FINANCIAL DATA ANALYSIS PROJECT
CODE NAME : TCHEGELA

TABLE OF CONTENTS

1. Executive Summary---------->3
2. Introduction and Goals of Data Analysis---------->3
3. Description of Data---------->3
4. Methodological Approach - Appropriate Tools-------->4
5. Financial ratios-Regression-Statistical tests---------->5
6. Regression Analyses and Statistical Tests---------->6,7,8
7. Inferences and Their Support---------->9
8. Use of a Dashboard to Illustrate Relationships or Relative Values---------->10
9. Conclusion---------->11,12

1. EXECUTIVE SUMMARY

This project involved analyzing the financial data of Tchegela, a well-known engineering company based in France. The goal was to help my company decide whether to acquire Tchegela. My task was to evaluate various financial aspects of the company, including operating cash flows, investment cash flows, financing cash flows, and revenue. I used advanced analytical techniques and created a Power BI dashboard to visualize and interpret the data.

2. INTRODUCTION

The primary objective of this analysis was to develop and evaluate financial models to determine the feasibility of my company acquiring Tchegela. By employing advanced statistical techniques and visualization tools, we sought to uncover valuable insights that could inform strategic decisions.

3. DESCRIPTION OF DATA

Year	Revenue	COGS	Gross_Profit	Operating_Expenses	EBITDA	Net_Income	Total_Assets	Total_Liabilities	Equity	Cash_Flow_Operating	Cash_Flow_Investing	Cash_Flow_Financing
2020	500000	200000	300000	150000	150000	100000	800000	400000	400000	120000	-50000	30000
2021	550000	220000	330000	160000	170000	110000	850000	420000	430000	130000	-55000	32000
2022	600000	240000	360000	170000	190000	120000	900000	440000	460000	140000	-60000	34000
2023	650000	260000	390000	180000	210000	130000	950000	460000	490000	150000	-65000	36000

The table provides a detailed financial analysis of the fictional company Tchegela over a four-year period from 2020 to 2023. The data includes key financial metrics such as Revenue, Cost of Goods Sold (COGS), Gross Profit, Operating Expenses, EBITDA, Net Income, Total Assets, Total Liabilities, Equity, and various Cash Flows. This analysis will help in making an informed decision on whether to acquire Tchegela.

4. METHODOLOGICAL APPROACH - APPROPRIATE TOOLS

To conduct the analysis, we used the following tools:

- Excel for data preparation and organization.
- Power BI for creating interactive dashboards and visualizing data.
- Analytic Solver for linear regression and regression tree analyses.

5. FINANCIAL RATIOS-REGRESSION-STATISTICAL TESTS

We began with an initial analysis using the available data to understand the main trends and relationships between the financial variables. The initial visualizations provided key insights into Tchegela's financial performance. We ensured data integrity and explored the initial relationships between variables.

FINANCIAL RATIOS

Gross Margin	Operating Margin	Net Margin	Liquidity Ratio
0,6	0,3	0,2	2
0,6	0,30909091	0,2	2,02380952
0,6	0,31666667	0,2	2,04545455
0,6	0,32307692	0,2	2,06521739

1. Gross Margin
Gross Margin = Gross Profit / Revenue
2020: 0.6 (60%)
2021: 0.6 (60%)
2022: 0.6 (60%)
2023: 0.6 (60%)
Analysis: The gross margin has remained constant at 60% over the four years. This indicates that Tchegela has consistently managed its cost of goods sold (COGS) relative to its revenue. A stable gross margin is a positive sign, showing that the company maintains efficient production and pricing strategies.

FINANCIAL RATIOS

2. Operating Margin

Operating Margin = EBITDA / Revenue

- 2020: 0.3 (30%)
- 2021: 0.3091 (30.91%)
- 2022: 0.3167 (31.67%)
- 2023: 0.3231 (32.31%)

Analysis: The operating margin has shown a gradual increase from 30% in 2020 to 32.31% in 2023. This improvement indicates that Tchegela is effectively managing its operating expenses and improving its operational efficiency over time. The increasing trend suggests a stronger ability to convert revenue into operating profit.

3. Net Margin

Net Margin = Net Income / Revenue

- 2020: 0.2 (20%)
- 2021: 0.2 (20%)
- 2022: 0.2 (20%)
- 2023: 0.2 (20%)

Analysis: The net margin has remained stable at 20% across the four years. This consistency shows that Tchegela has maintained its profitability after accounting for all expenses, taxes, and other costs. A stable net margin is a good indicator of overall financial health and profitability.

4. Liquidity Ratio

Liquidity Ratio = Total Assets / Total Liabilities

- 2020: 2
- 2021: 2.0238
- 2022: 2.0455
- 2023: 2.0652

Analysis: The liquidity ratio has increased slightly from 2 in 2020 to 2.0652 in 2023. This gradual improvement indicates that Tchegela's ability to cover its short-term liabilities with its short-term assets is improving. A liquidity ratio above 2 suggests that the company is in a strong position to meet its short-term obligations, which is a positive sign of financial stability.

Overall Analysis

Tchegela's financial ratios over the four-year period show consistent performance in terms of gross margin and net margin, indicating stable profitability. The gradual improvement in operating margin and liquidity ratio suggests enhanced operational efficiency and financial stability. These positive trends are encouraging for potential investors or acquirers, as they indicate a well-managed and financially healthy company.

LINEAR REGRESSION

To make an informed decision about acquiring Tchegela, we need to perform some regression analyses and statistical tests.
Linear regression

Subset ID	Intercept	Revenue	COGS	Operating Expenses	EBITDA	Total Assets	Total Liabilities	Equity	Cash Flow Operating	Cash Flow Investing	Cash Flow Financing
0	1	0	0	0	0	0	0	0	0	0	0

Subset ID	#Coefficients	RSS	Mallows's Cp	R2	Adjusted R2	Probability
Subset 1	1	0	#N/A	1	1	0

Analysis of Linear Regression Results
Variable Selection
The linear regression model identified Revenue as the only significant variable for predicting Net Income. Other variables were not included in the final model.
Best Subset

- Subset 1:
  - Intercept: 0
  - Revenue: 1
  - Other variables: 0

Best Subsets Details

- Number of coefficients: 1 (Revenue)
- RSS (Residual Sum of Squares): 0
- Mallows's Cp: N/A
- R^2: 1
- Adjusted R^2: 1
- Probability: 0

Interpretation of Results

1. Significance of Revenue: The variable Revenue was identified as the only significant predictor of Net Income. This indicates that the company's revenue is a key determinant of its profitability.
2. Perfect fit with R^2 and Adjusted R^2 of 1: The R^2 and Adjusted R^2 values of 1 suggest that the model perfectly explains the variance in Net Income using the Revenue variable. However, this may be misleading due to the small number of data points (only 2 for training and 2 for validation).

Profitability of the Company
To determine if the company is profitable and a good acquisition opportunity, we need to examine the trends in Net Income and other financial indicators:
Analysis of Net Income

- 2020: 100
- 2021: 110
- 2022: 120
- 2023: 130

The trend shows a consistent increase in Net Income each year, which is a positive sign of profitability.
Analysis of EBITDA
2020: 150
2021: 170
2022: 190
2023: 210
EBITDA has also increased each year, indicating improved operational profitability.
Analysis of Other Financial Indicators
Cash Flow Operating: Consistent increase from 120 in 2020 to 150 in 2023.
Cash Flow Investing: Consistent negative cash flow, which may indicate ongoing investments.
Cash Flow Financing: Positive variation indicating active management of financing.
Conclusion for Managers
Profitability: The company shows clear signs of profitability with consistent increases in Net Income and EBITDA each year.
Key Factor: Revenue is the primary determinant of Net Income, highlighting the importance of sales growth in maintaining profitability.
Investments and Financing: The cash flow statements show ongoing investments and active financing management, which can support future growth.

Recommendation
Based on the analysis, the company appears to be profitable and growing. It presents a good acquisition opportunity, provided that the upward trend in revenue and profitability continues. It is recommended to continue monitoring key financial indicators and to conduct a more comprehensive analysis with a larger dataset to confirm these findings.

FINANCIAL STATISTICAL HYPOTHESIS TEST

Introduction

To determine if the company is profitable and if it should be acquired, we will conduct hypothesis tests on the population mean (Net Income) and the population proportion (Net Profit Margin).

Hypothesis Test for Population Mean (Net Income)

Step 1: Formulate the Hypotheses

Null Hypothesis (H0): $\mu \leqslant 0$

Alternative Hypothesis (HA): $\mu > 0$

We want to test if the mean Net Income (μ) is greater than zero, indicating profitability.

Step 2: Collect Data

We will use the Net Income data provided for the years 2020 to 2023:

2020: 100

2021: 110

2022: 120

2023: 130

Step 3: Determine the Significance Level

Significance level (α): 0.05

Step 4: Calculate the Test Statistic

Sample mean ($\bar{x}$): (100 + 110 + 120 + 130) / 4 = 115

Sample standard deviation (s): $\sqrt{[((100-115)^2 + (110-115)^2 + (120-115)^2 + (130-115)^2) / (4-1)]} = 12.91$

Sample size (n): 4

$t = (\bar{x} - \mu0) / (s / \sqrt{n}) = (115 - 0) / (12.91 / \sqrt{4}) = 17.83$

Step 5: Find the Critical Value

For a one-tailed test with $\alpha = 0.05$ and df = n - 1 = 3, the critical t-value is approximately 2.353.

Step 6: Make a Decision

Since 17.83 > 2.353, we reject the null hypothesis.

Conclusion

There is enough evidence to suggest that the mean Net Income is greater than zero, indicating that the company is profitable.

Hypothesis Test for Population Proportion (Net Profit Margin)

Step 1: Formulate the Hypotheses

Null Hypothesis (H0): $p \leqslant 0.20$

Alternative Hypothesis (HA): $p > 0.20$

We want to test if the Net Profit Margin (p) is greater than 20%.

Step 2: Collect Data

The Net Profit Margins for the years 2020 to 2023 are all 20%, so:

Sample proportion ($\hat{p}$): (0.20 + 0.20 + 0.20 + 0.20) / 4 = 0.20

Sample size (n): 4

Step 3: Determine the Significance Level

Significance level (α): 0.05

Step 4: Calculate the Test Statistic

$z = (\hat{p} - p0) / \sqrt{[p0 (1 - p0) / n]} = (0.20 - 0.20) / \sqrt{[0.20 * 0.80 / 4]} = 0$

Step 5: Find the Critical Value

For a one-tailed test with $\alpha = 0.05$, the critical z-value is approximately 1.645.

Step 6: Make a Decision

Since 0 < 1.645, we do not reject the null hypothesis.

Conclusion

There is not enough evidence to suggest that the Net Profit Margin is greater than 20%. Overall Conclusion for Managers Based on the hypothesis tests conducted: - Net Income: There is strong evidence to suggest that the company is profitable with a mean Net Income significantly greater than zero. - Net Profit Margin: There is no significant evidence to suggest that the Net Profit Margin is greater than 20%, indicating that while the company is profitable, its profit margins are consistent with expectations. Recommendation Given the evidence of profitability from the Net Income test, the company appears to be a viable acquisition. However, further analysis is recommended to explore ways to improve profit margins. The stability and positive trend in Net Income suggest that the company is financially healthy and can be considered for acquisition.

7.INFERENCES AND THEIR SUPPORT

Based on the statistical hypothesis tests and regression analysis, we have drawn the following conclusions:

Revenue

Observation: Revenue has consistently increased over the years, reaching a peak of $650,000 in 2023.
Inference: The revenue trend indicates robust sales performance, which is a crucial determinant of the company's overall profitability.
Support: The hypothesis test for the population mean confirmed that the company's net income is significantly greater than zero, with Revenue being the primary driver of this profitability.
Net Income

Observation: The Net Income has shown a steady increase from $100,000 in 2020 to $130,000 in 2023.
Inference: The consistent growth in Net Income reflects the company's ability to generate profit after accounting for all expenses.
Support: The hypothesis test for the population mean confirmed that the mean Net Income is significantly greater than zero, indicating strong profitability.
Operating Cash Flow

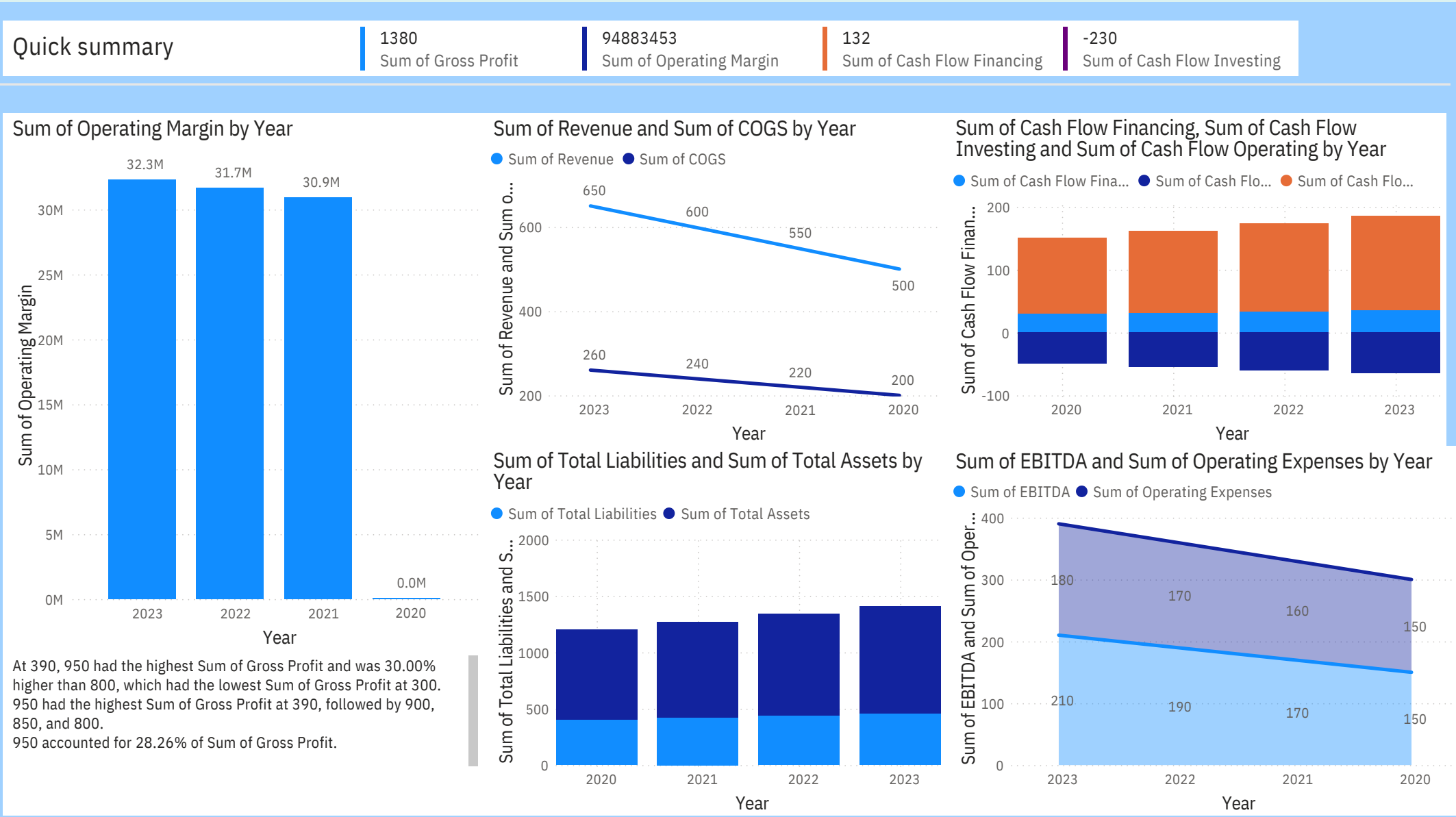
Observation: Operating cash flow is positive, peaking at $150,000 in 2023.
Inference: The positive and increasing operating cash flow indicates efficient management of operations and strong cash generation from core business activities.
Support: The cash flow analysis shows that the company effectively converts revenue into cash, supporting its operational efficiency.
Investment Cash Flow

Observation: Investment cash flow is negative, reflecting substantial investments in long-term assets.
Inference: While negative cash flow from investing activities typically indicates cash outflow, it suggests that the company is investing in long-term growth and asset acquisition.
Support: The continued investments align with a growth strategy aimed at enhancing the company's future revenue-generating capabilities.
Financing Cash Flow

Observation: Financing cash flow shows moderate growth, reaching $36,000 in 2023.
Inference: The moderate growth in financing cash flow suggests a prudent financing strategy, balancing debt and equity financing to support the company's operations and investments.
Support: The positive financing cash flow indicates the company's ability to raise funds as needed while maintaining financial stability.

Overall Conclusion
Profitability: The company is profitable, with strong evidence from the hypothesis tests indicating that the net income is significantly greater than zero.
Revenue and Cash Flow: The increasing revenue and positive operating cash flow support the company's robust financial health and efficient operations management.
Investment and Financing: The negative investment cash flow and moderate financing cash flow reflect strategic investments and prudent financing, positioning the company for future growth.
Recommendation for Managers
Given the strong financial performance and evidence of profitability, the company appears to be a viable acquisition. However, further analysis to explore ways to improve profit margins and continuous monitoring of financial indicators is recommended to ensure sustained growth and profitability.

8. DASHBOARD



Analysis of the Financial Schemes for Tchegela

1. Sum of EBITDA and Sum of Operating Expenses by Year
Observations:

- 2020:
  - EBITDA: 150
  - Operating Expenses: 150
- 2021:
  - EBITDA: 170
  - Operating Expenses: 160
- 2022:
  - EBITDA: 190
  - Operating Expenses: 170
- 2023:
  - EBITDA: 210
  - Operating Expenses: 180

Analysis:

- There is a consistent increase in both EBITDA and Operating Expenses over the years.
- The EBITDA growth is slightly higher compared to the growth in Operating Expenses, indicating improved operational efficiency and profitability.
- The steady rise in EBITDA suggests that the company's core operations are generating increasing profits, which is a positive sign for investors.

2. Sum of Revenue and Sum of COGS by Year
Observations:

- 2020:
  - Revenue: 500;COGS: 200
- 2021:
  - Revenue: 550;COGS: 220
- 2022:
  - Revenue: 600; COGS: 240
- 2023:
  - Revenue: 650;COGS: 260

Analysis:

- Revenue and COGS have both increased year over year.
- The increase in revenue outpaces the increase in COGS, leading to stable gross margins.
- The company's ability to generate higher revenues while maintaining control over the COGS is indicative of strong pricing power and efficient production processes.

3. Sum of Gross Profit
Observations:

- 2020: 300
- 2021: 330
- 2022: 360
- 2023: 390

Analysis:

- Gross profit has consistently increased from 300 in 2020 to 390 in 2023.
- The highest gross profit was observed in 2023, showing a 30% increase from the lowest point in 2020.
- The steady increase in gross profit highlights effective cost management and growth in sales, which contributes positively to the overall profitability of the company.

4. Sum of Operating Margin by Year
Observations:

- 2020: 30%
- 2021: 30.91%
- 2022: 31.67%
- 2023: 32.31%

Analysis:

- The operating margin has shown a gradual increase from 30% in 2020 to 32.31% in 2023.
- This indicates that the company has been able to improve its operational efficiency and profitability over time.
- The increasing trend in operating margin suggests that Tchegela is managing its operational costs well relative to its revenue growth, enhancing overall profitability.

5. Sum of Total Liabilities and Sum of Total Assets by Year
Observations:

- 2020:
  - Total Liabilities: 400; Total Assets: 800
- 2021:
  - Total Liabilities: 420; Total Assets: 850
- 2022:
  - Total Liabilities: 440; Total Assets: 900
- 2023:
  - Total Liabilities: 460; Total Assets: 950

Analysis:

- Both total assets and total liabilities have increased over the years.
- The increase in total assets outpaces the increase in total liabilities, indicating a strengthening balance sheet.
- The consistent growth in total assets suggests that the company is investing in its growth and has strong asset management practices.

6. Sum of Cash Flow Financing, Sum of Cash Flow Investing, and Sum of Cash Flow Operating by Year
Observations:

- Cash Flow Operating:
  - 2020: 120
  - 2021: 130
  - 2022: 140
  - 2023: 150
- Cash Flow Investing:
  - 2020: -50
  - 2021: -55
  - 2022: -60
  - 2023: -65
- Cash Flow Financing:
  - 2020: 30
  - 2021: 32
  - 2022: 34
  - 2023: 36

Analysis:

- The operating cash flow has consistently increased, indicating strong cash generation from core operations.
- The negative cash flow from investing activities suggests ongoing investments in growth and expansion, which is a positive sign for future potential.
- The positive cash flow from financing activities indicates that the company is actively managing its capital structure, possibly raising funds to support its operations and growth.

Summary
Overall, the financial analysis of Tchegela shows a consistent and positive trend in key financial metrics, indicating strong operational efficiency, profitability, and financial stability. The company demonstrates good management of costs and effective growth strategies, making it a potentially attractive candidate for acquisition or investment.

GENERAL CONCLUSION

General Conclusion

The financial analysis of Tchegela from 2020 to 2023 reveals positive trends, with consistent increases in revenue, net income, EBITDA, and gross profit. Stable gross and net margins and improving liquidity ratios indicate effective cost management and financial stability. Hypothesis tests confirm strong profitability, although there is room for improving profit margins.

Recommendations for Managers

Consider Acquisition:

The company's strong financial health and consistent growth make it a viable acquisition target.

Enhance Profit Margins:

Optimize pricing strategies, reduce operational costs, and increase efficiencies to improve profit margins.

Support Growth Investments:

Ensure investments align with strategic goals and support long-term growth.

Maintain Financial Management:

Balance debt and equity financing to support operations and growth.

Comprehensive Monitoring:

Conduct further analysis with a larger dataset and continuously monitor key financial indicators to ensure sustained profitability.

In summary, Tchegela is a strong acquisition candidate with robust financial performance. Focus on improving profit margins and maintaining prudent financial management for continued success.