

Fiscal Risk Implications of Coal and CPO Price Volatility in Indonesia

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Abstract. This article examines the implications of coal and crude palm oil (CPO) price volatility for Indonesia's fiscal risk using a descriptive approach based on secondary data for the period 2015–2024. The analysis focuses on price dynamics of the two commodities and their relationship with non-oil and gas natural resource non-tax revenue (PNBP). The results indicate that coal and CPO prices exhibit substantial fluctuations across periods. Increases in commodity prices, particularly during 2021–2022, were accompanied by higher PNBP, although the relationship is not linear and displays considerable variability. These findings suggest that commodity-based government revenue is characterized by a high degree of uncertainty. While commodity price booms may provide short-term fiscal gains, sharp price movements also raise the risk of revenue declines in subsequent periods. In this context, fiscal risk is reflected not only in potential revenue losses but also in revenue instability that may complicate medium-term fiscal planning. This study provides an initial empirical illustration of Indonesia's fiscal vulnerability arising from commodity dependence and highlights the importance of considering price volatility in fiscal risk analysis.

Keywords: *price volatility, CPO, fiscal risk.*

A. Introduction

Indonesia is a country with a relatively high degree of dependence on the commodity sector within its economic structure. Primary commodities such as coal and crude palm oil (CPO) play a central role not only in export performance but also as significant sources of government revenue, both through taxation and non-tax state revenues. This structural reliance implies that movements in global commodity prices have direct consequences for national fiscal conditions [1].

Global commodity prices are inherently volatile and shaped by a range of external factors, including shifts in global demand, supply chain disruptions, international trade policies, and geopolitical developments. Such price fluctuations generate uncertainty in government revenues, particularly for countries that rely heavily on natural resources as a key pillar of their fiscal framework [2]. In Indonesia's case, volatility in coal and CPO prices has the potential to induce substantial variation in government revenues over time [3].

The economic and fiscal policy literature consistently emphasizes commodity price volatility as one of the primary sources of fiscal risk in resource-based economies. Fiscal risk in this context is understood not merely as the possibility of revenue shortfalls, but more broadly as uncertainty regarding the magnitude of revenues that can be realized within a given budget period [4, 5]. This uncertainty complicates fiscal planning, especially when budgetary decisions continue to rely predominantly on single-point forecasts.

Deterministic approaches to fiscal planning, which assume specific revenue values without accounting for potential variation, risk overlooking the fundamental uncertainty inherent in economic variables. For commodity-based revenues, such approaches are particularly inadequate, as they fail to fully capture the risks arising from price volatility [6]. Consequently, a growing body of literature advocates conceptualizing fiscal risk as a distribution of possible outcomes rather than as changes in average values alone [7, 8]. Beyond price levels themselves, commodity price volatility is also widely recognized as a major source of fiscal vulnerability, especially in developing economies with high dependence on resource-based revenues [9, 10].

Empirical studies further indicate that commodity-exporting countries tend to experience higher fiscal volatility than economies with more diversified production structures. Commodity price swings can generate sharp revenue increases in one period, followed by steep declines in subsequent periods, thereby posing significant challenges to maintaining fiscal sustainability [9, 11, 12]. This dynamic is particularly relevant for Indonesia, where commodity sectors remain an important source of government revenue.

Importantly, not all commodities exhibit identical volatility characteristics. Coal and CPO, as two of Indonesia's key commodities, display distinct price dynamics in global markets. These differences may translate into varying fiscal implications, both in terms of revenue uncertainty and associated fiscal risks [13]. However, comparative analyses of how volatility across different commodities affects Indonesia's fiscal risk remain relatively limited, especially studies presented within analytical frameworks that are straightforward and accessible.

Against this backdrop, this article aims to examine the role of global commodity price volatility as a source of uncertainty in Indonesia's government revenues through a review of the literature and illustrative empirical evidence. The analysis focuses on two major commodities—coal and CPO—to provide insights into how price fluctuations in these markets translate into variability in government revenues, thereby constituting a key component of Indonesia's fiscal risk. The approach adopted is descriptive and illustrative in nature; it is not intended to deliver a comprehensive fiscal risk assessment, but rather to clarify the underlying characteristics of fiscal uncertainty associated with commodity-based revenues [4, 6].

The contribution of this article lies in presenting a conceptual framework for understanding fiscal risk that highlights the role of commodity price volatility and its implications for revenue variability, using a simple and communicative approach. As such, the article is expected to serve as an initial reference for understanding Indonesia's fiscal risk from a commodity-dependence perspective, while also providing a foundation for future research employing more advanced analytical methods [1, 14].

B. Method

This study adopts a descriptive approach using secondary data to examine the implications of commodity price volatility for the variability of government revenues in Indonesia. The objective of this approach is to provide empirical illustrations of the relationship between commodity price fluctuations and fiscal revenues, rather than to conduct a formal quantitative measurement of fiscal risk or to develop complex mathematical models. [4, 6].

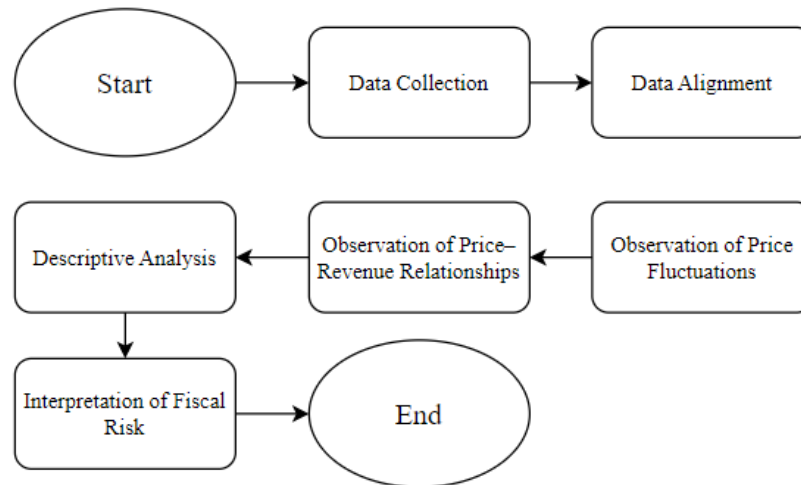


Figure 1. Research Flowchart

Research Data

The data employed in this study consist of coal and CPO price series, along with non-tax government revenues from the non-oil and gas natural resource sector. The selection of these two commodities is motivated by their substantial contribution to Indonesia's government revenues. All data are sourced from official and publicly available institutions and are aligned over a common time period to ensure analytical consistency [1, 14].

Analytical Procedure

The analysis is conducted through a set of simple and transparent steps designed to facilitate understanding of the relationship between commodity prices and government revenues. These steps can be summarized as follows

1. **Data Collection:** Data on coal and CPO prices are obtained from the World Bank Commodities Price Data (Pink Sheet), while non-oil and gas natural resource revenues (PNBP) are sourced from Indonesia's Ministry of Finance publications (APBN Kita).
2. **Observation of Commodity Price Movements:** The price series are examined to identify general patterns in the fluctuations of coal and CPO prices over the observation period.
3. **Visual Assessment of Price–Revenue Relationships:** The relationship between commodity prices and PNBP is explored visually to obtain empirical insights into their co-movement.
4. **Interpretation of Fiscal Implications:** The observed patterns are used to discuss how commodity price volatility translates into variability in government revenues, thereby constituting a source of fiscal risk.

Methodological Limitations

This study is subject to several limitations, as it adopts a descriptive and illustrative approach. The analysis does not encompass all commodities nor all components of government revenue. Accordingly, the findings are not intended to provide prescriptive estimates of fiscal risk, but rather to serve as empirical illustrations supporting the broader discussion on the importance of fiscal risk management in economies that depend heavily on commodity-based revenues [11, 6].

C. Result and Discussion

This section presents empirical observations on the evolution of coal and CPO prices and their implications for Indonesia's government revenues. The results are presented descriptively, drawing on tables and graphical visualizations to illustrate patterns of commodity price fluctuations and their relationship with non-oil and gas natural resource revenues (PNBP). This approach is intended to provide an accessible overview of how commodity price volatility can contribute to fiscal risk.

Developments in Coal and CPO Prices

Table 1 presents developments in coal and CPO prices, represented as annual volume-weighted export values, together with non-oil and gas natural resource revenues over the 2015–2024 period. All variables are expressed in billions of U.S. dollars (USD) to ensure consistency in the units of analysis.

Table 1. Coal Prices, CPO Prices, and Non-Oil and Gas Natural Resource Revenues (2015–2024)

Year	Coal Price	CPO Price	Non-Oil and Gas Natural Resource Revenues (IDR trillion)
2015	\$19.36	\$17.56	\$1.70
2016	\$20.59	\$16.75	\$1.56
2017	\$28.25	\$20.54	\$2.19
2018	\$36.72	\$17.82	\$2.66
2019	\$29.20	\$17.01	\$2.39
2020	\$21.00	\$19.50	\$2.27
2021	\$47.70	\$28.97	\$3.70
2022	\$124.19	\$31.89	\$8.09
2023	\$65.60	\$23.16	\$9.06
2024	\$55.24	\$20.85	\$6.79

Source: World Bank Commodities Price Data (Pink Sheet) and Indonesia's Ministry of Finance (APBN Kita).

Based on Table 1, both coal and CPO prices exhibit substantial fluctuations across periods. These movements become more evident when visualized through price trend graphs, as shown in Figure 1.

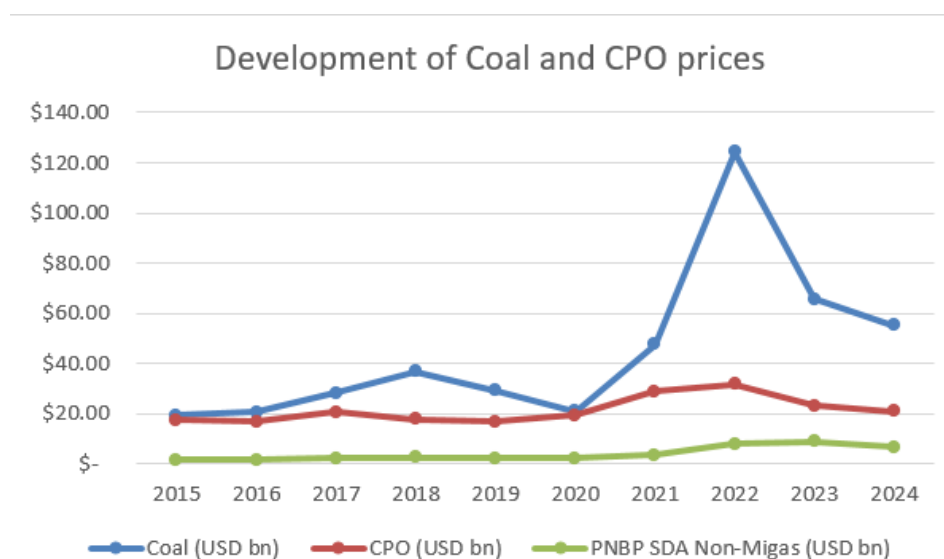


Figure 2. Trends in Coal and CPO Prices, 2015–2024.

Figure 2 The figure illustrates annual trends in coal and CPO prices, represented in volume-weighted export values, along with non-oil and gas natural resource revenues (PNBP) over the 2015–2024 period, expressed in billions of U.S. dollars. The movements of both commodity prices display pronounced fluctuations across periods. The most significant surge occurred during 2021–2022, particularly for coal, and was accompanied by a substantial increase in PNBP. Following this period, both commodity prices and PNBP declined, although they remained above the average levels observed in the early years of the sample. [4, 2].

Relationship Between Commodity Prices and Government Revenues

The relationship between coal prices and non-oil and gas natural resource revenues (PNBP) is illustrated in Figure 2.

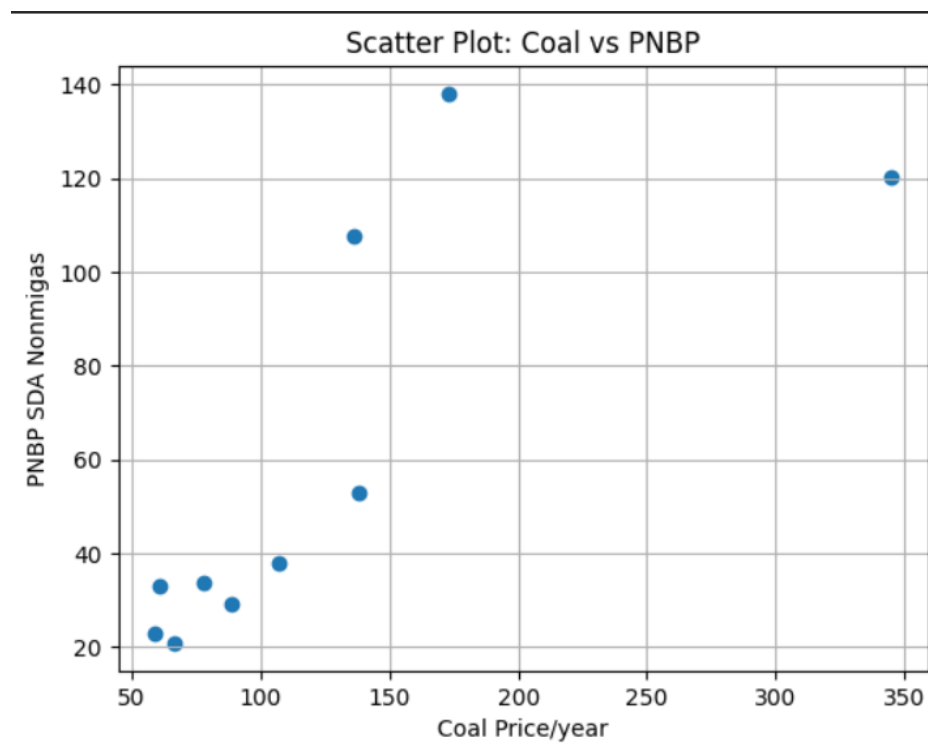


Figure 3. Scatter Plot of Coal Prices and Non-Oil and Gas Natural Resource Revenues (PNBP)

Based on Figure 3, there appears to be a positive association between coal prices and PNBP. Periods characterized by relatively high coal prices tend to coincide with higher levels of non-oil and gas natural resource revenues compared to periods of lower prices. However, the dispersion of data points indicates that this relationship is not linear and exhibits considerable variation.

This pattern suggests that while coal prices play an important role in shaping government revenues, other factors also influence PNBP, including production volumes, levy and royalty policies, and broader macroeconomic conditions. This finding is consistent with the literature, which emphasizes that commodity-based government revenues are highly sensitive to a range of factors beyond prices alone [7].

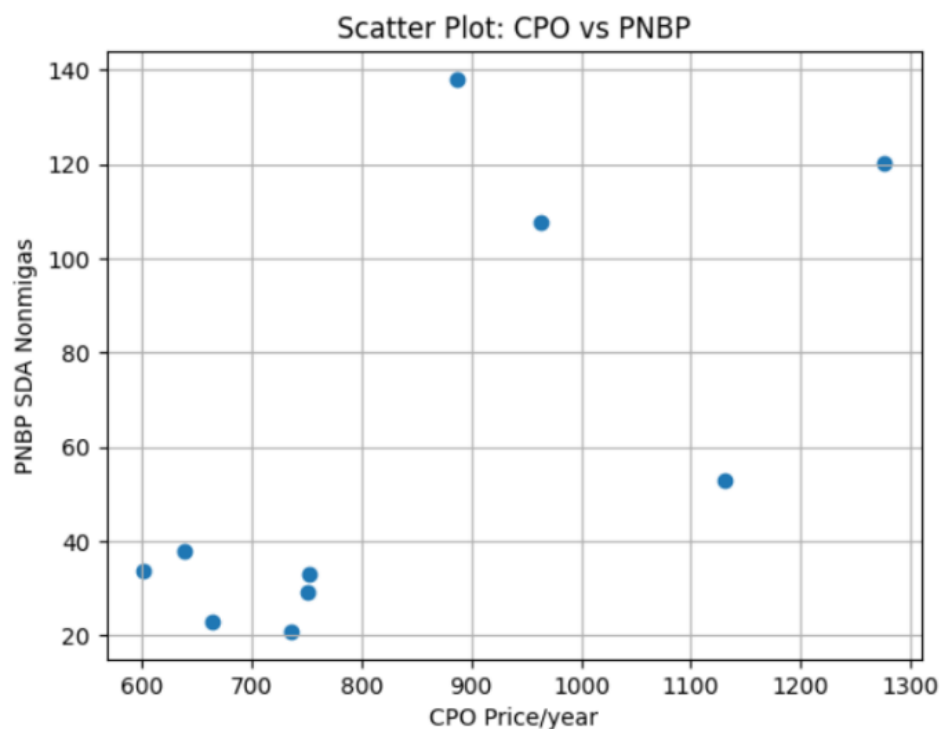


Figure 4. Scatter Plot of CPO Prices and Non-Oil and Gas Natural Resource Revenues (PNBP)

Figure 4 displays a broadly similar relationship, where increases in CPO prices in certain periods are followed by higher levels of PNBP. However, substantial variability is also evident for this commodity. This pattern indicates that dependence on CPO prices does not always translate into proportional increases in government revenues.

Implications for Indonesia's Fiscal Risk

The observed developments in commodity prices and their relationship with PNBP indicate that volatility in coal and CPO prices has direct implications for the variability of government revenues. Commodity price surges can provide short-term fiscal space, as reflected in the increase in PNBP during the 2021–2022 period. However, sharp price fluctuations also heighten the risk of revenue declines in subsequent periods. In developing economies, dependence on commodities amplifies the transmission of global price shocks to domestic fiscal conditions, thereby increasing fiscal vulnerability to external fluctuations [15].

This situation reflects a key characteristic of commodity-based fiscal risk: high uncertainty in government revenues. Fiscal risk in this context relates not only to the potential for revenue shortfalls, but also to revenue instability, which can complicate medium-term fiscal planning [6, 5]. Accordingly, the findings of this study reinforce the importance of commodity price volatility as a critical factor to be incorporated into Indonesia's fiscal risk analysis.

D. Conclusionn

This study aims to provide empirical insights into the implications of coal and CPO price volatility for Indonesia's fiscal risk by examining the relationship between commodity prices and government revenues. Based on the descriptive analysis presented, it can be concluded that coal and CPO prices over the observation period exhibit substantial fluctuations, reflecting the instability of global commodity markets that has the potential to affect Indonesia's fiscal performance.

The analysis of the relationship between commodity prices and government revenues indicates a general tendency toward a positive association, whereby increases in coal and CPO prices in certain periods are followed by higher levels of non-oil and gas natural resource revenues (PNBP). However, this relationship is not linear and displays considerable variability across periods. These findings suggest that government revenues are influenced not only by commodity

price movements but also by other factors, including fiscal policies, production volumes, and global economic conditions.

The main implication of these results is that reliance on commodity-based revenues renders the fiscal structure vulnerable to global price fluctuations. Commodity price booms can generate additional fiscal space in the short term, but they simultaneously increase the risk of revenue declines when prices correct. Accordingly, fiscal risk in this context is associated not only with the potential for revenue shortfalls, but also with the high degree of uncertainty and instability in government revenues.

Overall, the findings underscore the importance of fiscal risk management frameworks that explicitly account for commodity price volatility as a key determinant. The descriptive approach adopted in this study provides empirical illustrations of the fiscal vulnerabilities faced by Indonesia as a country with substantial dependence on natural resource-based revenues. These results are expected to serve as a foundation for future research that examines fiscal risk in greater depth, as well as to inform the design of fiscal policies that are more adaptive to the dynamics of global commodity prices.

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