

Oil Price Shocks and Fiscal Resilience: The Role of Sovereign Bonds in Mitigating Budget Deficits

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ABSTRACT

This study examines the impact of sovereign bonds on Indonesia's budget deficit, with global crude oil prices acting as a moderating variable, to understand fiscal resilience during periods of oil price volatility. The novelty of this study lies in the integration of sovereign bond financing and oil price shocks within a moderating framework, providing a more comprehensive explanation of budget deficit dynamics in an oil-importing emerging economy. Using Moderating Regression Analysis (MRA), quarterly data from 2010–2025 were analyzed. The results indicate that sovereign bonds have a positive and significant effect on the budget deficit ($\beta = 1.384$; $p < 0.001$), while crude oil prices alone do not significantly affect the deficit ($\beta = 1.124$; $p = 0.580$). However, the interaction between sovereign bonds and crude oil prices is statistically significant ($\beta = -1.111$; $p = 0.012$), confirming the moderating role of oil prices. The overall model is significant ($F = 15.836$; $p < 0.001$) and explains 79.4% of the variation in Indonesia's budget deficit ($R^2 = 0.794$). These findings suggest that sovereign bonds are an important fiscal instrument for managing budget deficits, while fluctuations in crude oil prices significantly influence their effectiveness. The study contributes to the literature by providing empirical evidence on the interaction between sovereign debt instruments and external energy shocks in shaping fiscal resilience and sustainable debt management.

Keywords: Budget Deficit, Crude Oil Price, MRA, Sovereign Bond

INTRODUCTION

Budget deficits remain a critical fiscal challenge for many developing economies, including Indonesia, where government expenditures frequently exceed revenues and require financing through public debt instruments. Among these instruments, sovereign bonds have become the primary mechanism for financing fiscal deficits while supporting government spending and economic development. The strategic role of sovereign bonds has become increasingly important following major economic disruptions, including the COVID-19 pandemic, which led to a significant increase in Indonesia's fiscal deficit and public financing needs.

At the same time, Indonesia's fiscal position is highly exposed to fluctuations in global crude oil prices. As a net oil-importing country, rising oil prices increase import costs and energy subsidy expenditures, placing additional pressure on the state budget. Conversely, declining oil prices may reduce inflationary pressures but can also create fiscal uncertainty through their effects on economic activity and government revenues. Consequently, oil price volatility has become an important external factor influencing fiscal sustainability and deficit management.

Previous studies have examined the relationship between sovereign bonds and budget deficits (Parisi & Rusydiana, 2016; Juanda & Gladiola, 2022), while other studies have investigated the impact of oil price fluctuations on fiscal balances and economic performance (Elsiddig et al., 2016; Kim & Lee, 2017; Donou & Diarra, 2022). However, these studies generally analyze sovereign debt and oil price shocks separately. Limited empirical evidence exists regarding how oil price volatility moderates the effectiveness of sovereign bonds in financing budget deficits, particularly in emerging economies that are highly vulnerable to external energy shocks such as

Indonesia. This gap limits the understanding of fiscal resilience under changing global commodity market conditions.

The novelty of this study lies in the development of an integrated framework that examines the interaction between sovereign bonds, budget deficits, and crude oil prices through a moderating approach. Unlike previous studies that focus on direct relationships, this research positions crude oil prices as a moderating variable that may strengthen or weaken the influence of sovereign bonds on budget deficits. Furthermore, the study employs quarterly data from 2010 to 2025, covering periods before, during, and after the COVID-19 pandemic, thereby providing a comprehensive assessment of Indonesia's fiscal resilience across different economic environments.

Therefore, this study aims to analyze the impact of sovereign bonds on Indonesia's budget deficit with crude oil prices as a moderating variable. The findings are expected to contribute to the literature on fiscal policy, sovereign debt management, and energy economics while providing policy implications for strengthening fiscal resilience amid global oil price uncertainty.

LITERATURE REVIEW

The relationship between crude oil prices, sovereign bonds, and budget deficits is complex and significantly influenced by fiscal policies and external economic conditions. Fluctuations in oil prices can directly impact government revenues, which in turn affect budget deficits and sovereign bond yields. Crude oil prices and sovereign bonds are closely linked to national budget deficits, particularly in countries reliant on oil revenues. The fluctuations in crude oil prices can significantly impact government fiscal health and borrowing strategies. High oil prices can have mixed effects on economic growth. While they may benefit oil-exporting nations by boosting revenues and investment, they can negatively impact oil-importing countries by increasing production costs and reducing disposable income for consumers. The overall economic outlook influences investor sentiment and demand for sovereign bonds. In times of economic uncertainty or recession caused by high oil prices, investors may flock to safer assets like government bonds, which can lower yields despite the initial rise in rates due to inflation concern (Qadan, 2024).

Sovereign Bond

Sovereign Bond are financial instruments issued by the government of a country to obtain funding. SBN is a form of debt issued by the government with a promise to repay the principal amount borrowed, along with predetermined interest, within a certain period of time. Sovereign Bond have an important function in fiscal and monetary policy. In fiscal policy, it functions to fund the budget deficit: The government can issue Sovereign Bond to obtain funds to cover the budget deficit. Sovereign Bond helps the government finance expenditures that exceed revenues, which can arise due to various factors such as public spending, decreasing income, or development projects. Cash flow regulation: The government can use Sovereign Bond to regulate state cash flow. In situations where the government faces a temporary cash shortage, they can sell Sovereign Bond to obtain the necessary cash funds. According to Hossain et al. (2021) issuing Bond is one way for the government to finance the budget deficit or obtain funds for development projects.

The results of research by Parisi & Rusydiana (2016) by comparing the effect of 2 types of Sovereign Bond, namely Sukuk and Bonds on the budget deficit, concluded that sukuk had a significant negative effect on the budget deficit while bonds had a significant positive effect on the budget deficit, the effect of sukuk issuance was greater and more effective than absorption. bonds in deficit budget financing, budget deficit and sukuk have a significant positive effect on bonds and the budget deficit variable has a significant negative effect on sukuk. The results of research by Li & Qin (2021) with the research object of Russian state bonds intended for debt repayment concluded that there is no influence between bonds and the budget surplus. Juanda & Gladiola, Syadza (2022) in their research concluded that Sovereign is one of the instruments that dominates in financing the State Budget deficit in Indonesia. This is in line with the government's efforts to continue to increase financing independence, increasing Sovereign followed by increasing primary balance, through productive capital expenditure thereby increasing growth and state revenues.

Budget Deficit

The state budget is a critical component of public finance, serving as the primary financial plan for government operations and social policy. It encompasses projected revenues and expenditures, which are influenced by various legal frameworks and economic conditions. The budget is established by legislative bodies and plays a vital role in economic development and social progress. The state budget includes income from direct and indirect taxes, as well as non-tax revenues such as customs duties (Naghiyeva, 2022). It allocates funds for public services, infrastructure, and social programs, impacting socio-economic development (Khranchenko & Скиба, 2024). The state budget refers to the government's financial plan, detailing expected revenues and expenditures. In Ukraine, the study highlights an unbalanced structure of budget expenditures, necessitating optimization to align with EU standards and improve economic growth. Shkolnyk. (2021). Budget deficits are influenced by a complex interplay of economic, political, and institutional variables. These factors shape fiscal policies and their effectiveness, impacting the overall economic health of a state. Understanding these variables is crucial for effective budget management and policy formulation. The relationship between inflation rates and budget deficits is significant, as higher inflation can affect the real value of debt and the demand for money (Mikhaleva, 2020).

Crude Oil Prices

Oil price decreases lead to significant reductions in oil revenues, which adversely affect government budgets, particularly in oil-dependent economies like Sudan (Elsiddig et al., 2016). Conversely, oil price increases do not have a similar effect on budget variables, indicating an asymmetric relationship (Elsiddig et al., 2016). Bernabe et al., (2017) discussed how commodity prices, including crude oil, influence fiscal policy, affecting budget deficits. It highlights the correlation between commodity revenues and government expenditures, emphasizing the role of financial hedging in managing fiscal adjustments during commodity price fluctuations. According to Guy, (2018) to understand the impact of oil prices on the fiscal deficit, there is a need to differentiate between net oil importing countries and net oil exporting countries, and specify how budget authorities respond to oil price shocks. In net oil exporting countries, rising world oil prices should improve the fiscal balance. The relationship between crude oil prices and budget deficits is evident in various studies. Lower oil prices generally lead to higher budget deficits as governments struggle with decreased revenues from oil sales. For example, a study focusing on Nigeria indicated that public spending often outpaces government revenue due to poor fiscal management exacerbated by low oil prices (Ebi & Aladejare, 2022). In summary, the interplay between crude oil prices and sovereign bonds is critical for understanding the broader implications for national budgets, especially in economies dependent on oil revenues. As crude prices fluctuate, so too do government fiscal strategies and public debt levels

METHOD

In this research was used Moderating Regression Analysis (MRA). MRA is a statistical technique used to examine how the relationship between two variables (often referred to as the predictor and the outcome) is influenced by a third variable known as a moderator. This method helps to determine whether the strength or direction of the relationship between the predictor and outcome varies depending on the level of the moderator. A moderator variable is one that affects the strength or direction of the relationship between an independent variable (predictor) and a dependent variable (outcome). The formula is

$$\hat{Y} = \alpha + \beta_1 X + \beta_2 Z + \beta_3 X \times Z + \varepsilon$$

$\hat{Y}$ is State Budget as dependent variable, X is Sovereign Bond as independent variable, Z is Crude Oil Price as moderating variable, $X \times Z$ as the interaction term, α is Constanta, β is Coefficient, ε is Error.

Data used in this research from 2010 up to 2025 in quarterly basis. The data sources are Central Bank Indonesia (Sovereign Bond), Ministry of Finance (Budget Deficit) and Texas Oil Price (Crude Oil Price).

To conduct a valid moderated regression analysis, several assumptions must be met, first is the dependent and independent variables should be measured on a continuous scale. Second is there should be a linear relationship among variables, which can be assessed using scatterplots. Third is the data should not exhibit multicollinearity, meaning that predictors should not be too highly correlated with each other. The fourth is the distribution of variables should be approximately normal, and there should be no significant outliers. The Fifth the Autocorrelation test shown there was no autocorrelation amongs the times series data. The paradigm of the research was described in Figure 1.

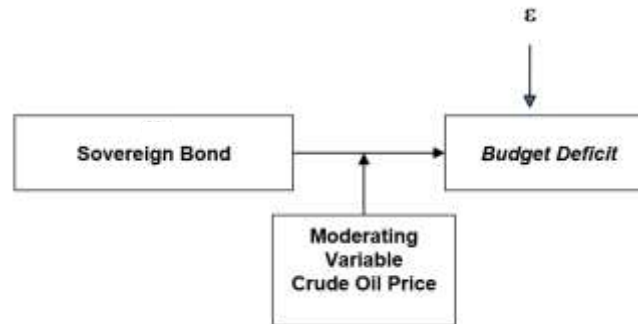


Figure 1. Paradigm Research

Source: Processed by Author, 2024

RESULTS

The result of the research was explained based on analysing of T test, F Test and Coeffisient Determination.

T Test

Table.1. T Test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-2.695	6.897		-0.391	0.697
Sovereign Bond	1.384	0.230	1.294	5.616	0.000
Crude Oil	1.124	2.017	0.073	0.557	0.580
Sovereign x Crude Oil	-1.111	1.684	-0.152	-0.660	0.012

a. Dependent Variable: Budget Deficit

Source: Result of SPSS 25

Based on the result of T Test the formula for the effect of Sovereign Bond to Budget Deficit with Crude Oil Price as Moderating is

$$\hat{Y} = -2.695 + 1.384X + 1.124Z + -1.111X \times Z + \varepsilon$$

$\hat{Y}$ is Budget Deficit as dependent variable, X is Sovereign Bond as independent variable, Z is Crude Oil Price as moderating variable, $X \times Z$ as the interaction term, α is Constanta, β is Coefficient, ε is Error.

The T test is carried out by comparing the t-statistic value against the t-table and the probability t value of each independent variable against α , namely 5%. If the probability value $> \alpha = 5\%$ or 0.05 then H_0 is accepted and H_a is rejected, meaning that the independent variable partially has no significant effect on the dependent variable. If the probability value $< \alpha = 5\%$ or 0.05 then H_0 is rejected and H_a is accepted, meaning that the independent variable partially has a significant effect on the dependent variable. Based on Table 1. It is shown that the probability value of Crude Oil Price $> \alpha = 5\%$ or 0.58 which meant the Crude Oil Price is not significance. While the probability value of Sovereign Bond and Interaction term of Sovereign Bond and Crude Oil Prices

$\alpha = 5\%$ or 0.00 and 0.012 which meant the Sovereign Bond and Interaction term of Sovereign Bond and Crude Oil Prices are significance to Budget Deficit.

F Test

Table.2. F Test

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	50.809	2	25.404	15.836	.000 ^b
Residual	91.440	57	1.604		
Total	142.249	59			

a. Dependent Variable: Budget Deficit

b. Predictors: (Constant), Sovereign Bond, Crude Oil Price

Source: Result of SPSS 25

The sigma value shows 0.000, which is smaller than 0.05, so H_0 is rejected and H_a is accepted. Thus, the growth of Sovereign which is moderated by Crude Oil Prices simultaneously has a significant effect on Budget Deficit.

Coeffisien Determination

Table.3. Coeffisien Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.8918 ^a	0.794	0.774	1.26657

Source : Result of SPSS 25

The R Square value is 0.794 or 79.4% of Sovereign Bond which is moderated by Crude Oil Prices simultaneously on Budget deficit while 20.6% is the influence of variables that were not observed in this research.

DISCUSSION

The overall model is significant ($F = 15.836$; $p < 0.001$) and explains 79.4% of the variation in Indonesia's budget deficit ($R^2 = 0.794$). The positive influence of Sovereign Bond on State Budget Deficit can be explained by its role as a financing instrument to cover government budget shortfalls. When issuance and demand for Sovereign Bond increases, the government has wider access to funds to finance the deficit without having to rely on more expensive or less stable financing sources. The growth of Sovereign Bond allows the government to attract funds from domestic and international investors through capital market mechanisms with competitive interest rates. A study by Abdullah and Rahman (2020) shows that increasing Sovereign Bond issuance positively contributes to managing budget deficits in developing countries, by providing governments with a stable source of financing and reducing dependence on foreign loans. The results of research by Parisi & Rusydiana, (2016) by comparing the effect of 2 types of Sovereign Bond, namely Sukuk and Bonds on the Budget Deficit, concluded that sukuk had a significant negative effect on the Budget Deficit while bonds had a significant positive effect on the Budget Deficit, the effect of Sukuk issuance was greater and more effective than absorption. Bonds in deficit budget financing, Budget Deficit and Sukuk have a significant positive effect on Bonds and the Budget Deficit variable has a significant negative effect on Sukuk.

Djuanda & Gladiola., (2022) in their research concluded that Sovereign Bond is one of the instruments that dominates in financing Budget deficit in Indonesia. This is in line with the government's efforts to continue to increase financing independence, an increase in Sovereign Bond is followed by an increase primary balance, through productive capital expenditure thereby increasing growth and state revenues. In the context of a Budget Deficit, increased Sovereign Bond issuance helps the government maintain fiscal stability without having to drastically reduce public spending. The government can use funds obtained from the issuance of Sovereign Bond to fund infrastructure projects, social programs and other spending needs that support economic growth,

without significantly worsening the short-term deficit. This provides greater fiscal flexibility for the government in managing the budget deficit.

The influence of petroleum prices on the Budget Deficit can be explained by its impact on state income and expenditure, especially in countries that import oil or that have a high dependence on oil as an energy source. When oil prices rise sharply, the cost of importing oil and its derivative products also increases, which can burden the state budget. This is because the government has to allocate more funds for energy subsidies or operational costs for the public sector which uses oil as the main input.

Rising oil prices can also trigger inflation, which in turn can increase government spending on social programs, such as subsidies and social assistance, to protect society from rising prices of goods and services. With this increasing expenditure burden, while state revenues may not increase significantly, the Budget Deficit is likely to worsen. For oil importing countries, rising oil prices can also reduce economic growth due to increased production costs and prices of goods. This has the potential to reduce state revenues from taxes and other revenues, worsening the budget deficit.

A study by Kim and Lee (2017) found that rising oil prices were significantly associated with increasing budget deficits in oil-importing countries, mainly due to their impact on subsidy spending and lower fiscal revenues due to the economic slowdown. Most research emphasizes the influence of oil prices on economic cycles and growth (Elsiddig et al, 2016). Therefore, the correlation between oil prices and Budget Deficit appears to be very diverse. According to Guy, D, B, (2018), to understand the impact of oil prices on fiscal deficit, there is a need to differentiate between net oil importing countries and net oil exporting countries, and specify how budget authorities respond to oil price shocks. In net oil exporting countries, increases in world oil prices should improve the fiscal balance. It is true, soaring income exports should be an important opportunity to consolidate their fiscal position. However, some countries that follow the procyclicality of government spending may face increasingly large non-oil deficits despite rising oil prices. To this end, Elsiddig et al., (2016) highlight that shocks Oil prices have an asymmetric effect on the Sudanese government budget. More precisely, positive oil prices do not cause a fiscal deficit, while negative oil prices have a significant influence on the budget.

CONCLUSION

The research highlights the significant role of Sovereign Bond in financing Budget Deficit, particularly in economies reliant on external funding sources. Sovereign Bond serve as a critical tool for managing fiscal imbalances, providing governments with the necessary liquidity to address expenditure needs. However, the analysis reveals that the effectiveness of Sovereign Bond in mitigating Budget Deficit is influenced by fluctuations in global Crude Oil Prices. Crude Oil Prices act as a moderating variable, amplifying the relationship between Sovereign Bond issuance and the Budget Deficit. In periods of high oil prices, increased government revenues from oil exports, since Indonesia is net importer of Crude Oil and the high of energy subsidy in Budget Deficit, thus alleviating budgetary pressures and increasing the fiscal burden due to higher interest obligations.

Some suggestion as follows, First : the growth of Soverign Bond must be controlled by the ministry of finance and ensured that it funds productive projects so that it has a positive influence on the country's economy. Considering that Soverign Bond can also burden Budget Deficit through interest payments or Soverign Bond debt that has matured. Second, to reduce the Budget Deficit, among other things, by focusing on the efficiency of the 3 largest expenditures, namely Employee Salaries, Expenditures and Debt items so that interest payments can be reduced. Third, the government must be alert to movements in Crude Oil Prices considering that Indonesia is a net importer of petroleum and one of the State Budget expenditures is energy subsidies. Accurate targeting of energy subsidies and savings in energy use can be one of the programs to reduce the Budget Deficit. Fourth, Soverign Bond, as the main financial instrument to cover the Budget Deficit, can be managed by paying attention to the positive influence on liquidity through the money supply, stability of the Rupiah exchange rate against the Dollar, competitive Soverign Bond taxes, and controlled inflation. The negative influence on Soverign Bond growth can be reduced by maintaining interest rates and economic growth.

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