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Crowding Out and Multiplier Effect in Indonesia

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ABSTRACT. The purpose of government policy from the issuance of SUN, which is anticipated to increase the amount of APBN funding available from the capital market, is affecting private investment and macroeconomic conditions. This research aims to find the correlation between SUN issuance, private bonds, Gross Domestic Product, inflation, and interest rates and finding out whether there is a multiplier effect in short term due crowding-out conditions in Indonesia. Canonical correlation is used to forecast and analyze correlations between sets of dependent and independent variables within a group. The degree of relationship between two sets of variables is measured by the canonical correlation, which characterizes an ideal linear combination of dependent and independent variables The government policy for issuing bonds (SUN) may alter the change with 48.437 percent on dependent variables (Gross Domestic Product, inflation, interest rates, and Indonesian Composite Index), and vice versa, changes in independent variables will also have an effect on changes with 38,666 percent in independent variables (Stocks, Government Bonds, And Corporate Bonds). The crowding out effect doesn't produce the expected increase in the economic scale greater than one as predicted by Keynesian theory; however, Indonesia's crowding-out situation has a positive multiplier effect, leading to increases in Gross Domestic Product, Inflation and the Indonesian Composite Index.

1. Introduction

The phenomenon known as the "crowding-out effect" happens when government expenditure rises and subsequently lowers the money availability for private investment. Businesses, investors, and individuals all suffer greatly from the Crowding Out effect, and governments are forced to intervene and provide finance when the private sector is unable or unable to do so. In addition to lowering long-term economic growth and raising interest rates, crowding out can also lower private investment and cause inflation. Both positive and negative crowding-out effects are possible. Government expenditure is able to support economic growth

by boosting consumer confidence, generating jobs, and raising demand for products and services. On the other hand, excessive government spending can have negative effects on businesses and the economy as a whole by increasing inflation, interest rates, and private investment.

A study examining the crowding-out effect by Trebicka et al. (2023) shows that there is a significant, long-term correlation in Albania between government and private investment, implying that an increase in government spending either drives away or discourages private investment [1]. Basically, the crowding-out effect aims to stimulate the economy. The goal of government spending is to boost employment, capital expenditure, business income, and production in order to further stimulate the economy. Theoretically, compared to an increase in government spending, the multiplier effect is sufficient to generate a larger overall Gross Domestic Product rise. Research from Dash (2016), shows an increase in Indian government investment by one percent as a ratio of Gross Domestic Product causes a decrease in private investment of 0.81 percent and 0.53 percent as a ratio of Gross Domestic Product in the long and short term, while research on the crowding out effect in the Eurozone demonstrates that while economic development has a beneficial influence on private investment, government debt, spending, interest rates, and budget deficits all have a negative effect.[2]. In Indonesia, research on crowding-out effects due to the issuance of government bonds was carried out in 2003 [3]. The issuance of government bonds had no effect on economic growth and inflation, and the effects of crowding out did not cause a weakening of private sector investment [4]. Meanwhile, in 2018, crowding-out research in Indonesia showed that there would be a negative effect on private sector bonds due to the issuance of government bonds [5].

The crowding-out effect in Indonesia occurred again when the government decided to issue Surat Utang Negara (SUN). The government's issuance of retail SUN since 2019 has been recorded to continue to increase until 2022. The decision to issue foreign exchange SUN in early 2023 is a step to mitigate the need for debt financing and takes into account the potential increase in SUN yields, which is expected to continue amidst global uncertainty. At the beginning of 2022, a test of the crowding-out effect in Indonesia was carried out again by Fathonah et al. (2023), and the findings demonstrated that, while bonds and Long-term economic growth instruments had the impact of crowding in private investment in Indonesia, but short-term effects of the budget deficit financed by these instruments had the opposite effect because the government's policy of issuing SUN is aimed at increasing Gross Domestic Product and having a positive effect in the long term [6].

The process of the crowding-out effect is not always simple. By establishing new markets and possibilities, government spending may occasionally even serve as a catalyst for private investment. pertaining to the idea of fiscal policy, This is how the government applies taxes and spending to influence the status of the economy [7], [8], [9]. Furthermore, higher interest rates are

typically a result of increased government borrowing, and higher interest rates discourage investment [10]. On the fiscal side, research by Chen (2021) shows that the correlation between stock market performance and economic theory can be elucidated by applying classical, Ricardian, or Keynesian theories. The study's findings demonstrate that, under typical macroeconomic circumstances, the stock market reacts unfavorably to an expansionary approach, but during times of economic downturn, there is a positive association [11].

Based on Keynesian multiplier effect theory that government expenditure can stimulate the economy and encourage private investment, and based the research results from Demirel et al. (2017) and Fathonah et al. (2023), we are trying to conduct research on whether there is a multiplier effect due to the issuance of SUN or crowding out conditions in Indonesia. We try to find the multiplier effect between SUN issuance, private bonds, Gross Domestic Product, inflation, and interest rates and their positive or negative effects.

2. Method

A multivariate approach called canonical correlation is used to forecast and analyze correlations between sets of dependent and independent variables within a group. The degree of relationship between two sets of variables is measured by the canonical correlation, which characterizes an ideal linear combination of dependent and independent variables [12]. From the end of 2020 until the end of 2022, observations were made for data collected from Biro Pusat Statistik (BPS), Indonesian Capital Market, and Central Bank of Indonesia. Because the canonical correlation method must meet the assumptions of linearity, normality, homoscedastic and multicollinearity, it is necessary to test the data first. In this study, we used the SPSS program for data processing.

The dependent variables (one set of Economic conditions) are Gross Domestic Product (Y1), Inflation (Y2), Interest rates (Y3), and Indonesian Composite Index (Y4). And the independent variables that make up the issue of SUN and its consequences are corporate bonds (X3), government bonds (X2), and stocks (X1).

2.1 Normality test

The normality test aims to test the normal distribution of the linear regression model. The goal of the Kolmogorov-Smirnov test is to determine if a sample originates from a population with a normal distribution of data. Kolmogorov-Smirnov Test Formula:

$$Z\_i = \frac{Xi - \ddot{X}}{s}, \quad i=1,2,3,...,k \tag{1}$$

$$D\_i = |F(Z\_i) - F(X\_i)|, \quad i = 1,2,3, \dots , k \tag{2}$$

if D_{max} > critical value, then H_o is accepted and H_1 is rejected

if D_{max} < critical value, then H_o is rejected and H_1 is accepted

or

sig. Value > 0.05, then H_o is accepted

sig. value < 0.05, then H_o is rejected

Multivariate outlier examination can be done with mahalanobis distance (d2) test that are distributed Chi Square (χ^2) with a degree of freedom (df) of a number of observation variables (p). Formula for calculating (d2) or mahalanobis distance value:

$$d_i^2 = (pi - \acute{p})^T \Sigma_i \quad (pi - \acute{p})^T \tag{3}$$

if $d^2 > \chi^2(\alpha,df)$, there's a multivariate outlier.

if $d^2 < \chi^2(\alpha,df)$, there's no multivariate outlier.

When mahalanobis distance (d2) value that is more than the chi square value (χ^2) with degrees of freedom df observation variable p and significance level, is said to be multivariate outlier data.

2.2 Linearity test

An analysis of the linearity of two variables is intended to ascertain whether or not there is a substantial linear relationship. The predictor (X) and dependent (Y) variables should have a linear relationship in good data. Linearity test with curve estimation is said to be met linearly, if the linear equation is significant (< 0,05). Linearity Assumptions Using the Curve Estimation Method in SPSS Relationship between variables is said to be met linear, if:

Table 1. Linearity Criteria

Linear	Not Linear
1. Linear Equation = Sig And Equation The Other Model Is Ignored	Linear Equation = No Sig, And There Is At Least One Equation Model That Is Another Sig
2 All Models = Not Sig	

2.3 Homoscedasticity test

Canonical correlation analysis describes a good relationship when it is homoscedastic. The purpose is to determine if the regression model exhibits variance inequality. It is referred to as homoscedastic Indonesian Composite Index if the variance between the residuals from one observation and another does not change, and heteroscedasticity if it does. One way to detect the occurrence of homoscedasticity or heteroscedasticity is by using a scatter plot. In the scatter plot,

if there is a certain pattern, then heteroscedasticity occurs, but if the scatter plot data spreads over four quadratics, then the data is homogeneous and there is no heteroscedasticity deviation.

2.4 Multicollinearity test

An association between the independent variables in multiple regression that is linear is the multicollinearity test. Finding each variable's correlation with each other is the goal of the multicollinearity test. We may utilize VIF (Variance Inflation Factor) numbers to determine whether multicollinearity exists. Indicating that multicollinearity is unquestionably an issue between the independent variables, the VIF value above 10 signifies this.

2.5 Canonical Correlation Test

Wilks' lambda is a multivariate analysis of variance metric that quantifies how well a set of independent variables can distinguish between distinct observation groups. Groups are created for each function by Wilks' lambda measurement. It is equivalent to the percentage of the discriminant scores' overall variation that cannot be accounted for by group differences. Smaller Wilks lambda values indicate a stronger discriminating capacity for the function.

$$A = \frac{SSw}{SSt} = \frac{\sum_{t=1}^{r} \sum_{j=1}^{k} (Xi.j - Xgj)^2}{\sum_{t=1}^{r} \sum_{j=1}^{k} (Xi.j - Xgj)^2 + \sum_{g=1}^{g} ng(Xgi - Xj.)^2} \tag{4}$$

2.6 Hypothesis

Hypothesis for Wilks Lambda test

H0: $\rho 1 = \rho 2 = \rho 3 = 0$ (not significant)

H1: $\rho i \neq 0$, i=1, 2, 3 (significant)

Test criteria: Reject H0 if p-value is less than 0.05, with $\alpha = 0.1$. There are three ways to interpret the canonical function test [13]. To ascertain each variable's sign and magnitude, Canonical Weight is employed. High weighted variables have a major impact on variable variance and vice versa. While variables of the same sign have a direct link with their canonical variables, those of opposing signs have an inverse relationship. Canonical Loading reflects the variation in evaluating each variable's linear correlation within each canonical function. The original variable's function within the canonical variance set increases in tandem with the mayoral load value. When a variable's canonical loading value exceeds 0.5, a big function is detected in the canonical variance collection for that variable. Canonical cross-loading aims to quantify the link between variables directly by eliminating the intermediary step present in traditional loading.

2.7 Redundancy Test

The index value of the percentage of diversity that can be described by the independent and dependent canonical variables is determined using redundancy analysis. The proportion of

variable diversity explained by the canonical variable is obtained from the calculation of the squared average canonical loadings [14], [15].

$$R^2_{x!ui} = \frac{\sum_{j=i}^{k} R^2_{Xjui}}{k} \tag{5}$$

$$R^2_{y!vi} = \frac{\sum_{j=i}^{k} R^2_{Yjvi}}{k} \tag{6}$$

The proportion of variable diversity that is explained by the opposing canonical variable is obtained by multiplying the square of the canonical correlation by the squared average of the canonical loadings.

$$R^2_{x!vi} = \rho^2_k R^2_{x!ui} \tag{7}$$

$$R^2_{y!ui} = \rho^2_k R^2_{y!vi} \tag{8}$$

3. Result and Discussion

3.1 Normality test

Table 2. Kolmogorov-Smirnov Tests Result

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Gross Domestic Product	,120	12	,200*	,951	12	,651
Inflation	,143	12	,200*	,936	12	,452
Interest rates	,213	12	,138	,809	12	,012
Stock	,160	12	,200*	,905	12	,187
Government bond	,120	12	,200*	,959	12	,769
Corporate bond	,180	12	,200*	,838	12	,026
Indonesian Composite Index	,203	12	,184	,886	12	,105

Table 2. show that all variables have significant value more than 0,05, it means H_o is accepted. In conclusion all variables have normal distribution.

Table 3. Outlier test

Mahalanobis Distance (d^2)	chi square (χ^2)
1,15465	26,217
1,89789	26,217
1,93272	26,217
1,99927	26,217
2,09123	26,217
2,33727	26,217
2,50199	26,217
3,37486	26,217
4,47061	26,217
7,26843	26,217
7,30163	26,217
7,66945	26,217

The lower limit for the mahalanobis distance value is 1.15465 and the upper limit is 7.66945. From Table 3, it shows that there is no outlier data, because the value of the mahalanobis distance < $\chi^2(0,01,12)$ or 26,217.

Table 4. Mahalanobis correlation

		Mahalanobis Distance	q1
Mahalanobis Distance	Pearson	1	,937**
	Sig.		,000
	N	12	12
q1	Pearson	,937**	1
	Sig.	,000	
	N	12	12
**. significant at the 0.01 level (2-tailed).			

Significant value from mahalanobis distance is 0,000, means all data has normal distribution and able to be using for correlation canonical test

3.2 Linearity Test

Table 5. Linearity Test

Variable	Acceptance Scale
X1 x Y1	No models.
X1 xY2	No models.

X1 x Y3	No models.
X1 x Y4	sig.0,000
X2 x Y1	No models.
X2 xY2	No models.
X2 x Y3	No models.
X2 x Y4	sig.0,000
X3 x Y1	sig.0,006
X3 xY2	No models.
X3 x Y3	No models.
X3 x Y4	No models.

Curve Estimation Method: Linearity Assumptions According to SPSS, a linear relationship exists between variables. Table 5 displays the significant results of the linearity test for each of the linear equations
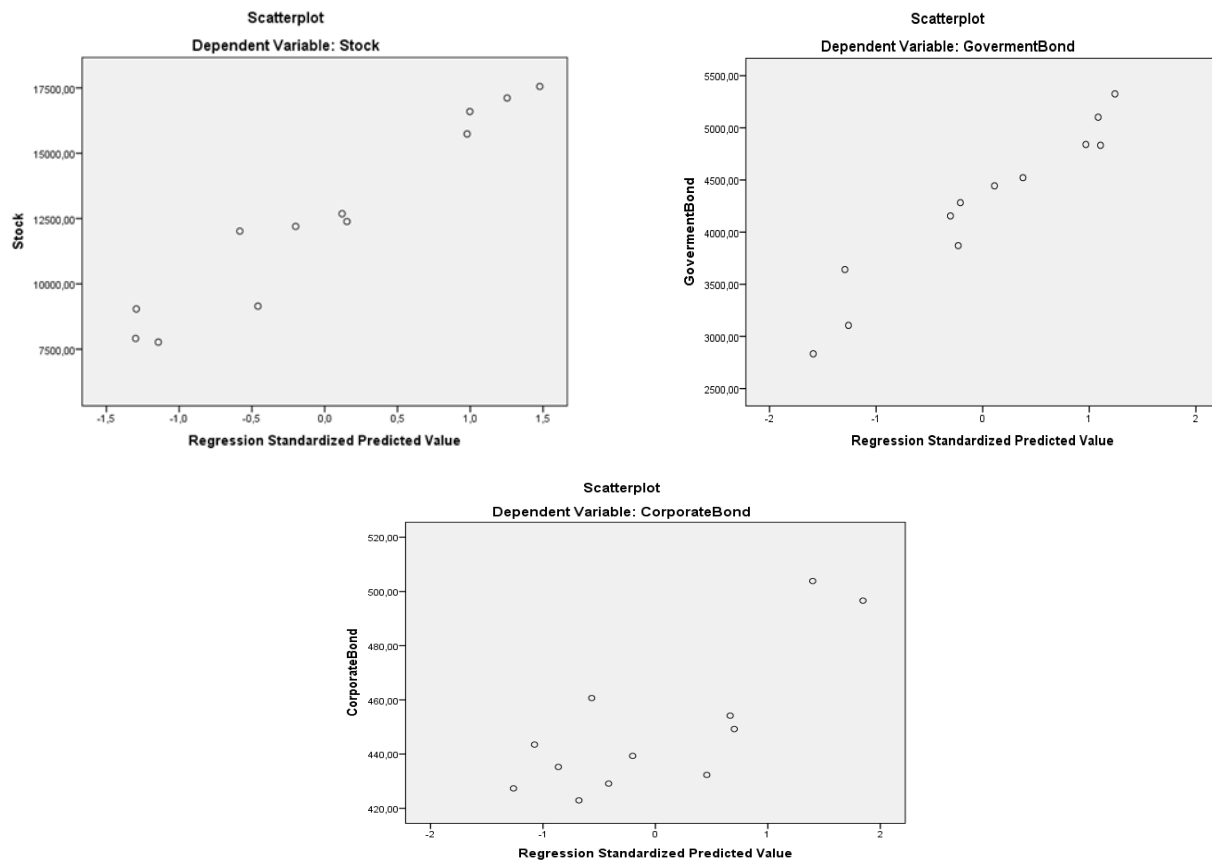
3.3 Homoscedasticity test

Figure 2. Scatter Plot

Figure 2. show the scatter plot there is no pattern, but scatter plot data spreads over four quadratics. It means the data is homogeneous and there is no heteroscedasticity deviation.

Table 6. Collinearity Test Result

	Stock		Government Bond		Corporate Bond	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
Gross Domestic Product	,785	1,273	,785	1,273	,785	1,273
Inflation	,324	3,090	,324	3,090	,324	3,090
Interest rates	,403	2,484	,403	2,484	,403	2,484
Indonesian Composite Index	,500	1,999	,500	1,999	,500	1,999

Because the score for each variable in the multicollinearity test is less than 10, as shown in Table 6, all variables are considered free of multicollinearity. The Wilks Lambda test is used after data testing to evaluate whether the significance test or canonical correlation test may be run.

Table 7. Significant of Canonical Correlation

Test	Value	Approx	Hypoth	Error	Sig
Pillai's	2,21944	4,97597	12,00	21,00	,001
Hotelling's	57,48740	17,56559	12,00	11,00	,000
Wilk's	, ,00257	9,61386	12,00	13,52	,000
Roy's	,98185				

The result of significance is less than 0.05, according to the Wilks-Lambda test it is possible to reject H0 or determine that the canonical correlation is significant as indicated in Table 7.

Table 8. Wilks-Lambda

Roots	Wilks L	F	Hypoth	Error	Sig
1 TO 3	,00257	9,61386	12,00	13,52	,000
2 TO 3	,14136	3,31946	6,00	12,00	,036
3 TO 3	,44410	4,38108	2,00	7,00	,058

It is possible to employ the first function for additional study because its level of significance is 0.000 or less than 0.05. In light of this, the second canonical function's level of significance is 0.036, or less than 0.05, suggesting that it can be employed in future studies. In the meantime, the

p-value of the third canonical function, which is bigger than 0.05, suggests that it is not significant by itself. Out of the three assessed functions, only the first and second are seen as relevant, with the third being deemed negligible. The conclusion drawn from these data is to accept H1 and reject Ho. Consequently, the subsequent stage will allow for an examination of the initial function.

Table 9. Canonical Correlations Function

Root No	Eigenvalue	Canon Cor	Sq. Cor
1	54,09401	,99088	,98185
2	2,14165	,82565	,68170
3	1,25174	,74559	,55590

It can be shown that the canonical variable of the first function accounts have variation for 98.18% in the dependent variable, with a canonical correlation of 0.9908. There is no further testing done on the second or third functions, despite their respective scores of 68.170% and 55.59%.

Table 10. Canonical Weight Dependent Variables

Variable	Canonical Function		
	1	2	3
Gross Domestic Product	,30716	1,00267	-,50834
Inflation	-,17734	-1,87518	-,98167
Interest Rates	,15988	, 1,41738	1,28683
Indonesian Composite Index	,95710	,59936	1,07650

The result canonical weight from the dependent variables places the Indonesian Composite Index at the first with score of 0.9571, Gross Domestic Product in second place with score of 0.30716, and inflation in third place with score of - 0.17734, The variables denoting Gross Domestic Product, inflation, and interest rates are all positive and show that their contributions align with the canonical variable's direction; nevertheless, the inflation variable is negative.

Table 11. Canonical Weight Independent Variables

Variable	Canonical Function		
	1	2	3
Stock	,29653	-1,21565	-1,63008
Government Bond	,62588	,72003	1,79675
Corporate Bond	-,29337	-,89129	,42363

With a contribution of 0.62588, the government bond variable is rated first by the canonical weight in the first canonical function. The tick variable comes in second with 0.29653, while the corporate bonds variable comes in third with -0.29337. Positive findings show that the canonical variable and the stock and government bond variables both contribute in the same way. The Corporate Bond variable, on the other hand, exhibits a negative result, indicating that its contribution is counterproductive.

Table 12. Canonical Loading Dependent Variables

Variable	Canonical Function		
	1	2	3
Gross Domestic Product	,62796	,38661	-,57943
Inflation	,52162	-,35271	,15806
Interest Rates	-,16311	,04897	,56812
Indonesian Composite Index	,96719	-,19760	,12034

Three variables (the Indonesian Composite Index variable at 0.96719, the Gross Domestic Product variable at 0.62796, and the inflation variable at 0.52162) get scores over 0.5 in the first function. Positive correlations between the all variables show that they are unidirectionally correlated with the canonical variable.

Table 13. Canonical Loading Independent Variables

Variable	Canonical Function		
	1	2	3
Stock	,91069	-,37845	-,16557
Government Bond	,94003	-,16843	,29661
Corporate Bond	-,48271	-,74186	,46544

Two variables, the Government Bond variable (0.94003) and the Stock variable (0.91069), yield scores over 0.5 in the first function. There is a unidirectional association between the two variables and the canonical variable when they both have a positive sign.

Table 14. Canonical Cross Loading Dependent

Variable	Canonical Function		
	1	2	3
Gross Domestic Product	,10846	,35406	-,17950
Inflation	-,10740	-1,13570	-,59454
Interest Rates	,28687	2,54321	2,30896
Indonesian Composite Index	,00107	,00067	,00121

Table 15. Canonical Cross Loading Independent

Variable	Canonical Function		
	1	2	3
Stock	,00010	-,00040	-,00054
Government Bond	,00082	,00094	,00234
Corporate Bond	-,01118	-,03396	,01614

Based on the results can be used to write the following equation:

Dependent function = 0.10846 Gross Domestic Product- 0.10740 Inflation + 0.28687 Interest Rates + 0.00107 Indonesian Composite Index (9)

Independent function = 0,0001 Stock + 0.00082 Government Bond – 0.01118 Corporate Bond (10)

3.4 Redundancy analysis

Table 16. Calculation of Redundancy Index

Variables	Canonical Loading	(Canonical Loading)²	Average	Canonical Correlation	Redundancy Index
Stock	,91069	,82935			
Government bond	,94003	,88365			
Corporate bond	-,48271	-,23300			
Independent variable		1.94600	,49333	,98185	,48437
Gross Domestic Product	,62796	,39433			
Inflation	,52162	,27208			
Interest rate	-,16311	-,02660			
IndonesianComposite Index	,96719	,93545			
Dependent variable		1.62846	,39381	,98185	,38666

The results above show a redundancy index of the independent variable of 48,437 percent, It indicates that the range of changes in the dependent variables can be explained by variations in the independent variable. In contrast, a 38.666 percent explanation of the diversity of changes in the independent variable can be provided by the diversity of dependent variables.

3.5 Finding

With an Indonesian Composite Index variable contribution of 0.9571, the Gross Domestic Product comes in second, followed by the interest rate with 0.15988, the inflation in last place with -0.1734, and the results on the dependent variable group show that the Indonesian Composite Index variable is first. Corporate bonds come in third place with -0.29337, stock comes in second with 0.29653, and government bonds come in first place with 0.62588 according to the independent variable group. The negative sign on inflation shows that every time there is an increase in Indonesian Composite Index, Gross Domestic Product, and interest rate, it will cause inflation to fall. This results are in accordance with finding from (Jepkemei, 2017), (Batayneh et al., 2021) (Nur Ilham et al., 2021), and Leasiwal et al. (2022), where inflation had negative effect on capital market investment and Gross Domestic Product [16], [17], [18], [19]. Meanwhile, an increase in government bonds and stock will cause corporate bonds to fall. The results of this research are in accordance with result from Wibowo et al. (2018) and Fatonah et al. (2023), which stated that the issuance of government bonds in Crowding out conditions will cause a decrease in investment in the private sector (corporate bonds) [5], [6]. From the canonical loading test for the dependent variables, there's three variables that get scores greater than 0.5: the inflation variable (0.52162), the Gross Domestic Product variable (0.62796), and the Indonesian Composite Index variable (0.96719). While in independent variables, government bonds had a 0.94003 and stock had a 0.91069. This result shows that there is a correlation between Indonesian Composite Index, Gross Domestic Product, and inflation (dependent variable) and stocks and government bonds (independent variable). This result is contrary to research from Waluyo (2017), which states that there is no effect of bond issuance on Gross Domestic Product and inflation [4].

The Canonical Cross Loading Result shows that due to crowding out, Gross Domestic Product will increase by 0.10846 points, inflation by 0.28687 points, Indonesian Composite Index by 0.00107 points, and reduce interest rates by 0.10740 points. The result of an increase in Gross Domestic Product of 0.10846 points is not as expected from the Keynesian theory regarding the multiplier effect, It claims that government expenditure can multiply the effects of economic activity and private investment, Reuss (2009) [21]. Furthermore, the results of our research show that there are positive effects (inflation and Indonesian Composite Index) and negative effects (interest rates). It can be seen that inflation causes an increase of 0.28687 points and actually reduces interest rates by 0.10740 points. This result is contrary to the results of research by Murphy & Walsh (2022), and Albonico et al. (2020) [22].

3.6 Implication

The empirical findings in this research were obtained from redundancy analysis's finding that there is a multiplier effect on crowding out in Indonesia. The government policy for issuing bonds

(SUN) may alter the change with 48.437 percent on dependent variables (Gross Domestic Product, inflation, interest rates, and Indonesian Composite Index), and vice versa, changes in dependent variables will also have an effect on changes with 38,666 percent in independent variables (stocks, government bonds, and corporate bonds). In accordance with research from Demirel et al. (2017) It claims that crowding out has a beneficial impact on economic growth and is not in accordance with the results of research from Domańska (2020) [20].

4. Conclusion

Private sector investment decreases (crowds out) when government bonds (SUN) are issued, particularly when it comes to private bonds but not shares. The government's actions do not produce the expected increase in the economic scale greater than one as predicted by Keynesian theory; however, Indonesia's crowding-out situation has a positive multiplier effect, leading to increases in Gross Domestic Product, inflation, and the Indonesian Composite Index. Finally, a number of significant factors can serve as guides for policymakers, including boosting Gross Domestic Product and stock market index growth to promote economic growth. When the stock market index growth rate is higher than the inflation rate, Investors will view the economy in positive conditions and will ultimately attract foreign investment to increase economic growth.

Conflicts of Interest: The authors declare that there are no conflicts of interest regarding the publication of this paper.

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