

FinTech Project

CEO Compensation and Stock Prices

Project G7

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Project Overview

- Project evaluated the correlation between executive compensation and stock price performance
- Team developed an interest in evaluating executive compensation when considering career paths in FinTech and comparing paths with finance versus technology companies
- We analyzed these questions to our satisfaction thanks to the strong teamwork of the G7 team
- In summary, the team discovered that executive compensation is correlated with stock price future performance - interestingly; based on direct salary, compensation for finance firms is at a much higher disparity to performance vs that of technology firms

Questions to solve in this study

- Does CEO **compensation** have a direct relationship with future stock performance ?
- Does CEO **tenure** have a direct relationship with future stock performance ?
- Does CEO **approval rate** by the board have a direct relationship with future stock performance ?
- Does CEO **ownership** have a direct relationship with future stock performance ?

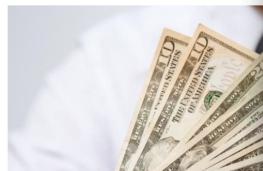
Does research support the relationship?

3,765 views | Aug 1, 2016, 11:43am

Time To Rethink CEO Compensation: Those With Higher Pay And Equity Lead Worse-Performing Companies



Monica Wang Contributor @ Leadership
I write about dimensions of leader



Executive Compensation

Number of pages: 91 • Posted: 19 May 1999

Kevin J. Murphy

University of Southern California - Marshall School of Business

CEO Incentives: It's Not How Much You Pay, But How

Michael C. Jensen, FOUNDATIONS OF ORGANIZATIONAL STRATEGY, Harvard University Review, No. 3, May-June 1990

Number of pages: 36 • Posted: 12 Apr 1999

Michael C. Jensen and Kevin J. Murphy

Harvard Business School and University of Southern California - Marshall School of Business

There are 2 versions of this paper

CEO Compensation

Carola Frydman¹ Dirk Jenter²

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²Graduate School of Business, Stanford University, Stanford, California 94305; email: djenter@stanford.edu

sections

On Leadership • Analysis

The Washington Post
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A new report suggests a fundamental idea behind CEO pay could be 'broken'



Incentive Compensation for Outside Directors and CEO Turnover

Presented at Tuck-JFE Contemporary Corporate Governance Conference

Number of pages: 36 • Posted: 24 Jul 2000

Tod Perry

Indiana University - Kelley School of Business - Department of Finance

Keywords: Board of Directors, Director Compensation, CEO turnover

CEO Compensation

Rock Center for Corporate Governance at Stanford University

Number of pages: 42 • Posted: 01 Apr 2010 • Last

Carola Frydman and Dirk Jenter

Northwestern University and London School of Economics & Political Science (LSE) - Department of Finance

There are 4 versions of this paper

Keywords: Executive compensation, managerial incentives, incentive compensation, equity compensation, option ...

Academic research and news identify strong relationship between CEO compensation and stock price performance

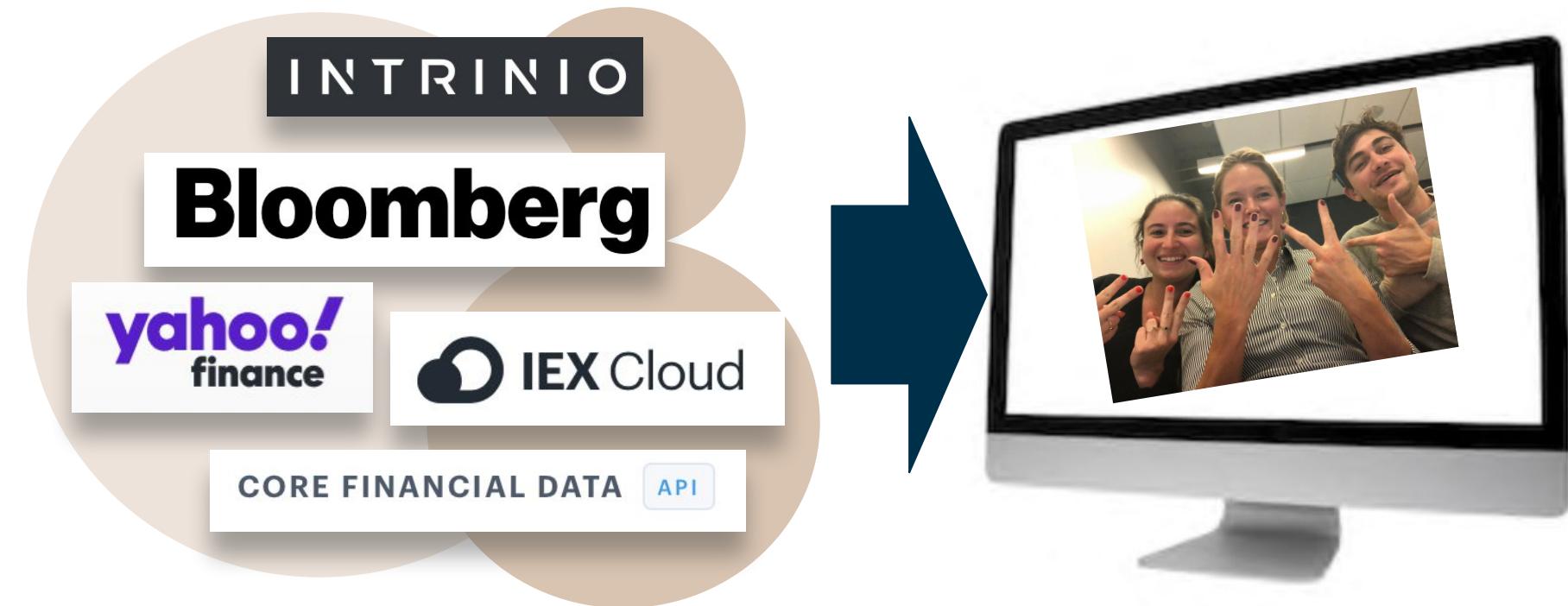
Data Aggregation Challenges

Initial API Attempts Posed Several Challenges

- Team was used to having access to meaningful data (often paid for by our employers)
- Majority of free data available was limited to a small sample set or a shortened time frame
- Free APIs restricted the number of requests an individual could extract



Data Findings



Data Exploration

Utilized two primary universes: Financial Firms (XLF) and Technology Firms (XLK) constituents:

Financial Firms (XLF)

WELLS FARGO

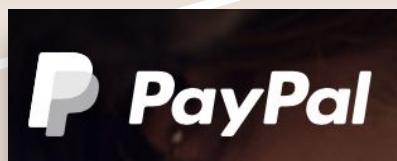
BB&T

JPMORGAN CHASE & Co.

CapitalOne®

BlackRock®

Technology Firms (XLK)

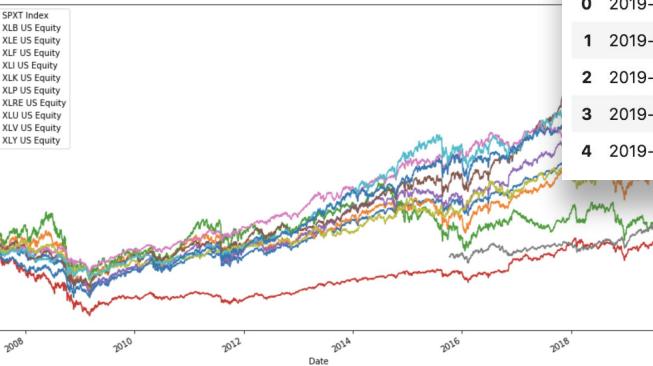


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Data Exploration Continued, and Cleanup

```
# Reading price data for financial stocks
temp_csv = Path("Resources/price_fin.csv")
price_fin=pd.read_csv(temp_csv)
price_fin.set_index(pd.to_datetime(price_fin['Date']))
price_fin.drop(columns=['Date'], inplace=True)
price_fin.head(3)
```

```
cumulative_returns_sector = (1 + ret_sector).cumprod()
cumulative_returns_sector.head()
cumulative_returns_sector.plot(figsize=(15,8))
<matplotlib.axes._subplots.AxesSubplot at 0x108a7d550>
```



```
# Return available tickers from API
tickers=pd.DataFrame(get_symbols())
tickers.head()
```

| | date | ieId | isEnabled | name symbol type | | |
|---|------------|-------|-----------|---------------------------|--------------------|------------------|
| 0 | 2019-06-11 | 2 | True | Agilent Technologies Inc. | A | cs |
| 1 | 2019-06-11 | 12042 | True | Alcoa Corporation | AA | cs |
| 2 | 2019-06-11 | 14924 | True | Pert | BRK/B US Equity | JPM US Equity |
| 3 | 2019-06-11 | 7653 | True | | BAC US Equity | |
| 4 | 2019-06-11 | 9169 | True | Date | | |

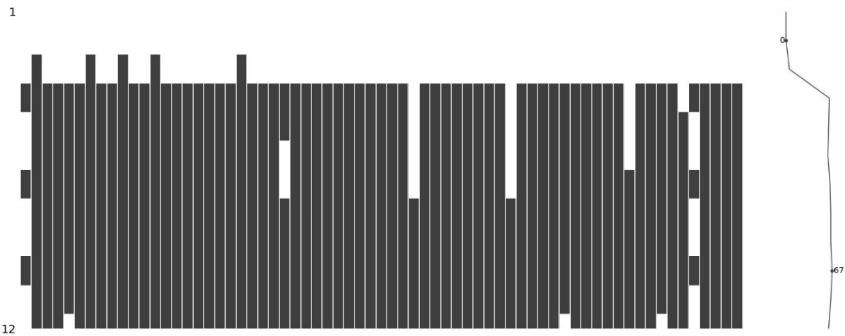
```
# Reading approval rate of CEO for financial stocks
temp_csv = Path("Resources/approval_fin.csv")
data1_fin=pd.read_csv(temp_csv)
data1_fin.set_index(pd.to_datetime(data1_fin['Date']), infer_dtypes=True)
data1_fin.drop(columns=['Date'], inplace=True)
data1_fin.dropna(how='all')
```

| | WFC US Equity | C US Equity | AXP US Equity | USB US Equity | CME US Equity | CB US Equity | GS US Equity |
|------------|------------------|----------------|------------------|------------------|------------------|-----------------|-----------------|
| 2007-01-03 | 72.86 | 35.0145 | 42.2129 | 25.2949 | 464.3320 | 49.0104 | 25.9003 |
| 2007-01-04 | 72.20 | 35.1019 | 42.4820 | 25.3374 | 462.7352 | 48.6532 | 25.9218 |
| 2007-01-05 | 71.56 | 34.8105 | 42.1417 | 25.1958 | 460.2980 | 48.0117 | 25.6139 |

Data Cleaning - missingno

We used a new package in order to inspect the data

- It highlights missing data from the dataframes
- Example of the output below



Markdown Example

Preview README.md

2. Process, Cleaning & Renaming

Process

Inorder to gather the necessary data to perform meaningful analysis and adhere to the requirement we used the CSV files listed below and created them into DataFrames. As we initially ran into some problems obtaining data from online APIs. Although we were able to access IEX Cloud for financial data, it limited us to the last 5 years. To solve this problem we gained access to a Bloomberg Terminal and were able to pull data going back 12 years to 2007. From this data source we were able to pull:

- Stock prices of all the stocks in XLF and XLK
- The market cap of the stock
- CEO compensation dating back to 2007
- Shares owned by the CEO
- Approval of the board over the timeframe

After obtaining the data, the first step was cleaning the data. Loading in the csv documents, we initially changed the date to the index and later dropped the column for "Date". By doing this for all the datasets we could use the DateTimeIndex as the universal index throughout the data. Please note that the dataframes are not from the same length.

Using a new package called Missingno, we were able to visualize what data we were missing. This new package will read through our dataframe and let us know what data was NaN or unavailable, allowing us to see where our data was most reliable and where it was not.

Using this new package, we were able to clean our data by removing all the rows with NaN values.

On top of checking the holdings of XLF and XLK for their performance over the timeframe, we were able to check the performance of each sector of the US economy.

- Relevant Libraries
- CSV Files
- Data Clean-up

3. Insights

Research Findings Support Correlation

Time To Rethink CEO

CEO Compensation

The Washington Post

On Leadership • Analysis

3,760 views | Aug 1, 2016, 11:43am

<https://github.com/KeepItOnTheDownload/FinTech-Group-Project/blob/master/README.md>

Analysis Process

When evaluating the datasets, the team utilized the following process:

- Created dataframes of the financial and technology firms
- Built dataframes of compensation data and stock prices
- Utilized Pandas to scrape and clean the data
- Designed visualizations and charts to understand relationships and observe trends

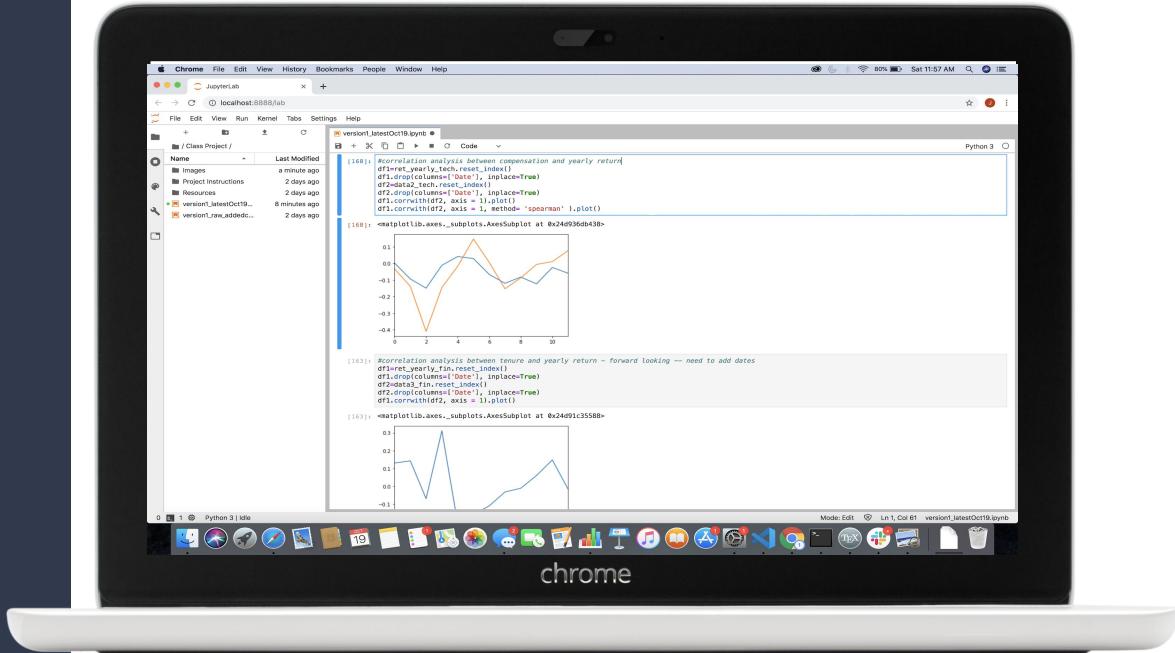
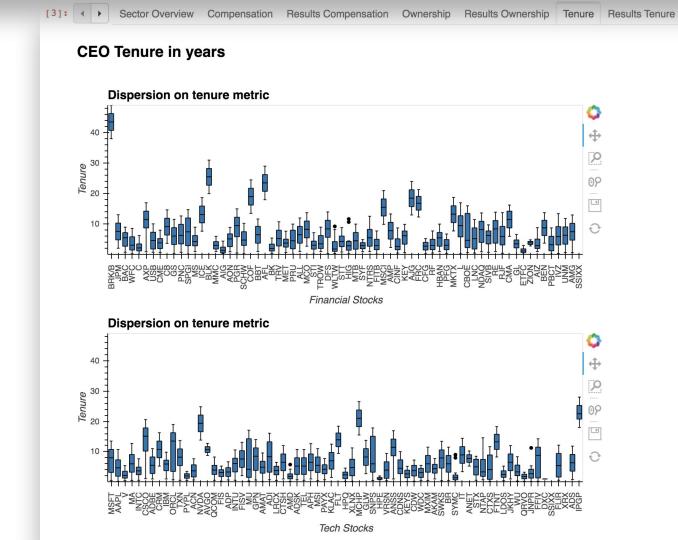
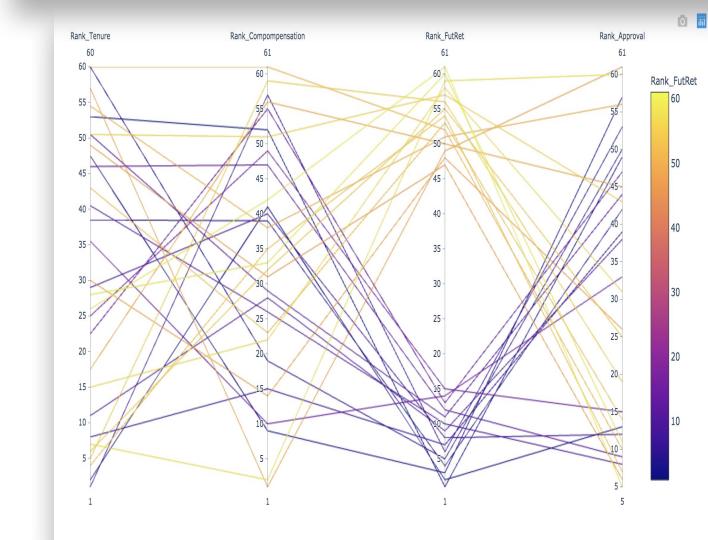


Chart Visualizations in Jupyter Notebooks

Dashboard Example



Interactive Chart Example

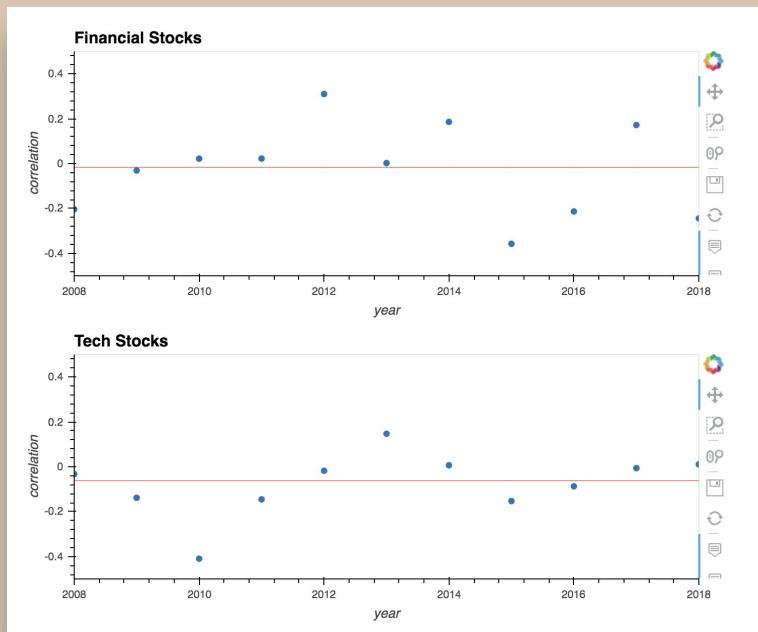


Demo Jupyter Notebook

Correlation between Compensation and Stock Price Performance

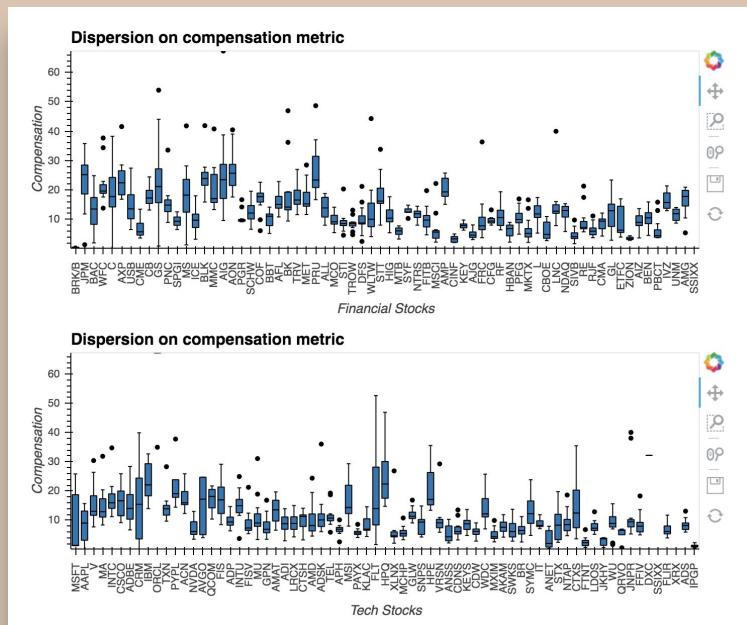
Correlation between CEO Compensation and Future Stock Returns

Tech stocks showed a net negative correlation, whereas Financial stocks showed zero correlation



CEO Compensation in Millions (USD)

Financial firms show greater dispersion between compensation and price vs that of technology companies



Key Takeaways from Analysis

CEO Compensation and Correlations to Stock Price:

- We expected to find stronger correlations between compensation and stock price performance, and were surprised by the disparity of the results
- Varying structures in compensation (stock vs cash) as well as timing may impact the correlation calculations
- With incremental time, we would like to continue to analyze the details between the two dataframes to understand key drivers of correlation

Overall Project Takeaways:

- Finding free quality data in sufficient quantities via APIs is challenging
- Python data frames and libraries make analysis much faster to execute vs Excel
- Interactive charts in Python enable you to form and test a hypothesis quickly
- Teamwork is the best work!



Considerations

Likely potential bias in dataset:

- Companies selected for analysis (large corporates with available stock price and compensation data) likely have robust board control and tightly controlled compensation rules
- As a result, the fact that compensation is highly correlated with stock price makes sense, as a tightly controlled company that is not performing well for shareholders will, hopefully, pay the CEO to directly correlate with the negative stock performance
- The team observed that companies that have had CEOs paid millions despite long-term negative stock performance are likely not included in this dataset
- For example, GE sold off the capital division and as a result, would not be included in the Financials selected for this analysis

THE WALL STREET JOURNAL.

The best performers got big pay and big raises last year, but the laggards didn't do much worse. Complex arrangements to tie compensation to company results keep coming up short.

By *Theo Francis and Vanessa Fuhrmans*
Updated May 17, 2019 5:11 pm ET

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The mechanics of chief-executive pay have grown ever more complex, but the rules remain simple: Strong performers get a raise. So do most of the rest.

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By *Anders Melin and Rick Clough*
March 12, 2018, 4:51 PM EDT Updated on March 12, 2018, 6:22 PM EDT

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Questions?

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