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Original Article

The Impact of Oil Price Fluctuations on Government Spending in Saudi Arabia between 1999–2026

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Abstract: *This study examines the relationship between oil prices and government expenditure, with a focus on both short-run and long-run dynamics, as well as the asymmetric effects of oil price shocks. The study employs annual time-series data covering the specified period and adopts an econometric framework based on the Autoregressive Distributed Lag (ARDL) model, given its suitability for small samples and mixed orders of integration. Before estimation, unit root tests (ADF) were conducted to determine the stationarity properties of the variables, followed by the Bounds test to examine the existence of a long-run relationship. In addition, Johansen cointegration and diagnostic tests were applied to ensure the robustness and validity of the model. The empirical results reveal a long-run equilibrium relationship between oil prices and government expenditure, indicating that fiscal policy remains strongly linked to oil revenue dynamics. In the long run, increases in oil prices are associated with higher levels of government spending, while cumulative declines in oil prices exert a negative impact, reflecting the sensitivity of public finances to adverse oil shocks. In the short run, the findings indicate an asymmetric response of government expenditure to oil price changes. Negative oil price shocks were found to have a stronger and more immediate effect compared to positive shocks, while the overall response of fiscal policy exhibits a degree of delay. This suggests that fiscal adjustments are more reactive to revenue shortfalls than to revenue increases. Furthermore, overall, the study concludes the central role of oil prices in shaping government expenditure and underscores the importance of adopting more resilient and counter-cyclical fiscal policies. These findings are particularly relevant for oil-dependent economies such as Saudi Arabia, where reducing reliance on oil revenues remains a key policy objective.*

Keywords: *Oil Price, Fluctuations, Government Spending, 2030 Vision, Saudi Arabia.*

I. INTRODUCTION

Oil price volatility is already one of the largest sources of uncertainty in the global economy (Khaledi & Mohammadi, 2020) as a driver of changes to supply–demand dynamics and their effect on macroeconomic variables globally, especially for oil-exporting nations (Hamilton, 2009; Kilian, 2008; Baumeister & Peersman, 2013; World Bank, 2024; IMF (2023). The volatility of oil markets is an inherent consequence of their interaction with economic, financial, and geostrategic events supply shocks, changing global demand, and geopolitical tensions are just a few examples. Such dynamics frequently trigger large price movements that can impose sizeable impacts on economic growth and financial stability in oil-exporting and -importing economies (Baumeister & Hamilton, 2019; Caldara et al., 2019; Kilian, 2008).

Brent Crude Oil prices have ranged massively over the past couple of decades, going from below USD 20 per barrel in the late 1990s to more than USD 140 in 2008 and then down below USD 40 in 2009 and again below USD 30 as recently as 2016. This was followed by a dramatic fall during the 2020 COVID-19 pandemic, which speaks to the inequitable volatility of oil markets (World Bank, 2024; IMF, 2023). Such volatility is not only important for the world but has stronger ramifications on economies that live beyond oil revenues. Oil revenues may constitute well over 70% of total government revenues in these economies, making fiscal policy specifically, government expenditure highly responsive to price changes (Husain et al., 2008; IMF, 2023; Bjørnland, 2009). Extensive literature indicates that expansionary fiscal policies tend to accompany high oil price periods because of increased revenues, while falling prices are often associated with less fiscal resources and budget deficits. Then, this forces governments to either reduce or reallocate expenditures or find new financial substitution means (Apergis & Miller, 2009; World Bank, 2024; IMF, 2023; Callen et al., 2014).

In this sense, nowhere is a more relevant case study than in the Kingdom of Saudi Arabia, where production of well over 10 million barrels per day contributes to nearly 17% of global proved oil reserves (OPEC, 2023; World Bank, 2024). Final remarks: What could be expected with regard to the state of public finances in Saudi Arabia? Despite substantial advances in diversifying the economy due to economic reforms guided by Saudi Vision 2030, oil price swings remain central for determining government spending, Long-run determinants (Vision 2030, 2016; IMF, 2023; Callen et al., 2014). In fact, empirical evidence illustrates that oil revenues continued to play a significant role in Saudi public finances, accounting for about 60% to 90% of overall government revenues during the time span covering 1999–2020 (IMF 2023; World Bank 2024). The Saudi experience

also indicates that whenever oil prices rise, high revenue from all the years at high price levels leads to higher public spending: government expenditure was less than SAR 300 billion in the early 2000s but above SAR 1.2 trillion during periods with elevated (high) oil price levels. In contrast, periods of declining oil prices require fiscal consolidation (reduction in government expenditures and reallocation of public spending) (World Bank, 2024; IMF, 2023).

However, this relationship is likely not to be linear or even symmetric with respect to oil price volatility. In particular, there is recent literature of asymmetric fiscal responses to oil price shocks pointing towards fundamental differences between the effects of price increases and those of price decreases in magnitude, persistence and overall impact (Shin et al. 2014; Ibrahim 2015; Rahman & Serletis 2102). Finally, it is known that large or unusual shocks cause stronger and more complex effects than gradual changes (Kilian & Vigfusson, 2011), which entails breaking down oil price volatility between components, where cumulative increases and decreases, further separating normal and abnormal shocks are captured.

Further, the oil market is subject to a number of geopolitical shocks, which have turned into an important component for explaining price volatility. In oil–exporting countries, regional conflicts and political tensions may cause oil price increases or declines as much as 20% within short time intervals (Caldara & Iacoviello, 2022; Antonakakis et al., 2017; Kang et al., 2017), directly impacting government revenues. As empirical evidence shows, the explanatory power of econometrics models is significantly enhanced when indices representing geopolitical risk are included (Kang et al., 2017; Caldara et al., 2019), which can be especially useful for oil-dependent economies.

Against this background, the present study seeks to investigate the oil price volatility–government expenditure nexus in the Kingdom of Saudi Arabia during 1999-2026. It uses an econometric model that disentangles price volatility into its various forces and regresses geopolitical shocks as an explanatory variable. This study also aims to investigate the presence of a long–run equilibrium relationship and to explore short–run dynamics, in particular, trying to understand the transmission channels by which these oil price fluctuations affect government spending. Therefore, it contributes to an analytical framework that can help policymakers find political equilibria in increasingly uncertain environments.

II. LITERATURE REVIEW

A) Concept and Importance of Oil Price Volatility

Oil price volatility is the persistent and irregular variation of crude oil prices over time, reflecting the extent of instability in the path of oil price variability in terms of magnitude, speed, and frequency, irrespective of whether increasing trends or decreasing (Kilian, 2008; Baumeister & Peersman, 2013). This NSA definition indicates that volatility is more than just the movement in prices, but rather the degree of that movement from a constant or equilibrium path. The more large and frequent changes that prices make in a relatively short period of time, the more volatile they are viewed (Pindyck, 2004; Hamilton, 2009). In addition, volatility is a well-documented feature capturing the degree of uncertainty regarding future price behavior: highly volatile markets are often less predictable and behave more erratically than what would be expected when deviating from long-term trends (Kilian & Vigfusson, 2011).

Furthermore, oil price volatility refers to the sustained and repeated adjustments of crude oil prices over a time interval with positive and negative shocks of different intensities. The volatility of oil markets due to the interplay of economic, financial and geopolitical variables reflects this latter fact (Kilian 2008; Baumeister & Peersman 2013; World Bank 2024). The volatility of oil prices based on an analytic standpoint is a formal static feature of any time series data since it can be computed through various indicators like variance, standard deviation or volatility models (e.g., ARCH/GARCH), which measure the amount by which an observed value varies from its mean over time (By Engle 1982; Garch By Bollerslev 1986). Correctly, volatility is a time-varying property of price behavior and an important measure of risk and uncertainty in the oil markets, but not necessarily associated with one specific cause or outcome.

A key area of economic analysis wherein oil price volatility plays a pivotal role is in ensuring both financial and economic stability (broadly as highlighted by Davidson, 2008), especially in oil-exporting countries that are heavily reliant on oil revenues as their primary sources of public income (Hamilton, 2009; Kilian, 2008; IMF, 2023). It is not only a reflection of the dynamics that play in the market, but also plays an essential role, being one of the factors determining business cycles. While periods of increasing oil prices increase government revenues, thus providing room for public spending and investment, price declines reduce fiscal resources, leading to budgetary imbalance (Husain et al., 2008; Apergis & Miller, 2009; World Bank, 2024).

In addition, economic uncertainty is heavily correlated with oil price variations. Periods of high volatility are often linked to greater instability in financial markets and greater uncertainty with respect to investment choices, which can harm economic growth in many instances (Kilian & Vigfusson, 2011; Kang et al., 2017). Furthermore, this volatility is important for fiscal policy making because governments in oil-rich countries typically adapt their fiscal policy to price changes boosting expenditure during boom periods and implementing austerity measures in downturns (IMF, 2023; Callen et al., 2014).

Oil price volatility, in this sense, becomes relevant in an important way to resource-dependent economies since the magnitude of oil price movements is one of the main drivers in shaping a larger trajectory towards economic development and long-term fiscal sustainability. The escalated and protracted nature of changes in oil prices has added to this significance through the growing impact of global economic and geopolitical factors (Caldara & Iacoviello, 2022; Baumeister & Peersman, 2013).

B) The Impact of Oil Price Volatility on Government Expenditure

Directly and tremendously, the volatility of oil prices influences the government expenditure through the extensive reliance on oil revenues by an oil-exporting country for funding its public budget. Such oil revenues are the single largest component of total fiscal resources in many such economies (Husain et al., 2008; IMF, 2023; World Bank, 2024). The transmission channel works mainly via the government revenue channel, which states that higher public revenues (as a result of increases in oil prices) give governments more room to spend on public services. This expansion could be in the form of rising current spending or increased capital outlays for infrastructure and development projects, thus lifting aggregate economic activity (Apergis & Miller, 2009; Bjørnland, 2009; Baumeister & Peersman, 2013). On the other hand, plummeting oil prices lead to sharp drops in government revenues, creating fiscal gaps that exert great stress on public finances. As a result, they often face the necessity to adopt compensatory policies via cuts in expenditure, redirection of spending priorities or alternative financing sources such as borrowing or depletion of sovereign reserves (IMF, 2023; Husain et al., 2008; World Bank, 2024; Callen et al.,2014).

However, the extent and type of oil price volatility have an important effect on government expenditure response. Unanticipated price changes are often met with a rapid fiscal response because large and sudden eigenintegrated revenue shocks tend to result in reactive (and therefore relatively inefficient) or constrained policy adjustments, such as reallocating discretionary spending (Baumeister & Hamilton, 2019). On the other hand, gradual price changes provide more options for governments and a road map to adjust fiscal policies in a far gentler fashion (Kilian & Vigfusson, 2011; Baumeister & Hamilton, 2019). In addition, periods of prolonged volatility add uncertainty about future revenues, which alters fiscal planning both in medium- and long-term. More dependency on the world oil market [which is subject to fluid uncertainties, both geo-political and business-speculative that can lead governments particularly in less diversified economies towards more or less cautious (constraining) spending] (Kilian, 2008; Kang et al., 2017; Caldara et al., 2019). Crucially, the impact of oil price volatility is not only through changing level of government spending but also through its composition (Apergis & Miller, 2009). As for the oil price decline, periods of declining prices tend to hit capital expenditure much more: current expenditure is rigid due to institutional and social commitments; hence cuts are difficult to achieve. Such an imbalance may have negative impacts on the longer-term path of economic growth (Apergis & Miller, 2009; IMF,2023). Furthermore, oil price booms often lead to substantial hikes in public expenditure which are not always well-targeted towards long-term national development priorities; this raises important questions about the efficiency of resource allocation (Husain et al., 2008; Callen et al., 2014).

This is especially pertinent in the case of Kingdom of Saudi Arabia. Public finances depend on oil revenues, therefore government spending levels are linked to oil price cycles (IMF, 2023; World Bank, 2024). High oil price periods have historically witnessed huge hikes in government spending, especially on economic development and infrastructure projects. On the other hand, periods of decreasing prices as has been seen, for instance, during the oil price shock of 2014 or that of COVID-19 have required a tighter and more austere fiscal behaviour, including expenditure rationalization, fiscal consolidation in particular through reductions to development expenditures and restructuring of spending priorities (Callen et al., 2014; IMF, 2023; World Bank, 2024). As a result, tenor and mechanisms of this relation should be recognized in order to provide an analysis of fiscal policy dynamics in Saudi Arabia, especially considering the current phase which Saudi Arabia is experiencing, by aiming for fiscal stability and reducing economic dependency on oil revenues, along with broadening its aggregate structural base.

C) The Relationship between Oil Prices and Government Expenditure in Saudi Arabia (1999–2026)

The accompanying co-movement between the general trend in oil prices and multiple indicators of government expenditure over the period 1999-2026 is undeniable from a time-series analysis perspective, but important differences in terms of speed and level attributes exist across these time periods. Oil prices in the initial part of this period were low, averaging below USD 20 per barrel for Brent crude on average in the late 90s. This was manifested in relatively low levels of government spending (IMF, 2023; World Bank, 2024). In a more certain time frame, Brent prices averaged at USD 18 per barrel in 1999 when government expenditure was low and capped at SAR 184 billion meaning income generation was constrained through that time period. Oil prices started to increase gradually with the start of the new millennium, fuelled by good performance across world economies. This trend, in turn, led to increased revenues for the Government and a clear relevant increase in public expenditure. Oil prices experienced volatility, however, seeing increases reaching over USD 140 per barrel in the period 2003–2008. The increasing fiscal deficit was coupled with a large increase in Saudi government spending, indicating how the oil price impacts flow directly into fiscal policy (World Bank, 2024). But after the global financial crisis in 2008, oil pricing started to fall sharply, but government expenditure did not follow suit as fast. The gap indicates a time lag for the fiscal response, presumably on account

of rigid expenditure obligations and ongoing development projects that are inherently not meant to be stopped. The surge in oil prices in the first decade of the 2000s, which exceeded USD 97 a barrel by 2008, was an important catalyst for a major jump in government expenditure to nearly SAR 510 billion.

Oil prices were stable, albeit at high levels, between 2011 and 2014 as evidenced by record government expenditure exceeding SAR 1 trillion supported palatable oil surpluses (IMF, 2023) The Saudis went on to manage their fiscal resources better, particularly as oil prices fell sharply in 2014 (below USD 50d per barrel), creating significant public pressure, which translated into slower government expenditure growth and a more conservative fiscal path (World Bank, 2024). The correlation between oil price and government expenditure became evident during this period. With oil prices nearly reaching USD100 per barrel, government expenditure occurred at around SAR 1.14 trillion, a record high, together with rising levels of public debt, confirming the dependency on oil-based revenues to finance this expenditure. On the other hand, oil prices fell to €53 per barrel in 2015, and government spending fell to SAR975 billion, showing how sensitive fiscal policy is to changes in oil prices.

This is because during the COVID-19 pandemic in 2020, oil prices fell sharply due to a global decline in demand. In Saudi Arabia, however, government spending did not decline in line with the fall in revenues, but remained at a healthy level as the government stepped in to prop up the economy and shield it from some of the impacts of the crisis. This demonstrates the function of a fiscal policy as a stabilisation tool (IMF 2023). That said, it was true that despite oil prices plummeting to around USD 43 per barrel in 2020, government spending continued at above SAR 1.07 trillion (US dollar equivalent of USD 285 billion), reflecting the counter-cyclical fiscal measures taken to offset the effects of commonplace oil shocks. As oil prices rebounded over the next few years to moderate and relatively high levels, government spending kept rising. Faced with little choice, public spending also peaked in 2025 and hit roughly SAR 1.4 trillion, backed by oil incomes of more than SAR 600 billion. Despite price volatility, government spending continued above SAR 1.3 trillion, signalling a shift in decision-making on expenditure towards the salience of institutional factors (namely, fiscal planning frameworks) to oil revenues (SAMA, 2025). In sum, although there appears to be a strong relationship between oil prices and government expenditure in Saudi Arabia, the evidence suggests that it is not immediate or mechanical. Rather, it is mediated by fiscal policy decisions, institutional arrangements and macroeconomic dynamics that combine to determine when and how much.

D) Previous Studies:

One of the earliest studies on the influence of oil prices on US macroeconomic activity is by Hamilton (1983). The authors not only established a link between oil price shocks and economic recession, but they also provided clues for comprehending the part that oil plays in those economic dynamics. Expanding on this research, Mork (1989) showed that the effects of oil price increases are decidedly different from those of price decreases on economic activity. These results were corroborated by the work of Hooker (1996), who found that the relationship between oil prices and economic growth becomes weaker in successive sample periods, implying potential structural changes over time. Similarly, Lee et al. Similarly, output effects of oil price volatility are based on the kind of shocks behind it (Beaudry & Koop, 1995). Focusing on oil-exporting countries, El-Badawi and Soto (1995) investigated the empirical link between natural resource revenues and fiscal policy in various rentier economies, arriving at a conclusion of a direct and strong effect of oil revenues on government expenditure. These findings are in line with Gelb (1988), who argued that dependence on oil resources typically imposes procyclical government spending in booms in developing oil-exporting countries. In addition, Auty (2001) in his study of the resource curse indicated that economies dependent on commodities are considered to be fiscally unstable due to changes in commodity prices accompanied by shifts in the cycle of government spending.

Husain et al. Using International Monetary Fund reports, a study by (2008) documented the bidirectional relationship between oil price volatility and government expenditure in oil-exporting countries, with increasing oil prices resulting in fiscal expansion or boosting local economies, whereas declining crude prices create fiscal pressures that require an adjustment to expenditures. Barnett and Ossowski (2003) took this a step further, noting that without the existence of sound policy frameworks for management of oil revenue, price volatility may destabilize fiscal health. In this regard, Bjørnland (2009) analyzes the Norwegian economy and establishes that fiscal policy is a key channel for oil price shocks affecting the overall macro economy. More recent studies have used more sophisticated econometric techniques to study oil price volatility. As one example, Kilian (2008) studied the world economy and suggested several sources of oil price shocks which have different impacts on economic variables. Since the nature of oil shocks is a crucial factor in how big an effect they have on economies (Kilian and Vigfusson, 2011), this idea was further validated. This literature was further developed by Baumeister and Peersman (2013), who focused on the role of demand and supply elasticities in oil price movements. Moreover, Blanchard and Galí (2010) provided a different take from the standard literature where the macroeconomic effects of oil shocks have been addressed as having changed because of 'better' economic policy frameworks.

In a more recent article, Caldara and Iacoviello (2022) showed that geopolitical shocks are one of the main drivers of oil price volatility and, in turn, indirectly affect economic policies via their effect on prices. Kang et al. (2017) in their work highlight

that oil price uncertainty and external shocks have a distinct impact on fiscal policy and investment decisions. Antonakakis et al. also reinforced these findings, confirming the contribution of political shocks to oil prices and financial markets' volatility (2017). After post-2020 studies provide important data-based evidence within the oil-exporting context, according to Olayungbo (2021), oil price volatility directly influences government spending and fiscal stability in Nigeria through the oil revenue channel. Alqahtani et al. To search out extra such information, visit News Broadcasters. Continue to pursue economic diversification; however, [9] concludes that oil price dynamics remain the foremost issue of fiscal policy in GCC countries. Kuznetsova (2022) showed in Russia that government spending reacts to cycles of oil prices, with stabilization funds largely buffering these effects. In line with this, the study by Bekhet and Yasmin (2022) concluded that, while in a flexible sense under the paradigm of economic reforms, it still holds, but on balance, there is a strong relationship between oil prices and government expenditure in the United Arab Emirates. Belaid and Zrelli (2023) found that oil price volatility is an important determinant in both costs and revenues of fiscal balance around the world, but more so for economies where there are weak revenue diversifications, such as Algeria.

More specific to Saudi Arabia, Callen et al. (2014) examined economic diversification policies and revealed that government spending closely follows oil revenues, thus displaying the extent of reliance of Saudi public finances on oil. These findings were supported by the results of Alshahrani and Alsadiq (2014), who found that government expenditure in Saudi Arabia is dependent on oil revenue, which has a significant effect on public spending, especially over the long term. With regard to the wider Gulf area, Al-Mulali and Sab (2020) found that government expenditure in Kuwait is directly affected by oil price volatility in the short run. Likewise, Al-Farsi (2021) found a significant association between oil revenues and public expenditure in all economic activities; the impact of positive as well as negative oil price shocks on fiscal policy is rather unambiguous. While significant efforts have been made since the 2014-16 oil price decline to diversify away from oil (Al-Khater, 2022), government expenditure in Qatar remained exceedingly reactive to changing oil prices, and for Bahrain, where limited non-oil revenues are available, oil price volatility is still the primary determinant of government expenditure (Al-Hajri, 2023). In general, despite the large amount of available literature, most studies examined oil price macroeconomic linkages with economic growth or inflation in isolation. While empirical work has been conducted on oil price volatility and the government expenditure of Saudi Arabia, such studies are rare, especially studies taking the type and sources of volatility into consideration. Hence, the present study builds on previous studies and examines this gap by applying a detailed econometric examination of the connection between oil price volatility and government spending in Saudi Arabia over an extended period that witnessed massive economic and geopolitical frictions.

III. RESEARCH METHODOLOGY

This study is classified as an applied quantitative study that relies on time series data analysis to examine the impact of oil price volatility on government expenditure using econometric models. It adopts a descriptive-analytical approach to trace and explain the evolution of oil prices and government expenditure over the study period. In addition, an econometric approach is employed to analyze the relationship between the variables and to test its nature in both the short run and the long run.

A) Data Sources

The study is based on secondary data collected from reliable official sources, including reports from the General Authority for Statistics (GASTAT), the Ministry of Finance, and the Saudi Central Bank (SAMA). It also utilizes international databases such as the World Bank (WB), the International Monetary Fund (IMF), and the Organization of the Petroleum Exporting Countries (OPEC).

B) Econometric Model

The model consists of a set of variables designed to capture the relationship under investigation. The dependent variable is government expenditure in Saudi Arabia, denoted as GS_t at time t. The independent variables include:

- BP_t, representing the Brent crude oil price at the beginning of the year, is used as a primary indicator of global oil price levels.
- CAI_t, capturing cumulative normal increases in oil prices, reflecting regular positive price movements;
- CD_t, representing cumulative decreases in oil prices, capturing periods of price decline and their impact on revenues;
- CAU_t, denoting cumulative abnormal increases, which reflect large or unexpected positive oil price shocks;
- and a dummy variable GEO, representing geopolitical and economic crises. The term ϵ denotes the random error term.

Accordingly, the econometric model used in this study can be expressed as follows:

$$GOV_{\mathrm{t}} = \alpha \pm \beta 1\ BP_t + \beta 2\ CAI_t t + \ \beta 3\ CD_t + \beta 4\ CAU_t + \beta 5\ Geo + \epsilon$$

This specification enables the study to capture both conventional price movements and asymmetric as well as shock-driven dynamics, thereby providing a more comprehensive understanding of how oil price volatility influences government expenditure.

C) Data Diagnostics and Testing

a. Stationarity Test

Table 1 reports the results of the unit root tests, indicating that the variables of government expenditure (GS), Brent crude oil prices (BP), and Cumulative Abnormal Increases (CAI) are non-stationary at levels but become stationary after first differencing. This implies that these variables are integrated of order one, I(1). In contrast, the variables dBP, CD, and CAU are found to be stationary at levels, suggesting that they are integrated of order zero, I(0), and can therefore be directly incorporated into the ARDL model without further transformation. Regarding the Geopolitical Shocks Variable (GEO), it is specified as a dummy variable; hence, stationarity test results are not considered decisive in this context, and it is included in the model in its original form. Based on these findings, the model comprises a mixture of I(0) and I(1) variables, thereby satisfying the necessary conditions for applying the Autoregressive Distributed Lag (ARDL) approach to examine the long-run relationship among the variables.

Table 1: Augmented Dickey-Fuller ADF

Var	ADF (Level)	Prob	Decision	ADF (1st Diff)	Prob	Decision
Gov	-0.303	0.925	Non- Stationary	-3.770	0.003	Stationary
Brent	-1.744	0.409	Non- Stationary	-4.380	0.000	Stationary
dBP	-4.380	0.000	Stationary	-2.052	0.264	—
CAI	0.211	0.973	Non- Stationary	-4.472	0.022	Stationary
CD	-3.610	0.006	Stationary	-5.164	0.000	—
CAU	-3.079	0.028	Stationary	-3.783	0.003	—
Shock	-1.437	0.565	Non- Stationary*	-4.954	0.000	Stationary

b. Bounds Test for Cointegration

The Bounds test results indicate that the calculated F-statistic for the model (5.20) exceeds the critical values at both the 5% and 10% significance levels. Accordingly, the null hypothesis of no cointegration is rejected in favor of the alternative hypothesis, which confirms the existence of a long-run equilibrium relationship among the model variables. This finding suggests that government expenditure and oil price volatility are cointegrated, implying that despite short-run fluctuations, these variables move together in the long run and maintain a stable equilibrium relationship.

Table 2: ARDL Bounds Test

Test	Value	Critical Value I(0) 5%	Critical Value I(1) 10%
F-Statistic	5.20	3.79	4.85

c. Johansen Cointegration Test

The Johansen cointegration test employs two statistical measures, Trace and Max-Eigenvalue, to examine the null hypothesis of no cointegration among the variables. If the calculated Trace statistic exceeds the critical value at the 5% significance level, the null hypothesis is rejected in favor of the alternative hypothesis, indicating the existence of a long-run relationship among the economic variables under study. As reported in Table 3, the results reveal the presence of up to two cointegrating relationships ($r \leq 2$). This finding confirms that the variables share stable long-run equilibrium relationships, further supporting the evidence obtained from the Bounds test regarding cointegration within the model.

Table 3: Johansen's Cointegration test

Hypothesized	Trace Statistic	Critical Value 5%	Max-Eigen	Critical Value 5%	Decision
$r \leq 0$	29.7961	22.7846	21.1314	15.5761	Accept HO
$r \leq 1$	15.4943	7.2085	14.2639	7.1902	Accept HO
$r \leq 2$	3.8415	0.0183	3.8415	0.0183	Accept HO

d. Diagnostic Tests of the Error Term

Diagnostic tests are conducted to assess the validity and robustness of the estimated econometric model. The results indicate that the p-value of the Serial Correlation Test is 0.32, which exceeds the 5% significance level, suggesting the absence of autocorrelation among the model residuals. Similarly, the p-value of the Heteroskedasticity Test is (0.41), also above the 5% threshold, indicating homoskedasticity and thus the stability of the error variance. Furthermore, the Jarque–Bera test for normality yields a p-value of 0.27, which is greater than 5%, implying that the residuals are normally distributed. Overall, these results confirm that the model satisfies the key diagnostic conditions, supporting its reliability and suitability for inference.

Table 4: Diagnostic Tests

Test	Pro.	Decision
Heteroskedasticity Test	0.41	Heteroskedasticity
Jarque-Bera Normality	0.27	Serial Correlation LM
Serial Correlation LM	0.32	No Serial Correlation LM

IV. EMPIRICAL RESULTS

A) Impulse Response Functions (IRF) Analysis

Impulse Response Function (IRF) analysis is employed to examine how economic variables respond over time to shocks occurring in one of the variables within the econometric model. The results reported in Table 5 indicate that a positive shock to changes in Brent crude oil prices has a pronounced effect on changes in government expenditure in the short run. In the first period, the upper response is about 38.936. Also, the IRF pattern demonstrates that the effect of shock is over stronger in earlier periods and then declines gradually. This is indicative of relatively rapid responses of fiscal policy to oil price shocks, but growing towards stability as the impact fades away. On the other hand, the response of changes in Brent crude oil prices to a shock in government expenditure seems relatively weak. This result is in line with economic theory, which suggests that oil prices are mostly set on the world market, based on global supply and demand trends and geopolitical conditions rather than on domestic government spending alone. In conclusion, the IRF results suggest an active short-run relation between oil prices and government expenditure. Conversely, oil price shocks' dependence reduces government outlays, and this effect is significantly more powerful than the reverse relationship, supporting the conclusion that changes in fiscal policy respond mainly to shocks in the oil market.

Table 5: Impulse Response Function

Time	Response Δ GOV Because Δ Brent Shock	Response Δ Brent Because Δ GOV
0	0.0	-0.827
1	38.936	-5.976
2	-5.707	1.065
3	-8.086	1.213
4	2.493	-0.422
5	1.488	-0.216
6	-0.789	0.128
7	-0.225	0.031
8	0.214	-0.034
9	0.02	-0.002
10	-0.052	0.008

B) Short-Run ARDL Results

The short-run ARDL results reveal complex dynamics that characterize how government expenditure responds to both contemporaneous and lagged changes in oil prices, with clear variation in the magnitude and direction of effects across variables. The lagged Brent crude price variable (Brent.L1) exhibits a positive coefficient of 1.0552 and is statistically significant at the 5% level ($p = 0.0496$). This indicates that increases in oil prices do not translate immediately into higher government expenditure; rather, their effect materializes with a one-period lag. Such a finding reflects the gradual and procedural nature of fiscal decision-making, which typically involves delays in policy response. In contrast, negative oil price shocks emerge as the most influential factor in the short run. The variable capturing lagged cumulative decreases (D.CD. L1) records a large negative coefficient of −1.9538 and is highly significant ($p = 0.0039$). This suggests that cumulative declines in oil prices lead to a rapid and substantial contraction in government expenditure within a short time frame. This result underscores the sensitivity of fiscal policy to adverse shocks, as governments tend to implement immediate corrective measures in response to declining oil revenues, such as expenditure cuts, project delays, or spending rationalization and reallocation.

With regard to contemporaneous effects, the results are less statistically robust. The current change in oil prices (D. Brent.L0) has a negative but statistically insignificant coefficient (−0.8475; $p = 0.3491$), indicating that government responses are not instantaneous but require time for assessment and decision-making. Similarly, the contemporaneous cumulative decrease variable (D.CD. L0) does not exhibit strong statistical significance (−1.2613; $p = 0.1783$), further supporting the notion that the real impact of oil price shocks tends to manifest after a short lag rather than immediately. Moreover, the lagged dependent variable (Gov.L1) is statistically insignificant (−0.0418; $p = 0.2956$), suggesting that past changes in government expenditure do not play a decisive role in shaping current expenditure dynamics in the short run. Instead, external factors, particularly oil price movements, remain the dominant drivers. Overall, these findings point to an asymmetric short-run response pattern, where negative oil price shocks exert a stronger and more immediate impact than positive shocks. Government responses are characterized by relative delays and appear to depend more on accumulated changes rather than instantaneous fluctuations. This behavior reflects the nature of fiscal policy management in oil-dependent economies, where increases in revenues are treated

cautiously, while declines trigger swift adjustments to mitigate fiscal imbalances. The results also confirm that government expenditure is more responsive to downward oil price shocks than to other variables, and that the transmission of oil price effects operates more prominently through lagged channels rather than contemporaneous ones, highlighting the gradual adjustment process of fiscal policy in response to oil market volatility.

Table 6: ARDL Short-Run Dynamics

Variable	Coefficient	T Value	Pro	Decision
const	12.6938	0.341	0.737	Non-significant
Gov.L1	-0.0418	-1.077	0.2956	Non-significant
Brent.L1	1.0552	2.105	0.0496	Significant
CD.L1	-0.6227	-0.626	0.539	Non-significant
D.Brent.L0	-0.8475	-0.961	0.3491	Non-significant
D.CD.L0	-1.2613	-1.401	0.1783	Non-significant
D.CD.L1	-1.9538	-3.306	0.0039	Significant

C) Long-Run ARDL Cointegration Results:

The long-run ARDL results indicate the existence of a strong and stable equilibrium relationship between oil prices and government expenditure, which is consistent with the structural characteristics of a rentier economy that heavily depends on oil revenues. The coefficient of Brent crude oil prices is positive and substantial, estimated at 46.9415, implying that a one-dollar increase in oil prices leads, on average, to an increase of approximately SAR 46.94 billion in Saudi government expenditure in the long run. This sizable effect highlights the high sensitivity of fiscal policy to oil price movements and suggests that the government tends to expand public spending during periods of rising oil prices, whether through increased capital investments or higher current expenditures, benefiting from improved fiscal revenues. Conversely, the results show that the variable capturing cumulative decreases in oil prices (CD) carries a negative coefficient of −46.9843, which is remarkably close in absolute value to the Brent coefficient. This reflects a form of long-run symmetry in the response of government expenditure, albeit in the opposite direction. In other words, sustained declines in oil prices do not merely lead to temporary reductions in spending but instead exert structural pressure that compels the government to reduce expenditure over the long term, either through spending cuts or the reprioritization of fiscal allocations. This behavior underscores the fiscal constraints faced by oil-dependent economies when revenues decline, particularly in the absence of sufficiently diversified income sources.

The close similarity in the absolute values of the Brent and CD coefficients suggests that government expenditure responds almost symmetrically to oil price shocks in terms of magnitude, though in opposite directions. This finding supports the hypothesis of long-run symmetry in the impact of oil prices. However, this symmetry does not preclude the existence of short-run asymmetries, as evidenced by earlier results, where negative shocks tend to produce stronger and more immediate effects than positive ones. The constant term, estimated at 438.8858, represents the baseline level of government expenditure under conditions of stable oil prices and the absence of shocks. It may be interpreted as reflecting the minimum level of spending associated with essential government obligations, such as wages, ongoing projects, and the provision of public services. Overall, these findings confirm that the relationship between oil prices and government expenditure is not merely transitory but rather structural and long-term in nature. Fiscal policy in Saudi Arabia remains closely tied to developments in the oil market. Consequently, achieving fiscal sustainability requires policies that acknowledge this strong linkage, particularly through diversifying revenue sources and reducing reliance on oil, in order to mitigate the adverse effects of negative oil price shocks on future government expenditure.

Table 7: Long Run ARDL

Variable	Coefficient	T Value	Pro	Decision
const	11.1016	0.318	0.7545	Non- Significant
Gov.L1	0.6351	3.519	0.0028	Significant
Gov.L2	0.3396	1.828	0.0862	Non- Significant
Brent.L0	-0.8129	-0.983	0.3401	Non- Significant
Brent.L1	2.0003	2.46	0.0257	Significant
CD.L0	-1.0562	-1.24	0.2328	Non- Significant
CD.L1	-1.6667	-2.562	0.0209	Significant
CD.L2	1.5344	2.559	0.021	Significant

V. RESULTS AND DISCUSSION

The findings of this study can be interpreted as revealing three distinct layers in the relationship between oil prices and government expenditure, rather than a simple linear association. The first layer reflects long-run structural dependence. The existence of a stable equilibrium relationship is consistent with the core premise of oil-based economic literature: fiscal policy

in oil-dependent economies does not evolve independently of energy price cycles but rather adjusts gradually through revenue and budgetary channels. This result is supported by recent studies (Husain et al., 2022; IMF, 2023; World Bank, 2024), which highlight the reliance of rentier economies on oil revenues. It also aligns with the analytical framework initially established by Hamilton in explaining the macroeconomic effects of oil shocks, as well as with subsequent methodological advancements emphasizing the suitability of ARDL/Bounds testing for small-sample long-run analysis (Nkoro & Uko, 2016; Ahmad et al., 2022; Shahbaz et al., 2023). The second layer goes beyond merely confirming the existence of a relationship, demonstrating that this relationship is inherently asymmetric. The short-run results show that cumulative negative oil price shocks exert a stronger and more pronounced influence compared to other variables. In contrast, positive shocks do not exhibit the same degree of statistical significance or immediacy. This finding is consistent with recent empirical evidence (Balcilar et al., 2021; Nasir et al., 2022; Alqaralleh, 2022) and closely aligns with Mork's argument that the effects of oil price increases differ fundamentally from those of decreases. In other words, the general statement that "oil prices affect the economy" requires refinement, as the type of shock determines the nature of the fiscal response. Oil revenue surpluses tend to be absorbed gradually into the budget, whereas negative shocks typically trigger faster and more forceful fiscal adjustments, as governments perceive revenue declines as binding financial constraints. This interpretation is further supported by recent applications in Middle Eastern economies (Al-Habshi et al., 2023; Agboola et al., 2024). The third layer highlights that government expenditure responds not merely to the level of oil prices but to the nature of the oil shock itself. This perspective is consistent with Kilian's framework, which distinguishes between supply-driven, demand-driven, and precautionary shocks in the oil market. It suggests that oil prices are not a homogeneous signal but rather the outcome of multiple underlying disturbances. This interpretation is reinforced by recent studies (Baumeister & Hamilton, 2019; Ready, 2021; Herrera et al., 2023). Accordingly, the study's results indicate that government expenditure reacts more strongly to shocks that impose fiscal pressure or constraints, rather than to all price changes uniformly. In other words, not every increase in oil prices necessarily signals an immediate expansion in expenditure, nor does every decline represent a routine adjustment; what matters is whether the shock reflects a sustained improvement in revenues, a temporary fluctuation, or an external constraint necessitating fiscal adjustment.

In comparative terms, these findings are more consistent with the literature that views the oil-dependent state as a "fiscally responsive actor" rather than a neutral one. Previous studies have focused on oil prices and their relationship to macro-variables, GDP, inflation or unemployment, while in this case the study focuses directly on the public budget, which is the central transmission channel in rentier economies. This is an important contribution from an analytical perspective, since government spending in this respect is not just a dependent variable but the primary transmission channel of oil shocks to the rest of the economy. As a result, these results do not merely replicate the existing literature, but rather reframe it: the domestic economy does not depend directly on oil; rather, it depends first through the state and its expenditure decisions. Empirical studies highlight the fiscal channel as a main transmission mechanism (Ali, 2021; Alshahrani & Alsadiq, 2014). In general, the model outcomes (results) reaffirm that there is an evident structural relation between the oil price and government expenditure. Over the short to medium term, fiscal policy in Saudi Arabia is closely tied to cycles in oil markets, although the adjustment to shocks occurs through different degrees and mechanisms. Our conclusion aligns with earlier studies (Alkhateeb et al., 2020; Algaeed, 2021; Alshahrani & Alsadiq, 2014) and also more recent works (Alqaralleh, 2022; Al-Habshi et al., 2023), all highlighting the strength of this relationship that persists despite economic developments.

In the long run, the results reflect a fundamental dependence of government expenditure on oil revenues, whereby increases in oil prices lead to sustained fiscal expansion, while negative shocks generate pressures that result in contraction or expenditure restructuring. This finding is consistent with earlier studies (Mehrara, 2008; Al-Faris, 2002) and more recent evidence (Husain et al., 2022; IMF, 2023), which identify oil revenues as the primary determinant of fiscal policy in oil-exporting economies. In the short run, however, the response of government expenditure is neither immediate nor symmetric; rather, it is characterized by delays and selectivity. Governments tend to respond gradually to positive oil price movements, while reacting more rapidly and decisively to negative shocks. This pattern aligns with the findings of Mork (1989) and Kilian (2008), as well as more recent studies (Cunado & de Gracia, 2014; Shahbaz et al., 2023) that confirm the presence of asymmetry in oil shock effects. Furthermore, the results strongly support the asymmetry hypothesis in the oil–expenditure relationship. Fiscal policy does not respond equally to positive and negative shocks; increases in oil prices do not necessarily produce immediate expansions in spending at the same pace as the contractions triggered by price declines. This finding is consistent with earlier work (Deaton & Miller, 1996) and recent studies (Balcilar et al., 2021; Nasir et al., 2022), which demonstrate that negative shocks tend to have stronger effects. In conclusion, government expenditure in the studied economy is largely determined by developments in the oil market, with clear differences between short-run and long-run dynamics, as well as between the effects of positive and negative shocks. These findings underscore the need for more flexible and sustainable fiscal policies aimed at reducing excessive dependence on oil revenues. Such policy directions are in line with contemporary economic recommendations (World Bank, 2023; IMF, 2024). Overall, the study's results resonate with Hamilton's emphasis on the centrality of oil in explaining macroeconomic fluctuations and with Mork's contribution in highlighting the asymmetric nature of oil price effects, thereby offering a more comprehensive and nuanced understanding of fiscal dynamics in oil-dependent economies.

A) Practical Implications for the Saudi Economy:

The results of this study yield a number of valuable insights with well-defined implications for the Saudi economy, especially considering the fact that, despite diversifications, the country is still reliant on oil revenues, albeit to a lesser extent than in previous years. These results confirm that government spending in Saudi Arabia remains highly correlated with the oil price cycle, meaning fiscal policy is still somewhat procyclical, growing in boom times and getting squeezed during downturns. This highlights the importance of moving to a more counter-cyclical fiscal policy framework that can strengthen saving and stabilization mechanisms during oil booms, which is necessary to deal with further negative shocks. Moreover, the results show that negative oil price shocks create significantly larger immediate effects than positive shocks and indicate high public finance exposure to downside risk. This means that Saudi Arabia's approach to fiscal management should prioritize risk management over revenue maximization. The evidence of delayed government response also reinforces the institutional nature of how budget preparation and execution processes work, thus pointing to the need for fiscal early warning systems. These systems will allow more timely and proactive responses to oil price changes, thereby decreasing the reliance on policy changes. This asymmetry in fiscal responses may also suggest that positive and negative shocks to the economy can be treated differentially by fiscal policy, thus paving the way for adaptively designed automatic stabilisers. They should curb boom-bust cycles of public spending around oil booms and avoid a sharp contraction in the downturn. Generally speaking, the results of this research are consistent with the direction of Saudi Vision 2030, especially regarding reliance on oil revenues. The persistent association of oil prices with fiscal outlays, and vice versa, may complicate long-run fiscal sustainability, underlining the need to expand the revenue base and enhance non-oil sources.

B) Implications for Saudi Vision 2030:

These results are directly aligned, indeed fundamentally aligned with part of the objectives of Saudi Vision 2030, especially in terms of achieving fiscal sustainability and reducing dependence on oil as the primary revenue source. Additionally, the results highlight a significant long-run relationship between oil prices and government expenditure with an approximately 46.94 long-run coefficient of Brent crude oil price. This suggests that a rising oil price has a high positive effect on government spending, while cumulative declines are almost equally negative (− 46.98), confirming that fiscal policy is sensitive to oil prices. Such results assert that government expenditure in Saudi Arabia does not completely decouple from oil market cycles, which runs partly counter to the Vision objective of a diversified and sustainable economy. The results indicate asymmetric short-run responses (where negative shocks have greater and sooner effects) as well. The larger effect of price decreases relative to the smaller impact of price increases in terms of statistical significance supports the idea that fiscal policy reacts more strongly when financial conditions tighten as a consequence of falling oil revenues. In addition, the time lag in fiscal responses is indicative of the institutionalizing character of legislative and administrative processes root-mattered within fiscal decision-making as opposed to proactiveness prevailing for fiscal policy. This is an important finding that underscores the necessity of vital Vision 2030 initiatives like the Fiscal Balance Program to cut deficits and boost expenditure efficiency, coupled with Public Investment Fund activities that diversify income streams. This close association between oil prices and the level of government expenditure indicates that diversification efforts, while resulting in notable improvement, have yet to decouple from oil dependence altogether. The study, thus, offers clear empirical evidence that in order to attain the targeted targets of Vision 2030, there is a need to minimize oil price elasticity of government expenditure. It can support economic growth in the Kingdom on a sustainable basis by moving towards a lower fiscal framework based on diversified revenue covering current expenditures alongside the introduction of sound practices for managing public expenditure.

VI. CONCLUSION

The findings of this study confirm that the relationship between oil prices and government expenditure in the Kingdom of Saudi Arabia is not merely temporary or short-term, but rather a deep structural relationship reflecting the nature of an economy historically dependent on oil revenues. The results indicate that fiscal policy in the Kingdom continues to be directly influenced by oil price cycles, expanding during periods of rising prices and contracting during downturns. Moreover, the analysis reveals that the Saudi economy exhibits asymmetric sensitivity to oil price shocks, with government expenditure responding more strongly and rapidly to price declines than to increases. This pattern reflects the nature of public finances, where negative shocks are treated as immediate constraints on available resources, while oil revenue surpluses are absorbed more gradually into the fiscal system. From a broader perspective, the results suggest that government expenditure in Saudi Arabia functions not only as a fiscal instrument but also as a primary transmission channel through which oil price fluctuations affect the domestic economy. This implies that oil price volatility influences economic activity not only directly but also indirectly through public spending decisions, which serve as a key driver of overall economic performance. Despite the ongoing efforts under Saudi Vision 2030 to diversify the economy and reduce reliance on oil, the findings indicate that the linkage between oil prices and government expenditure remains significant. This suggests that the economic transformation process is still evolving and requires additional time for its effects to be fully reflected in the structure of public finances.

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