

CSE 544 Project Final Report

Executive Compensation, Firm's Financial Performance and Market Trends for S&P 500 Companies from 1992-2023

Hai Van Le, JB Huang, Katie Overengland

March 2024

1 Introduction

This project is to analyze financial performance of the top 500 publicly-traded in Northern America. It will compare the financial performance of companies across different industries using core financial metrics such as return on assets (ROA), return on equity (ROE), gross profit margin. It will also report the trends in revenue and net income throughout the years to see if there is any correlation between financial performance of firms and economic cycle such as during and after the Covid-19 pandemic or 2008 financial crisis. Additionally, this project is also aimed at exploring the relationship between stock price and the financial performance of firms. We are also interested in the relationship between executive compensation and firm's financial performance. To be more specific, this project can help us answer many questions including but not limited to:

- How has the revenue of companies in different industries changed over the past five years?
- What is the ROE or ROA trend for top companies before, during and after the pandemic?
- How has the stock price volatility of technology companies changed over the last decade?
- Are there any patterns in the total returns of companies after significant events, such as mergers or acquisitions? Alternatively, one can ask: What impact did mergers have on the financial performance (e.g., ROE) of the involved companies?
- Compare the average ROA of companies within the same sector. Are there significant variations?
- Identify outliers in sector performance and investigate the factors contributing to their performance.
- What is the component of executive compensation package? This can help us explore questions that have been of interest to researchers such as whether bank's executive compensation is related to risk-taking behaviors of firms.[3]

2 Approach

This project makes use of data from the Wharton Research Data Services[4] including Compustat, Execucomp, and CRSP (Center for Research in Security Prices). We are thankful to the University of Washington for granting us access to the WRDS.

This project will use Snowflake for importing the data, data analysis and reporting as well as Tableau (also sponsored through UW) for data visualization. We also used libraries in Python such as the *cpi* library to adjust executive compensation to inflation with 2023 as base year.

Our approach is first, to create a schema for the four datasets 1 that allows us to access the data. The primary key is TICKE for all datasets. Then, we will do some descriptive statistic analyses with each dataset before merging them and answering more in-depth questions. We want to focus on producing a business-like

report that is interactive and comprehensive.

In terms of loading the data, we first need to download the SnowSQL command line interface from Snowflake¹. Once this is installed, open a new terminal and run the following commands,

```
01 | snowsql -a [account_id] -u [username] # then type your Snowflake password as requested
02 | create or replace warehouse companyceo with WAREHOUSE_SIZE="XSmall";
```

Then, we defined our database by running the following commands. Note that, due to the big size of each table, the following code is just an example:

```
01 | CREATE OR REPLACE DATABASE sp500;
02 |
03 | CREATE OR REPLACE TABLE sp500financialratios (
04 |     gvkey INT,
05 |     permno INT,
06 |     adate DATE,
07 |     ...
08 |     TICKER CHAR(5) PRIMARY KEY,
09 | );
```

Then, we exited the snowflake command line interface and ran *bash createdatabase.sh* as in A. After the data has been imported, we can go to the Snowflake website and run queries there.

In order to visualize findings, we integrated Snowflake and Tableau. After connecting the two apps, we can either drag and drop each or any combinations of datasets to Tableau interface or run queries with the “Run custom queries” feature in Tableau.

In terms of contribution, Van contributed the majority of this project. She came up with the idea since it’s based on her ongoing research. She integrated Tableau and Snowflake for the demo during poster session and did all the visualizations with Tableau, the project (writeup, producing the schema to import data, setup, etc.) and poster design. JB contributed to writing up the findings for two datasets - annual financial data and financial ratio and designing the Entity-Relationship diagram for the poster. Katie picked some stock-related questions and helped with answering them using the stock data.

Table 1: Table Description

Table	Variable Description
Annual Financial Data	Includes important annual financial metrics of firms
Financial Ratios	Includes important financial ratios of firms
Executive Compensation	Includes components of firms’ executives’ compensation, adjusted for inflation
Stock	Includes monthly stock data of firms

3 Related Works

Chief executive officer (CEO) compensation packages are typically composed of salaries, performance-based bonuses, as well as stock and option awards. These packages have grown tremendously for executives at top firms in the United States, surpassing wage earners in the income distribution’s 0.1% and S&P stock market growth itself². Strikingly, the ratio of CEO to worker compensation was 399 to 1 when utilizing a realized measure for stock awards and options.

Increased regulation and declines in CEO compensation align with key financial events and subsequent policy responses. The most prominent shock, the 2008 financial crisis, brought about two consequential pieces of legislation that declined compensation growth. Specifically, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 requires a triennial voting of shareholder opinions on executives’ compensation packages, though the vote itself is not legally binding[1]. Under the 2009 Troubled Asset Relief Program (TARP), the Special Master for TARP Executive Compensation, colloquially known as the “pay czar”, was

¹<https://developers.snowflake.com/snowsql/>

²Ibid

tasked with evaluating the compensation structure of executives in firms who received TARP assistance³. Both of these reforms restricted CEO’s compensation packages in an effort to mitigate excessive risk-taking. The relationship between executive compensation and risk-taking behaviors is premised on notions of risk-attitudes in the presence of incentives. Empirically, risk-taking incentives in compensation packages influence CEO risk-taking behavior: risk-taking is preferred as a means of maximizing shareholder value[2]. Nevertheless, the ramifications of excessive risk-taking prevail as observed in recent events in the banking sector, namely the collapse of Silicon Valley Bank, Signature Bank, and First Republic Bank. Hence, as a means of addressing concerns over financial stability, the primary research question, to what extent do CEO compensation packages induce risk-taking behavior, is observed under the dwindling of policy responses from the 2007 financial crisis.

The literature on top executive compensation and risk-taking in the banking industry is dense. A key inspiration for this research is by Guo et al. (2015) [3] in which they explore compensation structure itself as well as its effects on excessive risk-taking during the 2007-2008 financial crisis. Here, the authors introduce Altman’s Z-score and stock volatility as measures of risk-taking behavior and find a positive relationship between these risk proxies and incentive compensation.

For this project, given short time frame, we only explored different relationships amongst variables such as the relationship of executive compensation and firm’s risk-taking behaviors (measured by stock volatility) via data visualization which shows us visually whether executive total compensation or stock award packages move in line with firm’s stock price. The topic we chose has been extensively investigated in the scholarly community, mostly through econometric modelling. However, this project focuses on presenting an interactive model on the movements of interested variables, instead of looking into the econometric details of them.

4 Findings

4.1 Executive Compensation

For the analysis, we have adjusted all compensation data using CPI with 2023 as the base year. Our analysis agrees with the literature that stock awards account for nearly half of executive compensation package, followed by base salary and non-equity incentives at approximately 16% and 15% each, as reported to the Security and Exchange Commission. Additionally, the gender income gap was still prominent in the top 500 companies. The gap seems to get widen gradually despite the percentage of female S&P 500 CEO hires increased to 13% in 2022 from 6% in 2021, as reported by executive recruitment agency Spencer Stuart⁴. The states with highest compensation were unsurprisingly California, New York and Texas. Those are states with high cost of living and where most headquarters of big tech are located.

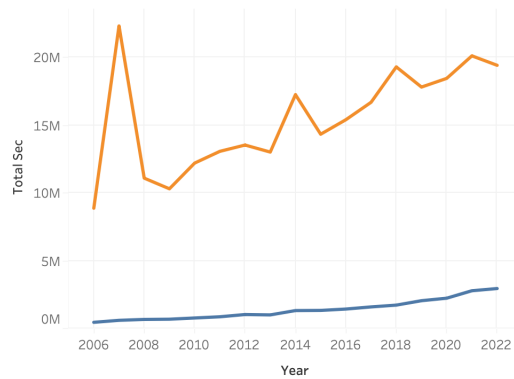
4.2 Annual Financial Performance

For the first task in the annual financial performance, we want to track down the top 15 companies with the most revenue growth over 10 years and their respective industries. By examining their financial records, we can identify the companies that have experienced significant increases in revenue over this period. This analysis will help us understand which companies have been successful in seizing opportunities and thriving in their respective industries. For the second part, we will check the cash ratios of companies across different industries. Our goal is to find the top 15 industries with the highest cash ratios and rank them accordingly . This will help us understand how financially healthy and risky these industries are. By knowing this, investors can spot industries that are financially strong and may offer good investment opportunities. As visualized in Figure 1, on average, the ROA and ROE of top tech companies were pretty low during the pandemic. Unlike other giants, APPLE’s ROE increased consistently, as the blue line above depicts, surpassing 0.7 in 2020.

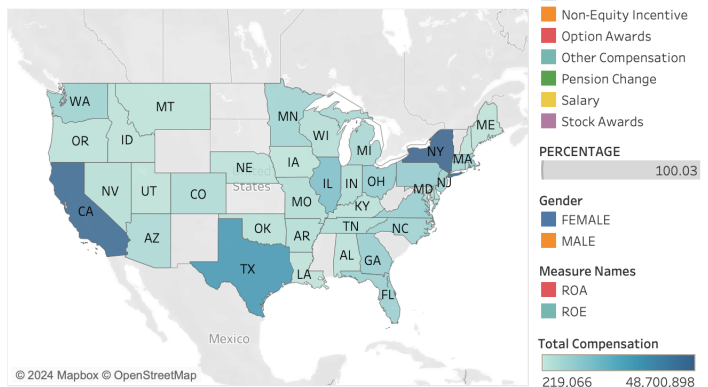
³Feinberg, “Office of the Special Master for TARP Executive Compensation.”

⁴<https://www.spencerstuart.com/leadership-matters/2023/october/where-are-the-women-leaders>

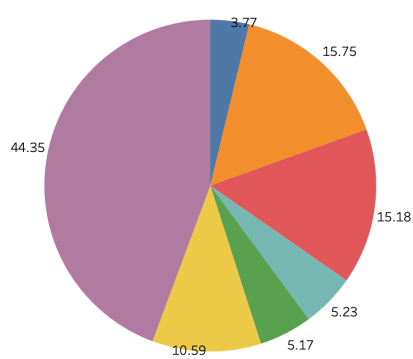
Total Compensation by Gender



Total Compensation by State



Compensation Components as a Percentage of Total Compensation



MAANG: Return on Assets v.s Return on Equity

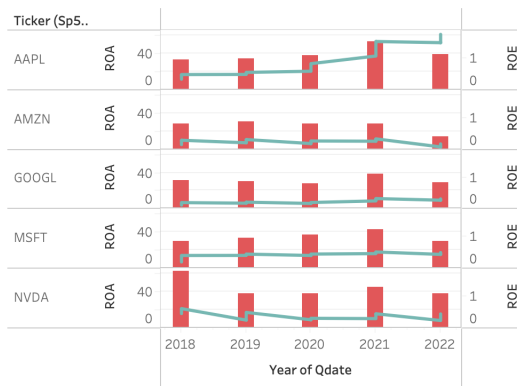


Figure 1: Example of a Tableau dashboard

4.3 Financial Ratios

Understanding the sectors with the best returns and their risk levels is key for investors. By spotting the top and bottom 10 sectors by returns, investors get a sense of past performance. In this session, the “Average Return” shows how sectors have performed on average, while “Volatility” indicates how much their returns have varied. This helps investors assess sector-specific risks and returns, guiding their investment choices based on their preferences and goals.

4.4 Stock Data

We then analyzed the average stock returns of companies previously identified as being strong performers with respect to revenue growth. We found that none of the 15 companies with the highest revenue growth came in the top 15 in terms of average stock returns. This indicated that high average stock returns did not necessarily correspond to increased revenue for top-performing companies.

5 Conclusions

Overall, the project was an exploratory effort where we employed different tools to analyze different data sets in the field of corporate finance. We learned that Snowflake and Tableau work well with each other even though there were some difficulties running independent queries. For example, a limitation of this tool integration is that if you add your second custom SQL query in the same connection, then you have to join it with the first SQL query using one or more columns that are shared by both outputs. If you want to

create different custom SQL queries, you need to ask Tableau to create a new data source that connects to the same warehouse and database.

References

- [1] D. Baker, J. Bivens, and J. Schieder. Reining in ceo compensation and curbing the rise of inequality. 2019.
- [2] I. Dittmann, K.-C. Yu, and D. Zhang. How important are risk-taking incentives in executive compensation? *Review of Finance*, 21(5):1805–1846, 2017.
- [3] L. Guo, A. Jalal, and S. Khaksari. Bank executive compensation structure, risk taking and the financial crisis. *Review of Quantitative Finance and Accounting*, 45:609–639, 2015.
- [4] W. R. D. Services. Wharton Research Data Services — wrds-www.wharton.upenn.edu. <https://wrds-www.wharton.upenn.edu/>. [Accessed 02-02-2024].

A createdatabase.sh

```
01 | export SNOWSQL_USER="username" # Change to your snowflake username
02 | export SNOWSQL_ACCOUNT="xxxxxxx" # Change to your snowflake account id (XXXXXXX-XXXXXXX)
03 | export SNOWSQL_PWD="xxxxxxx" # Change to your snowflake password
04 | export SNOWSQL_WAREHOUSE="companyceo"
05 | export SNOWSQL_DATABASE="sp500"
06 | export SNOWSQL_SCHEMA="public"
07 |
08 | tables=("sp500execucompapi sp500stock sp500annualfinancial sp500financialratios")
09 | sp500_files_directory=/Users/haivanle/cse544-levh/project/sp500 # Change to the file path
    holding the sp500.csv files
10 |
11 | snowsql -q "Create or replace FILE FORMAT sp500_CSV TYPE = CSV Field_Delimiter = ','
    FIELD_OPTIONALLY_ENCLOSED_BY = '\"' escape=none escape_unenclosed_field=none;"
12 |
13 | for table in $tables;
14 | do
15 |     snowsql -q "create or replace stage $table;"
16 |     snowsql -q "put file://$sp500_files_directory/$table.csv @$table;"
17 |     snowsql -q "copy into $table from @$table FILE_FORMAT = sp500_CSV;"
18 | done
```

B SQL Queries

```
01 | # Count number of CEOs and CFOs
02 | SELECT
03 |     COUNT(DISTINCT CASE WHEN CEOANN = 'CEO' THEN EXEC_FULLNAME END) AS CEO_Count ,
04 |     COUNT(DISTINCT CASE WHEN CFOANN = 'CFO' THEN EXEC_FULLNAME END) AS CFO_Count
05 | FROM sp500execucompapi;
06 |
07 | +-----+-----+
08 | | CEO_COUNT | CFO_COUNT |
09 | |-----|
10 | |      1686 |      1519 |
11 | +-----+-----+
12 |
13 | # Count number of firms - missing values for 2 companies
14 | SELECT COUNT(DISTINCT TICKER) AS company_count
15 | FROM sp500execucompapi;
16 | +-----+
17 | | COMPANY_COUNT |
18 | |-----|
```

```

19 | | 498 |
20 | +-----+
21 |
22 | # Report the CEO/CFO compensation package
23 | Compustat calculated TOTAL_SEC as the sum of BONUS, STOCK_AWARDS, OPTION_AWARDS,
    NONEQ_INCENT, PENSION_CHG and OTHCOMP. However, there are many observations without
    TOTAL_SEC but other components. Thus, in order to accurately report the percentage for
    which each compensation accounts, we need to create a temporary view where TOTAL_SEC is
    not null:
24 |
25 | CREATE OR REPLACE VIEW sp500execucompapi2 AS
26 | SELECT *
27 | FROM sp500execucompapi
28 | WHERE aTOTAL_SEC IS NOT NULL;
29 |
30 | SELECT
31 |     'Salary' AS Component,
32 |     SUM(aSALARY) / SUM(aTOTAL_SEC) * 100 AS Percentage
33 | FROM
34 |     sp500execucompapi2
35 |
36 | UNION
37 |
38 | SELECT
39 |     'Bonus' AS Component,
40 |     SUM(aBONUS) / SUM(aTOTAL_SEC) * 100 AS Percentage
41 | FROM
42 |     sp500execucompapi2
43 |
44 | UNION
45 |
46 | SELECT
47 |     'Stock Awards' AS Component,
48 |     SUM(aSTOCK_AWARDS) / SUM(aTOTAL_SEC) * 100 AS Percentage
49 | FROM
50 |     sp500execucompapi2
51 |
52 | UNION
53 |
54 | SELECT
55 |     'Option Awards' AS Component,
56 |     SUM(aOPTION_AWARDS) / SUM(aTOTAL_SEC) * 100 AS Percentage
57 | FROM
58 |     sp500execucompapi2
59 |
60 | UNION
61 |
62 | SELECT
63 |     'Non-Equity Incentive' AS Component,
64 |     SUM(aNONEQ_INCENT) / SUM(aTOTAL_SEC) * 100 AS Percentage
65 | FROM
66 |     sp500execucompapi2
67 |
68 | UNION
69 |
70 | SELECT
71 |     'Pension Change' AS Component,
72 |     SUM(aPENSION_CHG) / SUM(aTOTAL_SEC) * 100 AS Percentage
73 | FROM
74 |     sp500execucompapi2
75 |
76 | UNION
77 |
78 | SELECT
79 |     'Other Compensation' AS Component,
80 |     SUM(aOTHCOMP) / SUM(aTOTAL_SEC) * 100 AS Percentage
81 | FROM
82 |     sp500execucompapi2;

```

```

83 |
84 | COMPONENT          PERCENTAGE
85 | Stock Awards       44.350924566
86 | Option Awards      15.176113252
87 | Pension Change     5.173405665
88 | Other Compensation  5.227767323
89 | Non-Equity Incentive 15.751765651
90 | Salary             10.588071214
91 | Bonus              3.766825381
92 |
93 | # Top 5 highest paid CEO/CFO
94 | SELECT
95 |     EXEC_FULLNAME,
96 |     CEOANN,
97 |     CFOANN,
98 |     aTOTAL_SEC
99 | FROM sp500execucompapi
100 | WHERE (CEOANN = 'CEO' OR CFOANN = 'CFO') AND aTOTAL_SEC IS NOT NULL
101 | ORDER BY aTOTAL_SEC DESC
102 | LIMIT 5;
103 |
104 | +-----+-----+-----+-----+
105 | | EXEC_FULLNAME | CEOANN | CFOANN | ATOTAL_SEC |
106 | |-----+-----+-----+-----|
107 | | Stephen Allen Schwarzman, B.A., M.B.A. | CEO | NULL | 11482348.270777 |
108 | | Elon R. Musk | CEO | NULL | 2771539.79874941 |
109 | | Sundar Pichai | CEO | NULL | 334455.728329379 |
110 | | Peter Maxwell Kern | CEO | NULL | 333126.477528132 |
111 | | Patrick W. Smith | CEO | NULL | 298537.398759971 |
112 | +-----+-----+-----+-----+
113 |
114 | # Gender Pay Gap - Male dominates!
115 | SELECT GENDER, AVG(aTOTAL_SEC) AS AVG_TOTAL_SEC
116 | FROM sp500execucompapi
117 | GROUP BY GENDER;
118 |
119 | +-----+-----+
120 | | GENDER | AVG_TOTAL_SEC |
121 | |-----+-----|
122 | | MALE | 8464.346451396 |
123 | | FEMALE | 6344.796941574 |
124 | +-----+-----+
125 |
126 | # Effect of Performance on Compensation
127 | SELECT TICKER, AVG(aTOTAL_SEC) AS AVG_TOTAL_SEC
128 | FROM sp500execucompapi
129 | WHERE aTOTAL_SEC IS NOT NULL
130 | GROUP BY TICKER
131 | ORDER BY AVG_TOTAL_SEC DESC LIMIT 10;
132 |
133 | +-----+-----+
134 | | TICKER | AVG_TOTAL_SEC |
135 | |-----+-----|
136 | | BX | 208366.286916298 |
137 | | META | 61291.497179888 |
138 | | TSLA | 47390.617014768 |
139 | | ORCL | 43466.584229347 |
140 | | AAPL | 34293.903126547 |
141 | | CMCSA | 29500.218467519 |
142 | | GOOGL | 27118.341923596 |
143 | | GS | 26984.560429475 |
144 | | JPM | 24088.985595424 |
145 | | FOXA | 24079.518063575 |
146 | +-----+-----+
147 |
148 | # Effect of Firm Size on Compensation
149 | SELECT TICKER, AVG(aTOTAL_SEC) AS AVG_TOTAL_SEC
150 | FROM sp500execucompapi

```

```

151 | WHERE aTOTAL_SEC IS NOT NULL
152 | GROUP BY TICKER
153 | ORDER BY AVG_TOTAL_SEC DESC LIMIT 10;
154 |
155 | +-----+-----+
156 | | TICKER |      AVG_TOTAL_SEC |
157 | |-----+-----|
158 | | BX      | 208366.286916298 |
159 | | META    | 61291.497179888 |
160 | | TSLA    | 47390.617014768 |
161 | | ORCL    | 43466.584229347 |
162 | | AAPL    | 34293.903126547 |
163 | | CMCSA   | 29500.218467519 |
164 | | GOOGL   | 27118.341923596 |
165 | | GS      | 26984.560429475 |
166 | | JPM     | 24088.985595424 |
167 | | FOXA    | 24079.518063575 |
168 | +-----+-----+
169 |
170 | # Effect of Tenure on Compensation
171 | WITH TenureCalculation AS (
172 |     SELECT EXEC_FULLNAME,
173 |            DATEDIFF(YEAR, JOINED_CO, CURRENT_DATE) AS TENURE,
174 |            MAX(aTOTAL_SEC) AS MAX_TOTAL_SEC
175 |     FROM sp500execucompapi
176 |     WHERE aTOTAL_SEC IS NOT NULL
177 |     GROUP BY EXEC_FULLNAME, TENURE
178 | )
179 | SELECT EXEC_FULLNAME,
180 |        TENURE,
181 |        MAX_TOTAL_SEC AS aTOTAL_SEC
182 | FROM TenureCalculation
183 | WHERE TENURE IS NOT NULL
184 | ORDER BY TENURE DESC
185 | LIMIT 10;
186 |
187 | +-----+-----+-----+-----+
188 | | EXEC_FULLNAME | TENURE |      ATOTAL_SEC |
189 | |-----+-----+-----+-----|
190 | | Earl E. Congdon |      75 | 8939.061916212 |
191 | | John R. Congdon, Sr. |      73 | 1348.789321671 |
192 | | David W. Grainger |      72 | 1344.958566158 |
193 | | Raymond B. Plank |      70 | 36655.9160498 |
194 | | Phupinder S. Gill |      69 | 10664.86834534 |
195 | | John Willard Marriott, Jr. |      68 | 19039.050551667 |
196 | | Richard A. Manogian |      66 | 26137.106312946 |
197 | | Leland E. Tollett |      65 | 8290.891450526 |
198 | | Reuben Mark |      61 | 35160.66106994 |
199 | | Eugene R. McGrath |      61 | 19306.363077083 |
200 | +-----+-----+-----+-----+
201 |
202 | # Effect of Company Headquarter on Compensation
203 | SELECT CITY, AVG(aTOTAL_SEC) AS AVG_TOTAL_COMPENSATION
204 | FROM sp500execucompapi
205 | WHERE aTOTAL_SEC IS NOT NULL
206 | GROUP BY CITY
207 | ORDER BY AVG_TOTAL_COMPENSATION DESC LIMIT 10;
208 |
209 | +-----+-----+
210 | | CITY |      AVG_TOTAL_COMPENSATION |
211 | |-----+-----|
212 | | Cupertino | 34293.903126547 |
213 | | Menlo Park | 29970.115165441 |
214 | | Austin | 23949.820900303 |
215 | | Bentonville | 20409.972554462 |
216 | | Mountain View | 19369.461387281 |
217 | | Tarrytown | 18421.226864601 |
218 | | Burbank | 18063.803095246 |

```



```

219 | | New York | 17655.032480459 |
220 | | Philadelphia | 17267.460381994 |
221 | | Redmond | 16731.953767067 |
222 | +-----+
223 | WITH PreviousRevenue AS (
224 |     SELECT
225 |         f1.TICKER,
226 |         f1.datadate AS Date,
227 |         MAX(f2.revt) AS PrevRevenue
228 |     FROM
229 |         sp500annualfinancial f1
230 |     JOIN
231 |         sp500annualfinancial f2 ON f1.TICKER = f2.TICKER
232 |                                AND f2.datadate < f1.datadate
233 |                                AND DATEDIFF(YEAR, f2.datadate, f1.datadate) <= 10
234 |     GROUP BY
235 |         f1.TICKER,
236 |         f1.datadate
237 | ),
238 | RevenueChanges AS (
239 |     SELECT
240 |         e.CONAME AS CompanyName,
241 |         f.TICKER AS Ticker,
242 |         f.datadate AS Date,
243 |         f.revt AS Revenue,
244 |         pr.PrevRevenue,
245 |         (f.revt - pr.PrevRevenue) AS RevenueChange,
246 |         e.INDDISC AS Industry,
247 |         RANK() OVER (ORDER BY ABS(f.revt - pr.PrevRevenue) DESC) AS Rank
248 |     FROM
249 |         sp500annualfinancial f
250 |     JOIN
251 |         sp500execucomp e ON f.TICKER = e.TICKER
252 |     JOIN
253 |         sp500stock s ON f.TICKER = s.TICKER
254 |     JOIN
255 |         PreviousRevenue pr ON f.TICKER = pr.TICKER AND f.datadate = pr.Date
256 | )
257 | SELECT
258 |     CompanyName,
259 |     Ticker,
260 |     Industry,
261 |     RevenueChange
262 | FROM
263 |     RevenueChanges
264 | WHERE
265 |     Rank <= 15
266 | ORDER BY
267 |     RevenueChange DESC;
268 |
269 | COMPANYNAME | TICKER | INDUSTRY | REVENUECHANGE |
270 | +-----+-----+-----+-----+
271 | | AMAZON.COM INC | AMZN | Broadline Retail | 424995 |
272 | | EXXON MOBIL CORP | XOM | Integrated Oil & Gas | 220101 |
273 | | CVS HEALTH CORP | CVS | Health Care Services | 183100 |
274 | | BERKSHIRE HATHAWAY | BRK.B | Multi-Sector Holdings | 160958 |
275 | | CIGNA GROUP (THE) | CI | Health Care Services | 145233 |
276 | | CHEVRON CORP | CVX | Integrated Oil & Gas | 141246 |
277 | | MARATHON PETROLEUM CORP | MPC | Oil & Gas Refining & Marketing | 121620 |
278 | | COSTCO WHOLESALE CORP | COST | Consumer Staples Merchandise Retail | 114314 |
279 | | MICROSOFT CORP | MSFT | Systems Software | 112950 |
280 | | VALERO ENERGY CORP | VLO | Oil & Gas Refining & Marketing | 111074 |
281 | | PHILLIPS 66 | PSX | Oil & Gas Refining & Marketing | 105861 |
282 | | WALMART INC | WMT | Consumer Staples Merchandise Retail | 90000 |
283 | | ELEVANCE HEALTH INC | ELV | Managed Health Care | 82763.9 |
284 | | TESLA INC | TSLA | Automobile Manufacturers | 78263.644 |
285 | | GENERAL ELECTRIC CO | GE | Industrial Conglomerates | 71960 |
286 | +-----+-----+-----+-----+

```

```

287 | WITH IndustryMaxCashRatio AS (
288 |     SELECT
289 |         e.INDDDESC AS Industry,
290 |         MAX(fr.cash_ratio) AS CashRatio
291 |     FROM
292 |         sp500financialratios fr
293 |     JOIN
294 |         sp500execucomp e ON fr.TICKER = e.TICKER
295 |     WHERE
296 |         e.INDDDESC IS NOT NULL
297 |         AND fr.cash_ratio IS NOT NULL
298 |     GROUP BY
299 |         e.INDDDESC
300 | )
301 | SELECT
302 |     Industry,
303 |     CashRatio
304 | FROM
305 |     IndustryMaxCashRatio
306 | ORDER BY
307 |     CashRatio DESC
308 | LIMIT 15;
309 |
310 | +-----+-----+
311 | | INDUSTRY                                | CASHRATIO |
312 | |-----+-----|
313 | | Life Sciences Tools & Services          | 42.309 |
314 | | Biotechnology                          | 36.884 |
315 | | Communications Equipment                | 19.746 |
316 | | Health Care Equipment                  | 17.237 |
317 | | Broadline Retail                       | 8.981 |
318 | | Semiconductors                        | 8.93 |
319 | | Casinos & Gaming                       | 6.609 |
320 | | Soft Drinks & Non-alcoholic Beverages | 5.69 |
321 | | Aerospace & Defense                    | 5.475 |
322 | | Automotive Retail                      | 5.2 |
323 | | Systems Software                      | 4.067 |
324 | | Semiconductor Materials & Equipment    | 3.913 |
325 | | Telecom Tower REITs                   | 3.527 |
326 | | Application Software                   | 3.166 |
327 | | Restaurants                           | 3 |
328 | +-----+-----+
329 | WITH SectorPerformance AS (
330 |     SELECT
331 |         e.INDDDESC AS Sector,
332 |         AVG(s.RET) AS AverageReturn,
333 |         STDDEV(s.RET) AS Volatility
334 |     FROM
335 |         sp500stock s
336 |     JOIN
337 |         sp500execucomp e ON s.TICKER = e.TICKER
338 |     GROUP BY
339 |         e.INDDDESC
340 | )
341 | SELECT
342 |     Sector,
343 |     AverageReturn,
344 |     Volatility,
345 |     CASE
346 |         WHEN top_rank <= 10 THEN 'Top 10'
347 |         WHEN bottom_rank <= 10 THEN 'Last 10'
348 |     END AS RankCategory
349 | FROM
350 |     (
351 |         SELECT
352 |             Sector,
353 |             AverageReturn,
354 |             Volatility,

```

```

355 |         ROW_NUMBER() OVER (ORDER BY AverageReturn DESC) AS top_rank,
356 |         ROW_NUMBER() OVER (ORDER BY AverageReturn ASC) AS bottom_rank
357 |     FROM
358 |         SectorPerformance
359 |     )
360 | WHERE
361 |     top_rank <= 10 OR bottom_rank <= 10
362 | ORDER BY
363 |     top_rank, bottom_rank;
364 |
365 | SECTOR | AVERAGERETURN | VOLATILITY | RANKCATEGORY |
366 | -----+-----+-----+-----+
367 | | Broadline Retail | 0.02860680706 | 0.1590272042 | Top 10 |
368 | | Biotechnology | 0.0261202536 | 0.2153082009 | Top 10 |
369 | | Construction & Engineering | 0.02437436418 | 0.1566835299 | Top 10 |
370 | | Telecom Tower REITs | 0.02350166289 | 0.1392367844 | Top 10 |
371 | | Technology Distributors | 0.02320285088 | 0.06861273802 | Top 10 |
372 | | Semiconductor Materials & Equipment | 0.02267948506 | 0.144592587 | Top 10 |
373 | | Electronic Manufacturing Services | 0.02099521933 | 0.1683639345 | Top 10 |
374 | | Semiconductors | 0.02099093244 | 0.1406800602 | Top 10 |
375 | | Wireless Telecommunication Services | 0.02084687069 | 0.07355947311 | Top 10 |
376 | | Fertilizers & Agricultural Chemicals | 0.02037557143 | 0.07383022981 | Top 10 |
377 | | Household Products | 0.008713526882 | 0.05434554965 | Last 10 |
378 | | Cable & Satellite | 0.008462287185 | 0.1204683746 | Last 10 |
379 | | Electric Utilities | 0.008038404181 | 0.08544437955 | Last 10 |
380 | | Broadcasting | 0.00727979646 | 0.0778783228 | Last 10 |
381 | | Integrated Telecommunication Services | 0.005116378433 | 0.0666943369 | Last 10 |
382 | | Managed Health Care | 0.00257203876 | 0.04743126895 | Last 10 |
383 | | Multi-line Insurance | 0.002003157895 | 0.09003855679 | Last 10 |
384 | | Drug Retail | -0.0006872164948 | 0.07941953627 | Last 10 |
385 | | Passenger Ground Transportation | -0.002410953488 | 0.1376272127 | Last 10 |
386 | | Health Care REITs | -0.0220455 | 0.1804937964 | Last 10 |
387 | +-----+-----+-----+-----+
388 |
389 |
390 | # Top 15 Performing Companies Based on Average Stock Returns
391 | select ticker, AverageReturn
392 | from (select ticker, avg(ret) as AverageReturn
393 |      from sp500stock
394 |      group by ticker
395 |      order by AverageReturn desc)
396 | where AverageReturn is not null
397 | limit 15;
398 |
399 | +-----+-----+
400 | | TICKER | AVERAGERETURN |
401 | |-----+-----|
402 | | PITLF | 0.259139 |
403 | | WAND | 0.1902001875 |
404 | | RIGX | 0.1580591667 |
405 | | MG CX | 0.1531398947 |
406 | | CDG | 0.100159375 |
407 | | APLD | 0.08036875 |
408 | | CGCO | 0.06859277647 |
409 | | IDID | 0.06826923077 |
410 | | UNIP | 0.06628544444 |
411 | | JBIL | 0.06356648333 |
412 | | WED | 0.062007 |
413 | | PLU | 0.06189338462 |
414 | | MON | 0.06098966667 |
415 | | CRFC | 0.05692222222 |
416 | | ENPH | 0.05678891473 |
417 | +-----+-----+
418 |
419 |
420 | # Average Stock Returns of Companies with Top 15 Revenue Change
421 | select ticker, AverageReturn
422 | from (select ticker, avg(ret) as AverageReturn

```

```

423 |         from sp500stock
424 |         group by ticker
425 |     )
426 |     where ticker = 'AMZN'
427 |     or ticker = 'XOM'
428 |     or ticker = 'CVS'
429 |     or ticker = 'BRK.B'
430 |     or ticker = 'CI'
431 |     or ticker = 'CVX'
432 |     or ticker = 'MPC'
433 |     or ticker = 'COST'
434 |     or ticker = 'MSFT'
435 |     or ticker = 'VLO'
436 |     or ticker = 'PSX'
437 |     or ticker = 'WMT'
438 |     or ticker = 'ELV'
439 |     or ticker = 'TSLA'
440 |     or ticker = 'GE'
441 |     order by AverageReturn desc;
442 |
443 | +-----+-----+
444 | | TICKER | AVERAGEReturn |
445 | |-----+-----|
446 | | TSLA   | 0.04413798667 |
447 | | AMZN   | 0.03540932248 |
448 | | PSX    | 0.02290436634 |
449 | | MPC    | 0.02207619708 |
450 | | MSFT   | 0.0174396371  |
451 | | VLO    | 0.01715080593 |
452 | | CI     | 0.01584789516 |
453 | | COST   | 0.01228168675 |
454 | | CVX    | 0.0110621451  |
455 | | WMT    | 0.009253491935 |
456 | | CVS    | 0.00854620625 |
457 | | XOM    | 0.008294180505 |
458 | | GE     | 0.006896352151 |
459 | | ELV    | 0.00257203876 |
460 | +-----+-----+
461 |
462 | # Amazon's Stock Performance over time
463 | select date, ret
464 | from sp500stock
465 | where ticker = 'AMZN'
466 | order by date asc;

```