CSE 544 Project Final Report
Executive Compensation, Firm's Financial Performance and Market Trends for S&P 500 Companies from 1992-2023

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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 accross 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 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 Snowflake[1]. Once this is installed, open a new terminal and run the following commands,

```
    snowsql -a [account_id] -u [username] # then type your Snowflake password as requested
    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:

```
    CREATE OR REPLACE DATABASE sp500;

    CREATE OR REPLACE TABLE sp500financialratios (
    gvkey INT,
    permno INT,
    adate DATE,
    ...
    TICKER CHAR(5) PRIMARY KEY,
);
```

Then, we exitted 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' exectutives' 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 itself[2]. 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/
[2]Ibid

tasked with evaluating the compensation structure of executives in firms who received TARP assistance[3]. 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 Stuart[4]. 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.

[3]Feinberg, "Office of the Special Master for TARP Executive Compensation."

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

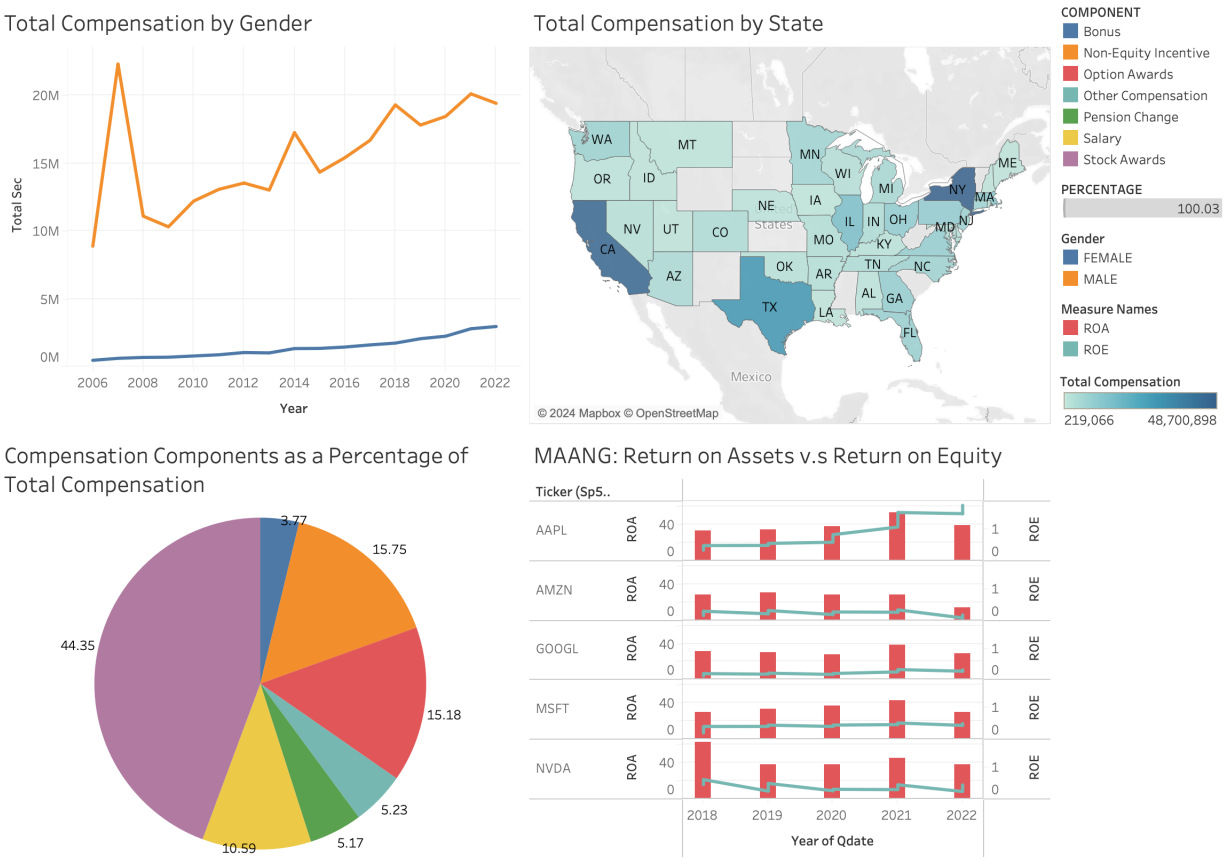

Figure 1: Example of a Tableau dashboard

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 indepedent 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

```
export SNOWSQL_USER="username" # Change to your snowflake username
export SNOWSQL_ACCOUNT="xxxxxxxx" # Change to your snowflake account id (XXXXXXX-XXXXXXXX)
export SNOWSQL_PWD="xxxxxxxx" # Change to your snowflake password
export SNOWSQL_WAREHOUSE="companyceo"
export SNOWSQL_DATABASE="sp500"
export SNOWSQL_SCHEMA="public"

tables=("sp500execucompcpi sp500stock sp500annualfinancial sp500financialratios")
sp500_files_directory=/Users/haivanle/cse544-levh/project/sp500  # Change to the file path holding the sp500.csv files

snowsql -q "Create or replace FILE FORMAT sp500_CSV TYPE = CSV Field_Delimiter = ',' FIELD_OPTIONALLY_ENCLOSED_BY = '\"' escape=none escape_unenclosed_field=none;"

for table in $tables;
do
    snowsql -q "create or replace stage $table;"
    snowsql -q "put file://$sp500_files_directory/$table.csv @$table;"
    snowsql -q "copy into $table from @$table FILE_FORMAT = sp500_CSV;"
done
```

B SQL Queries

```
# Count number of CEOs and CFOs
SELECT
    COUNT(DISTINCT CASE WHEN CEOANN = 'CEO' THEN EXEC_FULLNAME END) AS CEO_Count,
    COUNT(DISTINCT CASE WHEN CFOANN = 'CFO' THEN EXEC_FULLNAME END) AS CFO_Count
FROM sp500execucompcpi;

+-----------+-----------+
| CEO_COUNT | CFO_COUNT |
|-----------+-----------|
|      1686 |      1519 |
+-----------+-----------+

# Count number of firms - missing values for 2 companies
SELECT COUNT(DISTINCT TICKER) AS company_count
FROM sp500execucompcpi;
+---------------+
| COMPANY_COUNT |
|---------------|
```

```
|           498 |
+---------------+

# Report the CEO/CFO compensation package
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:

CREATE OR REPLACE VIEW sp500execucompcpi2 AS
SELECT *
FROM sp500execucompcpi
WHERE aTOTAL_SEC IS NOT NULL;

SELECT
    'Salary' AS Component,
    SUM(aSALARY) / SUM(aTOTAL_SEC) * 100 AS Percentage
FROM
    sp500execucompcpi2

UNION

SELECT
    'Bonus' AS Component,
    SUM(aBONUS) / SUM(aTOTAL_SEC) * 100 AS Percentage
FROM
    sp500execucompcpi2

UNION

SELECT
    'Stock Awards' AS Component,
    SUM(aSTOCK_AWARDS) / SUM(aTOTAL_SEC) * 100 AS Percentage
FROM
    sp500execucompcpi2

UNION

SELECT
    'Option Awards' AS Component,
    SUM(aOPTION_AWARDS) / SUM(aTOTAL_SEC) * 100 AS Percentage
FROM
    sp500execucompcpi2

UNION

SELECT
    'Non-Equity Incentive' AS Component,
    SUM(aNONEQ_INCENT) / SUM(aTOTAL_SEC) * 100 AS Percentage
FROM
    sp500execucompcpi2

UNION

SELECT
    'Pension Change' AS Component,
    SUM(aPENSION_CHG) / SUM(aTOTAL_SEC) * 100 AS Percentage
FROM
    sp500execucompcpi2

UNION

SELECT
    'Other Compensation' AS Component,
    SUM(aOTHCOMP) / SUM(aTOTAL_SEC) * 100 AS Percentage
FROM
    sp500execucompcpi2;
```

```
COMPONENT       PERCENTAGE
Stock Awards    44.350924566
Option Awards   15.176113252
Pension Change  5.173405665
Other Compensation      5.227767323
Non-Equity Incentive    15.751765651
Salary  10.588071214
Bonus   3.766825381

# Top 5 highest paid CEO/CFO
SELECT
    EXEC_FULLNAME,
    CEOANN,
    CFOANN,
    aTOTAL_SEC
FROM sp500execucompcpi
WHERE (CEOANN = 'CEO' OR CFOANN = 'CFO') AND aTOTAL_SEC IS NOT NULL
ORDER BY aTOTAL_SEC DESC
LIMIT 5;

+---------------------------------------+--------+--------+--------------------+
| EXEC_FULLNAME                         | CEOANN | CFOANN |         ATOTAL_SEC |
|---------------------------------------+--------+--------+--------------------|
| Stephen Allen Schwarzman, B.A., M.B.A. | CEO    | NULL   | 11482348.270777    |
| Elon R. Musk                          | CEO    | NULL   |  2771539.79874941  |
| Sundar Pichai                         | CEO    | NULL   |   334455.728329379 |
| Peter Maxwell Kern                    | CEO    | NULL   |   333126.477528132 |
| Patrick W. Smith                      | CEO    | NULL   |   298537.398759971 |
+---------------------------------------+--------+--------+--------------------+

# Gender Pay Gap - Male dominates!
SELECT GENDER, AVG(aTOTAL_SEC) AS AVG_TOTAL_SEC
FROM sp500execucompcpi
GROUP BY GENDER;

+--------+-----------------+
| GENDER |  AVG_TOTAL_SEC |
|--------+-----------------|
| MALE   | 8464.346451396 |
| FEMALE | 6344.796941574 |
+--------+-----------------+

# Effect of Performance on Compensation
SELECT TICKER, AVG(aTOTAL_SEC) AS AVG_TOTAL_SEC
FROM sp500execucompcpi
WHERE aTOTAL_SEC IS NOT NULL
GROUP BY TICKER
ORDER BY AVG_TOTAL_SEC DESC LIMIT 10;

+--------+------------------+
| TICKER |    AVG_TOTAL_SEC |
|--------+------------------|
| BX     | 208366.286916298 |
| META   |  61291.497179888 |
| TSLA   |  47390.617014768 |
| ORCL   |  43466.584229347 |
| AAPL   |  34293.903126547 |
| CMCSA  |  29500.218467519 |
| GOOGL  |  27118.341923596 |
| GS     |  26984.560429475 |
| JPM    |  24088.985595424 |
| FOXA   |  24079.518063575 |
+--------+------------------+

# Effect of Firm Size on Compensation
SELECT TICKER, AVG(aTOTAL_SEC) AS AVG_TOTAL_SEC
FROM sp500execucompcpi
```

```
WHERE aTOTAL_SEC IS NOT NULL
GROUP BY TICKER
ORDER BY AVG_TOTAL_SEC DESC LIMIT 10;

+--------+------------------+
| TICKER |    AVG_TOTAL_SEC |
|--------+------------------|
| BX     | 208366.286916298 |
| META   |  61291.497179888 |
| TSLA   |  47390.617014768 |
| ORCL   |  43466.584229347 |
| AAPL   |  34293.903126547 |
| CMCSA  |  29500.218467519 |
| GOOGL  |  27118.341923596 |
| GS     |  26984.560429475 |
| JPM    |  24088.985595424 |
| FOXA   |  24079.518063575 |
+--------+------------------+

# Effect of Tenure on Compensation
WITH TenureCalculation AS (
    SELECT EXEC_FULLNAME,
           DATEDIFF(YEAR, JOINED_CO, CURRENT_DATE) AS TENURE,
           MAX(aTOTAL_SEC) AS MAX_TOTAL_SEC
    FROM sp500execucompcpi
    WHERE aTOTAL_SEC IS NOT NULL
    GROUP BY EXEC_FULLNAME, TENURE
)
SELECT EXEC_FULLNAME,
       TENURE,
       MAX_TOTAL_SEC AS aTOTAL_SEC
FROM TenureCalculation
WHERE TENURE IS NOT NULL
ORDER BY TENURE DESC
LIMIT 10;

+---------------------------+--------+-----------------+
| EXEC_FULLNAME             | TENURE |      ATOTAL_SEC |
|---------------------------+--------+-----------------|
| Earl E. Congdon           |     75 |  8939.061916212 |
| John R. Congdon, Sr.      |     73 |  1348.789321671 |
| David W. Grainger         |     72 |  1344.958566158 |
| Raymond B. Plank          |     70 | 36655.9160498   |
| Phupinder S. Gill         |     69 | 10664.86834534  |
| John Willard Marriott, Jr. |     68 | 19039.050551667 |
| Richard A. Manoogian      |     66 | 26137.106312946 |
| Leland E. Tollett         |     65 |  8290.891450526 |
| Reuben Mark               |     61 | 35160.66106994  |
| Eugene R. McGrath         |     61 | 19306.363077083 |
+---------------------------+--------+-----------------+

# Effect of Company Headquarter on Compensation
SELECT CITY, AVG(aTOTAL_SEC) AS AVG_TOTAL_COMPENSATION
     FROM sp500execucompcpi
     WHERE aTOTAL_SEC IS NOT NULL
     GROUP BY CITY
     ORDER BY AVG_TOTAL_COMPENSATION DESC LIMIT 10;

+---------------+-------------------------+
| CITY          | AVG_TOTAL_COMPENSATION |
|---------------+-------------------------|
| Cupertino     |        34293.903126547 |
| Menlo Park    |        29970.115165441 |
| Austin        |        23949.820900303 |
| Bentonville   |        20409.972554462 |
| Mountain View |        19369.461387281 |
| Tarrytown     |        18421.226864601 |
| Burbank       |        18063.803095246 |
```

```
| New York      |        17655.032480459 |
| Philadelphia  |        17267.460381994 |
| Redmond       |        16731.953767067 |
+---------------+------------------------+
```

```
WITH PreviousRevenue AS (
    SELECT
        f1.TICKER,
        f1.datadate AS Date,
        MAX(f2.revt) AS PrevRevenue
    FROM
        sp500annualfinancial f1
    JOIN
        sp500annualfinancial f2 ON f1.TICKER = f2.TICKER
                                AND f2.datadate < f1.datadate
                                AND DATEDIFF(YEAR, f2.datadate, f1.datadate) <= 10
    GROUP BY
        f1.TICKER,
        f1.datadate
),
RevenueChanges AS (
    SELECT
        e.CONAME AS CompanyName,
        f.TICKER AS Ticker,
        f.datadate AS Date,
        f.revt AS Revenue,
        pr.PrevRevenue,
        (f.revt - pr.PrevRevenue) AS RevenueChange,
        e.INDDESC AS Industry,
        RANK() OVER (ORDER BY ABS(f.revt - pr.PrevRevenue) DESC) AS Rank
    FROM
        sp500annualfinancial f
    JOIN
        sp500execucomp e ON f.TICKER = e.TICKER
    JOIN
        sp500stock s ON f.TICKER = s.TICKER
    JOIN
        PreviousRevenue pr ON f.TICKER = pr.TICKER AND f.datadate = pr.Date
)
SELECT
    CompanyName,
    Ticker,
    Industry,
    RevenueChange
FROM
    RevenueChanges
WHERE
    Rank <= 15
ORDER BY
    RevenueChange DESC;
```

```
 COMPANYNAME              | TICKER | INDUSTRY                                | REVENUECHANGE |
|-------------------------+--------+-----------------------------------------+---------------|
| AMAZON.COM INC          | AMZN   | Broadline Retail                        |    424995     |
| EXXON MOBIL CORP        | XOM    | Integrated Oil & Gas                    |    220101     |
| CVS HEALTH CORP         | CVS    | Health Care Services                    |    183100     |
| BERKSHIRE HATHAWAY      | BRK.B  | Multi-Sector Holdings                   |    160958     |
| CIGNA GROUP (THE)       | CI     | Health Care Services                    |    145233     |
| CHEVRON CORP            | CVX    | Integrated Oil & Gas                    |    141246     |
| MARATHON PETROLEUM CORP | MPC    | Oil & Gas Refining & Marketing          |    121620     |
| COSTCO WHOLESALE CORP   | COST   | Consumer Staples Merchandise Retail     |    114314     |
| MICROSOFT CORP          | MSFT   | Systems Software                        |    112950     |
| VALERO ENERGY CORP      | VLO    | Oil & Gas Refining & Marketing          |    111074     |
| PHILLIPS 66             | PSX    | Oil & Gas Refining & Marketing          |    105861     |
| WALMART INC             | WMT    | Consumer Staples Merchandise Retail     |     90000     |
| ELEVANCE HEALTH INC     | ELV    | Managed Health Care                     |     82763.9   |
| TESLA INC               | TSLA   | Automobile Manufacturers                |    78263.644  |
| GENERAL ELECTRIC CO     | GE     | Industrial Conglomerates                |     71960     |
+-------------------------+--------+-----------------------------------------+---------------
```

```
WITH IndustryMaxCashRatio AS (
    SELECT
        e.INDDESC AS Industry,
        MAX(fr.cash_ratio) AS CashRatio
    FROM
        sp500financialratios fr
    JOIN
        sp500execucomp e ON fr.TICKER = e.TICKER
    WHERE
        e.INDDESC IS NOT NULL
        AND fr.cash_ratio IS NOT NULL
    GROUP BY
        e.INDDESC
)
SELECT
    Industry,
    CashRatio
FROM
    IndustryMaxCashRatio
ORDER BY
    CashRatio DESC
LIMIT 15;

+---------------------------------------+-----------+
| INDUSTRY                              | CASHRATIO |
|---------------------------------------+-----------|
| Life Sciences Tools & Services        |    42.309 |
| Biotechnology                         |    36.884 |
| Communications Equipment              |    19.746 |
| Health Care Equipment                 |    17.237 |
| Broadline Retail                      |     8.981 |
| Semiconductors                        |     8.93  |
| Casinos & Gaming                      |     6.609 |
| Soft Drinks & Non-alcoholic Beverages |     5.69  |
| Aerospace & Defense                   |     5.475 |
| Automotive Retail                     |     5.2   |
| Systems Software                      |     4.067 |
| Semiconductor Materials & Equipment   |     3.913 |
| Telecom Tower REITs                   |     3.527 |
| Application Software                  |     3.166 |
| Restaurants                           |     3     |
+---------------------------------------+-----------+
WITH SectorPerformance AS (
    SELECT
        e.INDDESC AS Sector,
        AVG(s.RET) AS AverageReturn,
        STDDEV(s.RET) AS Volatility
    FROM
        sp500stock s
    JOIN
        sp500execucomp e ON s.TICKER = e.TICKER
    GROUP BY
        e.INDDESC
)
SELECT
    Sector,
    AverageReturn,
    Volatility,
    CASE
        WHEN top_rank <= 10 THEN 'Top 10'
        WHEN bottom_rank <= 10 THEN 'Last 10'
    END AS RankCategory
FROM
    (
    SELECT
        Sector,
        AverageReturn,
        Volatility,
```

```
        ROW_NUMBER() OVER (ORDER BY AverageReturn DESC) AS top_rank,
        ROW_NUMBER() OVER (ORDER BY AverageReturn ASC) AS bottom_rank
    FROM
        SectorPerformance
    )
WHERE
    top_rank <= 10 OR bottom_rank <= 10
ORDER BY
    top_rank, bottom_rank;
```

SECTOR	AVERAGERETURN	VOLATILITY	RANKCATEGORY
Broadline Retail	0.02860680706	0.1590272042	Top 10
Biotechnology	0.0261202536	0.2153082009	Top 10
Construction & Engineering	0.02437436418	0.1566835299	Top 10
Telecom Tower REITs	0.02350166289	0.1392367844	Top 10
Technology Distributors	0.02320285088	0.06861273802	Top 10
Semiconductor Materials & Equipment	0.02267948506	0.144592587	Top 10
Electronic Manufacturing Services	0.02099521933	0.1683639345	Top 10
Semiconductors	0.02099093244	0.1406800602	Top 10
Wireless Telecommunication Services	0.02084687069	0.07355947311	Top 10
Fertilizers & Agricultural Chemicals	0.02037557143	0.07383022981	Top 10
Household Products	0.008713526882	0.05434554965	Last 10
Cable & Satellite	0.008462287185	0.1204683746	Last 10
Electric Utilities	0.008038404181	0.08544437955	Last 10
Broadcasting	0.00727979646	0.0778783228	Last 10
Integrated Telecommunication Services	0.005116378433	0.0666943369	Last 10
Managed Health Care	0.00257203876	0.04743126895	Last 10
Multi-line Insurance	0.002003157895	0.09003855679	Last 10
Drug Retail	-0.0006872164948	0.07941953627	Last 10
Passenger Ground Transportation	-0.002410953488	0.1376272127	Last 10
Health Care REITs	-0.0220455	0.1804937964	Last 10

```
# Top 15 Performing Companies Based on Average Stock Returns
select ticker, AverageReturn
from (select ticker, avg(ret) as AverageReturn
      from sp500stock
      group by ticker
      order by AverageReturn desc)
where AverageReturn is not null
limit 15;
```

TICKER	AVERAGERETURN
PITLF	0.259139
WAND	0.1902001875
RIGX	0.1580591667
MGCX	0.1531398947
CDG	0.100159375
APLD	0.08036875
CGCO	0.06859277647
IDID	0.06826923077
UNIP	0.06628544444
JBIL	0.06356648333
WED	0.062007
PLU	0.06189338462
MON	0.06098966667
CRFC	0.05692222222
ENPH	0.05678891473

```
# Average Stock Returns of Companies with Top 15 Revenue Change
select ticker, AverageReturn
from (select ticker, avg(ret) as AverageReturn
```

```
      from sp500stock
      group by ticker
)
where ticker = 'AMZN'
or ticker = 'XOM'
or ticker = 'CVS'
or ticker = 'BRK.B'
or ticker = 'CI'
or ticker = 'CVX'
or ticker = 'MPC'
or ticker = 'COST'
or ticker = 'MSFT'
or ticker = 'VLO'
or ticker = 'PSX'
or ticker = 'WMT'
or ticker = 'ELV'
or ticker = 'TSLA'
or ticker = 'GE'
order by AverageReturn desc;

+--------+----------------+
| TICKER |  AVERAGERETURN |
|--------+----------------|
| TSLA   | 0.04413798667  |
| AMZN   | 0.03540932248  |
| PSX    | 0.02290436634  |
| MPC    | 0.02207619708  |
| MSFT   | 0.0174396371   |
| VLO    | 0.01715080593  |
| CI     | 0.01584789516  |
| COST   | 0.01228168675  |
| CVX    | 0.0110621451   |
| WMT    | 0.009253491935 |
| CVS    | 0.00854620625  |
| XOM    | 0.008294180505 |
| GE     | 0.006896352151 |
| ELV    | 0.00257203876  |
+--------+----------------+

# Amazon's Stock Performance over time
select date, ret
from sp500stock
where ticker = 'AMZN'
order by date asc;
```