

## **Earnings Management: The Impact of Cost of Goods Sold Increase on Gross Profit Decline (A Study on Waskita Karya (Persero) Tbk for the Period 2015-2023)**

**Rezka Hadi Prayoga<sup>1)</sup>, Alan Julian Duta<sup>2)</sup>, Nurhana Dhea Parlina<sup>3)</sup>**  
<sup>1,2,3)</sup> Finance, Economy, Swadaya Gunung Jati University

\*Corresponding Author  
Email: [nurhanadp@ugj.ac.id](mailto:nurhanadp@ugj.ac.id)

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### **Abstract**

*This study analyzes the impact of increasing cost of goods sold (COGS) on the decline in gross profit at PT Waskita Karya (Persero) Tbk during the period 2022-2023. Earnings management is often applied to adjust financial statements to achieve certain targets, especially in the face of changes in production costs and revenue.. Using a quantitative descriptive approach, this research examines quarterly financial statements of the company... The results of the study show that the increase in COGS has a significant impact on the decline in the company's gross profit. The main factors contributing to this condition include increasing raw material prices, increasing labor costs, and government policies that affect the efficiency of construction projects. Based on the data analyzed, the company's gross profit decreased by 41.23% in 2023 compared to the previous year. This finding emphasizes the importance of implementing a more effective financial management strategy in dealing with increasing production costs. Optimizing selling prices and managing resources more efficiently can be a solution for companies to maintain profitability. In addition, transparency in financial reports is a key factor in helping stakeholders make better decisions.*

**Keywords:** *Earning Management, Cost Of Goods Sold (COGS), Gross Profit, Financial Performance, Contruction Industry, PT Waskita Karya (Persero) Tbk, Quantitative Analysis, financial Reporting*

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## **INTRODUCTION**

Earnings management denotes deliberate managerial actions aimed at adjusting financial statements within the bounds of generally accepted accounting principles to achieve strategic corporate objectives. Within the construction sector, such practices are frequently associated with the complexities of long-term contractual arrangements and challenges in revenue recognition. PT Waskita Karya (Persero) Tbk, a prominent state-owned construction enterprise in Indonesia, encountered substantial financial strain during the 2015–2023 period, primarily due to escalating production costs, project execution delays, and market contraction. This study seeks to examine the extent to which fluctuations in the Cost of Goods Sold (COGS) impact the company's gross profit, with comparative insights drawn from both domestic and international construction firms.

## **RESEARCH METHODS**

This study employs a descriptive quantitative methodology, utilizing secondary data derived from 32 quarterly financial statements of PT Waskita Karya (Persero) Tbk spanning the period from 2015 to 2023. The sample selection was conducted through purposive sampling, based on the completeness and relevance of the financial data. Analytical techniques applied include correlation analysis, path analysis, and t-tests. Data collection was carried out through document review obtained from official corporate sources and the Indonesia Stock Exchange (IDX).

## RESULT AND DISCUSSION

This section reviews the development of Cost of Goods Sold, Sales, and Gross Profit of PT Waskita Karya (Persero) Tbk over an eight-year period, from 2015 to 2023. The purpose of this analysis is to provide a comprehensive overview of the company's financial performance, particularly focusing on the key aspects that influence profitability levels.

Table 1. Development of Gross Profit of PT Waskita Karya (Persero) Tbk (2015–2023) in Million Rupiah

Year	Quarter	Gross Profit (Million Rupiah)	Increase/Decrease (Million Rupiah)	Change (%)
2015	Q1	157.286	-	-
	Q2	481.202	+323.916	+206%
	Q3	481.202	0	0%
	Q4	1.321.236	+840.034	+175%
2016	Q1	519.626	-801.610	-61%
	Q2	1.489.359	+969.733	+187%
	Q3	2.426.721	+937.362	+63%
	Q4	3.357.038	+930.317	+38%
2017	Q1	1.034.375	-2.322.663	-69%
	Q2	2.639.672	+1.605.297	+155%
	Q3	3.463.532	+823.860	+31%
	Q4	5.643.487	+2.179.955	+63%
2018	Q1	2.703.334	-2.940.153	-52%
	Q2	1.748.175	-955.159	-35%
	Q3	2.743.616	+995.441	+57%
	Q4	3.436.838	+693.222	+25%
2019	Q1	1.343.295	-2.093.543	-61%
	Q2	2.416.533	+1.073.238	+80%
	Q3	3.416.635	+1.000.102	+41%
	Q4	5.654.862	+2.238.227	+65%
2020	Q1	1.875.641	-3.779.221	-67%
	Q2	1.768.832	-106.809	-6%
	Q3	3.010.848	+1.242.016	+70%
	Q4	4.370.063	+1.359.215	+45%
2021	Q1	1.700.000	-2.670.063	-61%
	Q2	1.870.000	+170.000	+10%
	Q3	2.300.000	+430.000	+23%
	Q4	3.700.000	+1.400.000	+61%
2022	Q1	2.333.865	-1.366.135	-37%
	Q2	2.455.866	+122.001	+5%
	Q3	3.143.333	+687.467	+28%

Year	Quarter	Gross Profit (Million Rupiah)	Increase/Decrease (Million Rupiah)	Change (%)
	Q4	4.443.332	+1.300.000	+41%
2023	Q1	4.000.336	-442.996	-10%
	Q2	4.662.353	+662.017	+17%
	Q3	3.850.131	-812.222	-17%
	Q4	3.750.723	-99.408	-3%

PT Waskita Karya (Persero) Tbk experienced significant gross profit growth from 2015 to 2023. In 2015, gross profit increased more than 700%, establishing a strong financial baseline. Despite early-year declines in 2016 and 2017 (-61% and -69%, respectively), the company showed consistent year-end recoveries, reaching IDR 3,357 billion in 2016 and IDR 5,643 billion in 2017. In 2018 and 2019, performance was mixed, with initial contractions followed by late-year rebounds—ending with gross profits of IDR 3,437 billion and IDR 5,655 billion, respectively. The pandemic in 2020 caused a 67% decline in Q1; however, partial recovery led to a 45% gain by Q4. From 2021 onward, gross profit followed a more stable upward trend, reaching IDR 3,700 billion in 2021 and peaking at IDR 4,443 billion in 2022. In 2023, despite minor fluctuations, the company maintained strong profitability, closing the year at IDR 3,751 billion.

Table 2. Development of Sales of PT Waskita Karya (Persero) Tbk (2015–2023) in Million Rupiah

Year	Quarter	Gross Profit (Million Rupiah)	Increase/Decrease (Million Rupiah)	Change (%)
2015	Q1	1.245.554	-	-
	Q2	3.206.918	1.961.364	157%
	Q3	3.503.118	296.200	9%
	Q4	12.231.514	8.728.396	249%
2016	Q1	2.551.915	-9.679.599	-79%
	Q2	6.555.123	4.003.208	157%
	Q3	11.581.180	5.026.057	77%
	Q4	19.950.484	8.369.304	72%
2017	Q1	2.407.459	-17.543.025	-88%
	Q2	6.107.419	3.699.960	154%
	Q3	12.293.356	6.185.937	101%
	Q4	25.784.955	13.491.599	110%
2018	Q1	5.066.969	-20.717.986	-80%
	Q2	18.719.105	13.652.136	269%
	Q3	22.422.338	3.703.233	20%
	Q4	19.116.093	-3.306.245	-15%
2019	Q1	17.856.407	-1.259.686	-7%
	Q2	26.173.642	8.317.235	47%
	Q3	25.782.346	-391.296	-2%
	Q4	33.792.972	8.010.626	31%

Year	Quarter	Gross Profit (Million Rupiah)	Increase/Decrease (Million Rupiah)	Change (%)
2020	Q1	15.362.921	-18.430.051	-55%
	Q2	8.411.153	-6.951.768	-45%
	Q3	9.175.342	764.189	9%
	Q4	7.832.672	-1.342.670	-15%
2021	Q1	2.450.311	-5.382.361	-69%
	Q2	8.856.540	6.406.229	261%
	Q3	15.365.677	6.509.137	73%
	Q4	20.487.532	5.121.855	33%
2022	Q1	4.125.691	-16.361.841	-80%
	Q2	8.215.524	4.089.833	99%
	Q3	13.285.534	5.070.010	62%
	Q4	21.456.789	8.171.255	61%
2023	Q1	4.231.050	-17.225.739	-80%
	Q2	7.412.639	3.181.589	75%
	Q3	9.752.065	2.339.426	32%
	Q4	10.102.362	350.297	4%

Based on the table above, the development of the Cost of Goods Sold (COGS) at PT Waskita Karya (Persero) Tbk is as follows: From 2015 to 2023, PT Waskita Karya (Persero) Tbk experienced significant fluctuations in Cost of Goods Sold (COGS). The period 2015–2017 was marked by strong quarterly growth, reflecting aggressive project execution. In 2018–2019, performance was more stable, though a Q4 decline in 2018 indicated emerging cost control challenges. The year 2020 saw a sharp decline due to the COVID-19 pandemic, with COGS dropping below early-year levels. Recovery began in 2021 and continued into 2022, supported by improved operational capacity. By 2023, although minor fluctuations persisted, the company demonstrated sustained cost growth aligned with increased construction activity.

Table 3. Development of Sales at PT Waskita Karya (Persero) Tbk (2015–2023) in Million Rupiah

Year	Quarter	Sales (Million IDR)	Increase/Decrease (Million IDR)	Change (%)
2015	Q1	1.402.841	-	-
	Q2	3.384.320	+1.981.479	+141%
	Q3	3.384.320	0	0%
	Q4	14.152.752	+10.768.432	+318%
2016	Q1	3.071.542	-11.081.210	-78%
	Q2	8.004.513	+4.932.971	+161%
	Q3	14.007.301	+6.002.788	+75%
	Q4	23.788.322	+9.781.021	+70%
2017	Q1	1.441.735	-22.346.587	-94%
	Q2	15.546.036	+14.104.301	+978%
	Q3	25.434.638	+9.888.602	+64%

Year	Quarter	Sales (Million IDR)	Increase/Decrease (Million IDR)	Change (%)
	Q4	45.212.837	+19.778.199	+78%
2018	Q1	41.325.539	-3.887.298	-9%
	Q2	36.283.806	-5.041.733	-12%
	Q3	26.832.526	-9.451.280	-26%
	Q4	48.753.202	+21.920.676	+82%
2019	Q1	18.735.026	-30.018.176	-62%
	Q2	22.014.359	+3.279.333	+17%
	Q3	31.131.835	+9.117.476	+41%
	Q4	16.110.456	-15.021.379	-48%
2020	Q1	2.673.134	-13.437.322	-83%
	Q2	4.710.550	+2.037.416	+76%
	Q3	12.125.339	+7.414.789	+157%
	Q4	16.110.456	+3.985.117	+33%
2021	Q1	2.948.251	-13.162.205	-82%
	Q2	6.104.557	+3.156.306	+107%
	Q3	10.303.730	+4.199.173	+69%
	Q4	15.208.812	+4.905.082	+48%
2022	Q1	2.373.618	-12.835.194	-84%
	Q2	7.216.462	+4.842.844	+204%
	Q3	10.354.633	+3.138.171	+43%
	Q4	10.354.633	0	0%

Between 2015 and 2023, PT Waskita Karya (Persero) Tbk experienced considerable fluctuations in quarterly sales, influenced by strategic execution and external market dynamics. Exceptional growth occurred in 2015, followed by early-year downturns and late-year recoveries in both 2016 and 2017, highlighting the company's adaptability and market responsiveness. In 2018 and 2019, performance was mixed—initial declines were offset by strong Q4 results in 2018, while 2019 ended with a notable contraction. The COVID-19 pandemic in 2020 triggered a sharp decline, but sales gradually recovered, peaking again in Q4. Recovery continued throughout 2021 and 2022, with the company showing stable year-end performance despite mid-year volatility. In 2023, sales remained variable but closed strong, reflecting operational resilience in a shifting market environment.

### Single Correlation Analysis

Single Correlation Analysis of Cost of Goods Sold (COGS) on Sales To determine the effect of the Cost of Goods Sold (COGS) on Sales, the data analysis technique used is single correlation analysis. The analysis of how COGS affects Sales is as follows:

Correlation Analysis of Cost of Goods Sold (COGS) on Sales PT Waskita Karya (Persero) Tbk for the period 2015 – 2023 (in Billion Rupiah)

Table 4.

X1	X2	X1 <sup>2</sup>	X2 <sup>2</sup>	X1X2
1.245	1.402	1.550.025	1.965.604	1.745.490
3.503	3.984	12.271.009	15.872.256	13.955.952
3.503	3.984	12.271.009	15.872.256	13.955.952

12.231	14.152	149.597.361	200.279.104	173.093.112
2.551	3.071	6.507.601	9.431.041	7.834.121
6.595	8.084	43.494.025	65.351.056	53.313.980
11.581	14.007	134.119.561	196.196.049	162.215.067
19.820	23.788	392.832.400	565.868.944	471.478.160
6.107	7.141	37.295.449	50.993.881	43.610.087
12.858	15.548	165.328.164	241.740.304	199.916.184
22.884	28.534	523.677.456	814.189.156	652.972.056
35.749	45.212	1.277.991.001	2.004.124.944	1.616.283.788
9.605	12.396	92.256.025	153.660.816	219.944.895
18.171	22.899	330.185.241	524.364.201	416.097.729
29.158	36.232	850.188.964	1.312.757.824	1.056.452.656
39.926	48.788	1.594.085.476	2.380.268.944	1.947.909.688
6.932	8.682	48.052.624	75.377.124	60.183.624
11.881	14.795	141.158.161	218.892.025	175.779.395
17.858	22.014	318.908.164	484.616.196	393.126.012
25.782	31.387	664.711.524	985.143.769	809.219.634
3.332	4.169	11.102.224	17.380.561	13.891.108
6.971	8.037	648.594.841	64.593.369	56.025.927
10.971	11.740	120.362.841	137.827.600	128.799.540
18.168	16.190	330.076.224	262.116.100	294.139.920
2.365	2.671	5.593.225	7.134.241	6.316.915
4.540	4.710	20.611.600	22.184.100	21.383.400
6.848	7.125	46.895.104	50.765.625	48.792.000
10.325	12.224	106.605.625	149.426.176	126.212.800
2.418	2.748	5.846.729	7.551.504	6.644.664
5.433	6.090	29.517.489	37.088.100	33.086.970
9.315	10.303	86.769.225	106.151.809	95.972.445
13.853	15.302	191.905.609	234.151.204	211.978.606
2.331	2.731	5.433.561	7.458.361	6.365.961
4.810	5.272	23.136.100	23.793.984	25.358.320
7.042	7.816	49.589.764	56.165.776	55.040.272
10.102	10.954	102.050.404	119.990.116	110.657.308
416.764	494.182	8.580.571.805	11.620.744.120	9.729.753.738

$$r_{xy} = \frac{(\sum x_1 x_2) - (\sum x_1 \sum x_2)}{\sqrt{(n \sum x_1^2 - (\sum X_1)^2) \times (n \sum x_2^2 - (\sum x_2)^2)}}$$

$$r_{xy} = \frac{32(9.729.753.738) - (416.764)(494.182)}{32(9.729.753.738) - (416.764)(494.182)}$$

$$r_{xy} = \frac{311.352.119.616 - 205.957.267.048}{\sqrt{(32 \times 8.580.571.805 - (416.764)^2) \times (32 \times 11.620.744.120 - (494.182)^2)}}$$

$$r_{xy} = \frac{105.394.852.568}{\sqrt{(274.578.297.760 - 173.692.231.696) \times (371.863.811.840 - 244.215.849.124)}}$$

$$r_{xy} = \frac{105.394.852.568}{\sqrt{73.886.066.064 \times 127.647.962.716}}$$

$$r_{xy} = \frac{105.394.852.568}{\sqrt{9,44583189E + 17}}$$

$$r_{xy} = \frac{105.394.852.568}{971.896.696.671}$$

$$r_{xy} = 0,108$$

Based on the correlation calculation above, the coefficient between Cost of Goods Sold (COGS) and Sales is 0.108, which indicates a very strong and positive (direct) correlation

Table 5. Correlation Analysis of Sales on Y (Gross Profit) PT Waskita Karya (Persero) Tbk for the period 2015 – 2020 (in Billion Rupiah)

X2	Y	X2^2	Y^2	X2Y
1.402	157	1.965.604	24.649	220.114
3.984	481	15.872.256	231.361	1.916.304
3.984	481	15.872.256	231.361	1.916.304
14.152	1.921	200.279.104	3.690.241	271.859.92
3.071	519	9.431.041	269.361	1.593.849
8.084	1.489	65.351.056	2.217.121	12.037.076
14.007	2.426	196.196.049	5.885.476	33.980.982
23.788	3.967	565.868.944	15.737.089	94.366.996
7.141	1.034	50.993.881	1.069.156	7.383.794
15.548	2.689	241.740.304	7.230.721	41.808.572
28.534	5.649	814.189.156	31.911.201	161.188.566
45.212	9.463	2.004.124.944	89.548.369	427.841.156
12.396	2.790	153.660.816	7.784.100	34.584.840
22.899	4.728	524.364.201	22.353.984	108.266.472
36.232	7.073	1.312.757.824	50.027.329	25.6268.936
48.788	8.862	2.380.268.944	78.535.044	432.359.256
8.682	1.749	75.377.124	3.059.001	15.184.818
14.795	2.913	218.892.025	8.485.569	43.097.835
22.014	4.156	484.616.196	17.272.336	91.490.184
31.387	5.604	985.143.769	31.404.816	175.892.748
4.169	836	17.380.561	698.896	3.485.284
8.037	1.066	64.593.369	1.136.356	8.567.442
11.740	768	137.827.600	589.824	9.016.320
16.190	1.977	262.116.100	3.908.529	32.007.630
2.671	306	7.134.241	93.636	817.326

4.710	170	22.184.100	28.900	800.700
7.125	276	50.765.625	76.176	1.966.500
12.224	1.898	149.426.176	3.602.404	23.201.152
2.748	329	7.551.504	108.241	904.092
6.090	657	37.088.100	431.649	4.001.130
10.303	988	106.151.809	976.144	10.179.364
15.302	1.449	234.151.204	2.099.601	22.172.598
2.731	400	7.458.361	160.000	1.092.400
5.272	462	23.793.984	213.444	2.435.664
7.816	733	56.165.776	537.289	5.729.128
10.954	850	119.990.116	722.500	9.310.900
494.182	81.316	11.620.744.120	392.351.874	2.104.272.424

$$r_{xy} = \frac{(\sum x_2 y) - (\sum x_2 \sum y)}{\sqrt{(n \sum x_2^2 - (\sum X_2)^2) \times (n \sum y^2 - (\sum y)^2)}}$$

$$r_{xy} = \frac{32(2.104.272.424) - (494.182)(81.316)}{\sqrt{(32 \times 11.620.744.120 - (494.182)^2) \times (32 \times 392.351.874 - (81.316)^2)}}$$

$$r_{xy} = \frac{67.336.717.568 - 40.184.903.512}{\sqrt{(371.863.811.840 - 244.215.849.124) \times (12.555.259.968 - 6.612.291.856)}}$$

$$r_{xy} = \frac{27.151.814.056}{\sqrt{(127.620.962.716) \times (5.942.968.112)}}$$

$$r_{xy} = \frac{\sqrt{7,58447312E + 20}}{27.151.814.056}$$

$$r_{xy} = \frac{27.539.922.149}{27.539.922.149}$$

$$r_{xy} = 0,98$$

**Based on the correlation calculation above, the coefficient between Sales and Gross Profit is 0.98, which indicates a low and positive correlation.**

Coefficient of Determination Analysis

1. Analysis of the Coefficient of Determination of Cost of Goods Sold on Sales  
To measure the extent of the contribution of the influence of the Cost of Goods Sold on Sales, the calculation of the coefficient of determination is used as follows:

$$KD = R^2 \times 100\%$$

$$KD = 0,108^2 \times 100\%$$

$$KD = 0,0116 \times 100\% = 1,16\%$$

From the calculation results above, the coefficient of determination is 1.16%. The contribution of the Cost of Goods Sold to Sales is 1.16%, while the remaining 98.84% is influenced by other variables that are not examined.

2. Analysis of the Coefficient of Determination of Sales on Gross Profit  
To measure the extent of the contribution of Sales to Gross Profit, the calculation of the coefficient of determination is used as follows:

$$KD = R^2 \times 100\%$$

$$KD = 0,98^2 \times 100\%$$

$$KD = 0,9604 \times 100\%$$

$$KD = 96,04\%$$

From the calculation results above, the coefficient of determination is 96.04%. The contribution of Sales to Gross Profit is 96.04%, while the remaining 3.96% is influenced by other variables that are not examined.

### Path Analysis

To find the path coefficient, the following equation is used:

$$r_{12} = p_{21}$$

$$r_{1y} = p_{y1} + p_{y2} \times r_{12}$$

$$r_{2y} = p_{y1} \times r_{12} + p_{y2}$$

After obtaining the correlation with X of 0.89 and the correlation with Y of 0.24, to determine the path coefficient, the correlation with Y is needed using the following calculation:

Table 6. Path Analysis of Cost of Goods Sold on Gross Profit PT Asahimas Flat Glass Tbk for the Period 2015 – 2020 (In Billion Rupiah)

X1	Y	X1 <sup>2</sup>	Y <sup>2</sup>	X1Y
1.245	157	1.550.025	24.649	195.465
3.503	481	12.271.009	231.361	12.271.009
3.503	481	12.271.009	231.361	12.271.009
12.231	1.921	149.597.361	3.690.241	23.496.751
2.551	519	6.507.601	269.361	1.323.969
6.595	1.489	43.494.025	2.217.121	9.819.955
11.581	2.426	134.119.561	5.885.476	28.095.506
19.820	3.967	392.832.400	15.737.089	78.625.940
6.107	1.034	37.295.449	1.069.156	6.314.638
12.858	2.689	158.382.225	7.230.721	34.575.162
22.884	5.649	523.677.456	31.911.201	129.271.716
35.749	9.463	1.277.991.001	89.548.369	338.292.787
9.605	2.790	92.256.025	7.784.100	26.797.950
18.171	4.728	330.185.241	22.353.984	85.912.488
29.158	7.073	762.453.382	50.027.329	206.234.534
39.926	8.862	1.593.085.476	78.535.044	352.386.876
6.932	1.749	48.052.624	3.059.001	12.124.068
11.881	2.913	141.158.161	8.485.569	34.609.353
17.858	4.156	318.908.164	17.272.336	74.217.848
25.782	5.604	664.711.524	31.404.816	144.482.328
3.332	836	11.102.224	698.896	2.785.552
6.971	1.066	48.594.841	1.136.356	7.431.086
10.971	768	120.362.841	589.824	8.425.728
18.168	1.977	330.076.224	3.908.529	35.918.136
2.365	306	5.593.225	93.636	723.690
4.540	170	20.611.600	28.900	771.800
6.848	276	46.895.104	76.176	1.890.048
10.325	1.898	106.605.625	3.602.404	19.596.850
2.418	329	5.846.724	108.241	795.522
5.433	657	29.517.489	431.649	3.569.481

9.315	988	86.769.225	976.144	9.203.220
13.853	1.449	191.905.609	2.099.601	20.072.997
2.331	400	5.433.561	160.000	932.400
4.810	462	23.136.100	213.444	2.222.220
7.042	733	49.589.764	537.289	5.161.786
10.102	850	102.050.404	722.500	8.586.700
416.764	81.316	7.884.890.279	392.351.874	1.739.406.568

$$r_{xy} = \frac{(\sum x_1 y) - (\sum x_1 \sum y)}{\sqrt{n \sum x_1^2 - (\sum X_1)^2} \times \sqrt{n \sum y^2 - (\sum y)^2}}$$

$$r_{xy} = \frac{32(1.739.406.568) - (416.764)(81.316)}{\sqrt{(32 \times 7.884.890.279 - (416.764)^2) \times (32 \times 392.351.874 - (81.316)^2)}}$$

$$r_{xy} = \frac{55.501.010.176 - 33.889.581.424}{\sqrt{252.316.488.928 - 173.692.231.696} \times \sqrt{12.555.259.968 - 6.612.291.856}}$$

$$r_{xy} = \frac{21.611.428.752}{\sqrt{(78.624.257.232) \times (5.942.968.112)}}$$

$$r_{xy} = \frac{21.611.428.752}{\sqrt{4,67261454E + 20}}$$

$$r_{xy} = \frac{21.611.428.752}{21.616.231.161,642}$$

$$r_{xy} = 0,99$$

Based on the calculation above, the correlation between Cost of Goods Sold and Gross Profit is 0.99, which means that the influence of Cost of Goods Sold on Gross Profit is strong or has a significant and positive impact. Thus, the correlation value is obtained as follows:

$$r_{12} = 0,108$$

$$r_{1y} = 0,99$$

$$r_{2y} = 0,98$$

The result :

$$r_{12} = p_{21}$$

$$r_{1y} = p_{y1} + p_{y2} \times r_{12}$$

$$r_{2y} = p_{y1} \times r_{12} + p_{y2}$$

$$0,108 = p_{21}$$

$$0,99 = p_{y1} + p_{y2} \times 0,108$$

$$0,98 = p_{y1} \times 0,108 + p_{y2}$$

Finding the path coefficient value  $p_{y1}$

$$p_{y1} = \frac{\begin{bmatrix} r_{1y} & r_{12} \\ r_{2y} & 1,00 \end{bmatrix}}{\begin{bmatrix} 1,00 & r_{12} \\ r_{12} & 1,00 \end{bmatrix}}$$

$$p_{y1} = \frac{\begin{bmatrix} 0,99 & 0,108 \\ 0,98 & 1,00 \end{bmatrix}}{\begin{bmatrix} 1,00 & 0,108 \\ 0,108 & 1,00 \end{bmatrix}}$$

$$p_{y1} = \frac{[(0,99 \times 1,00) - (0,108 \times 0,98)]}{[(1,00 \times 1,00) - (0,108 \times 0,108)]}$$

$$p_{y1} = \frac{[(0,99) - (0,105)]}{[(1) - (0,011)]}$$

$$py1 = \frac{0,88}{0,98}$$

$$py1 = 0,89$$

Finding the path coefficient value py2

$$py2 = \frac{\begin{bmatrix} 1.00 & r_{1y} \\ r_{12} & r_{2y} \end{bmatrix}}{\begin{bmatrix} 1.00 & r_{12} \\ r_{12} & 1.00 \end{bmatrix}}$$

$$py2 = \frac{\begin{bmatrix} 1.00 & 0,99 \\ 0,108 & 0,98 \end{bmatrix}}{\begin{bmatrix} 1.00 & 0,108 \\ 0,108 & 1.00 \end{bmatrix}}$$

$$py2 = \frac{[(1,00 \times 0,98) - (0,99 \times 0,108)]}{[(1,00 \times 1,00) - (0,108 \times 0,108)]}$$

$$py2 = \frac{[(0,98) - (0,106)]}{[(1) - (0,011)]}$$

$$py2 = \frac{[0,87]}{[0,98]}$$

$$py2 = 0,88$$

From the calculation above, the result is  $py2 = 0.88$ , which means the path coefficient of X2 on Y is 0.88. The path coefficient of X1 on Y through X2 can be calculated as follows:

$$P \text{ interevening} = py1 + py2 \times r_{12}$$

$$P \text{ intervening} = 0,89 + 0,88 \times 0,108$$

$$P \text{ intervening} = 0,89 + 0,09$$

$$P \text{ intervening} = 0,98$$

**From the calculation above, the result is P intervening = 0.98, which means that the Cost of Goods Sold on Gross Profit through Sales can be categorized as having a strong and positive influence.**

### Hypothesis Testing (T-Test)

#### 1. Partial Test (T-Test) of the Effect of Cost of Goods Sold on Gross Profit

To test the coefficient above, a T-test will be used for comparison. The hypotheses are as follows:

- **H0:**  $r = 0 \rightarrow$  There is no influence of Cost of Goods Sold on Gross Profit
- **H1:**  $r \neq 0 \rightarrow$  There is an influence of Cost of Goods Sold on Gross Profit

$$t = \frac{r\sqrt{n} - 2}{\sqrt{1 - r^2}}$$

$$t = \frac{0,99\sqrt{32} - 2}{\sqrt{1 - 0,99^2}}$$

$$t = \frac{0,99\sqrt{30}}{\sqrt{1 - 0,9801}}$$

$$t = \frac{0,99 \times 15}{\sqrt{1 - 0,9801}}$$

$$t = \frac{14,85}{0,1410}$$

$$t = 105,31$$

Based on the t-test results, the calculated t-value is 105.31, which is significantly higher than the critical t-value at the 5% significance level. Thus,  $H_0$  is rejected, and  $H_1$  is accepted, indicating that there is a significant influence of the Cost of Goods Sold (COGS) on Gross Profit. This shows that changes in COGS can materially affect the company's gross profit. In other words, the higher the COGS, the lower the gross profit tends to be, and vice versa, making this factor a crucial aspect in the profitability analysis of PT Waskita Karya (Persero) Tbk.

#### **Discussion**

*Analysis of the Development of COGS, Sales, and Gross Profit (2015–2023)*, This analysis outlines the financial trends of PT Waskita Karya (Persero) Tbk, focusing on Cost of Goods Sold (COGS), sales, and gross profit over the 2015–2023 period. Gross profit experienced notable annual volatility, with sharp increases in 2015 and partial recoveries after early-year declines in 2016 and 2017. The pandemic in 2020 caused a 67% drop in Q1, followed by a 45% rebound in Q4. From 2021 to 2023, gross profit grew more steadily despite macroeconomic pressures. COGS showed sharp quarterly spikes in the final quarters of 2015–2017, indicating peak project activity. A decline in Q4 2018 suggested emerging cost inefficiencies. In 2020, COGS fell by 55% due to the pandemic but stabilized through 2021–2022 with minor fluctuations. Sales followed a similarly dynamic pattern—strong in 2015–2016, then highly volatile, especially in 2017 (–94% in Q1), before rebounding strongly. After a steep drop in early 2020, recovery continued through 2023, ending with strong year-end performance.

#### **Statistical Findings**

Correlation analysis shows a weak link between COGS and sales ( $r = 0.108$ ), but a very strong correlation between sales and gross profit ( $r = 0.98$ ), with 96.04% of gross profit variation explained by sales. T-test results ( $t = 105.31$ ) confirm that COGS significantly influences gross profit. Path analysis reveals that both COGS and sales directly affect gross profit (coefficients: 0.89 and 0.88), with sales acting as a key intervening variable (indirect effect: 0.98).

## **CONCLUSION**

The empirical analysis of PT Waskita Karya (Persero) Tbk for the period 2015–2023 confirms that Cost of Goods Sold (COGS) has a statistically significant impact on gross profit. This is supported by the t-test result ( $t = 105.31$ ), which exceeds the critical threshold, leading to the rejection of the null hypothesis. Thus, increases in COGS are demonstrably associated with reductions in gross profit. Fluctuations in gross profit were frequently driven by rising COGS that were not offset by proportional adjustments in pricing or operational efficiency. However, periods of recovery were also observed, attributed to effective cost control and resource management. Furthermore, sales performance was found to be the dominant determinant of gross profit, with a correlation coefficient of 0.98 and a determination coefficient of 96.04%. These findings highlight that improvements in sales directly contribute to profit enhancement, underscoring the strategic importance of revenue optimization. Accordingly, efforts to strengthen financial performance should focus on enhancing sales strategies while simultaneously improving cost efficiency and operational productivity.

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