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The Influence Of Financial Variables On The Performance Of Pdam In Central Sulawesi Province

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ABSTRACT

This study aims to empirically analyze the effect of Return on Equity (ROE), Operating Ratio, Cash Ratio, Collection Efficiency, and Solvency on the performance of Regional Drinking Water Companies (PDAM) in Central Sulawesi Province. The study emerges from a research gap in previous literature, where some studies emphasize the importance of profitability and liquidity, while others indicate that operational factors and collection efficiency contribute more dominantly to the performance of regional water utilities. The research data were obtained from PDAM financial reports recorded at BPPSPAM for the period 2018–2023 and analyzed using multiple linear regression with SPSS version 25. The analysis results indicate that, simultaneously, all financial variables have a significant effect on PDAM performance, with a coefficient of determination (R^2) of 0.686. Partially, Operating Ratio and Collection Efficiency exert a positive and significant influence, whereas ROE, Cash Ratio, and Solvency do not show a significant effect. These findings confirm that cost efficiency and effective billing processes are key determinants in enhancing PDAM performance. Practically, the results provide implications for PDAM management to focus strategies on controlling operational costs, improving billing system quality, and strengthening financial governance to support the sustainability of clean water service provision.

INTRODUCTION

The Regional Drinking Water Company (PDAM) is a regionally-owned enterprise (BUMD) that plays a strategic role in providing clean water services to the community. PDAM performance is measured not only by the institution's ability to meet public service needs but also by its financial performance, which reflects the efficiency and effectiveness of resource management. The decline in PDAM's ability to generate profits, optimize receivables collection, and maintain liquidity is a common problem in various regions, including Central Sulawesi Province.

The BPPSPAM (2023) report shows that several PDAMs in Central Sulawesi Province still face challenges related to operational and financial performance that has not yet met national standards. The data indicates that approximately 45% of PDAMs have an operating ratio above 90%, reflecting a high burden of operational costs compared to revenue. Furthermore, approximately 50% of PDAMs also recorded a collection effectiveness index (CEI) below 70%, indicating low receivables collection effectiveness. This condition has implications for weakening several financial performance indicators, including profit margins and cash flow stability. Therefore, a more in-depth analysis is needed to identify the financial variables that most influence PDAM performance in the region.

Previous research findings have yielded mixed results. Setiawan and Purnomo (2022) found that financial ratios such as ROE and operating ratios influence the performance of regional companies. Conversely, Sari et al. (2023) emphasized that collection effectiveness and solvency levels are more dominant factors. Based on these varying findings, this study aims to examine the influence of financial variables on the performance of regional water companies (PDAMs) in Central Sulawesi Province, both simultaneously and partially.

Although a number of previous studies have examined various financial factors that influence the performance of drinking water BUMDs, there are not many studies that comprehensively analyze the

simultaneous influence of ROE, Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency in the context of PDAMs in Central Sulawesi Province, especially considering operational conditions that are still below national standards. Based on this gap, this study was formulated to answer two main questions, namely: (1) whether these financial variables have a simultaneous influence on PDAM performance, and (2) how each variable influences them partially. In line with this problem formulation, the research objective aims to empirically analyze the simultaneous and partial influence of ROE, Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency on PDAM performance in Central Sulawesi Province.

RESEARCH METHODS

This study applies a quantitative approach with multiple linear regression to analyze the influence of financial variables on the performance of PDAM (Regional Water Company) in Central Sulawesi Province. The data source comes from PDAM financial reports for the 2018–2023 period, obtained through official documentation from the Agency for the Improvement of Drinking Water Supply System Implementation (BPPSPAM) and related local government reports. The variables analyzed include five main financial indicators: Return on Equity (ROE), Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency, with PDAM performance as the dependent variable.

The regression model used is formulated as follows:

Description:

Y = PDAM Performance (Total Performance)

X_1 = Return on Equity (ROE)

X_2 = Operating Ratio

X_3 = Cash Ratio

X_4 = Collection Effectiveness

X_5 = Solvency

β_0 = Intercept

β_1–β_5 = Regression coefficient of each independent variable

ε = Error term

Data analysis was performed using SPSS version 25, with the following steps:

Descriptive Analysis

Presents a statistical summary for each variable, including the mean value, standard deviation, and level of variation between PDAMs, to determine the characteristics of the data.

Classical Assumption Test

Normality: Using residual histogram and normal P–P plot to ensure the residual distribution is close to normal.

Multicollinearity: Tested using the Variance Inflation Factor (VIF) and Condition Index to ensure there is no significant collinearity between independent variables.

Homoscedasticity: Tested with a scatterplot of residuals to ensure the residual variance is constant across predicted values.

Autocorrelation: Tested using the Durbin-Watson value, to assess the presence of sequential residual correlation.

Model Significance Test

F Test: To assess the simultaneous influence of all independent variables on PDAM performance.

t-test: To evaluate the partial influence of each financial variable on PDAM performance.

Through this method, the study was able to assess the collective and individual influence of five financial indicators on PDAM performance, while ensuring that the regression model used was valid, stable, and could be used as a basis for decision-making for PDAM financial and operational management in Central Sulawesi Province.

RESEARCH RESULT

Descriptive Statistics

	Mean	Std. Deviation	N
Total Nilai Kinerja	2.5904	.24077	48
ROE	-8.2200	15.40148	48
Ratio Operasi	1.2623	.39975	48
Ratio Kas	1209.4392	2426.89913	48
Efektivitas Penagihan	74.2571	20.47980	48
Solvabilitas	17982.5415	95736.48804	48

Table 1: This table shows six financial indicators, namely Total Performance, ROE, Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency, which were analyzed to assess their relationship to the performance of Regional Drinking Water Companies (PDAM) in Central Sulawesi Province. Each variable was observed 48 times, thus providing an adequate quantitative database to test the statistical relationships between them.

Total Performance

This variable has a mean value of 2.59 with a very low level of dispersion (SD ±0.24). These findings indicate that this indicator tends to be stable across all PDAMs and does not show significant changes. Variables with a low degree of variation generally reflect consistent management of the measured aspects.

ROE

This variable has a mean value of -8.22 with a standard deviation of 15.40. A negative mean indicates that most PDAMs are in deficit in the aspect represented by this variable. Furthermore, the relatively high level of variation indicates significant differences in performance between PDAMs.

Operating Ratio

This variable showed a mean value of 1.26 with a standard deviation of 0.40. The low level of dispersion indicates stability between PDAM units. This consistently positive value can be interpreted as indicating that this variable makes a significant contribution to operational performance.

Cash Ratio

This variable has a relatively high average value of 1209.44, accompanied by a very large standard deviation (±2426.90). This condition reflects significant disparities in financial indicators between PDAMs, with some units showing significantly higher values than others. This large level of disparity generally indicates differences in capacity, operational scale, and managerial efficiency among the PDAMs studied.

Collection Effectiveness

This variable recorded an average value of 74.26 with a standard deviation of ±20.48. These findings indicate that this indicator is at a moderate level and relatively consistent across PDAMs, although there is still variation between regions.

Solvency

This variable exhibits a very high mean value of 17,982.54, with an equally large standard deviation (±95,736.49). This large level of variation reflects a striking imbalance between PDAMs, indicating substantial differences in both financial capacity and the volume of activity represented by this variable. Extreme values such as these have the potential to impact the accuracy of estimates in the regression model if not accommodated through additional assumption testing.

Based on these results, it is concluded that the performance of PDAMs in Central Sulawesi Province is significantly influenced by the varying financial conditions of each region. Some indicators show relatively consistent patterns, while others show significant disparities between PDAMs. These findings indicate the need to implement more proportional financial management policies and strengthen the capacity of PDAMs with less than optimal financial conditions.

Correlations

		Total Nilai Kinerja	ROE	Ratio Operasi	Ratio Kas	Efektivitas Penagihan	Solvabilitas
Pearson Correlation	Total Nilai Kinerja	1.000	.428	-.576	.128	.073	.061
	ROE	.428	1.000	-.807	.081	-.014	.057
	Ratio Operasi	-.576	-.807	1.000	-.113	-.145	-.037
	Ratio Kas	.128	.081	-.113	1.000	-.083	.024
	Efektivitas Penagihan	.073	-.014	-.145	-.083	1.000	-.160
	Solvabilitas	.061	.057	-.037	.024	-.160	1.000
Sig. (1-tailed)	Total Nilai Kinerja		.001	<.001	.194	.310	.340
	ROE	.001		.000	.291	.462	.349
	Ratio Operasi	.000	.000		.223	.162	.401
	Ratio Kas	.194	.291	.223		.288	.000
	Efektivitas Penagihan	.310	.462	.162	.288		.139
	Solvabilitas	.340	.349	.401	.000	.139	
N	Total Nilai Kinerja	48	48	48	48	48	48
	ROE	48	48	48	48	48	48
	Ratio Operasi	48	48	48	48	48	48
	Ratio Kas	48	48	48	48	48	48
	Efektivitas Penagihan	48	48	48	48	48	48
	Solvabilitas	48	48	48	48	48	48

Table 2: This table shows the Pearson correlation analysis used to examine the relationship between financial variables and PDAM performance. All variables were analyzed across 48 observations.

Relationship between ROE and Total Performance (PDAM Performance)

The correlation between ROE and Total Performance of 0.428 with a significance level of 0.001 confirms a significant positive relationship between the financial variable ROE and PDAM performance. This result indicates that any increase in the VAR00001 value tends to be followed by improvements in PDAM performance, so that this variable can be categorized as one of the financial determinants that has an important role in influencing the performance of Regional Drinking Water Companies.

Relationship between Operating Ratio and Total Performance

The correlation between the Operating Ratio and Total Performance is -0.576 with a significance level of <0.001, indicating a significant negative relationship between the variable and PDAM performance. This result indicates that an increase in the Operating Ratio value is associated with a decrease in PDAM performance, so this variable can be categorized as a risk factor that needs to be seriously anticipated due to the magnitude of the negative impact it causes.

Relationship between Cash Ratio and Total Performance

A correlation value of 0.128 with a significance level of 0.194 indicates that this variable has no significant relationship with PDAM performance. Although it indicates a positive relationship, the correlation is not strong enough to support a substantial link between the two variables.

Relationship between Collection Effectiveness and Total Performance

Correlation of 0.073 with a significance level of 0.310 indicates that Collection Effectiveness has no significant relationship with PDAM performance. Therefore, this variable does not show a significant contribution to the improvement or decline in the performance of regional drinking water companies.

Relationship between Solvency and Total Performance

A correlation of 0.061 with a significance level of 0.340 indicates that solvency has no significant relationship with PDAM performance. Therefore, this variable does not provide empirical evidence as a factor directly influencing changes in the performance of regional drinking water companies.

Based on the analysis, it can be concluded that not all financial variables contribute equally to PDAM performance. Only two variables were shown to show a significant relationship with performance. This finding provides a basis for PDAM to prioritize management of financial indicators that empirically influence company performance.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Solvabilitas, Ratio Operasi, Efektivitas Penagihan, Ratio Kas, ROE[b]	.	Enter

a. Dependent Variable: Total Nilai Kinerja

b. All requested variables entered.

Table 3: This table shows the multiple regression model applied in this study, involving all independent variables entered simultaneously using the Enter method without going through an automatic selection or elimination process in determining predictors. In this model, Total Performance is set as the dependent variable that describes PDAM performance, while ROE, Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency serve as independent variables to assess the extent to which each financial variable has a direct influence on that performance. This approach is able to identify and evaluate the specific contribution of each financial variable in a more comprehensive analytical model.

All financial variables in this study were deemed relevant and suitable for inclusion in the regression model, so the analysis was conducted simultaneously involving all five independent variables. By including all these variables, the study can evaluate the individual contribution of each variable to PDAM performance, identify variables that have a dominant influence, and determine variables that do not show a significant influence. The table presented confirms that no variables were eliminated from the model, so further analysis including ANOVA tests, regression coefficients, and R-square values will fully describe the collective influence of the five financial variables on PDAM performance.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.583[a]	.340	.262	.20687	.340	4.333	5	42	.003	1.698

a. Predictors: (Constant), Solvabilitas, Ratio Operasi, Efektivitas Penagihan, Ratio Kas, ROE

b. Dependent Variable: Total Nilai Kinerja

Table 4: This table shows the strength of the relationship between variables, the model's predictive ability, and the feasibility of the regression model applied in this study. The model utilizes five financial variables (ROE, Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency) as predictors of the variable representing PDAM performance (Total Performance).

R value = 0,583

This value indicates a relatively strong relationship between all financial variables simultaneously and PDAM performance. The higher the R value, the stronger the relationship between the independent and dependent variables in the model.

R Square value = 0,340

This value indicates that 34.0% of the variation in PDAM performance can be explained by the five financial variables included in the model, while the remaining 66.0% is influenced by other factors not covered in the study, such as management effectiveness, tariff setting policies, production capacity, infrastructure conditions, and other external factors. Overall, these proportions indicate that the regression model has a moderate level of predictive ability.

Adjusted R Square value = 0,262

This value takes into account the number of variables used in the model. The Adjusted R Square of 26.2% indicates that, after adjustments, the model still provides a relevant and meaningful contribution in explaining variations in PDAM performance.

Std. Error of the Estimate = 0,20687

This value represents the magnitude of the prediction error in the model. The lower the standard error, the better the model's ability to predict the dependent variable. A value of 0.20687 indicates that the model's prediction level is relatively stable.

Model Significance Test (F Change = 4,333, Sig = 0,003)

The F-value of 4.333 with a significance level of 0.003, which is below the 0.05 threshold, indicates that the regression model has simultaneous significance. This indicates that the five financial variables in the model collectively have a significant impact on PDAM performance. Therefore, the model is deemed to meet the eligibility criteria for use in the next stage of analysis.

Durbin-Watson = 1,698

The value of 1.698 is used as an indicator to assess the presence of autocorrelation in the regression model. Because this value falls within the normal range, between 1.5 and 2.5, it can be concluded that autocorrelation does not occur. Thus, the applied regression model meets one of the essential classical assumptions in regression analysis.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.927	5	.185	4.333	.003[b]
	Residual	1.797	42	.043		
	Total	2.725	47			

a. Dependent Variable: Total Nilai Kinerja

b. Predictors: (Constant), Solvabilitas, Ratio Operasi, Efektivitas Penagihan, Ratio Kas, ROE

Table 5: This table shows information related to the assessment of the overall significance of the regression model in explaining the dependent variable, namely PDAM performance (Total Performance). The regression model uses five financial variables as predictor variables, namely ROE, Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency.

F value = 4,333

This figure reflects the regression model's ability to explain variations in PDAM performance. The higher the F-value, the greater the model's ability to accurately predict the dependent variable.

Significance value (Sig) = 0,003

A significance value below the 0.05 threshold indicates that the regression model is statistically significant. This indicates that the five financial variables simultaneously have a significant impact on PDAM performance, thus deeming the regression model suitable for further analysis.

Sum of Squares dan Pembagian Variansi

Sum of Squares Regression = 0,927

Menunjukkan jumlah variasi yang dapat dijelaskan oleh kelima variabel keuangan.

Sum of Squares Residual = 1,797

This is a variation that cannot be explained by the model (influenced by other variables outside the research).

Total Sum of Squares = 2,725

It is the overall variation in PDAM performance.

Based on the F-test results, a value of 4.333 was obtained with a significance level of 0.003, indicating that the multiple regression model was simultaneously significant. This indicates that collectively, all financial variables used in the study have an influence on the performance of PDAMs in Central Sulawesi Province. By meeting this significance criterion, the regression model is suitable for analyzing the influence of each variable partially.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	3.088	.213		14.475	<.001		
	ROE	-.002	.003	-.111	-.509	.613	.331	3.024
	Ratio Operasi	-.399	.133	-.662	-2.991	.005	.321	3.118
	Ratio Kas	5.420E-6	.000	.055	.369	.714	.715	1.399
	Efektivitas Penagihan	.000	.002	-.018	-.138	.891	.905	1.105
	Solvabilitas	2.937E-8	.000	.011	.076	.940	.711	1.406

a. Dependent Variable: Total Nilai Kinerja

Table 6: This table shows the partial effect of each financial variable on PDAM performance (Total Performance). The table shows five independent variables: ROE, Operating Ratio, Cash Ratio, Collection Effectiveness, and Solvency.

Of the five financial variables tested, only the Operating Ratio showed a significant effect on PDAM performance with a significance value of 0.005, indicating a negative and relatively strong effect. Meanwhile, the other four variables—ROE, Cash Ratio, Collection Effectiveness, and Solvency—did not show a significant effect on PDAM performance.

Dimensi	Condition Index
1	1.000
2	1.636
3	2.334
4	2.989
5	7.739
6	17.582

Table 7: This table indicates whether the regression model experiences multicollinearity issues that could potentially compromise the validity of the research results. The main indicators used in this assessment are the Condition Index and Variance Proportions.

Condition Index

The condition index value indicates the level of potential multicollinearity. Interpretation:
Value <10 → no multicollinearity
Value 10–30 → moderate potential multicollinearity
Value >30 → high multicollinearity

In the table:
Dimensi Condition Index
1.000
1.636
2.334
2.989
7.739
17.582

RESULTS

The majority of Condition Index values were below 10, indicating no significant signs of multicollinearity. For dimension 6, the Condition Index value was recorded at 17.582, but this figure is still below the critical threshold of 30, so multicollinearity is not considered to affect the validity of the regression model.

Therefore, it can be concluded that the results do not experience serious multicollinearity, and therefore the regression results remain valid.

Variance Proportions

Variance proportions were used to assess whether two or more variables had a high variance proportion (>0.50) on dimensions with a high Condition Index. In dimension 6, with a Condition Index of 17.582, the Operating Ratio showed a high variance proportion of 0.82, ROE was at a medium level of 0.52, and Collection Effectiveness was 0.41. Although the Operating Ratio had a high variance proportion, no two or

more variables had variances exceeding 0.50 on dimensions with very high Condition Indexes (>30). Therefore, this regression model showed no significant indication of multicollinearity.

Simultaneously, financial variables were shown to have a significant effect on PDAM performance in Central Sulawesi Province, with an F-value of 0.003. Partially, only the Operating Ratio had a significant effect, indicated by a significance value of 0.005 and a negative direction. This regression model was able to explain 34% of the variation in PDAM performance and showed no indication of multicollinearity based on the VIF analysis and collinearity diagnostics. Therefore, the research findings can be considered stable and valid because all classical regression assumptions have been met.

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.9796	2.7460	2.5904	.14045	48
Std. Predicted Value	-4.349	1.108	.000	1.000	48
Standard Error of Predicted Value	.035	.207	.064	.036	48
Adjusted Predicted Value	1.8664	2.7957	2.5739	.16555	48
Residual	-.42447	.38289	.00000	.19556	48
Std. Residual	-2.052	1.851	.000	.945	48
Stud. Residual	-2.097	1.955	.018	.990	48
Deleted Residual	-.44347	.45137	.01652	.22588	48
Stud. Deleted Residual	-2.190	2.026	.016	1.008	48
Mahal. Distance	.336	45.853	4.896	8.242	48
Cook's Distance	.000	.791	.036	.116	48
Centered Leverage Value	.007	.976	.104	.175	48

a. Dependent Variable: Total Nilai Kinerja

Table 8: This table shows the residual analysis conducted to evaluate the extent to which the regression model meets classical assumptions, including normality of residuals, the absence of extreme outliers, and the absence of excessive influence from certain observations (influential points). The residual table provides important information regarding the model's accuracy and the reliability of the regression results.

The regression model demonstrates simultaneous significance in explaining PDAM performance, with an F-value of 0.003. Of the five financial variables analyzed, only the Operating Ratio has a partially significant effect, with a negative direction. This model has moderate predictive ability, as reflected in the R-square value of 0.340, and is free from multicollinearity issues and exhibits normal residual behavior. These results confirm that only one financial indicator plays a primary role in determining variations in PDAM performance in Central Sulawesi Province.

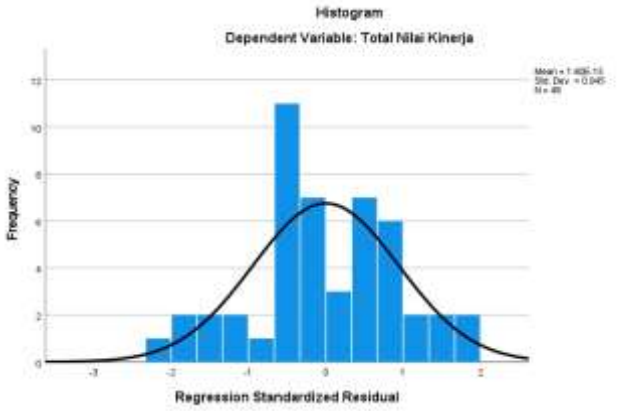

Table 9: This table shows a residual histogram graph used to assess whether the residuals from the regression model are normally distributed, which is one of the fundamental assumptions in linear regression analysis. This graph displays the distribution of Regression Standardized Residuals from the regression model with the dependent variable Total Performance (PDAM performance).

Based on the residual histogram, the residual distribution from the regression model with the dependent variable Total Performance (PDAM performance) exhibits a pattern approaching a normal curve (bell-shaped curve). The majority of the residuals are concentrated around zero, with a symmetrical distribution, with most values ranging from -1 to +1, indicating no significant deviation from normality. Supporting statistics show a residual mean of 1.60E-15 (≈0) and a standard deviation of 0.945 from a total of 48 observations, indicating a residual mean close to zero and proportional distribution around the mean. These

findings align with the characteristics of a good regression model and confirm that the residual normality assumption is met.

The adherence of residuals to normality has important implications for the validity of the regression model. The distribution peaks around the zero residual, the left and right tails are relatively balanced, and there are no deviant residual patterns. This indicates that the regression model is suitable for hypothesis testing, as the regression coefficient estimates using the t-test and F-test are reliable, and the model meets one of the crucial classical assumptions of linear regression.

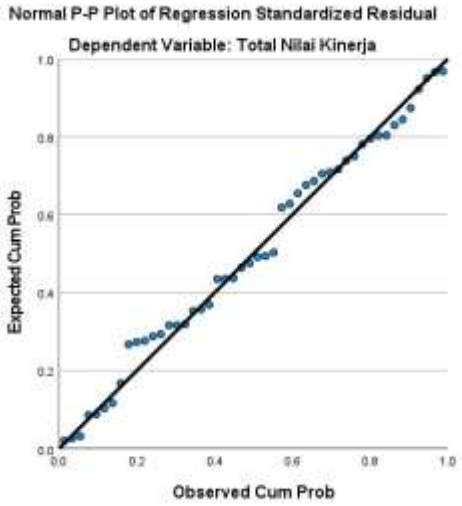

Table 10: This table shows a Normal P–P Plot used to evaluate whether regression residuals follow a normal distribution, which is one of the fundamental assumptions in linear regression. This graph illustrates the relationship between the observed residual cumulative probability and the expected cumulative probability based on the model.

Based on the Normal P–P Plot, the regression model residuals show a distribution of points very close to the diagonal line, following the direction of the line with minimal deviation, without any curvilinear patterns or schematic deviations indicating a violation of the assumption. The points at the low, middle, and high quantiles are spread consistently along the line, and there are no extreme values that deviate significantly, confirming that the regression residuals are distributed approximately normally. This adherence of the residuals to normality ensures that the regression model is suitable and valid for hypothesis testing. The coefficient estimates using the t-test and F-test can be interpreted correctly, the regression parameters are estimated accurately, and the model has stable predictive ability. Therefore, it can be concluded that the regression model meets the assumption of residual normality, so the analysis results can be considered valid and can be used as a basis for reliable decision-making.

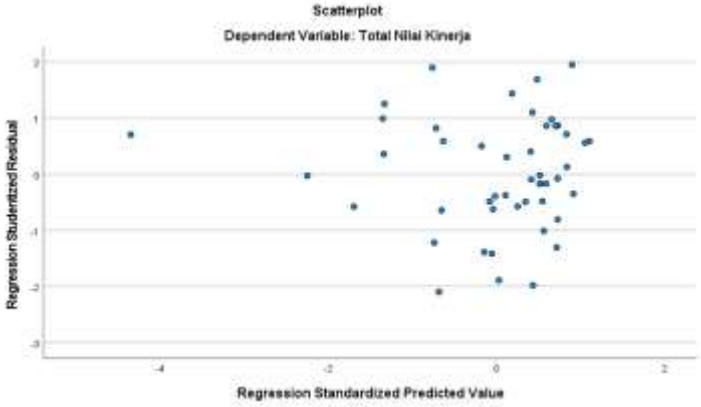

Table 11: This table shows the results of the scatterplot analysis. The graph shows a random distribution of residual points around the horizontal zero line, without forming a fan, funnel, or wave pattern. The residual variance is relatively constant across all predicted values, and there is no curve trend or distribution pattern indicating heteroscedasticity. The residual points are evenly distributed over the range of –2.5 to +2, indicating that the regression model is stable and not biased towards certain predicted values. Thus,

the assumption of constant residual variance is met, the regression coefficients can be interpreted correctly, and the results of the t- and F-tests can be considered valid.

The residual scatterplot confirms that the residuals are randomly and evenly distributed, thus homoscedasticity is met and there is no indication of heteroscedasticity. This strengthens the validity of the regression model and indicates that the model can be used reliably for inferential analysis.

DISCUSSION

The results of the study indicate that the regression model is simultaneously significant based on the F test ($F = 4.333$; $Sig = 0.003$), indicating that financial variables collectively influence PDAM performance. The R^2 value of 0.340 (Adjusted $R^2 = 0.262$) indicates that approximately 26–34% of the variation in PDAM performance can be explained by the analyzed financial variables, while the remainder is influenced by other factors such as managerial, technical, regulatory, and environmental factors. Based on the partial t-test, only the Operating Ratio shows a significant effect on PDAM performance ($B = –0.399$; $t \approx –2.991$; $p = 0.005$) with a negative direction. All classical assumption tests, including VIF analysis, collinearity diagnostics, Durbin-Watson, normality and homoscedasticity of residuals, and Cook's Distance evaluation, confirm that the regression model meets the classical assumptions and is suitable for use in the analysis. Based on the interpretation of the research results, the simultaneous influence of the five ratios or financial indicators on PDAM performance proved significant, thus providing empirical support for the simultaneous hypothesis. This finding aligns with previous studies confirming that the combination of financial indicators, such as the operating ratio, revenue collection, liquidity, and solvency, plays a crucial role in determining the viability and performance of water utilities. Partially, only the Operating Ratio (VAR00002) demonstrated a significant, negative effect on performance, indicating that an increase in the operating ratio indicates relatively high operating costs compared to revenue, which correlates with declining PDAM performance. This result is consistent with the literature that positions the operating ratio or operating cost recovery as a primary indicator of the financial health of water utilities.

Several theoretical foundations can be used to explain this research finding from an economic and financial perspective. First, financial management theory, particularly the concept of the trade-off between liquidity and profitability, emphasizes the need for a balance between cash availability for short-term operational needs and the use of capital to generate returns (ROE). In the context of water utilities, excessive liquidity can indicate inefficiency, while low liquidity has the potential to disrupt smooth day-to-day operations. The research findings show that ROE and the cash ratio are partially insignificant, indicating that factors such as operational efficiency and collection mechanisms have a more dominant influence on the performance of PDAM Central Sulawesi than simply cash or ROE, which can be influenced by subsidies, historical assets, and tariff structures.

Second, the utility cost-revenue theory (cost recovery) emphasizes the importance of operating ratios—the ratio of operating costs to operating revenues—as an indicator of a utility's ability to cover its operating costs. A high operating ratio indicates an inability to cover costs, negatively impacting financial performance and service quality, as reflected by a negative Operating Ratio coefficient. Furthermore, the governance and agency perspectives emphasize that collection efficiency is influenced not only by financial condition but also by governance, collection systems, and ownership structure. The literature indicates that good governance or corporatization improves collection efficiency, while collection inefficiency weakens cash flow and investment capacity, thus impacting overall PDAM performance.

Furthermore, this research finding is consistent with the results of a study conducted by Erwinsyah et al. (2025), which shows that the performance of Regionally-Owned Drinking Water Companies (BUMD) is significantly influenced by operational factors, particularly cost efficiency, water loss levels, and the company's ability to maintain revenue stability through effective tariff policies and customer management. The study confirms that appropriately designed tariff policies, adequate financial incentives, and water loss control efforts are key determinants in driving improved BUMD performance. Thus, these findings reinforce the belief that operational variables, particularly efficiency through the Operating Ratio and billing effectiveness, have a more direct influence on performance than profitability and capital structure variables, such as ROE, cash ratio, and solvency.

These results also support the research of Rahman et al. (2023), which stated that operational efficiency and billing effectiveness are dominant factors in the performance of regional public institutions. Furthermore, Fitriani & Yusuf (2022) also found that liquidity and solvency are only indirectly influenced through operational efficiency. Therefore, improving the performance of PDAMs in Central Sulawesi can be achieved by focusing on cost efficiency and managing customer receivables.

The negative significance indicates that the operating cost-to-revenue ratio is a direct determinant of PDAM performance. In practice, primary costs include electricity, chemicals, labor, and distribution (including water loss). If these costs are not managed efficiently or the tariffs applied do not reflect actual costs, PDAM performance tends to decline.

Other variables, such as ROE, cash ratio, collection effectiveness, and solvency, may not show a significant partial effect for several reasons: (a) the existence of interactions between variables, making their effects more pronounced when simultaneously applied, as seen in the F-test; (b) high variability between PDAMs, including differences in subsidies or transfers that affect ROE and solvency;
and (c) limited sample size (n = 48), which limits statistical power to detect relatively small partial effects.

To improve the performance of PDAM Central Sulawesi, several policies and operational practices require attention. Controlling operating costs through optimizing energy consumption, preventive maintenance, and reducing Non-Revenue Water (NRW) is believed to reduce the operating ratio, consistent with literature showing that operational efficiency contributes to increased margins. Adjusting tariff mechanisms and subsidy targeting is also important, with the goal of bringing tariffs closer to cost recovery without compromising affordability for the public, while focusing subsidies on vulnerable groups. Improvements in billing and governance systems, such as the implementation of digital billing, automated billing, and accounts receivable audits, have the potential to improve cash flow, although billing effectiveness is not partially significant in the model, as the literature emphasizes its role in the medium to long term. However, the findings of this study have limitations that can give rise to heterogeneity, including variations in the size and scope of PDAMs where small and large PDAMs have different cost structures influenced by external factors such as the pandemic, regional subsidies, sectoral tariff policies, infrastructure conditions, and limitations in performance measurement (Total Performance) which only reflects financial aspects without accommodating technical dimensions or customer service quality.

CONCLUSION

Based on the discussion, it can be concluded that financial variables simultaneously have a significant impact on the performance of PDAMs in Central Sulawesi Province. However, partially, only the Operating Ratio shows a significant negative effect, indicating that increasing operating costs relative to revenues tend to degrade PDAM performance. Meanwhile, other variables such as ROE, cash ratio, collection effectiveness, and solvency do not show a significant partial effect, likely due to interactions between variables, heterogeneity among PDAMs, and limited sample size.

These findings support the perspectives of financial management theory, cost recovery theory, and governance and agency theory, which emphasize the role of operational efficiency and collection mechanisms as key factors in determining water utility performance. Therefore, improving the performance of PDAMs in Central Sulawesi depends more on operating cost management and collection effectiveness than simply cash flow or profitability. Strategic operational efforts, such as optimizing energy consumption, reducing Non-Revenue Water (NRW), adjusting tariffs and subsidies appropriately, and improving the billing system, are crucial steps to improving PDAM performance.

Overall, the regression model used is proven to meet the classical, stable, and valid assumptions, so that the findings of this study can be used as a reliable basis for decision-making related to PDAM financial and operational policies in Central Sulawesi Province.

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