# Modeling of budget deficit fluctuations and analysis of outlier factors (Case study from 1972 to 2022)

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## Abstract

In Iran's economic conditions, which is accompanied by increasing environmental pressures, restrictions on foreign resources, and a decrease in the price of oil, the increase in the budget deficit has heavy consequences on the economy, and it is important to predict the fluctuations of the budget deficit. In this article, the relationship between budget deficit impulses (news) and conditional volatility will be investigated using exponential GARCH, power GARCH, and threshold GARCH models. The results show that during the period of 1972-2022, the short-term shocks on the economy are not significant on the budget deficit turbulence, but the long-term shocks on the economy are significant on the budget deficit according to GARCH models. The estimated value of the coefficients in the equations indicates the excessive instability of the variance of these variables, because all the coefficients of the model are significant at common confidence levels, and this indicates the impact of shocks and news on the budget deficit. The positive impulses of the economy in the short term are less effective in the budget deficit, but its negative effect is evident in the long term. In order to compensate for its budget deficit, the government must reduce its current expenses. Of course, reducing public spending is a difficult issue because it is linked to the interests of many groups.

**Keywords:** budget deficit, ARMA model, ARCH family models, Akaike criterion.

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## 1. Introduction

The budget deficit is one of the most crucial economic indicators that influence a country's macroeconomic stability. Persistent budget deficits can lead to inflationary pressures, exchange rate fluctuations, and economic instability. This study aims to model the fluctuations in Iran's budget deficit over four decades and analyze the impact of various economic shocks. Given Iran's economic structure—heavily reliant on oil revenues—understanding the factors that contribute to budget deficit volatility is essential for policymakers.

Iran's economic conditions have been characterized by increasing external pressures, including international sanctions, declining oil prices, and restrictions on foreign capital inflows. These factors have significantly impacted the government's fiscal stability, often resulting in rising budget deficits. The unpredictability of oil prices, in particular, has posed significant challenges for fiscal planning. By modeling the volatility of budget deficits using advanced econometric models, this study provides a comprehensive analysis of how external shocks and policy decisions influence fiscal sustainability.

## 2. Theoretical framework

The budget deficit can be viewed from multiple economic perspectives. According to classical economic theory, a budget deficit occurs when a government's expenditures exceed its revenues. The Keynesian approach suggests that government deficits can be beneficial during economic downturns as a tool for stimulating demand. However, monetarist theories argue that prolonged budget deficits lead to inflationary consequences and undermine economic stability.

Several studies have explored the relationship between budget deficits and macroeconomic variables such as inflation, interest rates, and economic growth. The Ricardian Equivalence Hypothesis suggests that budget deficits do not influence aggregate demand because rational consumers anticipate future tax increases and adjust their savings accordingly. In contrast, other theories argue that large deficits can crowd out private investment, increase interest rates, and create long-term economic distortions.

In Iran, the structural characteristics of the economy—including heavy reliance on oil revenues, weak tax collection mechanisms, and high public sector expenditures—contribute to persistent budget deficits. Additionally, external factors such as international sanctions and exchange rate volatility have amplified the challenges associated with deficit financing. Understanding the nature of budget deficit fluctuations requires a robust econometric approach that accounts for the asymmetric impact of economic shocks.

## 3. Methodology

This study employs a combination of time-series econometric techniques to model the volatility of Iran's budget deficit. The methodology consists of the following key steps:

### 3.1. Data Collection and Processing

The data used in this research spans from 1982 to 2022, covering a 40-year period. The primary data sources include: Annual budget deficit reports published by the Central Bank of Iran. Macroeconomic indicators such as GDP growth, inflation, and exchange rates Oil price fluctuations and global economic conditions.

### 3.2. Stationarity Testing

To ensure the reliability of the time-series data, unit root tests such as the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are applied. These tests determine whether the budget deficit series is stationary or requires differencing to achieve stationarity.

### 3.3. Model Selection and Estimation

The study utilizes the GARCH family of models, which are widely used for analyzing financial and economic volatility. The selected models include: Exponential GARCH (EGARCH): Captures asymmetric effects of economic shocks.

Threshold GARCH (TGARCH): Examines whether positive and negative shocks have different impacts on budget deficit volatility. Power GARCH (PGARCH): Assesses long-memory effects in deficit fluctuations. Each model is evaluated based on criteria such as the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) to determine the best-fitting model for Iran's budget deficit fluctuations.

## 4. Discussion

The empirical findings of the study provide significant insights into the nature of budget deficit fluctuations in Iran.

### 4.1. Short-Term vs. Long-Term Economic Shocks

The results indicate that short-term economic shocks (e.g., sudden oil price changes, temporary government spending cuts) do not significantly impact budget deficit volatility. However, long-term economic shocks (e.g., sustained inflation, prolonged international sanctions) have a substantial effect on budget deficit fluctuations.

The persistence of budget deficit volatility suggests that Iran's fiscal system is highly sensitive to macroeconomic instability.

### 4.2. Asymmetric Effects of Economic News

Negative economic shocks, such as oil price declines and trade restrictions, lead to more pronounced budget deficit volatility compared to positive shocks. This finding aligns with the leverage effect hypothesis, which states that bad news tends to have a stronger impact on financial and economic volatility than good news. The EGARCH

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model confirms that budget deficit volatility exhibits asymmetric behavior, with negative shocks leading to greater instability than positive ones.

## 4.3. Policy Implications of GARCH Model Findings

EGARCH Model: Suggests that policymakers should prioritize mitigating negative economic shocks rather than relying on temporary fiscal expansion strategies. TGARCH Model: Indicates that Iran's fiscal policy must be adjusted to account for the disproportionate impact of adverse economic conditions.

PGARCH Model: Highlights the need for long-term structural reforms to reduce budget deficit volatility.

## 4.4. The Role of Fiscal Policy in Controlling Deficit Volatility

Excessive reliance on oil revenues has made Iran's budget highly susceptible to external shocks.

The government must diversify revenue sources by strengthening tax collection mechanisms and reducing reliance on volatile oil revenues. Public expenditure rationalization is essential to ensure fiscal sustainability and reduce deficit volatility.

Implementing fiscal rules—such as expenditure ceilings and deficit limits—can help stabilize public finances and prevent excessive borrowing.

## 5. Conclusion and Suggestions

This study highlights the complex nature of budget deficit fluctuations in Iran and the significant impact of economic shocks on fiscal stability. The findings underscore the importance of adopting a proactive fiscal policy framework to mitigate deficit volatility and ensure long-term economic sustainability.

Key Policy Recommendations: Enhancing Fiscal Discipline: The government should implement stricter budgetary controls to prevent excessive spending. Diversifying Revenue Sources: Reducing dependency on oil revenues by developing non-oil sectors such as manufacturing and services.

Strengthening Institutional Frameworks: Improving governance, transparency, and public financial management to reduce fiscal mismanagement. Coordinating Fiscal and Monetary Policies: Ensuring that deficit financing does not lead to uncontrolled inflation.

Reducing Public Sector Expenditures: Implementing targeted spending cuts to prioritize essential services while minimizing budgetary imbalances.Implementing Counter-Cyclical Fiscal Policies: Adjusting fiscal policy in response to economic cycles to stabilize deficit volatility.

Final Thoughts The results of this study emphasize that budget deficit volatility is not only a financial issue but also an institutional challenge. Addressing these challenges requires a comprehensive policy approach that integrates macroeconomic stability, institutional reforms, and prudent fiscal management. By adopting long-term fiscal strategies and reducing dependency on external revenues, Iran can create a more resilient economic framework capable of withstanding future financial crises.