	0.23715	2.17715

Data Source: Table compiled and prepared by the author, 2024.

- *Coefficients marked with an asterisk (*) indicate statistical significance at the 5% level.*
- *Only significant results and relevant relationships are included to maintain focus on key insights.*

The VECM analysis reveals the complex, interconnected nature of the kingdom's economy, with notable distinctions between short-run dynamics and long-term equilibrium. In the short run, SIZE significantly affects liquidity and oil rents, but its long-term contribution to GDP growth is negative. Similarly, while oil rents offer short-term benefits, these effects are largely insignificant. However, the long-term impact of oil rents is negative for sustainable economic growth, reinforcing the complexities associated with an oil-dependent economy. Unemployment persists as a critical issue across both time frames, while inflation (CPI) self-corrects in the short run with minimal long-term impact.

These findings underscore the necessity for comprehensive reforms that address financial market inefficiencies, reduce the country's dependency on oil, and better integrate human capital into the economy. Such reforms are crucial for achieving the sustained and balanced economic growth envisioned in Vision 2030.

The overall model diagnostics show moderate explanatory power, with R-squared values ranging between 0.214 and 0.494 for different equations. The F-statistic values suggest that the model fits adequately, although the relatively low R-squared values indicate the complexity of the Saudi economy. These results imply that while the economy does tend to move toward equilibrium, it does so slowly, requiring sustained and coordinated policy efforts to address structural challenges and promote long-term stability.

The error correction term for GDP in table 9, with a value of -0.254983, indicates that about 25% of any short-term deviation from the long-term equilibrium is corrected in the following period. This relatively slow adjustment reflects the structural challenges within the kingdom economy, particularly in relation to its dependence on oil revenues. Although the economy moves toward equilibrium, the persistence of deviations emphasizes the need for ongoing policy efforts aimed at reducing dependency on oil and fostering economic diversification.

Table 9: Error Correction Term (Adjustment to Equilibrium):

Variable	Coefficient	Standard Error	t-Statistic
CointEq1 (D (GDP PC))	-0.254983	0.21487	[-1.18668]
CointEq1 (D (SIZE))	-1.049385	1.00960	[-1.03941]
CointEq1 (D (HDI))	0.009862	0.00575	[1.71519]
CointEq1 (D (CPI))	-5.235736	-4.42495	[-1.18323]
CointEq1 (D (Oil Rent))	13.79005	-13.2312	[1.04223]
CointEq1 (D (Liquidity))	95.34527	-108.851	[0.87593]
CointEq1 (D (UN))	2.188751	0.82123	[2.66522]

Data Source: Table compiled and prepared by the author, 2024.

Model Summary

The VECM applied to the Kingdom's economic data provides valuable insights into the short- and long-term interactions between key variables. However, the model's performance, as reflected by metrics such as R-squared and Adjusted R-squared, as shown in Table 10, suggests that the country's heavy reliance on oil revenues may contribute to the model's mixed explanatory power. This aligns with the resource curse phenomenon, where resource-rich countries, especially those reliant

on oil, experience slower or more volatile economic growth due to structural inefficiencies and an over-reliance on a single commodity.

The R-squared values for the dependent variables range from 0.214 to 0.494, meaning the model explains between 21.4% and 49.5% of the variance. While these values suggest that the model performs reasonably well in some areas, such as explaining liquidity (R-squared of 0.494815), the relatively low R-squared for SIZE (0.214019) may be indicative of the oil curse dynamics. In an oil-dependent economy, the financial sector may not effectively translate into diversified economic growth because oil revenues tend to dominate other sectors. Thus, fluctuations in SIZE may not capture the broader economic health, leading to weak explanatory power.

The Adjusted R-squared values, which account for the number of predictors, are generally lower, and some are even negative. This further highlights the challenges in using the model to explain short-term variations in economic indicators. These weak results are consistent with the resource curse, where oil wealth can lead to misallocation of resources, inefficiencies in governance, and lack of economic diversification, all of which dampen the model's ability to capture economic growth dynamics in the kingdom fully.

Table 10: Model Summary:

Variable	R-squared	Adjusted R-squared
GDPPC	0.252	-0.02
SIZE	0.214	-0.072
HDI	0.373	0.145
CPI (Inflation)	0.369	0.139
Oil Rent	0.269	0.003
Liquidity	0.495	0.311
Unemployment (UN)	0.434	0.228

Data Source: Table compiled and prepared by the author, 2024.

Log Likelihood and Akaike Information Criterion (AIC)

Higher Log Likelihood values in Table 11 indicate better model fit, with D(HDI) having the highest log-likelihood (139.5998). The Akaike Information Criterion (AIC) and Schwarz Criterion (SC) also suggest a better fit for HDI. However, the negative long-term relationship between HDI and GDPPC highlights inefficiencies in leveraging human capital in an oil-driven economy. This again reflects the resource curse, where investments in human development may not lead to productivity gains if the economy remains concentrated in resource extraction sectors.

Table 11: Log Likelihood and Akaike Information Criterion (AIC)

Lag	Log Likelihood (Log L)	Akaike Information Criterion (AIC)
0	-316.043	21.5362
1	-139.7955	13.053
2	-60.71996	11.048
3	89.07391	4.3284

Data Source: Table compiled and prepared by the author, 2024.

Diagnostic Tests

To ensure the reliability of the results, a series of diagnostic tests were conducted to evaluate the key assumptions underlying the VECM model, focusing on autocorrelation, heteroscedasticity, multicollinearity, and the normality of residuals.

Autocorrelation

The Breusch-Godfrey Serial Correlation LM Test in Table 12 revealed the presence of autocorrelation, with significant results (F-statistic: $p = 0.0367$; Chi-Square: $p = 0.0188$). This suggests that the residuals exhibit serial correlation, meaning they are not fully independent, which could impact the efficiency of the model's estimates by leading to biased standard errors. Additionally, the VECM Serial Correlation LM Tests showed weak evidence of autocorrelation at lag 2($p = 0.0993$), although lag 1 indicated no significant serial correlation. These findings highlight the need to interpret the results with caution, as autocorrelation may influence the statistical significance of the coefficients.

Table 12: Breusch-Godfrey Serial Correlation LM Test

Statistic	Value	Degrees of Freedom (df)	Probability (p-value)
F-statistic	3.8062	2	0.0367
Obs*R-squared	7.9465	2	0.0188

Data Source: Compiled and prepared by the author, 2024.

Heteroscedasticity

In contrast to the autocorrelation findings, the Breusch-Pagan-Godfrey Test in Table 13 confirmed that the residuals exhibit constant variance, indicating no significant heteroscedasticity (p = 0.1493). However, the VECM Heteroscedasticity Test detected significant heteroscedasticity in specific residual components, particularly in res7*res7, indicating that some variables may not maintain constant variance. While heteroscedasticity in some components suggests the presence of volatility, it does not severely impact the overall model validity.

Table 13: Heteroscedasticity Test: Breusch-Pagan-Godfrey

Statistic	Value	Degrees of Freedom (df)	Probability (p-value)
F-statistic	1.7495	6	0.1493
Obs*R-squared	9.4902	6	0.1478
Scaled Explained SS	8.9292	6	0.1776

Data Source: Table compiled and prepared by the author, 2024.

Multicollinearity

To assess potential multicollinearity among the predictor variables, the Variance Inflation Factor (VIF) test was employed. As shown in Table 14, all variables exhibit VIF values well below the threshold of 10, confirming that multicollinearity is not a concern in the model. This ensures that the model's estimates are not distorted by inflated standard errors due to highly correlated independent variables, further enhancing the reliability of the results.

Table 14: Variance Inflation Factor (VIF)

Variable	VIF	1 / VIF
SIZE	2.58	0.388
HDI	3.12	0.321
CPI (Inflation)	1.75	0.571
Oil Rent	2.06	0.485
Liquidity	1.85	0.541
Unemployment	1.92	0.521

Data Source: Table compiled and prepared by the author, 2024.

Residual Analysis and Model Validity

As shown in Figure 3, the residuals from the VECM model exhibit a nearly normal distribution, as confirmed by the Jarque-Bera test (p-value = 0.472). This high p-value supports the null hypothesis of normality, indicating that the residuals are normally distributed and that the model does not suffer from bias. The mean of the residuals is very close to zero, further reinforcing the model's accuracy in predicting the data. Additionally, the skewness value, near zero, indicates a symmetrical distribution. In contrast, the kurtosis value (4.03) suggests only a slight deviation from perfect normality, which does not raise significant concerns about outliers.

Serial Correlation Analysis

The results of the VEC Residual Serial Correlation LM Tests in Table 15(Table: VEC Residual Serial Correlation LM Test Results) provide further insight into serial correlation in the model. At lag 1, the p-values for both the LRE statistic (p = 0.4090) and the Rao F-statistic (p = 0.4832) are well above the 0.05 significance level, supporting the null hypothesis that no serial correlation exists. At lag 2, the LRE statistic's p-value (p = 0.0993) suggests a weak indication of possible serial correlation, but this is not sufficient to reject the null hypothesis. When testing for serial correlation across lags 1 to 2, the calculated p-value for the LRE statistic is 0.0852, which remains above the significance threshold. The Rao F-statistic (p = 0.2033) also indicates no significant serial correlation across these lags. Therefore, the residuals appear free from substantial autocorrelation, ensuring that the model's estimates remain unbiased and reliable

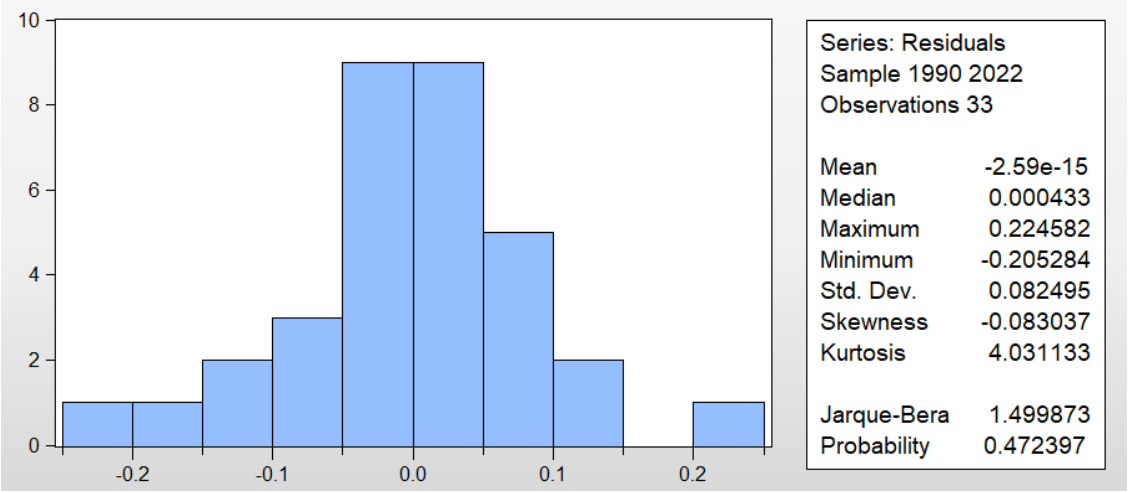
Table 15: VEC Residual Serial Correlation LM Test Results (Lags 1 and 2)

Lag	*LRE Statistic**	Degrees of Freedom (df)	Probability (p-value)	Rao F-stat	Probability (p-value)
1	50.6312	49	0.409	1.0118	0.4832
2	62.083	49	0.0993	1.3543	0.1442

Data Source: Table compiled and prepared by the author, 2024.

This analysis complements the earlier tests for autocorrelation and heteroscedasticity. Although autocorrelation was identified as a potential issue through the Breusch-Godfrey test, the normality of the residuals and the lack of significant autocorrelation in the VECM tests reinforce the overall reliability of the model. Consequently, the VECM is considered a robust tool for analysing the complex dynamics of Saudi Arabia's economy. By confirming that the residuals meet key assumptions of both normality and the absence of significant autocorrelation, this analysis further supports the validity of the VECM results. As a result, the conclusions drawn from the model are statistically reliable, ensuring that the insights provided can be trusted for informing economic policy and strategic analysis.

Figure No. 3: Histogram of Residual Values from the Regression Model with Key Statistical Measures



Diagnostic Tests for Model Robustness

To validate the robustness of the Vector Error Correction Model (VECM), diagnostic tests for serial correlation and heteroscedasticity were conducted. These tests confirm that the model meets critical econometric assumptions, enhancing the reliability of the results.

The VEC Residual Serial Correlation LM Tests (Table 16) indicate no evidence of serial correlation at lag 1 (p-value = 0.4090), confirming that residuals are independent. While marginal concerns arise at lag 2 (p-value = 0.0993), these do not significantly affect the model's validity for short-term dynamics. The Null Hypothesis: No Serial Correlation at Lags 1 to h test (Table 17) similarly supports the absence of autocorrelation at key lags, reinforcing the stability of the model for short- and long-term relationships.

The VEC Residual Heteroskedasticity Tests (Levels and Squares) (Table 18) confirm that the residuals exhibit homoscedasticity, with the joint test yielding a p-value of 0.2703. This finding ensures that the variance of the residuals is constant, a critical assumption for unbiased estimations. While minor variance issues are observed in individual components (e.g., res7*res7, p-value = 0.0385), they do not compromise the overall reliability of the model.

These diagnostic results validate the econometric integrity of the VECM, supporting the conclusions drawn from the short- and long-term dynamics presented in this study.

Table 16: VEC Residual Serial Correlation LM Tests

Lag	*LRE Statistic**	df	p-value	Rao F-stat	p-value
1	50.63117	49	0.409	1.011811	0.4832
2	62.08296	49	0.0993	1.354263	0.1442

Data Source: Table compiled and prepared by the author, 2024.

Table 17: Null Hypothesis: No Serial Correlation at Lags 1 to h

Lag	*LRE Statistic**	df	p-value	Rao F-stat	p-value
1	50.63117	49	0.409	1.011811	0.4832
2	137.6149	98	0.0052	1.370982	0.2033

Data Source: Table compiled and prepared by the author, 2024.

Table 18: VEC Residual Heteroskedasticity Tests (Levels and Squares)

- ***Joint Test:***

Statistic	*df*	p-value
465.8853	448	0.2703

- ***Individual Components:***

Component	*R-squared*	F-stat	p-value	Chi-sq	p-value
res1*res1	0.683813	1.892351	0.1185	21.19821	0.171
res7*res7	0.879905	6.410896	0.0006	27.27705	0.0385
res5*res3	*0.761124*	2.787993	0.0303	23.59485	0.0987

Data Source: Table compiled and prepared by the author, 2024.

Discussion

This study provides critical insights into the intricate dynamics between oil dependency, stock market progression, and economic growth in Saudi Arabia, supporting the resource curse framework. The results reveal a significant negative long-term correlation between oil rents and GDP, aligning with previous research that highlights the adverse effects of oil dependency on sustainable development. This underscores the need for comprehensive reforms to diversify the economy, as outlined in Vision 2030.

Saudi Arabia's Vision 2030 prioritizes several diversification strategies to reduce reliance on oil revenues and foster sustainable growth. For instance, the National Industrial Development and Logistics Program (NIDLP) focuses on promoting the manufacturing, mining, and logistics sectors to drive non-oil GDP growth. Additionally, significant investments in the renewable energy sector, such as the Sakaka Solar Power Plant and NEOM's plans for green hydrogen production, aim to position Saudi Arabia as a global leader in clean energy. The tourism and entertainment sectors are also central to Vision 2030, with initiatives like the Red Sea Project and the development of Qiddiya transforming the non-oil economy and creating new employment opportunities. By implementing these reforms, Saudi Arabia seeks to reduce economic volatility and unlock the potential of underutilized sectors. This aligns with the findings of Alkhareif, Barnett, and Alsadoun (2017), who highlight that fiscal expenditures and economic diversification efforts have significantly contributed to narrowing the output gap in Saudi Arabia, particularly in the non-oil sector. Their analysis emphasizes the critical role of aligning fiscal policy with structural reforms to enhance economic stability and maximize potential output.

Furthermore, the findings of this study align with those of Samargandi, Fidrmuc, and Ghosh (2014), who demonstrate that financial development in Saudi Arabia disproportionately benefits the non-oil sector. This underscores the need for sector-specific financial reforms, as outlined in Vision 2030, to bolster non-oil sector growth and reduce dependency on oil revenues. Together, these insights highlight the importance of integrating fiscal, structural, and financial strategies to achieve sustainable economic diversification.

A key finding is the human development paradox, where improvements in education and health have not translated into higher productivity due to job market inefficiencies. The misalignment between educational outcomes and the demands of the economy, exacerbated by the dominance of the oil sector, limits the full utilization of human capital. This highlights the need for job market reforms to ensure that human capital contributes more effectively to economic growth, particularly in high-growth non-oil sectors such as technology and renewable energy. Addressing the skills mismatch requires targeted policy changes, including the introduction of industry-aligned education and vocational training programs that equip graduates with skills demanded by emerging sectors. For example, expanding partnerships between universities and private sector companies can provide practical training opportunities and improve employability. Additionally, upskilling and reskilling initiatives for the existing workforce, particularly in digital technologies, renewable energy, and advanced manufacturing, can bridge the gap between job market needs and current skillsets. Policymakers could also promote STEM-focused curricula in education to align with the needs of technology-driven industries while offering incentives for companies to invest in employee training. These measures will not only address the skills mismatch but also ensure that human capital development aligns with Saudi Arabia's Vision 2030 goals for economic diversification and sustainable growth.

The negative long-term impact of oil rents on GDP growth emphasizes the risks of oil dependency. Diversification efforts must be accelerated to mitigate the effects of global oil price fluctuations, as the pace of reform under Vision 2030 remains critical. Moreover, the study highlights that stock market progression has a marginal effect on long-term growth, indicating that Saudi financial markets are underdeveloped. To enhance market efficiency, several concrete steps can be recommended. First, policymakers could promote greater market transparency and regulatory reforms to increase investor confidence and attract both domestic and foreign investments. Second, diversifying financial instruments—such as the introduction of more derivatives, bonds, and green financial products—could broaden market participation and improve liquidity. Additionally, fostering Initial Public Offerings (IPOs) from high-growth non-oil sectors, such as technology and renewable energy, would strengthen market depth and diversity. Encouraging fintech innovation through supportive policies and infrastructure can also streamline trading processes and expand market access. These measures collectively can enhance the efficiency and role of financial markets in driving sustainable economic growth, in line with the Vision 2030 agenda. This underscores the need for financial market reforms to improve efficiency, liquidity, and sectoral diversity, particularly by expanding into emerging industries like technology and renewable energy.

Autocorrelation, detected in the residuals, raises some concerns about the accuracy of the model estimates. While the findings provide valuable insights, future studies should address this limitation using more advanced econometric techniques to enhance the robustness of the results.

Control variables , such as the Consumer Price Index (CPI) and unemployment, significantly explain fluctuations in economic growth. Unemployment has a robust negative relationship with GDP, indicating inefficiencies in the job market. High youth unemployment, in particular, underscores the need for targeted reforms to create opportunities in the private sector. Programs such as vocational training and career development will be crucial in bridging the gap between human capital improvements and economic productivity.

Sectoral diversification is essential for reducing Saudi Arabia's reliance on the oil sector. Establishing Special Economic Zones (SEZs) could promote export-oriented industries, attract private investment, and foster growth in high-tech sectors.

Conclusion

This study provides a comprehensive examination of the relationship between oil rents, stock market progression, and economic growth in Saudi Arabia from 1990 to 2022. The findings reveal significant structural challenges tied to oil dependency, supporting the resource curse theory. The negative long-

term relationship between oil rents and GDP growth highlights the urgent need for economic diversification, as emphasized in Vision 2030. While stock market progression has a marginal impact on long-term growth, it indicates that the financial markets are not yet mature enough to drive diversified economic development. Reforms aimed at improving market efficiency, enhancing liquidity, and broadening sectoral diversity are essential for ensuring that the stock market contributes more effectively to economic growth. Policymakers should incentivize Initial Public Offerings (IPOs) in emerging sectors such as technology and renewable energy, aligning with the goals of Vision 2030.

Moreover, the study highlights the human development paradox, where improvements in health and education have not translated into higher economic productivity due to job market inefficiencies. Addressing youth unemployment and fostering private-sector employment are critical for ensuring that human capital is fully utilized in sectors that support diversified growth.

The presence of autocorrelation in the residuals suggests that caution should be exercised when interpreting the results. Future research should focus on refining the econometric model and exploring alternative variables, such as institutional quality and foreign direct investment (FDI), to provide a more nuanced understanding of Saudi Arabia's economic dynamics.

In conclusion, this study underscores the need for comprehensive reforms to enhance financial market efficiency, reduce oil dependency, and better integrate human capital into the economy. Policymakers should prioritize innovation, education, and investment in high-growth sectors, such as renewable energy and technology, to achieve the goals of Vision 2030 and ensure sustainable economic growth. This can be achieved through specific targeted measures. For instance, investing in renewable energy infrastructure, such as NEOM's green hydrogen projects and the Sakaka Solar Power Plant, can create employment opportunities while reducing oil dependency. Similarly, fostering innovation ecosystems by supporting research and development (R&D) hubs and tech incubators would attract private-sector investments and encourage technological advancement.

In addition, aligning education and training programs with job market needs is essential to address the existing skills mismatch. Expanding vocational education and STEM-focused curricula can equip the workforce with skills tailored for emerging sectors, such as renewable energy, fintech, and advanced manufacturing. Financial incentives, such as tax breaks or subsidies for companies that invest in workforce development, can accelerate this process. Furthermore, improving financial market efficiency through regulatory reforms, transparency, and diversification of financial products will strengthen investor confidence and mobilize capital for non-oil sectors. Encouraging Initial Public Offerings (IPOs) from technology startups and renewable energy companies can broaden market participation and promote sustainable economic diversification.

These targeted policies would directly address the structural challenges identified in the study, ensuring that Saudi Arabia transitions toward a resilient, diversified economy, as envisioned in Vision 2030.

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