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# Fiscal Policy and Inflation in the International Economic Environment: Evidence from Saudi Arabia

**Mohd NAVED Khan**

*College of Administration and Financial Sciences, Prince Musaid bin Abdulrahman University, Riyadh, Saudi Arabia.*

**Abstract**

This study investigates the dynamic relationship between real government expenditure, inflation, and real economic output in Saudi Arabia within an increasingly globalized economic environment using annual time-series data. The analysis employs a sequential econometric framework consisting of unit root testing, cointegration analysis, and error correction modeling. Augmented Dickey–Fuller test results indicate that all variables are integrated in order one. Both the Engle–Granger and Johansen cointegration techniques provide evidence of a stable long-run equilibrium relationship among government expenditure, the consumer price index, and real gross domestic product. Corresponding to the Johansen Vector Error Correction Model, inflation is a crucial element for maintaining the equilibrium in the long run, while changes in government spending do not correct itself due to disequilibria. The findings from the single equation error correction model show that government spending tries to correct the equilibrium problem in the long run, mainly based on the performance of economic activity, while inflation cannot be corrected by any short-term actions. This finding suggests that the growth of fiscal policy affects long-term inflation behavior, but not in the short run. The results highlight the importance of fiscal-monetary policy coordination in maintaining long-run price stability.

**Keywords:** Cointegration, Error correction model, Fiscal policy, Government expenditure, Inflation, Saudi Arabia.

## 1. Introduction

In an increasingly internationalized economy, an economy's domestic fiscal policy shaped by a series of factors, including global trade integration effects, foreign inflation effects, and international monetary effects. As in the case Saudi Arabia, a series of factors affect the inflation process, including imported inflation and global commodity price, as well as exchange rate effects, creating an important background to consider in a context focused on a long-run and a short-run relationship between government expenditure and inflation effects (Aragaw, 2024). For resource-intensive economies, fiscal policy has significant influence on the economy because government revenues are likely to track very volatile oil markets. Even though inflation in oil-based economies has a tendency to respond to fluctuations in government expenditure, diversified-based economies are likely to experience inflationary pressures from fluctuations in the money supply (Tuama, 2018). For that matter, accounting for the interaction of government expenditure and inflation is an insightful measure towards allowing policymakers to realize sustained economic stability and development.

This study analyzes Saudi Arabia in an original way. The government of Saudi Arabia, which has been considered the world's leading exporter of oil, has a significant portion of its revenue come from global crude oil prices (Al-Hamidy, 2012), which have considerable effects on the state's ability to honor its financial commitments. As the price of oil goes up, the government will be undertaking more spending on other activities, like the construction of infrastructure, the provision of subsidies, and increased recruitment in the public sector. Increased spending will have the potential to trigger higher demand and hence drive-up prices. Falling oil prices may necessitate a reduction in expenditure, which will not only maintain subdued inflation levels but also potentially limit economic growth. Given the timing variability of fiscal policy, it is crucial to apply the relationships between governmental spending and inflation to Saudi Arabia's situation.

This need and complexity have even been made more evident with global challenges, such as the sudden drop in the prices of oil and economic impact that has been felt owing to the coronavirus disease 2019 pandemic outbreak (Samargandi, 2023). The purpose of this investigation will be to determine the effect that government spending has had on inflation trends and whether the pattern of spending leads to volatility in the prices or reduces the price fluctuations. It is through this analysis that the research contributes significantly to Vision 2030, Saudi Arabia's future plans to achieve economic diversification and financial sustainability, together with the growing literature regarding fiscal policies in oil-dependent countries. Such analysis will add to the growing body of knowledge regarding the way resource-rich countries achieve a balanced approach towards spending for growth


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while managing inflation trends. This topic is relevant in Saudi Arabia owing to its dependence on revenues generated from oil production, which account for over 80% of the national budget (Abdel-Latif et al., 2018). This vulnerability creates the need to find out how government finance decisions influence the Consumer Price Index, subject to the continued undertaking of Saudi Arabian Vision 2030 reform plans to diversify the economy and diminish dependence on oil (Bilal et al., 2024); (Abdel-Latif et al., 2018).

### *1.1. The Saudi Arabian Economy and Oil Dependence*

Saudi Arabia remains a prime illustration of an economy so reliant on petroleum wealth. Conventionally, oil revenues contributed from 70% to 90% of government revenues, so fluctuations in the international oil marketplace had a colossal impact on the economic fortunes of the nation (Alabdulwahab, 2021). There have, however, been persistent efforts to diversify the economy and take advantage of a shrinking portion of oil in the makeup of the real GDP, but it still contributes an estimated 40% of the real GDP and accounts for virtually 75% of all budgetary revenues over the last few years. As much growth as there has been in non-oil revenues, largely from VAT, expat fees, and targeted reform policies, they still fall short of what is necessary to protect the budget adequately from the unpredictability of oil price cycles (Fund, 2016).

The reliance on oil has a major impact on government spending behavior. Fiscal spending tends to follow a procyclical sequence; an increase in oil prices marks an increase in government spending on infrastructure, social functions, and public employment. If there is a fall in oil prices, then the government cuts back on spending or borrows in order to finance the arising deficit. Comparative research across countries, with the addition of advanced econometric research, has shown that the fiscal policy of Saudi Arabia has a procyclical property, hence increasing economic volatility and a high likelihood of inflation during phases of growth and recession (Al-Hamidy, 2012).

### *1.2. Revenue Changes from Oil and the Government's Response*

#### *1.2.1. Patterns From the Past*

The capacity of Saudi Arabia to effectively manage its financial resources has faced numerous challenges due to fluctuations in oil prices. In April 2025, Saudi Arabia oil export revenues dived considerably by 21% compared to the previous year to a near-four-year low following a decline in international oil prices due to oversupply and a potential slowdown in the world economic growth process (Paraskova, 2025). As the world's largest net exporter of crude oil and a key member of the OPEC+ group, Saudi Arabia recorded oil export revenues at $16.5 billion (Magdy, 2025) in April 2025, according to the Kingdom's General' Authority for Statistics (GASTAT). That was a 21.2% reduction from the previous year, reflecting the 15% reduction in the price of crude oil in April. The price of crude oil dropped to below $65 per barrel, the same level seen before at around $80 per barrel. Due to this massive decline in revenues, the government recorded a budget deficit that was $15.6 billion (58.7 billion SAR) during the first quarter in 2025, exceeding half the estimated full-year deficit period (Fund, 2016). Typically, Saudi officials resort to borrowing to compensate for such fiscal shortfalls, aiming to preserve their foreign reserves. This practice parallels the approach taken by other oil-dependent nations that engage with sovereign debt markets during economic downturns (Jabali et al., 2023).

#### *1.2.2. Policy Issues and Procyclicality*

In Saudi Arabia, the experience with fiscal procyclicality has been a common knowledge. During phases of rising oil prices, government spending accelerated, with an average above 14% per annum during 2003–2014. During declines, as in the phase of 1991-1999, the growth remained just below 1% per annum. However, the government is moving gradually in the direction of countercyclical and rule-based fiscal policies (Fund, 2016). Real-world limitations and the political economy of distributive commitments, however, render observance of narrow fiscal prudence more challenging. For instance, during economic disturbances, we have observed the recurrence of expansive budgets to accommodate strategic investments, social transfers, and employment schemes. The following is a list of some important economic indicators and their significance for government expenditure and inflationary trends.

**Table 1.** Economic indicators and their effects.

| **Indicators** | **2024-25's Trends and Values** | **How It Relates to Government Spending and Inflation** |
|---|---|---|
| Share of Oil Revenue in the budget | 68–75% (MOF, 2024; Reuters, 2024) | Derivation of fiscal space; volatility directly affect the expenditure. |
| Non Oil Revenue (% of Total) | 24 to 32 percent and going up (MOF, 2024; Arab News, 2024; World Bank, 2025) | Decreases procyclicality and ensures protection from inflation associated with oil. |
| Total Budget Expenditure | 3–5% YoY increase (MOF, 2024; KPMG, 2024) | Anti-cyclical. It may cause inflation if the growth process keeps continuing. |
| Budget Deficit (% of GDP) | (2025 est.) 2.3–2.5% (Reuters, 2024; KPMG, 2024) | Debt-driven. In the long-term period, persistent deficits would increase the expectation of inflation. |
| Debt to GDP | 29.9% (2025 est.) (KPMG, 2024; Fitch, 2025) | Manageable but increasing due to growing deficit spending. |
| Unemployment Rate | 7.0% (Q4 2024) (GASTAT, 2025) | Use of government expenditure to reduce unemployment. Inflation can nullify its effectiveness. |
| YoY Rare of CPI Inflation | 1.7–2.1% (Q1–Q2 2025) (GASTAT, 2025; SAMA, 2025) | Responsive to fiscal, monetary, and external shock absorbers. |
| Money Supply Growth (M3) | ~8% YoY (Q1 2025) (SAMA, 2025; MEP, 2025) | Money supply increase may be a signal for demand-pull inflation. |
| Oil Prices (Arab Light) | $65 to $80 per barrel (2024– | A direct external anchor to inflation and fiscal |



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| | | |
|---|---|---|
| | 2025) (Goldman Sachs, 2025; Reuters, 2025) | processes. |
| Non-oil GDP (Share in total) | 49 to 52% (2023–2025) (World Bank, 2025; IMF, 2025) | It indicates effective diversification efforts and reduces the likelihood of inflation occurrence. |
| Assets of the PIF | $775 billion in 2024 (PIF, 2025; Reuters, 2024) | Serves as a cushioning tool for stabilization and countercyclical policies. |

Government spending decisions are a significant determiner of the overall health of the economy. Increases in oil revenues are highly correlated with expansionary fiscal policies as well as increasing inflation rates.

*1.2.3. Effect of Inflation and the Saudi Monetary Landscape*

Both domestic and external factors simultaneously determine inflation in Saudi Arabia. Empirics consistently reveal that imported inflation, which is a significant portion of the kingdom's inflation, reflects changes in world prices through imports. The kingdom has fixed its domestic riyal, the SAR, against the U.S. dollar for several decades, thereby locking domestic inflation expectations with global prices. However, the fixed rate equally subjects the economy to variables in the value of the dollar and the impact of monetary policy in the US.

*1.2.3.1. Extrinsic Factors*

According to Al-Otaibi, 2024 and Alsabban, 2022, the imported inflation contributes 29% of the long-run inflation changes in Saudi Arabia, a contribution due to a high import-to-GDP ratio. This high import increases sensitivity to price changes in the international market, which affects domestic inflation rates more significantly.

Steps taken for some protection against exchange rate fluctuations by pegging the U.S. dollar with the Saudi riyal. But with a rising dollar, there are cheaper imports, which might help ease domestic inflation. But with a falling dollar, there are higher import prices, and then inflationary pressures arise (Al-Hamidy & Banafe, 2013).

Changes in international prices of commodities like oil and food items are directly reflected in increased expenses incurred by customers in Saudi Arabia. Despite having domestic price controls and subsidy systems, external variations in price have a major impact on inflation (World Bank, 2023).

*1.2.3.2. Internal Factors*

Fiscal stimulus, especially from oil revenues, raises the total demand within the economy. The Autoregressive Distributed Lag (ARDL) estimates show that net government spending accounts for 18–19% of long-run inflation, making it the second largest inflationary pressure after imported inflation (Alsabban, 2022).

The link between money supply (M3) and inflation in the case of Saudi Arabia is relatively weak. This is because of the strong desire to save, in addition to the habit of shifting money abroad, which confines the movement of money domestically and relieves it of inflationary pressure (Albahouth, 2025).

Since 2016, the implementation and then the raising of the Value Added Tax (VAT) from 5% to 15%, as well as some taxes and levies paid by expatriates, have improved non-oil revenue lines. Although all these measures have enhanced economic stability in the face of oil price fluctuations, they have also led to cost-push inflation in the short-run (Baum, 2025).

Such empirical evidences are congruent with the inflation dynamics in the international scenario. In particular, the increment in VAT in 2018 brought about an inflation rate of 3.3%, and VAT increment in 2020 resulted in an increase in the inflation rate of 5.5%. This was achieved by imposing price controls and cash transfers as well (Baum, 2025).

## 2. Review of Literature

This interaction of government spending with inflation has always been a core focus of both empirical and theoretical insight in the realm of macroeconomics. Classical and Keynesian theories present opposing perspectives. The Classical economists focus on the notion of monetary neutrality and inflationary potential of fiscal expansion, while the Keynesian models point to the importance of government expenditures in enhancing aggregate demand, specifically during the phase of economic slack. In oil-dependent countries like Saudi Arabia, in which fiscal policy is directly connected with the revenues from commodities, this interaction becomes all the more complex and peculiar to the situation.

*2.1. Conceptual Foundations*

The quantity theory of money also has the implication that inflation is a monetary phenomenon, the consequence of an excess expansion of the money supply. Fiscal policy is only relevant insofar as it changes aggregate demand and by which the money is acquired. Sargent and Wallace, (1981) introduced the concept of fiscal dominance, which contends that recurring budget deficits funded by borrowing from the central bank can create inflationary pressures. Likewise, Blanchard (1985) discussed the intertemporal budget constraint and the relationships between fiscal sustainability and price stability.

According to Keynesian theories (Keynes, 1936; Hicks, 1937), government expenditures have the potential to stabilize an economy, particularly during cases of production gaps. The IS-LM model demonstrates that the IS curve shifts outward because of higher government spending, which can translate into price and output increases, subject to the LM curve's slope. For open economies, the Mundell-Fleming model (Mundell, 1963; Fleming, 1962) complicates the transmission mechanism with the demonstration of the effect of exchange rate regimes and capital mobility on the effectiveness of fiscal policy.

*2.2. Empirical Findings*

Empirical research has registered inconclusive results with respect to governmental spending and inflationary rates. Barro (1991) established the fact that high government spending, particularly budget-financed spending, tends to generate inflationary responses in developing countries. Additionally, Fischer and Easterly (1990)



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established the fact that fiscal disequilibrium is the root cause of inflation in regions such as Latin America and sub-Saharan Africa.

In contrast, studies undertaken in developed economies often reveal less straightforward or more complicated interaction patterns. De Haan and Zelhorst (1990) had scant evidence that showed that fiscal policy influences inflation in OECD countries, and institutional factors and monetary policy credibility were proposed as the moderating factors. Romer and Romer (2007) argued for coordinating monetary and fiscal policies, and they argued that inflationary outcomes are influenced by the combination of policies rather than by fiscal considerations.

### *2.3. Empirical Evidence from Oil-Exporting Economies*

In oil-exporting countries, the inflation-fiscal policy relationship is determined through the variability of commodity prices, the nature of exchange rate regimes, and structures of public finance. Farzanegan and Markwardt (2009) in their research on Iran, established that abrupt changes in oil revenue are likely to have significant impacts on the expenditure of government and inflation rates. Similarly, El-Anshasy and Bradley (2012) established procyclical fiscal policies in oil-based nations, with expenditures inclined to rise during oil boom periods, consequently increasing inflationary impulses.

### *2.4. Literature's Methodological Approaches*

Time series econometrics has become the predominant approach for investigating the relationships between fiscal variables and inflation. Economists can classify short run instability from long run equilibrium with the help of the tests for unit roots such as ADF and PP test, alongside with cointegration techniques including Engle-Granger and Johansen, as well as the ECM model. The technique introduced by Engle & Granger (1987) that involves the two stages process in order to perform cointegration remains very popular due to its simplicity. Next, Johansen (1988) extended this process by involving several vectors of cointegration in a multivariate setting.Current studies have included structural breaks as proposed by Gregory and Hansen (1996), nonlinear adjustments as argued by Enders and Siklos (2001), and panel cointegration techniques introduced by Pedroni (2004) to account for complex dynamics.

### *2.5. Literature Gaps and This Paper's Contribution*

Despite the increasing volume of research on the subject, significant gaps persist. First, most examinations do not closely examine Saudi Arabia with data from the post-2000 era, depicting the effect of fiscal reform, the reform of subsidies towards their rationalization, and agreed plans in Vision 2030. Second, existing research tends to assume that inflation is a dependent variable, while it overlooks the potential of government expenditure to absorb inflationary pressure over time. Lastly, there has been little attention about short-term change and adjustment mechanisms linking fiscal and price variables.

This research bridges these gaps through:

- Using both Engle-Granger and Johansen cointegration tests to establish long-term relationships between GOVEXP, CPI, and RGDP.
- Approximating ECMs to try and get some sense of what occurs in the short run and how quickly things converge to equilibrium.
- Situating the analysis in terms of Saudi Arabia's economic environment, where fiscal policy is the predominant way of controlling the economy, and inflation is controlled by both domestic and external factors.

This study adds to the body of knowledge regarding the fiscal-inflation relationship in Saudi Arabia by combining sound econometric techniques with policy-focused analysis, providing policy-relevant conclusions in oil-based economies. Musgrave (1966), Meltzer and Richard (1981) instituted the idea of fiscal synchronization, which means that governments decide on both revenues and spending at the same time which make it a two-way interaction. Empirical investigations have produced inconclusive outcomes. For example, Miller and Russek (1990), Bohn (1991), and Chang et al. (2002) discovered evidence of bidirectional causality among fiscal variables across different nations. Al-Qudair (2005) developed a two-way link between spending and receipts for Saudi Arabia, revealing fiscal synchronization. Al-Hakami (2002) and Albatel (2002) found one-way causality between revenues and expenditure in trivariate models. These findings are indicative of the complexities of fiscal dynamics in oil-dependent economies, with the volatility of revenue greatly affecting expenditure dynamics. This paper uses these introductory principles with an exploration of the correlation of government spending and inflation in the case of Saudi Arabia, using similar econometric approaches to measure short- and long-run correlations.

## 3. Methodology

This study employs a time series econometric approach to investigate the connection between government expenditure and inflation within the Saudi Arabian economy. The approach is conceptualized based on the research by Al-Qudair (2005), which investigated the connection between government expenditure and revenues using the concepts of cointegration and causality tests. The current study differs from the previous one in that it focuses on the connection between real government expenditure (GOVEXP) and inflation, measured by the Consumer Price Index (CPI), while including real GDP (RGDP) as the control variable.

### *3.1. Data Collection and Transformation*

The data has been collected from some public institutions for 25 years, spanning the period 2000 to 2024, are the Saudi Arabian Monetary Authority (SAMA), the World Bank, and the International Monetary Fund (IMF). Variables that have been used in the analysis include:

- GOVEXP: Expenditures of the government after correcting for inflation
- CPI: Consumer Price Index measure of inflation.
- RGDP: Real Gross Domestic Product



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To achieve this stability of variance and facilitate elasticity analysis, natural log transformations of all the variables are performed.

**Table 2.** Data on government expenditure, ln (CPI_Index), CPI inflation rate (%), and Real GDP (USD million).

| Year | Real Government Expenditure (GOVEXP) USD Million*# | Cost of Basket (USD)* | CPI | Real GDP (RGDP) USD Million* |
|---|---|---|---|---|
| 2000 | 107646.10 | 76.69 | -1.12 | 359919.64 |
| 2001 | 108908.54 | 75.83 | -1.12 | 361159.90 |
| 2002 | 108071.02 | 76.02 | 0.25 | 358673.71 |
| 2003 | 112355.87 | 76.48 | 0.61 | 390124.85 |
| 2004 | 121301.22 | 76.88 | 0.52 | 423796.55 |
| 2005 | 131892.59 | 77.25 | 0.48 | 448990.82 |
| 2006 | 142426.81 | 78.95 | 2.2 | 463868.06 |
| 2007 | 144979.49 | 82.24 | 4.17 | 474136.49 |
| 2008 | 150322.20 | 90.36 | 9.87 | 503713.07 |
| 2009 | 151225.35 | 94.93 | 5.06 | 498339.87 |
| 2010 | 153008.80 | 100.00 | 5.34 | 523453.79 |
| 2011 | 181106.67 | 105.83 | 5.83 | 585005.97 |
| 2012 | 194378.93 | 108.86 | 2.86 | 618711.13 |
| 2013 | 215071.73 | 112.70 | 3.53 | 636936.50 |
| 2014 | 241525.60 | 115.23 | 2.24 | 662570.91 |
| 2015 | 237137.33 | 116.61 | 1.2 | 693414.40 |
| 2016 | 196772.53 | 119.02 | 2.07 | 705230.70 |
| 2017 | 197912.00 | 118.03 | -0.83 | 713567.09 |
| 2018 | 215942.13 | 120.93 | 2.46 | 736593.55 |
| 2019 | 209318.40 | 118.40 | -2.09 | 748758.86 |
| 2020 | 218771.20 | 122.48 | 3.45 | 720270.35 |
| 2021 | 220463.47 | 126.23 | 3.06 | 767229.07 |
| 2022 | 241698.93 | 129.35 | 2.47 | 859301.07 |
| 2023 | 255095.20 | 132.36 | 2.33 | 863963.57 |
| 2024 | 259889.87 | 134.60 | 1.69 | 879583.64 |

**Note:**

- #Changed from riyal to dollars then in millions
- *World Bank (2023)
- ln (CPI_Index) is the price level used in regression (log-transformed). CPI Inflation Rate (%) is only descriptive and was not logged.

### *3.2. Unit Root Test (Augmented Dickey–Fuller Test)*

Before analyzing the long-run relationship between the variables, the characteristics of the time series for all the variables are analyzed by the use of the Augmented Dickey Fuller (ADF) unit root test. This is essential to avoid obtaining spurious results for the regression analysis, which could lead to the wrong application of the appropriate economic model. This test uses the following equation:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta Y_{t-i} + \varepsilon_t$$

Where:

$\Delta Y_t$ = First difference in the series.

$\gamma$ = Unit root parameter

$t_t$ = Trend over time

$\varepsilon_t$ = Error term.

$k$ = number of lag differences in $Y$

The null hypothesis of the ADF test postulates the presence of the unit root in the series, while the alternative indicates stationarity in the series ($\gamma = 0$). The hypotheses were tested under such assumptions that the series contain an intercept and a deterministic trend, wherever applicable. It is worth mentioning that all variables turned out to be non-stationary in level, but became stationary after the first difference; thus, all variables could be said to be integrated of order 1, i.e. I(1). According to Guo, (2023) and Senyefia, (2019), one of the major aims of the Augmented Dickey-Fuller Test is to determine if there exist unit roots in the time series, since unit roots tell us whether or not the series in question is stationary. Stationarity issues with the data can pose problems in the sense of spurious regression in which relationships are detected among the unrelated variables resulting in problems of inferential statistics (Mushtaq, 2011). When there is a unit root in the series, then the series will continue with the effect of the shock rather than allowing it to diminish with time. This is especially significant in the context of the examination of economic policies and forecasting (Omosehin et al., 2021) because when there is no proper assessment of whether there is a unit root or not in the series, then the result may end up being wrong (Natsiopoulos & Tzeremes, 2022).

Hypothesis:

H0 = The series contains a unit root (non-stationary).

H1 = The series does not contain a unit root (stationary).

If $P < 0.05$, reject the hypothesis.



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*3.3. Cointegration Analysis*

Having found that each variable integrated to the same order, typically I(1), the Engle-Granger two-step test or Johansen-Juselius cointegration test is employed to test for the long-run relationship between variables GOVEXP and CPI while controlling for RGDP. The Johansen test applies the trace and maximal eigenvalue tests for the number of cointegrating vectors that exist among the variables.

*Engle-Granger Cointegration Regression:*

OLS has been used here to figure out the equation below:

$$\ln(GOVEXP_t) = \alpha_0 + \alpha_1 \ln(CPI_t) + \alpha_2 \ln(RGDP_t) + \varepsilon_t$$

Next, confirm to see if the residuals εt are stationary. If εt = I(0), the variables are cointegrated.

**The Johansen Cointegration Test:**

The Johansen test uses a Vector Autoregression (VAR) architecture and produces two statistics:

- Trace Test:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i)$$

- Maximum Eigenvalue Test:

$$\lambda_{max} = -T ln(1 - \hat{\lambda}_{r+1})$$

The specified projected eigenvalues are presented here, and T represents the number of observations.

*3.4. Error Correction Model (ECM)*

If cointegration exists, then an error correction model is employed to analyze both the short-term behavior as well as long-term changes. This approach incorporates an error correction component, which is the lagged error term from the cointegrated relationship. It reveals an error-correction speed for the system.

If the time series are cointegrated, ECM will be used to develop the short- and long-run change models. The ECM equations show how the series' deviations from the long-run equilibrium are corrected over time.

ECM equations long-run model:

$$ln(GOVEXP)_t = \alpha_0 + \alpha_1 ln(CPI) + \alpha_2 ln(RGDP) + \varepsilon$$

ECM for Government Expenditure:

$$\Delta ln(GOVEXP)_t = \beta_0 + \beta_1 \Delta ln(CPI)_t + \beta_2 \Delta ln(RGDP)_t + \varphi \varepsilon_{t-1} + u_t$$

ECM for CPI:

$$\Delta ln(CPI)_t + \gamma_0 + \gamma_1 \Delta ln(GOVEXP)_t + \gamma_2 \Delta ln(RGDP)_t + \psi \varepsilon_{t-1} + u_t$$

Where:

$\varepsilon_{t-1}$ is the lagged error correction term from the cointegration equation

ϕ and ψ show how quickly things change.

$u_t$, $v_t$ are error terms.

*3.5. Granger Causality Test*

The Granger Causality Test is employed to determine the nature of Granger causality between government spending and inflation. This test is employed to determine whether the past observations of any series can forecast the value of another series for the current period. Causality is tested in both directions:

CPI - GOVEXP: Inflation causes government spending.

GOVEXP - CPI: Government spending causes inflation

F-tests for lagged differences are employed for testing short-run causality, whereas t-tests are employed for testing long-run causality based on the significance of the error correction term.

*3.6. Model Specification and Lag Selection*

Akaike Information Criterion (AIC) is employed during the selection of the lag order of the VAR and ECM equations. This assists the models in incorporating the required dynamics without overfitting.

## 4. Results and Discussion

This section presents empirical results, which were obtained by conducting the econometric analysis. First, it presents the examination of the time-series properties of the variables using the Augmented Dickey–Fuller (ADF) unit root test, in conformity with the specification outlined in Section 3.2. The findings show that real government expenditure (lnGOVEXP), consumer price index (lnCPI), and real gross domestic product (lnRGDP) are all non-stationary in levels, since their null hypothesis containing a unit root cannot be rejected at conventional significance levels. However, after taking first differences, all the variables become stationary, implying that they are integrated of an order one, I(1). It follows that the application of cointegration techniques may be appropriate to test for the presence of a long-run equilibrium relationship that exists among the variables.

*4.1. ADF Test*

To ensure stable variance and make it possible to calculate elasticity, all variables were transformed into their log form. The test is carried out at a level as well as at the first difference. The results support the fact that the three variables are non-stationary at level but are stationary at first difference; therefore, they have order one integration, denoted as I(1). This is why the process of the cointegration test is carried out using both the Engle-Granger test and the Johansen test.



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**Table 3.** Hypothesis.

| Component | Meaning |
|---|---|
| $H_0$ (Null Hypothesis) | The series has a unit root, which means it is not stationary. |
| $H_1$ (Alternative Hypothesis) | The series does not have a unit root, which means it is stationary. |
| Decision Rule | If the p-value < 0.05, reject $H_0$ - conclude the series is stationary. |

The Saudi economy is dependent on its oil revenues; therefore, public spending behavior is not stable. External pressures on prices and domestic demand cause changes in the structure of inflation in the long term. Noticing the overall environment of the economy, it is important to test stationarity to ensure that long-term modeling is correct.

We have transformed all the variables into logs to be able to interpret elasticities and to keep the variance constant. The ADF test is conducted at both the level and the first differenced series. This is how the results have been explained:

**Table 4.** Unit Root (ADF) results.

| Variable | Level (p-value) | 1st Diff. (p-value) | Order |
|---|---|---|---|
| *ln(GOVEXP)* | -0.92 (0.78) | -3.72 (0.0038) | I(1) |
| *ln(CPI_Index)* | -0.22 (0.94) | -4.42 (0.00018) | I(1) |
| *ln(RGDP)* | -1.28 (0.65) | -3.82 (0.0029) | I(1) |

It is evident from the results that the three variables contain non-stationary levels, but their first-differenced values are stationary. This confirms that the order of integration for the variables is I(1).

The presence of unit roots in the variables GOVEXP and CPI indicates that spending and price levels in Saudi Arabia are driven by structural changes, oil price shocks, and policy reforms, such as Saudi Vision 2030. Stationarity achieved by differencing captures the strict model of long-run associations, particularly in gauging the systematic relationship between output and government spending.

These findings verify the cointegration test among the Engle-Granger and Johansen methods that can be applied to I(1) data and can detect the long-run stable equilibrium of the Saudi macroeconomic system.

The outcomes of the ADF tests reveal that GOVEXP, CPI, and RGDP are individually non-stationary at level but are transformed into stationarity by the first difference. It implies that these series are I(1). There is not much surprising in this for Saudi Arabia. A volatile income stream from crude oil has traditionally affected government expenditure, generating structural changes in behavior over time (Fasano & Wang, 2002). Domestic and international sources, including import prices, exchange rate changes, and government prices, determine inflation in the Saudi Arabian economy. Being a measure of economic output, the chart of RGDP also records long-term dynamic trends of growth alongside the short-term variations.

### *4.2. Engle-Granger Two-Step Cointegration Test*

The Engle–Granger two-step cointegration test for the existence of a long-run relation between government expenditure, inflation, and output, keeping in mind that all the variables are I(1) follows. First, the long-run equation specified in Section 3.3 was estimated by using ordinary least squares, where real government expenditure was expressed as a function of the consumer price index and real GDP. Based on the estimated coefficients, it appears that in the long run, both inflation and real output are positively related to government expenditure. Next, the residuals obtained from the long-run regression were subjected to the ADF test. The series proved to be stationary, hence rejecting the null hypothesis of no cointegration. Cointegration between the series implies that there exists a stable equilibrium relationship between the series such that any shock to one series will also affect the other series. The following results were observed:

**Table 5.** Long-run OLS (Engle-Granger).

| **Dependent:** *ln(GOVEXP)* | | | | |
|---|---|---|---|---|
| **Variable** | **Coeff.** | **Std. Err.** | **t-Stat** | **p-value** |
| Const. | -0.623 | 1.56 | 0.40 | 0.694 |
| *ln(CPI_Index)* | 0.370 | 0.30 | 1.22 | 0.237 |
| *ln(RGDP)* | 0.734 | 0.22 | 3.35 | 0.003 |
| $R^2$ = 0.955; DW = 0.86 (Autocorrelation is addressed through the ECM framework rather than static OLS inference) | | | | |
| Residual ADF test stat = -3.142 (p=0.024) (Stationary) | | | | |

Table 5 presents the long-run regression results using the Engle–Granger method, with the log of government expenditure as the dependent variable.

The effect of price level on government spending can be measured through the sign of the coefficient for *ln(CPI_Index)*. Since its value is positive (+0.370), it is clear that price changes do not have any effect on government spending in the long-run period, as the estimated coefficient is insignificant. Log real GDP is positively associated with government spending, since the effect is positive (0.734) and significant at 1%. So, when real GDP rises by one percentage point, government spending increases by about 0.73 percent. About 95.5 percent variation in government expenditure is explained by the model, as suggested by the $R^2$ value of 0.955, although the low Durbin–Watson statistic of 0.86 points to residual autocorrelation. Residuals were checked for stationarity to correct this, as the ADF test statistic value was −3.142, p = 0.024, residuals are stationary. This confirms the presence of a cointegration relationship between real GDP, ln(CPI_Index), and government expenditure, thus verifying the application of an error correction model as well as vector error corrections in the subsequent analysis process.



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### 4.3. Test for Stationarity on Residuals

The Johansen maximum likelihood cointegration method has been performed to further establish the presence of cointegration and consider the joint dynamics of the system. Based on both the trace and maximum eigenvalue statistics, there is one cointegrating vector among lnGOVEXP, lnCPI, and lnRGDP, confirming the evidence obtained from the Engle–Granger methodology. The calculated cointegrating vector, which is normalized with respect to the real government expenditure, depicts the relationship between fiscal expenditure, prices, and real income in the case of Saudi Arabia in the long run.

The resulting VECM provides insight into the adjustment process towards the long-run equilibrium. From the estimation results for the adjustment coefficients, it can be inferred that the main variable adjusting to the deviation from the long-run equilibrium is the inflation rate, as indicated by the statistically significant loading coefficient of the CPI equation. As far as the adjustment of the real government expenditure is concerned, there is no significant adjustment, thus indicating that the fiscal policy is not responsive to the disequilibrium in the system. Such results reflect the institutional characteristics of the Saudi economy, where fiscal policy is largely policy-driven and anchored to oil revenues rather than short-term macroeconomic feedback.

**Table 6.** Stationary Residues.

| Test Components | Value |
|---|---|
| Statistics for ADF | -4.21 |
| p-value | 0.02 |
| Critical Value (5%) | -2.95 |
| Decision | Reject $H_0$ |
| Conclusion | Residuals are stationary, which means that cointegration is confirmed. |

In Step 2, you took the residuals from the long-run regression:

$$\varepsilon_t = \ln(GOVEXP_t) - [-0.623 + 0.370\ln(CPI_t) + 0.734\ln(RGDP_t)]$$

From the data analysis, it is observed that there exist strong indications of a balance between government expenditure, inflation, and real GDP in the long run for the Saudi government. The test validates the Keynesian concept, which links fiscal policy closely to economic output and prices (Keynes, 1936; Blanchard & Johnson, 2013; Mankiw, 2019). For Saudi Arabia, it means that government spending acts as a stabilizing factor, but it also has to be designed in such a way that it factors in inflation pressures as well as growth dynamics.

- Though Saudi government expenditure varies over the shorter time, it varies in a stable pattern over the longer period because of changes in real GDP and inflationary factors.
- The term "cointegration" indicates a direct relationship among fiscal policy and inflation, which emphasizes the relevance of coordination in controlling macroeconomic policies.

This is supported by the theoretical concept that inflation and economic output influence the behavior of fiscal policymakers, as cited by (El Anshasy & Bradley, 2012; Korhonen & Mehrotra, 2009), especially within oil-dependent countries where the role of government expenditure is central to economic stabilization.

### 4.4. Johansen Cointegration Test

Given the validation of cointegration, single-equation error correction models are estimated in accordance with the specification to capture short-run dynamics and long-run adjustment behavior. The ECM for real government expenditure has a negative and statistically significant error correction term, suggesting that deviations from the long-run equilibrium are corrected overtime. This suggests a quick response because the disequilibrium adjustment takes care of correcting a large part of the disequilibrium within a single period. Changes in real GDP in the short run positively and significantly affect government spending, whereas inflation in the short run has a non-significant impact, meaning that fiscal policies react more strongly to real economic performance than inflation in the short run.

Unlike this, in the ECM for inflation, it has been observed that variations in short-run government spending and real GDP do not have any significance on CPI. Furthermore, it was also observed that the error correction term in inflation equations does not have any significance. This means that in the case of inflation, there is no mechanism at work that attempts to correct the deviations. Therefore, it is appropriate to say that, compared to inflation in Saudi Arabia, external influences like import prices, administered prices, and exchange rates determine these inflations much more than short-run fiscal disequilibria. ECM results clearly indicate inferences that can be made from the SCM results. They are as follows:

Cointegrating Vector (β) - Normalized on ln(GOVEXP)

$$\ln(GOVEXP)_{t-1} - 0.37\ln(CPI)_{t-1} - 0.73\ln(RGDP)_{t-1} = 0$$

This cointegrating equation signifies the long-run equilibrium relationship between real government expenditure, inflation, and real output in Saudi Arabia.

**Table 7.** Johansen Cointegration and VECM Results (Rank = 1).

| Adjustment (Loading) Coefficients (α) | | |
|---|---|---|
| $\Delta ln(GOVEXP)$ | -0.127 | (not significant) |
| $\Delta ln(CPI_Index)$ | +0.091 | (significant at 5%) |
| $\Delta ln(RGDP)$ | -0.097 | (borderline) |

The findings of the Johansen Vector Error Correction Model are reported in Table 7 below. These results show that there exists only one cointegrating equation among the variables real government expenditure, CPI, and real GDP in Saudi Arabia. The cointegrating vector, expressed in terms of government expenditure, implies that there exists a positive relationship between fiscal policies and both price and economic activities in the long run. The error correction terms reveal that the major adjusting factor for the deviations from the equilibrium is the inflation rate because of its positive and statistically significant coefficient. The lack of significance of the



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government expenditure error correction term is due to its endogeneity in an oil-exporting country. Overall, the results imply that fiscal expansion is associated with long-run inflation dynamics, calling for fiscal-monetary policy coordination.

The Johansen test confirms the outcome of the Engle-Granger methodology test because it supports the fact that real government expenditure, the CPI, and the RGDP are cointegrated. The presence of the cointegrating vector implies that:

- A basic connection between government spending and inflation exists over the long term.
- The fiscal policies in Saudi Arabia have long-run effects on price levels rather than short-run effects.
- Fiscal expansion through government expenditure can directly affect aggregate demand because it is related to aggregate output.

This is particularly relevant for Saudi Arabia because government spending is a primary determinant of economic activity for the Riyadh regime, and inflation in the kingdom would be prima facie affected by several domestic and international factors.

### *4.5. Results of the Error Correction Model (ECM)*

As we have already established an equilibrium relationship in the long run between the variables GOVEXP, CPI, and RGDP, the ECM can help explain the short-run behavior (response of variables in the short run) and speed of adjustment (convergence of variables towards the equilibrium). The crucial part here is the error correction term, which is symbolized by φ.

**Table 8.** ECM for GOVEXP.

| Variable | Coeff | Std. Err | t-Stat | p-value |
|---|---|---|---|---|
| Δ*ln(CPI_Index)* | 0.214 | 0.18 | 1.19 | 0.24 |
| Δ*ln(RGDP)* | 0.711 | 0.32 | 2.23 | 0.038 |
| Error Correction (φ) | -0.448 | 0.185 | -2.42 | 0.025 |

Table 8 reports the error correction model with real government spending as the dependent variable and including the lagged error correction term based on the Johansen equation for cointegration. The coefficient on the error correction term is negative and significant, suggesting that the system is adjusted to return to long-run equilibrium in response to disequilibria. Further, it can be seen that the lagged disequilibrium is adjusted each year. In the short-run equation, the coefficient on the change in real GDP is positive and significant, while the coefficient on the change in inflation is not significant. This result confirms that fiscal policy in Saudi Arabia reacts more to real economic conditions rather than inflationary pressure in the short run. Overall, it appears that fiscal policy in Saudi Arabia functions as an agent of stabilization in the system by adjusting to restore long-run disequilibrium in line with the expected role in an oil economy.

This conforms to the economic structure of Saudi Arabia, which has government spending as one of its fundamental macroeconomic variables, and also to the fact that price level in this economy is affected by supply shocks and administrative prices (Albassam, 2015; Espinoza & Senhadji, 2011; Alkhareif & Barnett, 2014).

While cointegration demonstrates that there is a long-run equilibrium relationship, there is no indication of how such departures are made. This issue can be addressed with an error correction model (ECM) because it incorporates short-run adjustment and long-run error correction. There are two types of ECMs; one estimates GOVEXP while the other estimates CPI.

The ECM estimates show that the error correction term of the GOVEXP equation is statistically significant and negative. This shows that the state spending adjusts to restore balance when it deviates from the long-run movement. The value of -0.47 means that about 47% of the imbalance will be fixed in a year. The error correction element in the CPI calculation, on the other hand, is not statistically significant. This means that inflation does not change in the near run to correct fiscal disequilibrium.

These results indicate that the fiscal policy of Saudi Arabia is reacting to macroeconomic conditions. When output or inflation deviates from its long-run path, the government responds by adjusting expenditure in order to bring balance to the system. This is because this approach is consistent with countercyclical fiscal policy, stating that the budgetary spending needs to increase during economic recessions while decreasing during economic expansions. Moreover, it shows the way through which the budgetary spending is used to stabilize the economy when it relies heavily on public expenditures and subsidies.

However, the nonexistence of any error correction term in the inflation equation indicates that the inflationary pressures in Saudi Arabia result mostly from short-run and exogenous factors rather than fiscal imbalances. This is because of the nature of the Saudi Arabian economy, where the inflation pressures could easily arise due to rising import prices, exchange rate policies, and supply shortages.

**Table 9.** ECM for CPI.

| Variable | Coeff. | Std. Err | t-Stat. | p-value |
|---|---|---|---|---|
| Δln(GOVEXP) | 0.118 | 0.10 | 1.20 | 0.24 |
| Δln(RGDP) | 0.097 | 0.09 | 1.10 | 0.28 |
| Error Correction ψ | 0.110 | 0.089 | 1.24 | 0.23 |

Table 9 shows the results of the error correction model on inflation, using the consumer price index as the dependent variable. The lack of statistical significance in the changes in government spending and GDP in the short run indicates that fiscal policy and economic growth in Saudi Arabia do not affect inflation during this period. Additionally, the error correction term in the results, based on the cointegration relationship, is statistically insignificant and lacks correction in the error itself, indicating a weak self-correcting mechanism in the Saudi Arabian economy, as operational in the error correction mechanism in the specification within the system-based



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Johansen approach. Inflation, thus, in the Saudi Arabian economy, corrects itself in the long run since it is part of the system, as captured by the Johansen approach, as reported in Table 9.

## 5. Conclusion

In this paper, the relationship between real government expenditure, inflation, and real economic output was explored using a complete model of economic time-series data for Saudi Arabia. The results obtained from applying tests for unit roots, cointegration tests, and error correction models provide strong evidence regarding both long- and short-run relationships for Saudi Arabia's market. The Augmented Dickey-Fuller test results confirmed that all variables were of order one; therefore, cointegration tests could be used to analyze economic activity for Saudi Arabia. The results obtained from both Engle-Granger and Johansen tests confirmed that a long-run relationship existed between Saudi Arabian real government expenditure, its consumer price index, and real economic output.

According to the Johansen Vector Error Correction Model results, inflation appears to play a key role in restoring equilibrium conditions in the long run, while government expenditures fail to adjust for disequilibrium forces occurring in the short run. This result can also be considered a reflection of the fundamental nature of the Saudi economy, as government expenditures are largely geared towards strategic and developmental objectives and are less likely to respond to disequilibrium forces occurring in the economy. The results of the Single Equation Error Correction Model also support this idea of disequilibrium forces occurring between the long and the short run, as government expenditures adjust for disequilibrium occurring in the long run, while focusing primarily on responses due to real economic activity. However, according to the system-based Johansen VECM, inflation also participates in this disequilibrium.

These results are important from a global perspective, given that markets today are more integrated than ever before, and domestic inflation is increasingly tagged by external price shocks, import prices, and world economic conditions. An economy like Saudi Arabia, highly integrated with international markets, cannot solely analyze long-run inflation based on domestic factors. These results show that price pressures in the short term due to fiscal expansion might remain subdued, but sustained government spending could condition longer-term inflation pressures, particularly during the occurrence of global shocks and when international channels play their role of transmission.

## 6. Policy Implications

Such findings hold definite policy implications. It is suggested that budget planners need to factor in long-run inflation concerns into their budgeting process, especially since budgeting for development under Vision 2030 poses a monumental task. The sticky nature that inflation takes over in the short run must be a reminder to planners to seriously work toward harmonization of functions between fiscal authorities. It is believed that budget planners must work toward harmonization between their budgeting moves and monetary authorities/exchange-rate regulators to ensure that inflation remains stable in the future. In conclusion, this paper contributes to building literature in a plethora of ways by shedding some valuable insights to inform policy on a wide range of insights regarding how government expenditures must factor into considerations regarding inflation in both the long run and short run in a hugely interdependent world economy.

## 7. Contribution to Literature and Future Research

This study contributes to the relevant literature on the impact of inflation, as well as government expenditure, on oil-exporting countries. It proves, using appropriate econometric analysis on Saudi data, not only the existence of a long-run relationship between government expenditure and inflation but also the significance of short-run adjustment processes, as well as fiscal policies, in stabilizing the economy as a whole.

Other studies can follow this one by incorporating additional variables such as the price of oil, interest rates, or exchange rates. Panel data techniques can also be used to compare Saudi Arabia with other Gulf Cooperation Council countries. Structural vector autoregression models could offer further information observing the transmission channels of fiscal shocks.

## 8. Limitations

However, there are major weaknesses associated with this study. First, the study is based on annual data, and annual data tends to obscure short-run fluctuations in inflation and the economy which can be better captured using larger amounts of data. Second, the model does not capture external shocks that have been shown to affect Saudi macroeconomic conditions, including changes in oil price, exchange rate fluctuations, or international inflation trends. Third, policy regime changes and structural breaks, especially those related to Vision 2030 reforms, are not modeled properly, and this can make estimated relationships less stable.

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