

Insights into M&A Performance: Exploring Financial Metrics in Pre and Post-Merger Scenarios

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Abstract—This project explores the intricacies of Mergers and Acquisitions (M&A) through the development of a Python and Streamlit-based tool, aiming to automate and simplify the calculation of critical financial metrics such as Earnings Per Share (EPS), Price-to-Earnings (P/E) ratio, Debt-to-Equity (D/E) ratio, and Return on Equity (ROE). By providing a detailed analysis of these metrics before and after M&A transactions, the tool facilitates a comprehensive evaluation of the financial health and strategic positioning of entities involved in M&A. It classifies mergers based on stake percentages post-transaction into Acquisition, Majority Acquisition, and Merger of Equals, offering insights into the strategic dynamics of each type. The methodology incorporates an analysis of financial performance and merger classification, enhancing stakeholders' understanding of M&A implications. This study not only highlights the importance of financial metrics in evaluating M&A activities but also demonstrates how technological innovation can streamline complex financial analyses. The findings point to the potential for improved decision-making processes, suggesting avenues for future research in sector-specific analyses and the development of predictive models for M&A success. This approach underscores the significance of blending financial evaluation with strategic considerations in corporate restructuring.

Index Terms—mergers and acquisitions, earnings per share, price-to-earnings, debt-to-equity, ratio analysis, decision making

I. INTRODUCTION

The modern business landscape is characterised by dynamic market conditions, rapid technological advancements, and increasing competition. In such an environment, companies often resort to strategic initiatives like mergers and acquisitions (M&A) to enhance competitiveness, drive growth, and create value for stakeholders.

Mergers and Acquisitions (M&A) refer to strategic transactions in which companies combine or one company acquires another, typically intending to achieve synergies, expand market presence, or realise strategic objectives. By combining the resources of two or more firms, M&As help companies access new markets, ultimately enhancing shareholder value and strategic positioning.

M&A activities involve complex financial transactions, including mergers, acquisitions, consolidations, and takeovers, that require thorough analysis to assess their potential impact on the financial performance of the involved entities.

II. OBJECTIVE

The premise of this project revolves around the automation of EPS calculation for companies involved in M&A activities. By leveraging Python programming and the Streamlit framework, we aim to develop a tool that simplifies the EPS calculation process and enhances the efficiency of M&A analysis. Through automation, we seek to address the complexities associated with manual calculations of M&A, thereby enabling stakeholders to access timely and accurate financial information essential for evaluating the implications of M&A transactions. The methodology aims to calculate various financial metrics including Earnings Per Share (EPS), Price-to-Earnings (P/E) ratio, Debt-to-Equity (D/E) ratio, and Return on Equity (ROE), to evaluate the pre- and post-merger financial health of the entities involved. Additionally, the tool will provide insights by categorizing the type of merger based on the stake percentages post-transaction, classifying it into three distinct types: Acquisition, Majority Acquisition, and Merger of Equals, further enriching the understanding of the transaction dynamics.

III. PRELIMINARIES

In mergers and acquisitions (M&A), financial metrics such as Earnings Per Share (EPS), Price-to-Earnings (P/E) ratio, Debt-to-Equity (D/E) ratio, and Return on Equity (ROE) hold immense significance in assessing the potential impact of the transaction on shareholder value, earnings dilution or accretion, and overall financial performance.

- 1) Earnings Per Share (EPS): EPS is a fundamental metric that measures a company's profitability on a per-share basis. In M&A, analyzing EPS helps stakeholders understand the potential impact of the transaction on earnings distribution among shareholders. An increase in EPS post-merger indicates enhanced profitability and can contribute to shareholder value, while a decrease may signal dilution.
- 2) Price-to-Earnings (P/E) Ratio: The P/E ratio is a valuation metric that compares a company's current share price to its earnings per share. It reflects market sentiment regarding a company's growth prospects and risk profile. In M&A, changes in the P/E ratio can indicate shifts in market perception of the combined entity's earnings potential. A higher P/E ratio post-merger suggests favourable expectations for future earnings growth, while a lower ratio may indicate scepticism or uncertainty.
- 3) Debt-to-Equity (D/E) Ratio: The D/E ratio measures the proportion of a company's financing that comes from debt relative to equity. It indicates the level of financial leverage and risk exposure. In M&A transactions, the D/E ratio can change significantly depending on the financing structure. Taking on excessive debt to fund the acquisition may elevate the D/E ratio, potentially increasing financial risk, while a balanced approach can mitigate risk and enhance financial stability.
- 4) Return on Equity (ROE): ROE measures a company's ability to generate profits from shareholders' equity. It is a key indicator of operational efficiency and financial performance. In M&A, changes in ROE reflect alterations in profitability, asset utilisation, and equity structure resulting from the transaction. A merger that enhances profitability and efficiency can lead to a higher ROE, benefiting shareholders, while a decline may indicate challenges or inefficiencies post-merger.

The impact of M&A on these financial metrics is multifaceted. Positive outcomes, such as increased profitability, improved market valuation, and efficient capital structure management, can enhance shareholder value and financial performance. Conversely, negative outcomes, such as earnings dilution, excessive leverage, or decreased profitability, may erode shareholder value and pose financial risks. Therefore, understanding and analysing these metrics before and after M&A transactions are essential for stakeholders to make informed decisions regarding investment, divestment, and strategic planning.

IV. LITERATURE SURVEY

The landscape of mergers and acquisitions (M&A) has its challenges with complexities, with effects that defy easy analysis. This literature review dives into how M&A operations affect industries such as banking, microfinance, and insurance, examining the various financial ramifications of these high-stakes business transactions.

A. Unpacking M&A outcomes

At the core of M&A analysis is the desire to understand the financial consequences of these strategic mergers. For example, a study of Indonesian companies after mergers and acquisitions reveals that macroeconomic levers and stock market indices have a considerable impact on capital gains and yields [1]. This revelation emphasises the sensitivity of M&A performance to the broader economic and market environment, implying the essential timing and strategic calculus underlying these transactions.

B. Sectoral Dissections

- 1) The Banking and Microfinance Conundrum: In banking and microfinance, the M&A narrative is far from linear. Pakistani microfinance institutions, post-M&A, showcased an ambiguous financial trajectory, with key ratios like ROA, EPS, and NPM not signalling clear-cut enhancements [2]. This ambivalence extends to the banking sector, where the post-M&A landscape is a mixed bag of financial indicators, some ascending, others stagnating [3][4]. The essence of strategic alignment and integration prowess emerges as pivotal in navigating the M&A labyrinth within the financial sector.
- 2) Insurance Sector Insights: The insurance domain offers its own tapestry of M&A outcomes. In India, while some entities flourished post-M&A, others grappled with integrating synergies [5]. The sector-specific challenges of melding business models and strategic visions post-M&A are laid bare, spotlighting the intricate dance of achieving harmony and operational efficiency in the aftermath of such deals.

C. Decoding M&A Success

The crux of M&A success orbits around a constellation of factors: the strategic congruence between entities, the finesse of post-merger integration, and the agility to navigate the macroeconomic and sector-specific currents. The discourse suggests that synergy realisation, alongside cultural and organisational alignment, are linchpins in enhancing post-M&A financial performance and shareholder value [3][5]. Additionally, the strategic timing of M&A, vis-à-vis economic cycles and market sentiments, emerges as a decisive factor in determining the trajectory of these corporate amalgamations.

In summary, the M&A narrative is filled with intricacies that necessitate a thorough understanding of strategic, operational, and environmental factors. While some studies trumpet the financial benefits of M&A, others warn of the quagmire of disappointed expectations and integration challenges. The

research agrees that M&A is not the answer, but rather a strategic gambit that requires precise planning, alignment, and the ability to navigate macroeconomic and industry storms.

V. METHODOLOGY

The methodology section outlines a novel approach to analyse the financial and strategic dimensions of M&A activities. This analysis is predicated on a custom-built software tool, developed in Python and deployed via the Streamlit platform, which enables an interactive assessment of M&A scenarios based on user-generated inputs. The methodology integrates a suite of financial metrics calculations, merger classification algorithms, and a user-friendly interface for data input and result visualisation.

A. Development of Analysis Tool

The software tool was designed to facilitate a comprehensive evaluation of M&A transactions, incorporating a broad spectrum of financial indicators and strategic considerations. Developed in Python, the tool leverages the Streamlit library to provide a web-based interface where users can input specific data pertaining to the companies involved in a merger or acquisition scenario. The tool automates the calculation of several key financial metrics and classifies the merger type based on predefined criteria.

B. Merger Classification and Analysis

The tool classifies the merger based on the stake percentages post-merger and the resulting debt-to-equity ratio, categorizing the transaction as either an Acquisition, Majority Acquisition, or Merger of Equals. It provides nuanced commentary on the strategic implications of the merger type and evaluates the financial health of the entity post-merger.

C. Expanded Financial Analysis

An expanded financial analysis is conducted, encompassing both pre-merger and post-merger scenarios. This includes detailed calculations of EPS, P/E ratio, D/E ratio, and ROE for each company individually, as well as for the combined entity, considering the implications of new shares issued as part of the transaction.

D. Merger Strategic Classification

The methodology extends to classify mergers based on the percentage of ownership post-merger and whether the companies operate within the same industry, distinguishing among Horizontal Merger, Conglomerate Merger, Market Extension Merger, and Product Extension Merger.

E. Data Input and Result Visualization

Through the Streamlit application, users are prompted to input specific financial data and merger details. Upon executing the analysis, the application presents the results in a structured format, showcasing key financial metrics and merger classifications alongside strategic insights into the merger's implications.

F. Methodology Application

This methodology serves as a holistic framework for analyzing M&A activities, integrating financial metrics, strategic classifications, and accessible technology to offer a comprehensive assessment of mergers and acquisitions. The tool's development and its application in evaluating M&A scenarios underscore the importance of combining financial analysis with strategic considerations to understand the implications of M&A transactions fully. This approach facilitates informed decision-making for stakeholders involved in or analyzing M&A activities.

G. Equations

Earnings Per Share (EPS) measures the profit available to equity shareholders per outstanding share, indicating a company's profitability.

$$\text{EPS} = \frac{\text{Net Earnings}}{\text{Total Shares Outstanding}} \quad (1)$$

The Price-to-Earnings (P/E) Ratio assesses a company's current share price relative to its per-share earnings, used for valuing companies.

$$\text{P/E Ratio} = \frac{\text{Share Price}}{\text{EPS}} \quad (2)$$

The Debt-to-Equity (D/E) Ratio compares a company's total liabilities to its shareholder equity, indicating the relative proportion of equity and debt used to finance the company's assets.

$$\text{D/E Ratio} = \frac{\text{Total Debt}}{\text{Total Equity}} \quad (3)$$

Return on Equity (ROE) measures the financial performance by dividing net income by shareholder equity, indicating how well a company uses investments to generate earnings growth.

$$\text{ROE} = \frac{\text{Net Income}}{\text{Shareholder Equity}} \quad (4)$$

New Shares Issued for an acquisition reflects the number of shares a company must issue to finance the purchase of another company.

$$\text{New Shares Issued} = \frac{\text{Purchase Price for Company B}}{\text{Share Price of Company A}} \quad (5)$$

Post-Merger EPS calculates the earnings per share after two companies have merged, considering the new total of outstanding shares.

$$\text{Post-Merger EPS} = \frac{\text{Combined Earnings}}{\text{Total New Shares Outstanding}} \quad (6)$$

The Post-Merger D/E Ratio assesses the leverage of the combined companies by comparing their total debt to total equity.

$$\text{Post-Merger D/E Ratio} = \frac{\text{Combined Debt}}{\text{Combined Equity}} \quad (7)$$

```

import streamlit as st
import plotly.graph_objects as go
import matplotlib.pyplot as plt
import pandas as pd
import matplotlib.pyplot as plt

def calculate_pe_ratio(eps, share_price):
    """Calculate the Price-to-Earnings (P/E) Ratio."""
    return share_price / eps

def calculate_de_ratio(total_debt, total_equity):
    """Calculate the Debt-to-Equity (D/E) Ratio."""
    return total_debt / total_equity

def calculate_roe(net_income, shareholder_equity):
    """Calculate the Return on Equity (ROE)."""
    return net_income / shareholder_equity

```

Fig. 1. Initializing libraries in Python and calculating financial metrics

The stake percentage of Company A in the merged entity is calculated as the proportion of shares of Company A to the total new shares outstanding, expressed as a percentage.

$$\text{Stake of Company A (\%)} = \left(\frac{\text{Shares of Company A}}{\text{Total New Shares Outstanding}} \right) \times 100$$

The stake percentage of Company B in the merged entity is calculated similarly, but using the new shares issued to Company B.

$$\text{Stake of Company B (\%)} = \left(\frac{\text{New Shares Issued to Company B}}{\text{Total New Shares Outstanding}} \right) \times 100$$

H. Back End Implementation

The core of the Merger Analysis Tool is encapsulated by the `merger_analysis()` function. This crucial component conducts an in-depth financial analysis to discern the outcomes of mergers and acquisitions. Inputting vital financial metrics for two entities, such as earnings, share counts, and debt levels, allows for the efficient calculation of pre-merger indicators including Earnings Per Share (EPS), Price-to-Earnings (P/E) ratio, and Debt-to-Equity (D/E) ratio for each company as mentioned in Fig 1. Following the initial assessment, the function simulates the merger, analysing the issuance of new shares and evaluating the combined financial metrics post-merger. It accurately determines the ownership stakes within the newly formed entity and categorises the merger based on control distribution and financial leverage.

The `merger_analysis()` function provides essential quantitative evaluations and strategic insights into the financial implications of mergers and acquisitions, making it a vital tool for stakeholders contemplating such ventures.

I. Front End Implementation

By combining Streamlit's intuitive development environment with HTML customization, the implementation achieves a user-friendly and aesthetically pleasing interface for financial analysis applications, enhancing the overall user experience. Implementation:

```

def merger_analysis(earnings_a, shares_a, share_price_a, total_debt_a, total_equity_a,
                   earnings_b, shares_b, share_price_b, total_debt_b, total_equity_b,
                   purchase_price_b):
    """Perform an expanded financial analysis of a merger scenario."""

    # Pre-Merger Calculations
    eps_a = earnings_a / shares_a
    eps_b = earnings_b / shares_b
    pe_a = calculate_pe_ratio(eps_a, share_price_a)
    pe_b = calculate_pe_ratio(eps_b, share_price_b)
    de_a = calculate_de_ratio(total_debt_a, total_equity_a)
    de_b = calculate_de_ratio(total_debt_b, total_equity_b)
    roe_a = calculate_roe(earnings_a, total_equity_a)
    roe_b = calculate_roe(earnings_b, total_equity_b)

    # Assume the acquisition is paid in shares; calculate new shares issued by A to B shareholders
    new_shares_issued = purchase_price_b / share_price_a

    # Post-Merger Calculations
    combined_earnings = earnings_a + earnings_b
    total_new_shares = shares_a + new_shares_issued
    post_merger_eps = combined_earnings / total_new_shares
    combined_debt = total_debt_a + total_debt_b
    combined_equity = total_equity_a + total_equity_b + (new_shares_issued * share_price_a) - purchase_price_b
    post_merger_de = calculate_de_ratio(combined_debt, combined_equity)
    post_merger_pe = calculate_pe_ratio(post_merger_eps,
                                       share_price_a) # Assuming share price remains constant for simplicity

    # Calculate stake percentages
    stake_a = (shares_a / total_new_shares) * 100
    stake_b = (new_shares_issued / total_new_shares) * 100

    # Determine merger type and generate comments
    merger_type, stake_comment, de_comment = merger_type_and_comments(post_merger_de, stake_a, stake_b)

    return eps_a, eps_b, pe_a, pe_b, de_a, de_b, roe_a, roe_b, post_merger_eps, post_merger_de, post_merger_pe, \
        stake_a, stake_b, merger_type, stake_comment, de_comment

```

Fig. 2. Merger analysis calculation for pre and post merger scenarios

The process begins with users inputting the financial details of two companies involved in the merger. These details include earnings, total number of outstanding shares, price per share, total debt, and total equity for each company. Once the details are provided, users initiate the analysis by clicking on the "Analyse Merger" button. Behind the scenes, the system's back-end computes key financial metrics such as earnings per share (EPS), return on equity (ROE), debt-to-equity ratio (D/E), and price-to-earnings ratio (P/E) for both companies post merger. Additionally, it calculates the stake owned by each company post-merger based on the provided details.

One of the critical aspects of the implementation is the identification of the type of merger based on the percentage stake owned by each company post-merger. The system categorizes the merger as either a merger of equals, acquisition, or majority acquisition, depending on the stake percentages. This categorization adds another layer of analysis.

Furthermore, the system generates commentary on the debt-to-equity ratio and stake ownership percentages, providing valuable insights into the financial health and control dynamics post-merger. The front-end interface also features a doughnut chart illustrating the stake owned by each company after the merger, offering users a visual representation of ownership distribution.

Overall, the systematic flow of the implementation ensures that users can seamlessly input financial data, analyze the merger, and gain insights into the financial and strategic aspects of potential mergers and acquisitions, in turn reducing chances of manual calculation errors.

VI. CONCLUSION AND FUTURE SCOPE

In our study, Python and Streamlit emerge as powerful tools that significantly enhance our ability to analyze mergers and acquisitions (M&A) with precision and depth. Python, with its robust programming capabilities and a vast ecosystem of libraries such as Pandas for data manipulation and

Merger Analysis Tool

Company A Input

Earnings

5000000

- +

Number of shares

1000000

- +

Price per share

10.00

- +

Total Debt

2000000

- +

Total Equity

8000000

- +

Purchase Price for Company B

10000000

- +

Analyze Merger

Company B Input

Earnings

2000000

- +

Number of shares

500000

- +

Price per share

8.00

- +

Total Debt

1000000

- +

Total Equity

4000000

- +

Merger Type

Merger of Equals

Stake Comment

Stake percentages suggest a merger of equals, with balanced control. 🍷

D/E Ratio Comment

The post-merger debt-to-equity ratio is within a healthy range.

Ownership Stake Post-Merger

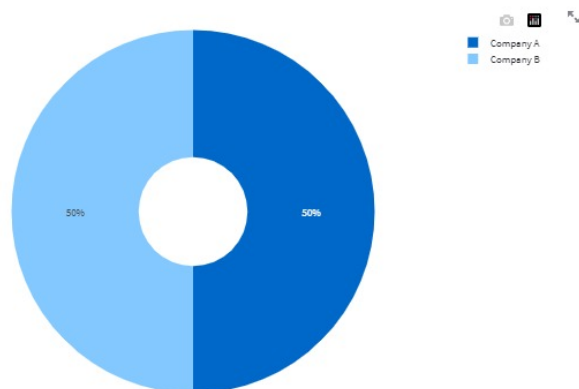


Fig. 3. Homepage dashboard to input details about 2 companies .

Merger Analysis Results

	Metrics	Company A	Company B
0	Earnings Per Share	5	4
1	Price-To-Earnings Ratio	2	2
2	Debt-To-Equity Ratio	0.25	0.25
3	Return on Earnings	0.625	0.5
4	Stake owned (%)	50	50

Post Merger EPS

3.5000

Post Merger D/E

0.2500

Post Merger P/E (using A's share price)

2.8571

Fig. 4. Merger analysis results on different financial metrics

NumPy for numerical analysis, serves as the backbone of our computational framework. This versatile language enables the efficient processing of complex financial data, allowing for the automation of calculations for essential metrics like EPS, P/E ratio, D/E ratio, and ROE. The use of Python ensures not only accuracy in computations but also the flexibility to adapt and expand our analysis to accommodate various M&A scenarios.

Streamlit, on the other hand, transforms our Python scripts into interactive web applications with minimal effort. This innovative framework allows users to interact with the data, adjust parameters, and visualize outcomes in real-time, making the analysis of M&A performance both accessible and engaging. Streamlit's intuitive interface and ability to seamlessly integrate with Python's analytical power create a user-friendly environment. Stakeholders, investors, and board members can now explore the financial implications of M&A transactions without needing to navigate complex spreadsheets or specialized software. This democratization of data analysis fosters a more inclusive approach to evaluating M&A activities,

Fig. 5. Type of merger, stake and D/E ratio have been identified and the ownership stake of the two companies is displayed in a doughnut chart

enabling informed decision-making based on comprehensive, real-time financial insights.

Together, Python and Streamlit represent a synergistic combination that brings sophisticated financial analysis to a wider audience. By leveraging these technologies, our research not only advances the methodology for assessing M&A transactions but also contributes to a more transparent, informed, and strategic approach to corporate restructuring. The integration of advanced computational techniques with interactive data visualization opens new avenues for future research and practice in the field of M&A, promising enhanced strategic insights and decision-making capabilities in the dynamic world of corporate finance.

The framework outlined in this study lays the groundwork for further research in several key areas:

1) Longitudinal Analysis:

- **Extended Time Frames:** While initial analysis provides valuable insights for the current time frame, extending the time-frame for analysis can uncover trends and patterns in the long-term financial performance of merged entities. Researchers could explore how performance metrics evolve over multiple years post-merger, capturing both short-term fluctuations and long-term trends.
- **Impact of Economic Cycles:** Examining how merged entities navigate through different economic environments—such as periods of recession, recovery, or expansion—can provide valuable insights into their resilience and adaptability.

2) Real-Time Data Integration Framework:

- Establish seamless integration with financial data providers, M&A databases, and regulatory filings through APIs to retrieve real-time data on current M&A transactions, deal valuations, and financial metrics.

3) Enhanced Predictive Analytics:

- Machine Learning Models: Develop advanced machine learning models to predict the likelihood of M&A success or failure based on real-time data inputs such as financial indicators, market sentiment, and industry trends.

4) Synergy Valuation:

- Dynamic Synergy Assessment: Instead of treating synergies as static values, researchers could explore dynamic synergy valuation approaches that account for evolving market conditions, operational changes, and integration challenges over time.

5) Sector-Specific Models:

- Industry-Specific Analysis: Researchers could delve into sector-specific factors such as technological disruption, regulatory changes, competitive dynamics, and consumer trends to develop more targeted models and insights.

6) Stakeholder Perspectives:

- Investor Sentiment Analysis: Incorporating sentiment analysis techniques to gauge investor reactions and market sentiment using natural language processing (NLP) surrounding M&A announcements providing insights into market perceptions and expectations.

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