**Q3-2022 in Corporate America**

**Assessing the Financial Health of**

**American Firms with Statistical Methods**

**STAT-5010**

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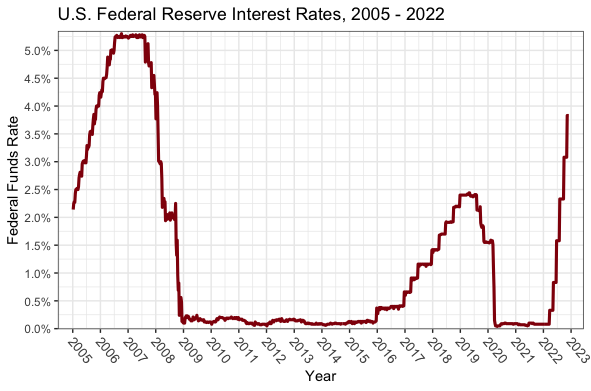
1. **Introduction**

The earnings of a corporation are an essential metric that provides insight into its financial health. Understanding corporate earnings is important for several reasons; for investors, earnings can be a key factor in deciding whether to buy, hold, or sell a company's stock – and whether to hold a short or long position. For analysts and researchers, earnings can provide valuable information about the company's performance and competitiveness in the market. For the public, earnings for individual companies or industries can be key indicators of the overall health of the economy and the stability of the financial system.

This project will use a variety of statistical methods, the earnings data from quarterly earnings reports, to analyze the profitability and financial health of U.S. firms given the current economic climate. With the use predictive modeling techniques, we can evaluate the profitability (measured as earnings per share) of U.S. firms in the third fiscal quarter of 2022 and the overall state of the economy. We will evaluate the performance of different firms and industries, and we will use predictive models to forecast the earnings of these firms in the future. This analysis aims to provide insights into the profitability and financial health of U.S. firms, and to shed light on the implications of these earnings for the broader economy.

1. **Background**

The Federal Reserve is tightening its monetary policy – in short, raising interest rates by constraining the money supply. In the last year alone, the U.S. federal funds rate has increased by 375 basis points, the highest level since January 2008 when the Federal Reserve was cutting rates during the subprime mortgage crisis.



**Fig. 1: Federal funds rate, 2005 – 2022**

During the 2008 Financial Crisis and concurrent Great Recession (2007-2009), the Federal Reserve slashed the federal funds rate to near-zero, where it stayed for over half a decade; this economic expansion with simultaneously loose monetary policy created a unique investment environment; low cost of capital allowed investors to put money into companies that they may not have invested in had interest rates been higher. This was since interest rates were at historically low levels during this time, which made it relatively cheap for investors to borrow money to finance their investments.

As a result, investors were able to take advantage of the low cost of capital by investing in a wider range of companies and assets. This increased demand for stocks and other assets, which helped to drive up their prices and contribute to the overall growth of the economy.

Additionally, the low cost of capital allowed companies to access more financing, which they could use to invest in new projects and expand their operations. This helped to drive economic growth and create jobs, as companies were able to invest in new technologies and innovations that would not have been possible with higher interest rates.

This is part of the mechanism of countercyclical monetary policy, was part of normal countercyclical monetary policy, which is a policy used by central banks to help stimulate economic growth during periods of economic downturn. Typically, during a recession, a central bank will lower interest rates to make it cheaper for businesses and consumers to borrow money and finance new projects or investments. This can help to stimulate economic activity and help the economy recover from the downturn.

However, during the 2010-2020 period, the economy was in an expansionary phase, and interest rates were already at historically low levels. Despite this, the Federal Reserve and other central banks continued to pursue a policy of low interest rates, to support economic growth and prevent a potential downturn.

While this policy may have helped to support economic growth and prevent a recession, it has also raised concerns among some economists and analysts. These concerns include the possibility that the low interest rates have created overleveraged companies and that the market is due for a correction.

Some analysts worry that the low cost of capital has encouraged companies to take on too much debt and that they may be unable to repay this debt if interest rates were to rise in the future.

Overall, while the low cost of capital during the 2010-2020 period may have helped to support economic growth, it has also raised concerns among some economists and analysts who fear that it may have created overleveraged companies and that the market is due for a correction.

Overall, the 2010-2020 period was characterized by a low cost of capital, which allowed investors to put money into companies that they may not have invested in if interest rates had been higher. This contributed to the growth of the economy and the development of new technologies and innovations.

Following the COVID-19 pandemic which disrupted the global economy and spurred unprecedented monetary and fiscal easing, U.S. inflation remains elevated, and economists debate the degree to which inflation is becoming an endemic issue in the economy. In response, the Federal Reserve has in recent months been particularly aggressive in its tightening of monetary policy, rattling markets in the process.

1. **Analysis and Methods**

This section describes the process of data collection, data processing and wrangling, and statistical modeling methods used.

* 1. Data and Data Collection

This project compiles internal financial data from individual companies’ quarterly reports. These include earnings (reported earnings per share and deviation from consensus analyst expectations), income statements (revenue and profits, operating incomes and expenditures, EBITDA), balance sheets (assets and liabilities), and quarterly cash flows.

Premium access to a financial data REST API hosted by Alpha Vantage[[1]](#footnote-1) was generously granted for this project. The organization “provides enterprise-grade financial market data through a set of powerful and developer-friendly data APIs and spreadsheets.” The API gives output for a single company at a time represented by its stock symbol, in a single category (earnings, income statements, balance sheets, and cash flows), for each API call. The raw data came in JSON output and was reformatted during the collection process in Python before being joined using R. Additionally, descriptions, titles, and general information about the companies’ industries and categories were collected. Macroeconomic data including interest rates, quarterly year-over-year GDP growth, and consumer demand was collected from the API and from the St. Louis Federal Reserve’s Economic Data (FRED) website.

Financial reporting data was requested from the API for 4,215 unique companies listed on the NYSE, NYSE MKT, and NASDAQ exchanges. The 4,215 stock symbols were identified using NASDAQ’s stock screener tool, and data was collected using Python. Out of the 4,215 symbols for which data was requested, the API returned more than 70,000 individual quarterly reports for 3,946 companies (93.6% of symbols traded on New York’s exchanges). The final dataset, which eliminated companies for which there were missing values in any of the key parameters needed for modeling and in any of the quarterly earnings reports (including prior ones excluded from modeling in this project) totaled 38,566 earnings reports for 2,648 companies (62.82% of symbols traded).

For the relatively limited scope of this project, only the latest earnings report for each company is included for modeling. As such this project pertains solely to the Q3 of 2022 and in a limited scope, Q2 of 2022.

* 1. Data Preprocessing, Normalization, and Feature Engineering

The raw data contains a very large number of features, with the following selected to use in modeling. Companies in the dataset, and in general, differ significantly in terms of operational size and capital structure. Therefore, key financial ratios were calculated and will be used as a basis for modeling, which accounts for different company sizes. The following features are kept:

|  |  |  |
| --- | --- | --- |
| **Variable** | **Description** | **Type** |
| Stock symbol | Company’s unique stock symbol | Character |
| Exchange | Exchange on which the company is traded:  NYSE, NYSE MKT, NASDAQ | Categorical |
| Quarter end date | Fiscal end of quarter, varies by company | Date |
| Sector | Primary economic sector of the company:  Life Sciences, Energy & Transportation, Finance, Manufacturing, Technology, Real Estate & Construction, Trade & Services | Categorical (Life Sciences, Energy & Transportation |
| State | State where company is headquartered | Categorical |
| Size | Discretized variable for market capitalization, representing the size of the company | Categorical |
| EPS | Earnings per share in Dollars | Numeric, outcome variable |
| EPS binary | Binary – 1 if EPS was negative, 1 if positive | Binary, outcome variable |
| EPS direction | Change in EPS from previous quarter’s EPS | Numeric, outcome variable |
| EPS direction binary | Change in EPS, binary – 1 if EPS increased, 0 if decreased | Binary, outcome variable |
| Total Revenue | Total Revenue in dollars | Numeric |
| Profit margin | Net income to total revenue | Numeric (ratio) |
| EBITDA margin | Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) to total revenue | Numeric (ratio) |
| Operating Margin | Operating income to net income | Numeric (ratio) |
| Current ratio | Ratio of current assets to current liabilities | Numeric (ratio) |
| Debt ratio | Total debt to total assets | Numeric (ratio) |
| Debt-to-equity ratio | Leverage; total debt to shareholder equity | Numeric (ratio) |
| Interest coverage | Ratio of operating income to interest expense | Numeric (ratio) |
| Gross margin | Gross profit to net income | Numeric (ratio) |
| Return on assets | Net income to total assets | Numeric (ratio) |
| Return on equity | Net income to shareholder equity | Numeric (ratio) |
| Change in federal funds rate | Change in the federal fund’s rate since the previous quarter | Numeric (percentage points) |
| Note: the outcome variables also have associated lag variables for features to model changes from the previous quarter. | | |

**Table 1. Data dictionary**

* 1. Exploratory Data Analysis
  2. Model Selection

1. **Results and Findings**
2. **Conclusions**
3. **References**

1. See [API documentation](https://www.alphavantage.co/documentation/) and references. [↑](#footnote-ref-1)