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# A cointegration and causal analysis of the government revenue and expenditure relationship in Indonesia

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## ABSTRACT

This study aims to discuss the causal analysis of government revenues and expenditures in Indonesia in light of the fact that Indonesian fiscal policy significantly relies on government finance. Therefore, it can lead to fragile macroeconomic conditions. In addition, to illustrate this occurrence, the researchers used Granger causality method on data from 1971 to 2021 provided by the World Bank. This paper's findings indicate that in Indonesia, the long run or equilibrium relationship between government revenue and government expenditure goes from government expenditure to government revenue. In addition, this conclusion demonstrates that government expenditures affect government revenue.

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## ABSTRAK

Tujuan dari penelitian ini adalah untuk membahas analisis kausal pendapatan dan pengeluaran pemerintah di Indonesia mengingat kebijakan fiskal Indonesia sangat bergantung pada keuangan pemerintah. Oleh sebab itu, ini dapat menimbulkan kondisi ekonomi makro yang rapuh. Selain itu, untuk menggambarkan kejadian ini, metode kausalitas Granger digunakan pada data dari tahun 1971 hingga 2021 yang disediakan oleh Bank Dunia. Temuan penelitian ini menunjukkan bahwa di Indonesia, hubungan jangka panjang atau ekuilibrium antara penerimaan pemerintah dan pengeluaran pemerintah bergerak dari pengeluaran pemerintah ke penerimaan pemerintah. Selain itu, kesimpulan ini menunjukkan bahwa pengeluaran pemerintah mempengaruhi pendapatan pemerintah.

## Keyword:

Government Expenditure, Fiscal Imbalances, Granger Causality.



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## 1. INTRODUCTION

Recently, economists and public policy academics have challenged the link between government revenues and spending. Understanding this connection is essential for implementing fiscal solutions that prevent or reduce unsustainable deficits.

Aspects of government expenditure include using direct resources that they own and/or control indirectly owned by the community. According to Wagner (1958), government spending and government activities are increasing. Wagner refers to this tendency as legislation continually expanding the government's role. The major theory is expanding the government's role in the activities and economic life of the entire community. Wagner argued that when per capita income rises in an economy, the government's relative Expenditure will increase, primarily because the government must manage the links that form in society, law, education, entertainment, culture, etc. (Todaro & Smith, 2022).

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With the passage of the regional autonomy law in 2000, government investment in Indonesia is vital for regional economic development. This is clear from the Indonesian budgeting system, which heavily relies on productive and non-productive government spending to finance virtually all economic operations. This substantial dependence on government spending generates a parallel relationship between government revenue and expenditures in the short and long term.

The primary objective of this study is to determine the direction of causality between the disaggregated values of Indonesian government revenues and expenditures using a robust econometric methodology. The results will aid policymakers in identifying potential sources of fiscal imbalances and, consequently, in focusing their efforts on the creation of necessary measures for a sound fiscal framework.

## 2. THEORETICAL FRAMEWORK AND HYPOTHESIS

Typically, the researchers used Keynes equilibrium model to measure government spending within a macroeconomic framework.

$$Y=C+I+G+X_n$$

Where C is Consumption, I is Investment, G is Government Expenditure, and  $X_n$  is Net Export. Furthermore, in this instance, government expenditure is an exogenous variable, meaning its value is determined by circumstances beyond the scope of the model. This might be construed to mean that government spending remains constant until a change is attempted or implemented (Mankiw, 2021). Moreover, Peacock & Wiseman (1961) emphasizes that tax revenue is one of the strategies utilized to raise government revenue. While Buchanan & Musgrave (1999) noted that there are several ways to boost government revenues, such as per capita income growth, private sector activities, and population changes, there are several other methods as well.

On the contrary, numerous other studies on government spending, such as Shelton (2007), found a new explanation for Wagner's Law after conducting research in 100 IMF member countries between 1970 and 2000. There is strong evidence that heterogeneity of preferences leads to decentralization rather than a decline. Directly in expenditures and that much of the Expenditure linked with increased trade openness does not fall into categories that clearly merit risk, as well as evidence that both political access and income disparity affect social security levels. Then, Nwosu & Okafor (2014) conclude that their data corroborate the expenditure tax theory in Nigeria, which states that changes in government expenditures cause changes in government income. This study's policy implication is that an increase in government spending without a corresponding rise in revenue can exacerbate the budget imbalance.

Moreover, Obioma & Ozughalu (2022) found in their investigation Their empirical findings reveal, among other things, a long-term link between government revenues and expenditures in Nigeria. There is also evidence of a unidirectional causal relationship between government revenues and expenditures. Sinha (2010) discovered in his research that, in general, the regression findings revealed a high positive correlation between government spending and GDP. The Granger causality test indicates that there is some evidence of a flow causality between government spending and GDP, but not the other way around.

According to the Granger causality test by Mehrara & Rezaei (2014) there is a unidirectional causal relationship between government revenue and government spending. Thus, these findings are compatible with the expenditure-income hypothesis. Moreover, according to Durongkaveroj (2014), there are elements that influence government spending, such as exogenous shocks (government subsidies), taxation, and money supply.

There are also various domestic studies, the first of which Bastias (2010) utilizing regression with the ECM model demonstrates that only government investment on transportation has a significant beneficial effect on economic growth over the near term. Government expenditures on education, health care, and housing have little effect on economic growth. On the other hand, variable government spending on housing and transportation has a positive effect on economic growth over the long term, whereas variable government spending on education and health has no effect on economic growth. There has been a negative association between government spending and economic growth in Malaysia over the past 45 years, according to Hasnul (2015). In addition, the classification of government expenditures reveals that only housing sector expenditures and development expenditures significantly contributed to slower economic growth.

**3. RESEARCH METHODS**

This study used the methodology of Fasano-Filho & Wang (2002) and data provided by World Bank Data from 1971 to 2021. However, when the variables are stationary and cointegration exists between variables in any of the equations, we use the traditional Granger causality method in which the error correction factor is included. Considered. In addition, the method can be seen as follows:

$$GOVEX_t = \alpha_0 + \alpha_1 GREV_t + \mu_1 \dots \dots \dots (1)$$

$$GREV_t = \beta_0 + \beta_1 GOVEX_t + \mu_2 \dots \dots \dots (2)$$

Where:

GOVEX<sub>t</sub> = Real Government Expenditure

GREV<sub>t</sub> = Real Government Revenue

α<sub>0</sub>, α<sub>1</sub>, β<sub>0</sub>, β<sub>1</sub> = Parameters to be estimated

μ<sub>1</sub>, μ<sub>2</sub> = stochastic error terms

This study employed World Bank Data Base time-series data collected between 1971 and 2021. Dickey Fuller developed the ADF (Augmented Dickey Fuller) test, which the researchers used to analyze the stationarity of the data (Dickey & Fuller, 1979). The ADF equation is the following:

$$\Delta G_t = b_1 + b_{2t} + dG_{t-1} + \sum_{i=1}^m a_i \Delta G_{t-i} + \epsilon_1 \dots \dots \dots (3)$$

In addition, for ADF test is to use Philips-perron unit root test:

$$\hat{t}_\alpha = t_\alpha \left( \frac{\gamma_0}{f_0} \right)^{\frac{1}{2}} - \frac{T(f_0 - \gamma_0)(se(\hat{\alpha}))}{2f_0^{\frac{1}{2}}S} \dots \dots \dots (4)$$

In contrast to the Augmented Dickey- Fuller’s technique, the Phillips-Perron approach uses non-parametric statistical approaches to account for the autocorrelation of the initial Differences in a series.

Once it has been confirmed that all variables are integrated of order one, cointegration tests are done to assess whether the variables have a long run or equilibrium relationship. In this study, the Engle-Granger (EG) test and the Johansen Cointegration test are utilized to conduct cointegration tests. Engle & Granger (1987). This test determines if the residuals from equations 1 and 2 are steady at the residual level. If residuals are level and stationary, then variables are cointegrated. In addition, the EG test must be supplemented with the Johansen test (Johansen, 1988) since, compared to the Johansen test, the EG test is insufficiently robust or effective. This test will adhere to the VAR model of order P:

$$Y_t = A_1 Y_{t-1} + \dots + A_p Y_{t-p} + B X_t + e_t \dots\dots\dots(5)$$

Where  $X_t$  is a vector of deterministic variable and  $e_t$  is a vector of innovations. Therefore, we can rewrite this VAR Equations as Follows:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + B X_t + e_t \dots\dots\dots(6)$$

$$\Pi = \sum_{i=1}^p A_i - I, \quad \Gamma_i = - \sum_{j=i+1}^p A_j \dots\dots\dots(7)$$

Finally, we conducted the granger causality test within ECM Framework; the researchers modified the following ECM Equations.

$$\Delta GOVEX_t = \alpha_1 + \alpha_2 \Delta GOVEX_{t-1} + \alpha_3 \Delta GREV_{t-1} + \alpha_4 ecm1(-1) + \varepsilon_1 \dots\dots(8)$$

$$\Delta GREV_t = \beta_1 + \beta_2 \Delta GREV_{t-1} + \beta_3 \Delta GOVEX_{t-1} + \beta_4 ecm2(-1) + \varepsilon_2 \dots\dots(9)$$

**4. RESULTS AND DISCUSSION**

The unit root test of the ADF was utilized to examine the stationarity of variables in equations 1 and 2. The outcomes presented in Table 1. All variables are stationary at the first difference; hence, they are integrated of order one.

In addition to ADF testing, Phillips-Perron (PP) testing was performed. The outcomes are shown in Table 2 below. The table demonstrates that all variables are stationary at the first difference; hence, they are integrated from one to one. ADF data support this conclusion. The EG cointegration test demonstrates that the variables in question are cointegrated.

**Table 1**  
**ADF Unit Root Test for the Variables in Equations 1 and 2**

Variables	ADF Statistics (at first difference)	Order of Integration
$GREV_t$	-0.486828 (-3.705085) *	I (1)
$GOVEX_t$	-0.730498 (-4.732554) *	I (1)

Source: Processed Data

Note: (a) Mackinnon critical values for the rejection of unit root are in parentheses. (b)Tests include intercept and trend. (c) \* implies 1 percent level of significance.

**Table 2**  
**PP Unit Root Test for the Variables in Equations 1 and 2**

Variables	PP Statistics (at first difference)	Order of Integration
$GREV_t$	-0.486828 (-3.705085) *	I (1)
$GOVEX_t$	-0.730498 (-4.732554) *	I (1)

Source: Processed Data

Note: (a) Mackinnon critical values for the rejection of unit root are in parentheses. (b) Tests include intercept and trend. (c) \* implies 1 percent level of significance.

**Table 3**  
**Engle-Granger Cointegration Test in Equations 1 and 2**

Variables	Engle-Granger tau-statistic
$GREV_t$	-2.786067 (0.1883) *
$GOVEX_t$	-2.814588 (0.1794) *

Source: Processed Data

**Table 4**  
**Johansen Cointegration Test for the Variables in Equations 1 and 2**  
**Trace Test**

Hypothesized No of CEs	Eigenvalue	Trace Statistics	5 % of Critical Value	Prob**
None	0.129699	6.746242	15.49471	0.6073
At most 1	0.001629	0.078273	3.841465	0.7796

Source: Processed Data

Notes: (a) \* indicates rejection of the hypotheses at the 5 per cent level of significance; (b) Trace test indicates 2 cointegrating equations (CEs) at 5 per cent level of significance; and (c) \*\* indicate Mackinnon-Haug-Michelis (1999) p-values.

**Table 5**  
**Johansen Cointegration Test for the Variables in Equations 1 and 2**  
**Maximum Eigenvalue Test**

Hypothesized No of CEs	Eigenvalue	Max-Eigen Statistic	5% of Critical Value	Prob**
None	0.129699	6.667968	14.26460	0.5291
At most 1	0.001629	0.078273	3.841465	0.7796

Source: Processed Data

Notes: (a) \* indicates rejection of the hypotheses at the 5 per cent level of significance; (b) Trace test indicates 2 cointegrating equations (CEs) at 5 per cent level of significance; and (c) \*\* indicate Mackinnon-Haug-Michelis (1999) p-values.

Tables 4 and 5 demonstrate that the Johansen cointegration tests (both the trace test and the maximum Eigenvalue test) validate the EG test outcomes, indicating that these variables are cointegrated. Therefore, we conclude that government revenue and government expenditure are in long-run equilibrium.

$\Delta GOVEX_t = -1292313216.13 + 0.00532\Delta GOVEX_{t-1} + 11.454862\Delta GREV_{t-1} + 4.651719ecm1(-1) + \varepsilon_1$
$\Delta GREV_t = 440037128.85 + -10.62049\Delta GREV_{t-1} - 0.074813\Delta GOVEX_{t-1} + 0.097405ecm2(-1) + \varepsilon_2$

**Figure 1**  
**Estimation Result**

Source: Processed Data

According to Table 6, the estimated link between Indonesian government revenues and spending is unidirectional. Consequently, it is obvious that the revenue spending theory holds true for Indonesia. This study also determined that the two variables are cointegrated and established the direction of causality between government revenue and Expenditure. However, the result indicates that Expenditure generates revenue and not the other way around.

This result can contribute to the recent literature such as research by Takumah (2014) and Ullah (2016) that shows that the nature of the causal relations between each country is always vary and always depend on the macroeconomic stability of each country.

**5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS**

This research demonstrates a long-run or equilibrium relationship between government revenues and expenditures in Indonesia. Furthermore, the researchers can conclude that Government expenditures have a causal relationship with government revenues. Specifically, this result shows that government spending affects government revenue in Indonesia.

This result occurs because, in Indonesian economic development throughout the research period, the Indonesian government has relied extensively on external financing or foreign debt to finance the nation’s economy for the duration of its existence. It is due to the early period condition: Indonesian manufacturers and industries could not produce and export goods with a high value-added; in contrast, almost all Indonesian products are in the form of raw materials. Moreover, this condition is worsening by a low percentage of tax revenue, making Indonesian trade balance and Net Income cannot financing most of the Indonesian economy and forcing the already existing corrupt government to increase the foreign debt that later, led Indonesia into a monetary crisis. After this period, the Indonesian economy has improved so much better that we can see it from more optimistic economic growth and an increase of the GDP each year before slowing down towards the pandemic (Limba et al., 2020). However, this steady growth in recent years still has a problem: the Indonesian economy is heavily affected by exogenous shocks such as the volatility of oil prices, exchange rates (US\$), and Interest rates.

Indonesia still relies on fossil fuels to carry out most of its economic activity, and the Indonesian market still get heavy influence by foreign exchange rates condition, such as from the United States, because many products still must import; this makes a slight change in US\$ will create inflation for the imported goods and decrease purchasing power. In addition, every time the U.S. Federal reserve increases the interest rates,

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Indonesian stock markets will experience crowding out, especially in portfolio investment.

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The empirical findings of this study imply that: Government has to expand the Indonesian expenditure policy is imminent, with an emphasis on increasing capital expenditure and productive Expenditure. To generate a multiplier effect that can lead to export growth. Therefore, this policy can help to increase government revenue; (ii) the researchers believe the government must adjust the subsidy policy on oil considered to be more realistic and sustainable over time, therefore, the Expenditure could direct into a more robust social welfare policy (health and education). Furthermore, in the long-run government can protect its spending plans from fluctuations in crude oil revenue. (iii) To protect the economy from the unpredictability of oil revenue, the government should strengthen efforts to generate alternative revenue sources.

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For future research, it is essential to determine what aspect determines the effectiveness of Indonesian expenditures to get a solid conclusion and clearer policy implications. Furthermore, it is vital to investigate why Indonesian government revenue cannot balance Indonesian expenditures over the long term.

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