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EGYPT UNIVERSITY
OF INFORMATICS

Egypt University of Informatics
Computer and Information Systems
Data Analysis Course

Analysis of the Impact of Debt-to-Equity Ratio on Stock Performance Across Different Sectors

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Introduction

This project aims to analyse The Egyptian Market Stock and how the financial health of companies, as measured by the debt-to-equity ratio, affects their stock performance, as indicated by the Relative Strength Index (RSI). Specifically, we seek to determine if this relationship varies across different sectors.

Research Question

Does the debt-to-equity ratio have a significant impact on the Relative Strength Index (RSI) across different sectors?

Hypothesis

Null hypothesis (H_0): The debt-to-equity ratio does not significantly impact the RSI within any sector.

Alternative hypothesis (H_a): The debt-to-equity ratio significantly impacts the RSI within at least one sector.

Population of Interest

Publicly traded companies in Egypt with available financial and stock performance data (240).

Sampling Method

Using the Whole Population

The dataset used for this analysis represents the entire population of companies listed on the Egyptian stock market. By utilizing the full dataset, we ensure that our analysis is comprehensive and free from sampling bias. This approach allows us to capture the overall market dynamics and provide a complete picture of the relationship between leverage and stock performance.

Stratified Analysis

To gain more detailed insights, we performed stratified analysis by dividing the population into distinct subgroups based on their sectors. Each sector represents a unique stratum, and we conducted separate analyses within these subgroups. This stratified approach helps us understand sector-specific relationships and ensures that the unique characteristics of each sector are considered in the analysis.

Bias Identification

- **Selection Bias:**

We acknowledged the risk of selection bias, where the selection of companies in the sample might not be representative of the entire population. To mitigate this, we filtered the dataset to include only sectors containing four or more companies after removing outliers. This approach ensured our sample was representative of a diverse range of companies within each sector.

- **Data Quality Bias:**

We rigorously cleaned the dataset to remove outliers and ensure that our analysis focused on companies with reliable and valid financial metrics. This step aimed to reduce data quality bias and improve the accuracy of our results.

Collected Data/Dataset

The dataset used in this study contains financial metrics and stock performance indicators for companies listed in the Egypt Stock Market in specific date (2024-05-08). Below is a detailed explanation of each feature included in the dataset:

sector: The sector to which the company belongs.

description: The full name of the company.

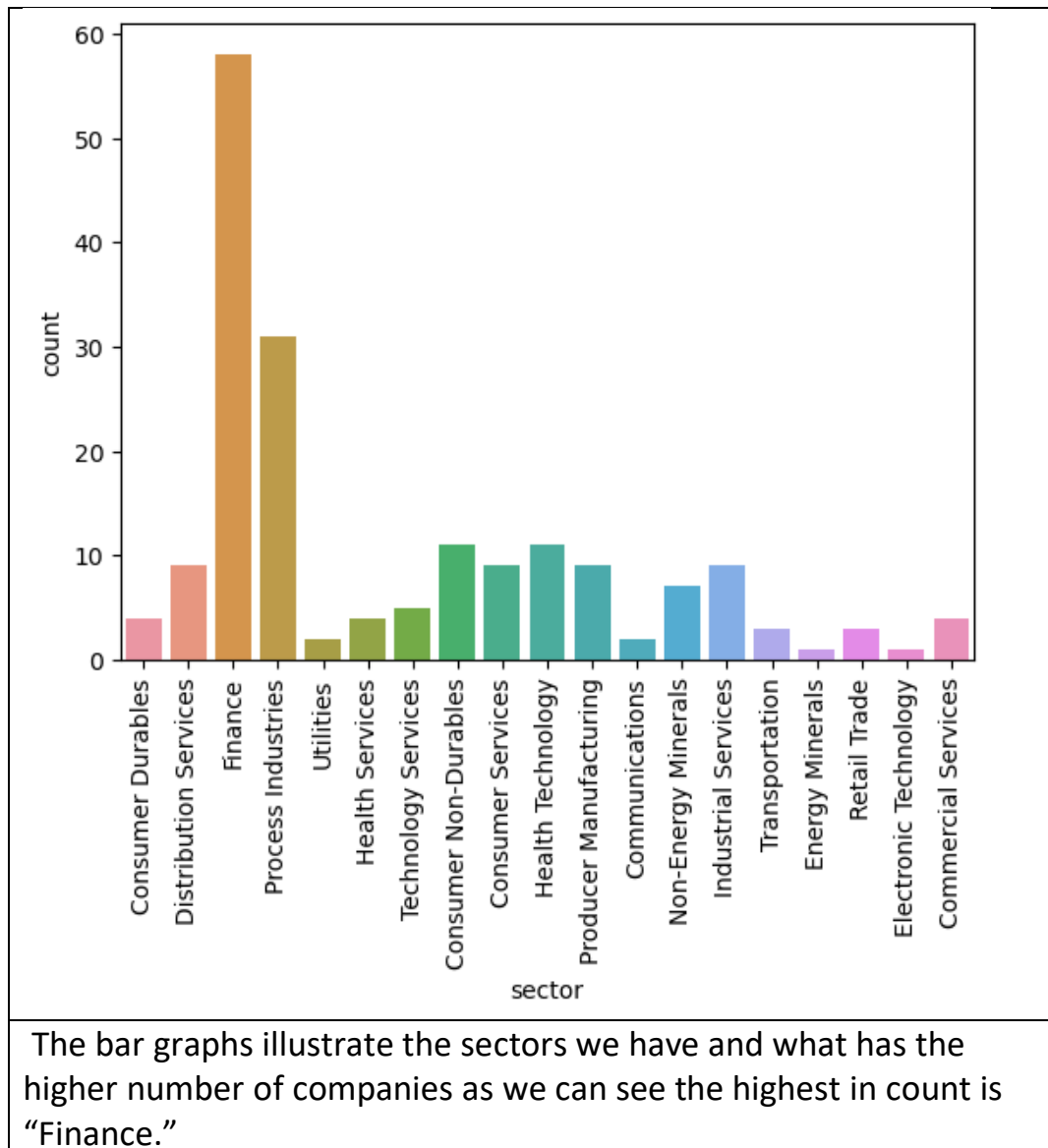
debt_to_equity_fq: The debt-to-equity ratio of the company, a financial metric that measures the proportion of debt used to finance the company's assets relative to the value of shareholders' equity.

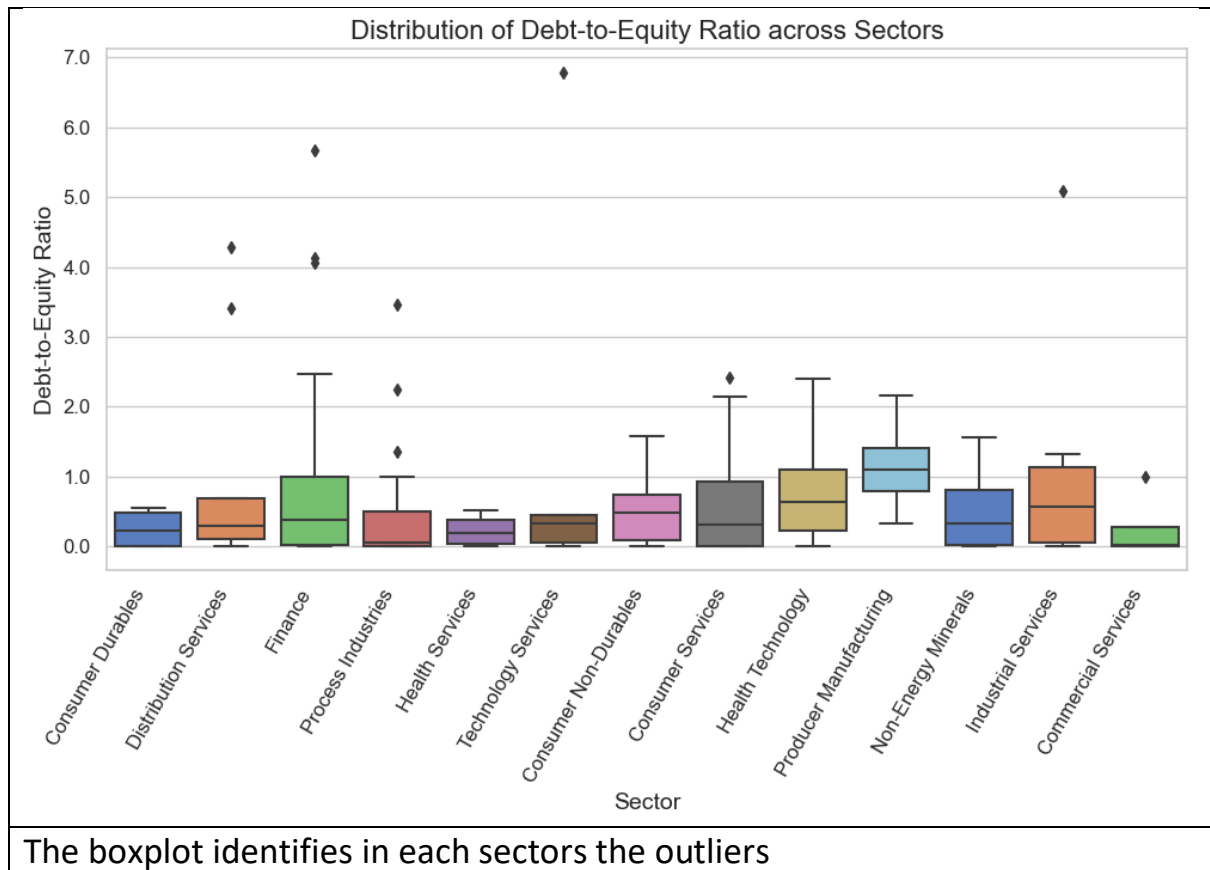
RSI: The Relative Strength Index (RSI), an indicator of stock price momentum. It measures the speed and change of price movements and ranges between 0 and 100.

other_features_1, other_features_2, ...: Additional financial and stock performance metrics included in the dataset.

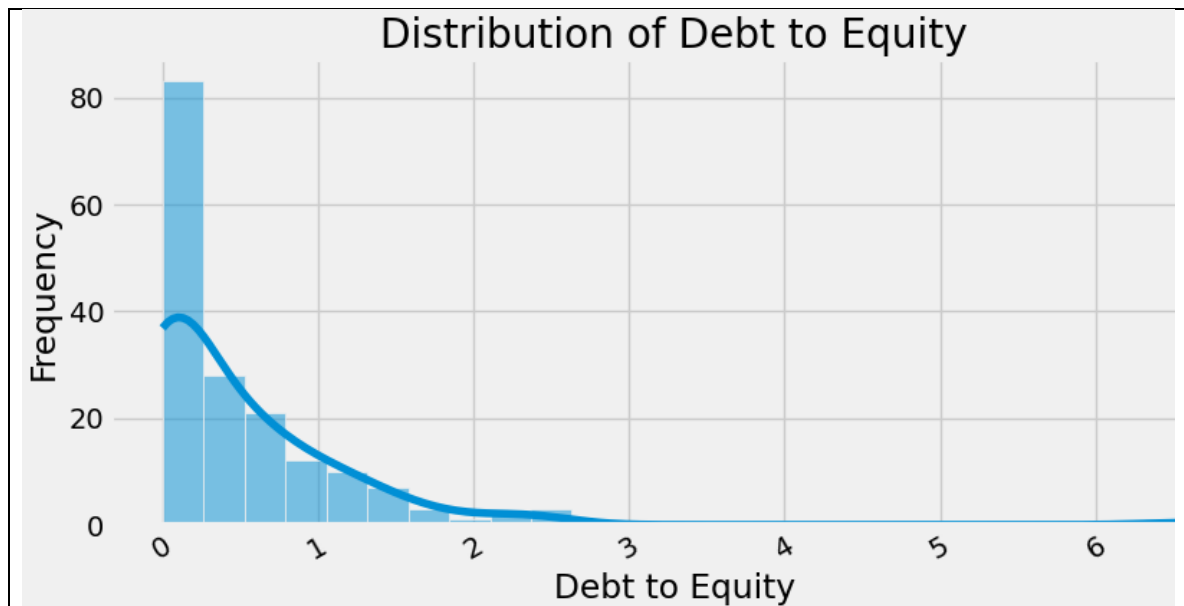
Analysis

We wanted to study more about the sectors we have so we made some graphs to know visualize more the data.

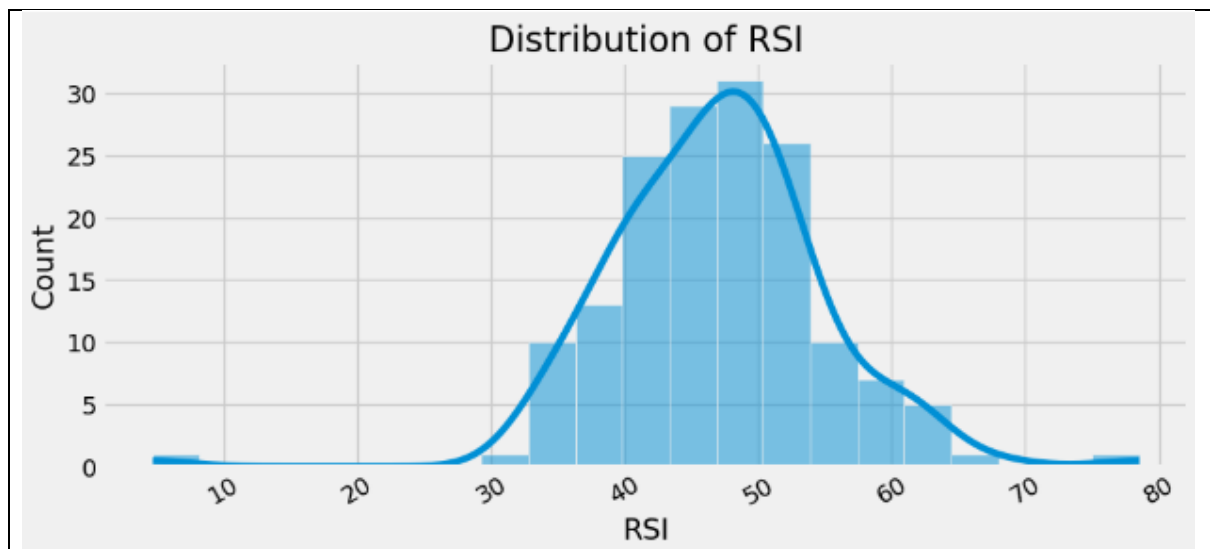




To analyse the data collected, we calculated the mean of debt to equity and RSI.

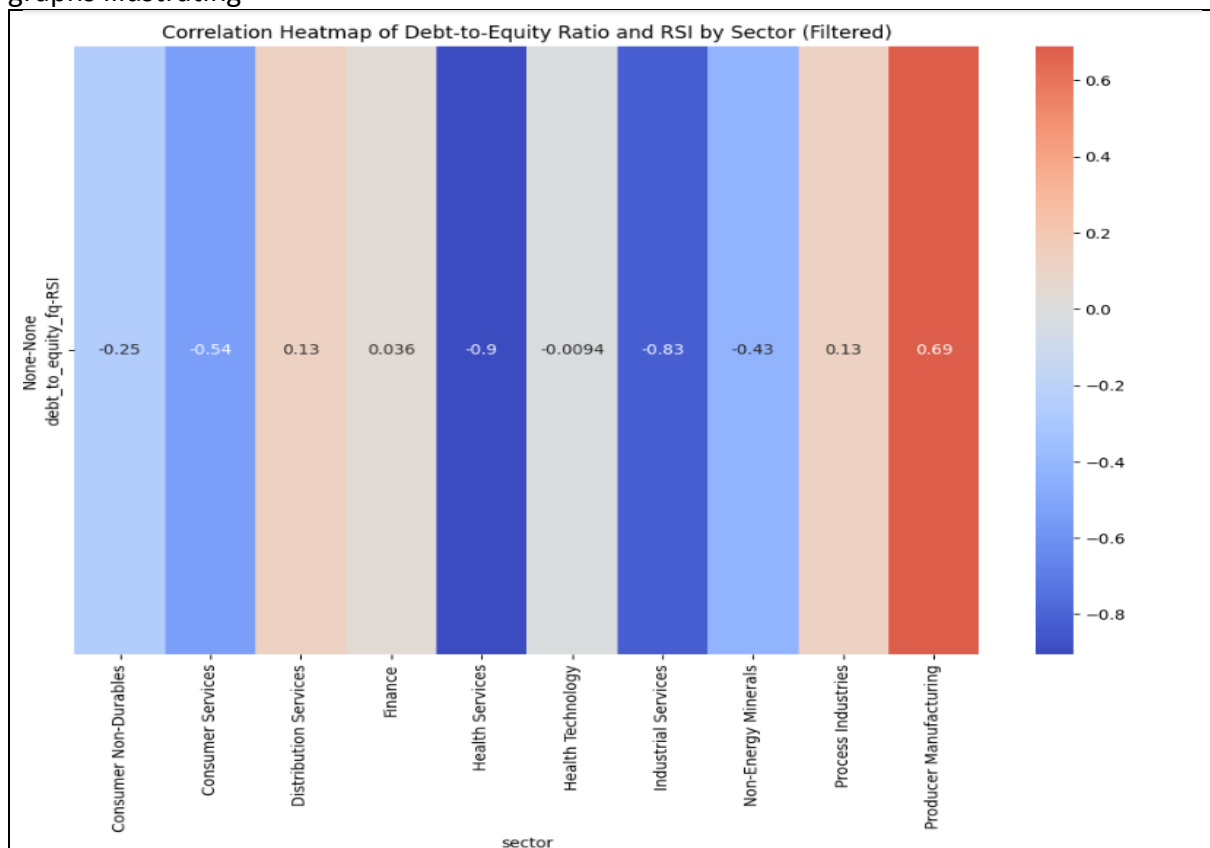


The mean of debt to equity is 0.49 and the standard deviation is 0.735. This graph illustrates the measure of central tendency as we can see the graph is right Skewed.

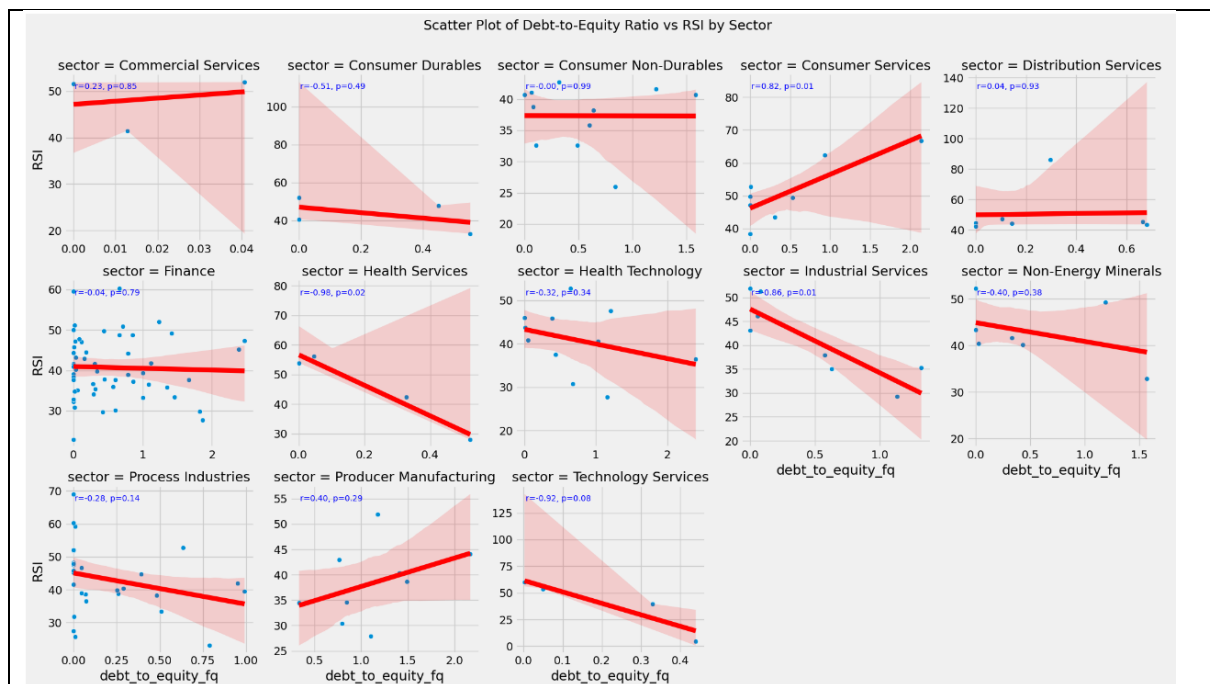


The mean of debt to equity is 42.2 and the standard deviation is 9.62. This graph illustrates the measure of central tendency of RSI.

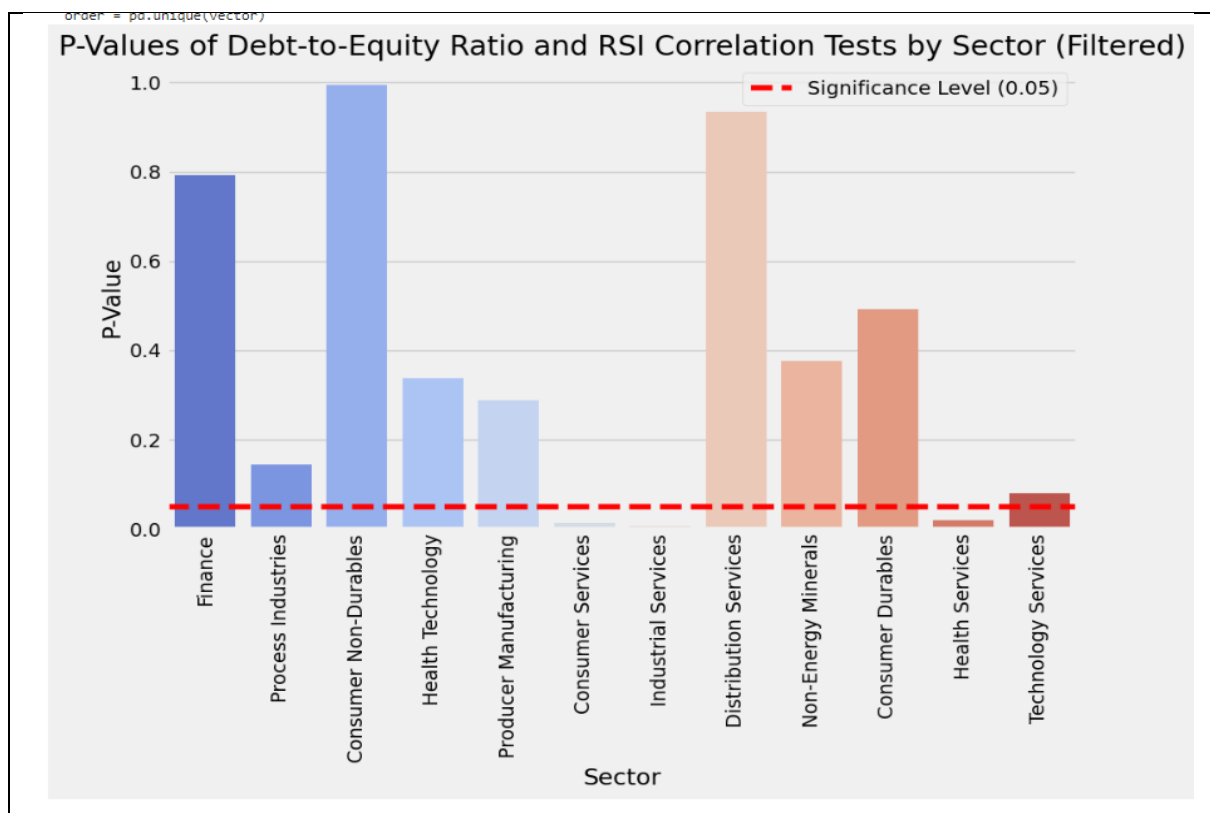
We want to go deeper in analysing each sector to study our hypothesis here are some graphs illustrating



The heatmap shows sectors that has more than 4 companies correlation value and let us determine wither there is strong week or moderate correlation



The above graphs Visualize each sector and its correlation values along with the p values. It shows how each sector has a distinct behaviour.



The red dotted line is the limit (alpha values which is 0.05). The graph shows the sectors and their corresponding p values. The graph helps us identify the relevant sectors (sectors with values less than the limit)

Hypothesis Testing Steps

- Step 1: We calculated p-values for each sector
- Step 2: Counted how many sectors have p-values less than or equal to 0.05.
- Step 3: Decided based on the count of significant sectors:
 - If at least one sector shows a significant p-value ($p \leq 0.05$), you reject the null hypothesis.
 - If no sectors show a significant p-value, you fail to reject the null hypothesis.
- Step 4: Summary of p-values from your analysis
 - Consumer Services: $p = 0.01$ (significant)
 - Industrial Services: $p = 0.01$ (significant)
 - Health Services: $p = 0.02$ (significant)
 - Consumer Durables: $p = 0.49$ (not significant)
 - Consumer non-durables: $p = 0.99$ (not significant)
 - Distribution Services: $p = 0.93$ (not significant)
 - Finance: $p = 0.79$ (not significant)
 - Health Technology: $p = 0.34$ (not significant)
 - Non-Energy Minerals: $p = 0.38$ (not significant)
 - Process Industries: $p = 0.14$ (not significant)
 - Producer Manufacturing: $p = 0.29$ (not significant)
 - Technology Services: $p = 0.08$ (not significant)
 - Commercial Services: $p = 0.33$ (not significant)

Conclusion

Since Consumer Services, Industrial Services, and Health Services have p-values less than 0.05, we have at least three sectors showing a significant relationship between the debt-to-equity ratio and RSI.

Therefore, based on our aggregated analysis, we reject the null hypothesis (H_0) and conclude that the debt-to-equity ratio significantly impacts the RSI within at least one sector.

Any potential issues

1. Selection Bias:

- **Issue:** Selection bias occurs when the sample collected is not representative of the entire population, leading to skewed results.
- **Tip:** Ensure that the sampling method is random and that all sectors and companies have an equal chance of being included in the sample. Avoid cherry-picking specific companies or sectors.

2. Data Quality Issues:

- **Issue:** Data may contain errors, missing values, or outliers that could affect the analysis and interpretation of results.
- **Tip:** Perform rigorous data cleaning to address errors, missing values, and outliers. Use statistical techniques to identify and handle outliers appropriately.

3. Sector-Specific Factors:

- **Observation:** The healthcare sector may have a higher debt-to-equity ratio due to increased spending on scientific research.
- **Consideration:** Consider how sector-specific factors, such as research and development expenditures, may influence the debt-to-equity ratio within each sector. Adjust the analysis to account for these factors to ensure a more accurate comparison between sectors.

4. Temporal Bias:

- **Issue:** Data collected at various times or during different economic conditions may not be comparable.
- **Tip:** Ensure that the data collected spans a consistent time or adjust for temporal effects in the analysis. Consider the economic environment and its impact on the data.