Visualizing the Investing of US Congressional Officials

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Abstract

This data visualization project deals with the controversy over stock trading in Congress which has been a hot topic over the past year or so. Members of Congress are required to publicly disclose any trades they make so as to not violate insider trading laws. However, much of this data is not easily readable by the average retail investor. The goal of the project is to present this information in the most transparent way possible to retail investors.

Link to GitHub Repository: https://github.com/DS4200-S22/final-project-visualizing-congress-stock-trading

1 Introduction

Members of the United States Congress have both power over legislation that affects the financial markets, as well as early access to information that impacts the markets. Members of Congress are required to disclose any trades they make to prevent insider trading based on this information. In recent months, there has been much controversy regarding Congresspeople either not disclosing their positions or having made trades that blatantly took advantage of early access to material information, and there has been a bill proposed to ban members of Congress from trading. We would like to create data visualizations that communicate the extent to which regulations are violated and the success these investments have compared to the returns of average investors.

2 Related Work

Given the current prevalence of this topic in the news, and the concerns of corruption that have existed for many years, there are many articles which focus on our project topic.

1. https://www.sciencedirect.com/science/article/pii/S0047272722000044

This source gives valuable background information to better understand our topic as well as guidance on how to work with the same data.

2. https://senatestockwatcher.com/ https://housestockwatcher.com/summary_by_rep/Hon.%20Nancy%20Pelosi

This is a data visualization tool similar to what we are building that we can draw inspiration from.

3. https://www.opensecrets.org/personal-finances

Open Secrets is a website which "follows the money in Congress." As its name suggests, the website lists the net worth, assets, and outside sources of income of members of our Congress.

4. https://www.businessinsider.com/congress-most-popular-stocks-members-investing-2021-12

This article discusses the general topic of our project and includes a visualization of which stocks are the most popular among Congresspeople. This visualization is interactive and displays both ownership information and special notes for stocks being hovered over.

5. https://www.nytimes.com/2022/01/24/briefing/congress-stock-investments-profits.html

Since Congressional investing has been a prominent news story recently, this article discusses some major conflicts of interest that have garnered attention recently as well as current sentiment for what should be done about the issue.

6. https://money.usnews.com/investing/stock-market-news/articles/tracking-congressional-stock-trades-what-are-congress-members-trading

An article from last year, this discusses the STOCK Act and how it has been enforced over recent years. Additionally, major transaction from early 2021 are listed as long bullet points - reemphasizing the need to visualizations to make this information more approachable.

Given all of these sources provide different perspectives a and a variety of approaches to communicating the information in the scope out this project. However, we noticed a distinct lack of visualizations across a majority of relevant sources. This is crucial to the use case of our project as it demonstrates a lack of approachability for this information. The Business Insider Article gave the most inspiration for how to approach one visualization. The website is embedded with an interacted bubble chart which is sized based on the number of Congresspeople who own a given security.

3 Use Case

The two main uses cases for this would be to give retail investors a clear view of Congressional trading activity and to highlight the corruption involved in elected official making independent investing decisions.

The former of these two use cases focuses on the democratization of financial markets, which has become a popular movement in recent years. While there is plenty of secrecy in competitive markets, it goes against the principles of our government for our representatives to profit from secretive information. The disclosures of what Senators and Representatives trade are public record, but a minority of people know about them or take the time to read them. Increasing the awareness and readability of the disclosures would give the average American more access to the advantages held by elected officials. A user could see what any given Congressperson disclosed to the public in real time, as well as the impact the disclosure has on the involved securities.

While following these trades could lead to returns, a more valuable use case might be to highlight the flaws of our government officials engaging in these trades and pressuring regulatory change. At the moment, large pools of money follow the investments of prolific traders within Congress and actually have the capability to move markets temporarily. If this continues to happen and expands to the average investor, it would force a change to be made in how political insider trading is controlled. This would be easy to visualize in individual cases, and would involve plotting where a given official's trade took place on a time-series price chart for a stock.

4 Data

The most important data source for the project will be the official disclosures made my members of Congress. These contain

historical reports that will need to be scraped for meaningful data. Each of the pages that exist on these website is an individual disclosure in which an elected official reported a trade (or set of trades) they had recently made. I'll be able to scrape the websites with Python to compile a dataset of all the disclosures on the website. Additional sources will be needed to put these trades into perspective. General financial data will be taken from Yahoo Finance for seeing historical market prices. Yahoo Finance is free to use and completely reputable, so it will be used for any situation in which price quotes are needed for a given security and date. Another reference which will be used more sparingly and less as data is the official congressional record. This will be used to contextualize when information relevant to some trades become public information. Most likely, this will be able to show special cases of trading that was done on information before it was made official (example: members of Congress buying Pfizer stock before the announcement that it was going to receive FDA approval).

5 Task Analysis

#	Domain Task	Analyze Task (high-level)	Search Task (mid-level)	Analytical Task (low-level, "query")
1	We want to visualize the timing between trades made by members of Congress and newsworthy events (namely COVID and the Russian Invasion of Ukraine) to expose potential corruption.	Consume → Present	Lookup	Compare
2	We want to show which members of Congress trade the most frequently and with the most volume.	Consume → Discover	Lookup	Identify
3	We want to compare trends in trading habits of Congresspeople to that of total market volatility and volume.	Consume → Discover	Locate	Compare
4	We want to find the most popular stocks among Congress people and compare their returns to average returns of the market.	Produce → Derive	Locate	Identify

From our initial ideation and interviews, we've decided that the primary consumer of our visualization will be an average retail investor.

Our visualization will primarily focus on the "Discover" type of consumption. We want to discover trends and indicators that can give us more transparency and insight into what Congress members trade, when they trade, and if there are signs of corruption in their trades.

6 Implementation Plan

The visual encodings we will be using include line charts, bar charts, and pie charts all customizable to the user's preference. The positioning of the charts is included above in the design sketch. We chose that positioning because it shows the most generic relevant information first, front and center, and then moves into smaller breakdowns in the other charts. As for interactions, we will use brushing and linking to select members of congress in the section showing trading amounts by Congress members within the bar charts so that users can see how much they contributed to a certain trading volume on the bar chart. Each chart will have filtering to compare any number of congress members or all of Congress as a whole to certain indices, the S&P 500, or ETFs as we determine them fit to compare against. The zoom feature will just be to select certain years of the time-oriented charts. Some "nice to have" items will be annotation boxes for data that users select and information on congress members like their state and district when they are clicked on.

As for the implementation, we still plan on using the tools we have learned about in class such as D3, HTML, CSS, and JavaScript. We do not need to connect any APIs to collect data as we have our dataset as a .csv file which is very easy to work with. It will be a challenge to set up the graphs to be highly customized by the user, but that will just be math formulas that we will need to create- a challenge we are looking forward to. We do not anticipate needing to set up an additional server besides a local host on our computers.

7 Visualization Design

Our final visualization will be a dashboard that gives the most relevant information to understand trading done by members of Congress. The primary overview will be given through a tree map of Congress's largest holdings. Tree maps are generally used to display information about a grouping of stocks – mainly their weight and recent performance. Weight is represented by box size and performance is shown through color (red/green). These channels will be important for displaying what is unique about Congress's holdings. This will allow the user to see abnormal over-weighting in stocks which have significantly outperformed over recent years, as well as a general pattern of positive performance from stocks held by Congressmembers. Another important note on this chart is that it will be used to filter other charts in the dashboard. This means that selecting a stock from the tree map will adjust the other charts to only display data for the selected stock. Allowing this selection to be made will allow the user to investigate individual securities and better understand how members of Congress invest.

The next chart a user will see – and the other chart currently made statically in our GitHub page – is a horizontal bar chart of the most prolific traders within Congress. The "Top Traders" chart is a relatively simple concept but satisfies the important need of identifying which elected officials are the most active in financial markets. It may be shocking for a user to see just how much wealth that some Congress members (who have salaries below $200,000) such as Rick Scott and Nancy Pelosi have over $100 million of net worth, much of which is actively traded. Once again, the contents of this chart will be filtered based on the selections made in the tree map. Selecting $AAPL in the first visualization will display which members of Congress have traded the most Apple stock.

Another chart that will change in parallel to the "Top Traders" visual will be our time series of "Trade Volume Over Time". While we do not have a static version of this developed yet, it will display patterns of market-wide trade volume compared to trading activity from members of Congress. Additionally, we will add marks for important events that spurred major volatility and trading activity. The key takeaway from this visualization will be

the edge Congress has in preempting these events, as its members often receive classified information before the American public.

Combined, we believe that these charts will give a full overview of how elected officials of the United States take advantage of their positions to outperform the stock market. This is a major area of contention and corruption that we hope to shine a light on with our visualizations.

References

[1] A. Wang. These are the 50 top stocks that members of Congress own. *Business Insider,* 2021.

[2] D. Leonhardt. Personal Profit in Congress. *The New York Times,* 2022.

[3] *House stock watcher - see what representatives are trading*. House of Representatives Stock Watcher - See What Representatives are Trading. (n.d.). 2022.

[4] J. Divine. What Are Congress Members Trading? *US News,* 2021.

[5] *Personal finances*. OpenSecrets. (n.d.). 2022.

[6] *Senate stock watcher - see what senators are trading*. Senate Stock Watcher - See What Senators are Trading. (n.d.). 2022.

[7] W. Belmont. Do senators and house members beat the stock market? Evidence from the STOCK Act. *Journal of Public Economics,* 2022. ISSN 0047-2727.

Appendix A: Group Charter

1 Group Purpose

To complete our DS4200 Final Project and create visualizations that show how elected officials invest in publicly traded securities.

2 Group Goals

We are not explicitly concerned with a specific grade. Our goal is to get a "good" grade on our DS4200 Final Project. More specifically, we hope to accomplish all of the requirements to the highest quality in a way that accommodates all of our expectations and commitment levels.

3 Group Member Roles and Responsibilities

Generally, we are all competent and comfortable working together and collaborating on most tasks (As far as facilitating meetings, communication, and management). However, Matt and Nikola are significantly more familiar with the data-science aspect (cleaning/compiling) of this project while Josh is more familiar with the d3/JavaScript implementation. Therefore, it is important that we utilize each other's skills to maximize our work efficiency.

4 Ground Rules

Generally, our group will meet whenever there is a project milestone due. Because we are all very used to and familiar with group work online, we will be using Zoom. As far as general ground rules go: it is important that everyone does their part or informs other group members if they are not able to accomplish their part on time. Our expectations for one another are to complete the project in a way that is respectful of everyone's time and expectations of what the project will be. We do not expect any strict participation or commitment to this project as long as the project is completed. If there are dissenting views, we can discuss the best course of action as a group. The expectation is that we will not need to hold each other accountable as long as we have good communication regarding our share of work.

5 Potential Barriers and Coping Strategies

A potential barrier to effective group work might be the fact that it is difficult to manage times to work together while in a group of three. Everyone has schedules that may change and circumstances come up where a group member may not be able to meet. A potential workaround is to have members work on some of the project on their own and articulate their work once it is combined with the overall project.

A previous group dynamic that we have all experienced in the past is a member not doing enough work. To ensure that this is handled and is not a problem for our group, we have decided to come to the understanding that there must be an equitable amount of work done by all members. This means going over the description and questions as a team and catering specific work towards those who have strengths in that area and maximizing everyone's time to complete the project as efficiently as possible.

6 Project Midpoint Questionnaire

Have you all been abiding by your agreed-upon guidelines?

Yes, every member of the group has been abiding by our guidelines. We have met each week over Zoom prior to project milestones. Additionally, each group member has contributed their fair share within appropriate deadlines and has been communicative about the status of their work.

Do you all feel comfortable with the group roles?

Yes, our group roles are not set and stone and vary each week based on open discussion. We know each other's strengths and weaknesses, which are taken into consideration for each milestone. When work is divided up it is done so based on everybody's thoughts on who is best suited for each task.

Are there any problems you need to troubleshoot, and if so how can you address them?

No, we currently have no notable problems as a group.

A positive note from each group member:

- Gary: I appreciate how Matt puts together all the work neatly into the working document and formats it super well. I know it is not easy, but he has put together perfect work every milestone thus far.
- Josh: I appreciate how everyone is able to find what they need to do and efficiently work on their own tasks without much issue. I think the group dynamic is good and everyone is contributing their fair share.
- Shane: I appreciate our group dynamic and how smoothly we are able to get through work together.
- Matt: I appreciate the hard-work contributed by each group member. I feel like we have a good rhythm of work going at this point and all get our fair share done.
- Nikola: I appreciate everyone being able to split up work effectively and get their part done independently and well.

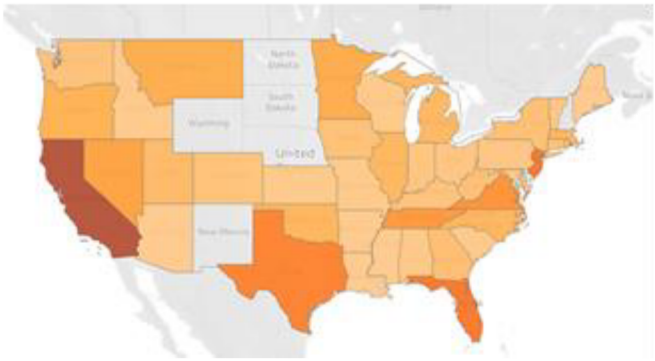
Appendix B: Data Exploration

1 Data Review

Each item is a disclosure that represents a transaction. There are no unique identifiers within the original dataset to differentiate between items. The attributes are 'disclosure year', 'disclosure date', 'transaction date', 'owner', 'ticker', 'asset_description', 'type', 'amount', 'representative', 'district', 'ptr_link', 'cap_gains_over_200_usd'.

The measures of dates, including 'disclosure year', 'disclosure date', and 'transaction date', are all ordinal attribute types. There is a clear order to the years and dates, but one would not be able to differentiate between half days and particular timings of the disclosures and transactions. 'Owner' refers to the ownership of the account. Most 'owner' values are "joint", "self, "dependent", or " ". Hence this attribute is categorical. 'Ticker' and 'asset_description' both refer to the individual investment in which the representative has invested. These are categorical and although there is repetition of certain investments, there are so many different levels. 'Type' refers to the type of transaction that occurred. It is categorical and the levels present in the dataset are "purchase", "sale_partial", and "sale_full". 'Amount' represents the size of the transaction. Although this attribute refers to numbers, the dataset has made the transaction amounts categorical by creating levels such as "$1,001 - $15,000", "15,001 - $50,000", "50,001 - $100,000", and "$100,001 - $250,000". The 'representative' and 'district' refer to the individual the transaction is filed for. These are categorical. The 'representative' levels are the names and the 'district' levels are the code for the district, where the first two characters are the state abbreviation and the last two characters are the district number. 'Ptr_link' is the link to the official disclosure form. These are categorical where the levels are the individual link addresses. Finally, 'cap_gains_over_200_usd' is categorical with levels of "TRUE" and "FALSE".

There are 13,482 disclosures in the dataset. The data contains disclosures made between 1/2/2020 and 2/23/22 for transactions between 9/8/18 and 2/23/22. The frequency of the sizes of the amounts is listed in the table below. In short, the amounts range from $1,000 to over $50,000,000. Representatives from 43 states have made disclosures in this data set.



Count of Amount	Amount
2	$50,000,000 +
3	$15,000 - $50,000
4	$1,000 - $15,000
8	$5,000,001 - $25,000,000
28	$1,000,000 +
33	$1,000,001 - $5,000,000
133	$500,001 - $1,000,000
210	$250,001 - $500,000
242	$1,001 -
520	$100,001 - $250,000
685	$50,001 - $100,000
2,114	$15,001 - $50,000
9,500	$1,001 - $15,000

Overall, this dataset is very high quality in terms of how clean it is. It has 12 columns with over 13,000 rows with very well filled out data. Below are some of the issues (and fixes) we will be doing with the data.

- For Column A: The data is clean and there are no known issues.
- For Column B: The data seems clen and there are no known issues.
- For Column C: There are a few dates that need to be fixed, seems to be just some data entry issues.
    - For cell C9349, the date should be changed from 6/19/12 to 6/19/20. This is according to the official disclosure.
    - For cell C2198, the date again seems to have been messed up and will need to be fixed. We will assume a change from "0009-06-09" to 6/9/21 since that is an accurate time close to where the data was entered but we will do more research to confirm this change.
- For Column D: The data has many holes for the data.
- For Column E: This is the stock ticker column and the only holes in the data are when there are no ticker for the investment type, for example with crypto investments or private investments/donations like to colleges or infrastructure.
    - To fix these issues, we will need to create new "ticker symbols" for the relevant cryptos, as well as create a overarching "ticker symbol" for private investments
- For Column F: There are 4 datums that are missing. This column is just a company description and for 2 of the holes the information can be found in other rows (listed below), and for the other 2 we can easily find the same information on the internet.
    - Cell F799 will be the same as Cell F930 since it is for the same company.
    - Cells F11500 and F11501 will need to be found online. (URGO Capital)
    - Cell F3586 will also need to be found online. (Celulosa Argentina Sociedad Anonima)
- For Column G: This data is clean , is categorical and has no known issues.
- For Column H: This data is categorical and has very few issues.

- At a couple of points towards the top of the data sheet, there is a “$1,001 -” data entry , where it should be “1001 - 15000”. To fix this we will finish off the data correction.
    - Cells that need this are: H14, H56, H57, H77-H81, and some others throughout.
    - Using a python script we will be able to change all of these values with ease.
- For Column I: This is who the representative is, and there are no known issues.
- For Column J: This is the district of the representative, and there are no known issues.
- For Column K: This is the link to the relevant disclosure announcement and there are no known issues.
- For Column L: This column is connected to column H (amount) and is a boolean value, there are no known issues in this column.

2 INSIGHTS

In exploring our data, we found promising trends that lend themselves to our initial hypotheses. We noticed that the distribution of trades was not even over time, as in there were spikes in trading where numerous representatives seemed to be responding to the same event. Additionally, we often saw multiple representatives trading the same securities around the same time. Both of these trends will be further investigated as we continue this project and work toward a conclusive story to tell. We were surprised to see some large gaps between the dates that transactions were enacted and reported. We understand that this means our current dataset is not fully representative of recent transactions, which will limit out ability to investigate trades made based on recent events.

As discussed previously, the exact amounts of the transactions are not specified in the reports. This will make data analysis difficult as we will need to make assumptions based on the range given – likely with a midpoint of each range or the minimum to be conservative. Another approach we can take is by comparing the prices of the underlying assets at the reported dates of purchase and sale, which will give us a percentage return we can apply to our assumed value.

3 SCREENSHOTS

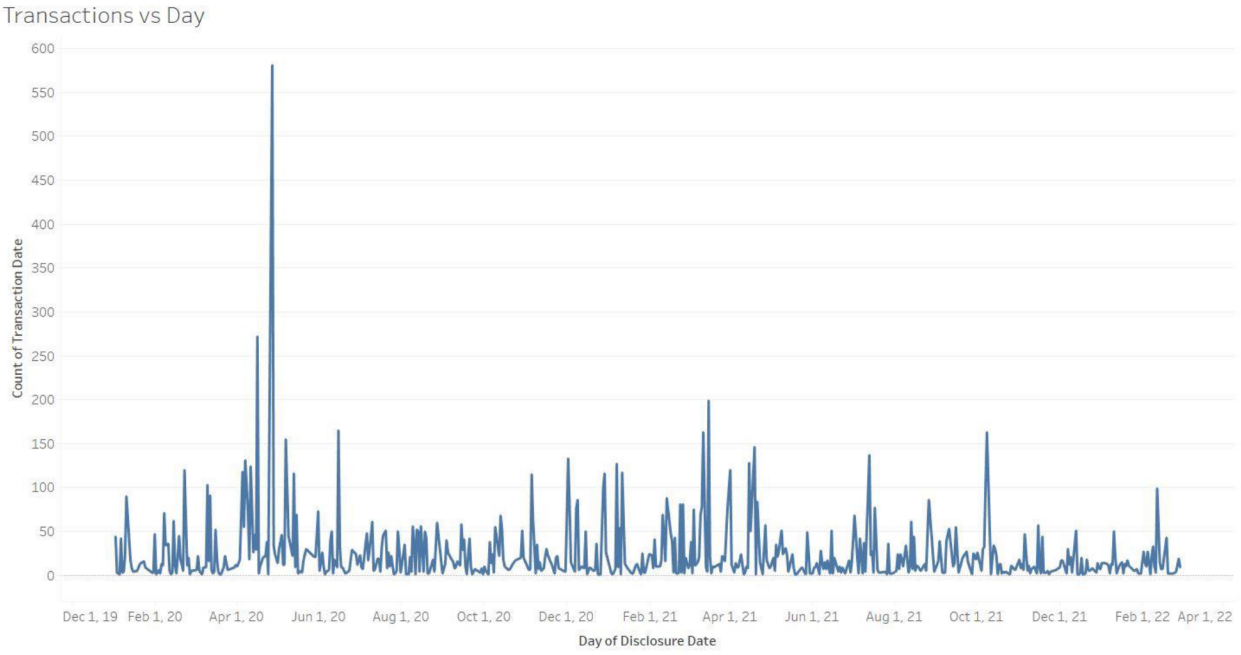


Figure 1

This graph above shows the amount of trades on each particular day of the data set. The dates range from January 2, 2020 to February 28, 2022. The subset of data we are looking at is the dates and trades on those dates. We used a simple line graph to show the change over time of volume of trades. We can see that there is a huge spike in volume on April 27, 2020 reaching a count of 581 transactions as well as the second biggest spike happening shortly before. There are a number of other smaller spikes.

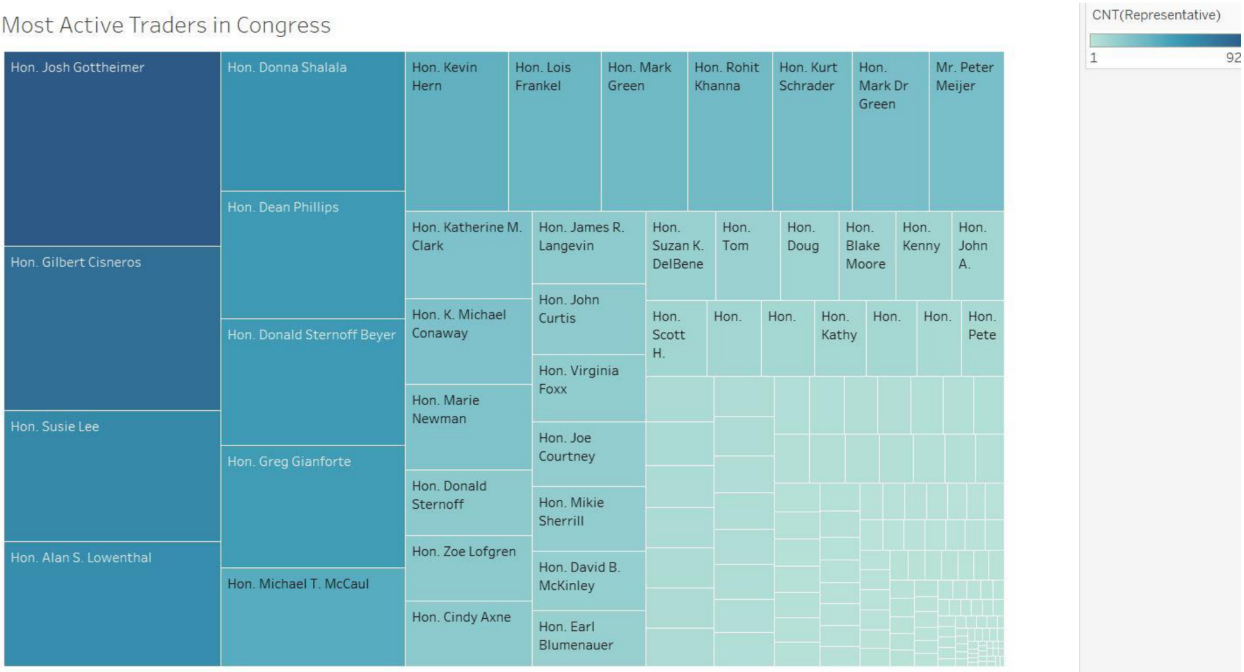


Figure 2
This treemap shows the members of congress that have made the most trades. The subset of data we are looking at is the representative and the number of trades. The visual encoding used is the size of the rectangle and the color on the gradient scale to represent the magnitude of the amount of trades made. The rectangles are ordered in descending order from top to bottom, left to right. We can see that the top 5 most active representatives are Josh Gottheimer, Gilbert Cisneros, Susie Lee, Alan S. Lowenthal, and Donna Shalala..

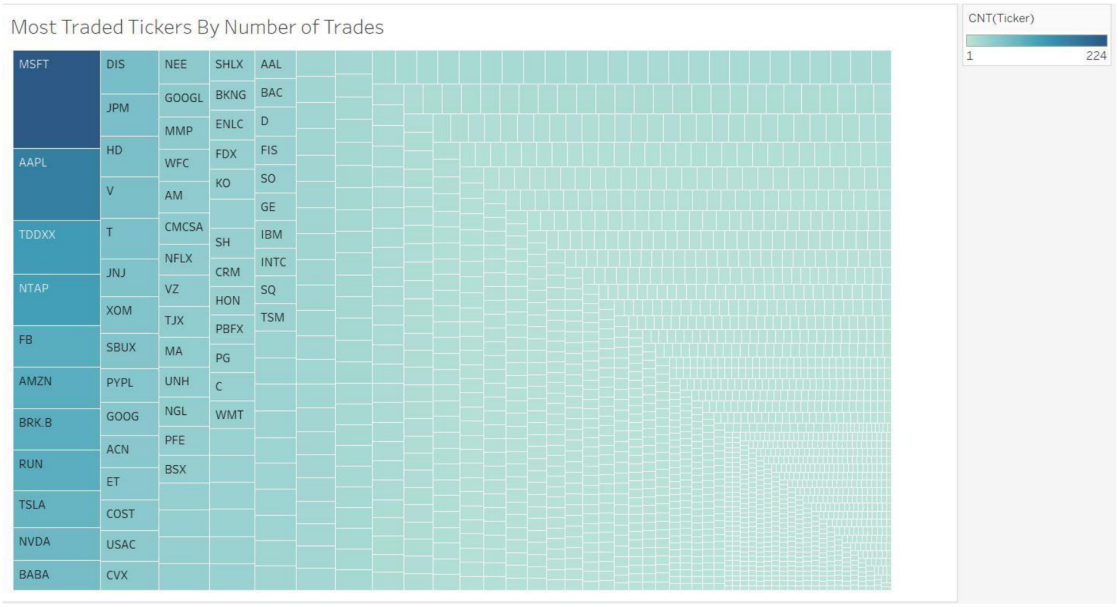


Figure 3
This treemap shows the tickers that were traded the most. The subset of the data that we looked at was just the tickers and their counts. This figure uses the same visual encoding as Figure 2. We can see that some of the most traded tickers are MSFT (Microsoft), Apple (AAPL), BlackRock Liquidity Fed Fund (TDDXX), NetApp (NTAP), and Facebook (FB).

4 Data Snippet

EXAMPLE UNCLEANED DATA SET

disclosure_year	disclosure_date	transaction_date	owner	ticker	asset_description	type	amount	representative	district	ptr_link	cap_gains_over_200_usd
2021	01/26/2021	2021-01-22	self	LEE	Lee Enterprises, Inc.	sale_full	$1,001 - $15,000	Hon. Mo Brooks	AL05	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/20018077.pdf	FALSE
2021	02/25/2021	2021-01-08	dependent	--	Indiana Bd Bk Rev	purchase	$100,001 - $250,000	Hon. Michael T. McCaul	TX10	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/8217869.pdf	FALSE
2021	01/26/2021	2021-01-21		--	Spectra Energy Capital LLC	sale_full	$1,001 - $15,000	Hon. Mo Brooks	AL05	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/20018077.pdf	TRUE
2021	01/26/2021	2020-12-01	joint	VTRS	Vitatris Inc.	sale_full	$1,001 - $15,000	Hon. Mo Brooks	AL05	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/20018077.pdf	FALSE
2022	02/18/2022	2022-01-05		--	New York NY City MUN WTR FIN AUTH WTR	purchase	$15,001 - $50,000	Hon. Carolyn B. Maloney	NY12	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2022/20020477.pdf	FALSE

CLEANED DATA SET RESULT

disclosure_year	disclosure_date	transaction_date	owner	ticker	asset_description	type	amount	representative	district	ptr_link	cap_gains_over_200_usd
2021	01/26/2021	2021-01-22	self	LEE	Lee Enterprises, Inc.	sale_full	$1,001 - $15,000	Hon. Mo Brooks	AL05	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/20018077.pdf	FALSE
2021	02/25/2021	2021-01-08	dependent	IBBR	Indiana Bd Bk Rev	purchase	$100,001 - $250,000	Hon. Michael T. McCaul	TX10	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/8217869.pdf	FALSE

2021	01/26/2021	2021-01-21	unreported	SEC	Spectra Energy Capital LLC	sale_full	$1,001 - $15,000	Hon. Mo Brooks	AL05	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/20018077.pdf	TRUE
2021	01/26/2021	2020-12-01	joint	VTRS	Vitatris Inc.	sale_full	$1,001 - $15,000	Hon. Mo Brooks	AL05	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2021/20018077.pdf	FALSE
2022	02/18/2022	2022-01-05	unreported	MWFAUW	New York NY City MUN WTR FIN AUTH WTR	purchase	$15,001 - $50,000	Hon. Carolyn B. Maloney	NY12	https://disclosures-clerk.house.gov/public_disc/ptr-pdfs/2022/20020477.pdf	FALSE

Appendix C: Interview

5 End User Personas

Persona #1: Retail Investor

This person is someone who trades regularly to build wealth. Through their investments, they have developed a deep interest in understanding markets, financial news, and daily news. They use visualizations on the daily, looking at Tree maps of the market, line graphs of stock prices, and countless other charts and graphs other retail investors, and experts, use to get an edge on analyzing the market. They know that at the end of the day, many of their investments are heavily dependent on laws and regulations, many of which coming from the US Capitol. This also means that they understand US Representatives get a look at what the markets do before anyone else does. Due to their investments being publicized, this person may use government websites such as the Office of the Clerk website to track what representatives are doing.

Using this visualization, this retail investor will be able to get a look at what investments our representatives are making. They will be able to use this information to guide their investment decisions, hopefully making money off of the trades of decisionmakers like Nancy Pelosi and the Biden family.

Persona #2: Securities and Exchange Commission Officials

SEC monitors constantly review large purchase and sale orders of stocks and options from politicians, financial institutions, and even wealthy retail investors to uncover instances of insider trading. Large stock orders are required to be disclosed in accordance with U.S. law. The SEC officials review these disclosures to find patterns within trades ordered close to significant events that boost or reduce a given company's stock price. Currently, the disclosures are filed as .pdfs in many different formats, making it difficult to use big data analysis to find insider trading cases. Hence, we believe that the use of visualizations within the SEC insider trading visions is minimal and would greatly benefit from the use of clean, standardized financial disclosure datasets such as the one we will be using. This would allow them to maximize efficiency while sorting through hundreds of reports that are filed every day.

With the visualization, these SEC officials would be able to chart out trades for a certain company and quickly identify when a large trade is made near a major news event. They can also combine multiple individual's disclosures to see which groups of people are working together and acting on the same information.

6 Interview Script

Important Questions

- Why do you research stock trading trends?
- Do you follow the investment choices of US House of Representatives and Senate members?
    - If yes, what kind of data do you analyze when researching these strategies? What are the advantages and disadvantages of this data and the way it is presented?
    - If no, what market data do you track? How could this data be presented better?
- Would you/your organization be interested in exploring new data presentation methods such as charts and graphs?
    - If yes, what features would you like to see from this visualization? Ask for elaborations and detail on each feature. Dig deeper!
    - If no, how come? What kind of flexibility would you like to see? Ask if they want pre-made graph templates or if they would like to create their own visualizations with raw data
- What are the top three easiest, most functional graph types that you/your organization will be comfortable using?

Extra Questions

- Do you believe that Representatives and Senators have an advantage when making investment choices?
- Why do you think this might be the case?

7 Interview Notes

Persona 1 – Retail Investor

- Why do you research stock trading trends?

I research trends in the stock market to determine what the market sentiment is (positive or negative) to certain companies and industries. If big players such as large asset management companies and hedge funds are making sizable investments into certain companies, I can assume there is upside to those particular investments. I try to follow the "follow the money" trading strategy, and following where hedge funds are investing usually proves to be a successful strategy.

- Do you follow the investment choices of US House of Representatives and Senate members?

While I usually do not directly track the investment choices of US House Reps and Senate members, when I come across the information on twitter or other websites it usually inspires me to look into that stock. When I see significant interest from representatives, I assume that stock has some strong upside or some new laws in the future that will support that company.

    - If yes, what kind of data do you analyze when researching these strategies? What are the advantages and disadvantages of this data and the way it is presented?

I have a couple of different strategies I look for. I play 3 week - 3 month swing plays so I try to look for companies that are releasing news in the short term and like to choose to enter based on the Fibonacci chart. Although many of my investments are news based, I still like to check some quantitative analysis checking on cashflow and measurements such as the 20-day moving average and IV,

and multiples such as P/E and P/B for certain companies. I do not currently use financial disclosures to inform my decisions on a regular basis because they are difficult to access in a timely manner.

With the Fibonacci numbers, I find it is a good way of predicting in the long term when a stock is at a top or bottom. The cash flow numbers are good to know if the company is in a good state and has strong financials. I do not enjoy trying to track down this data, as it is super scattered and hard to find.

The best part of the Fibonacci analysis is how easy it is to use. I have it set up right on all of my charts on WeBull and can very easily just use it.

When searching for potential swings, I have people I follow on Twitter, Discord, and just popular news articles that pop up. Also, seeing, this connects to seeing House of Representatives and Senates investments, and usually sparks an interest in a potential swing.

- Would you/your organization be interested in exploring new data presentation methods such as charts and graphs?

  Absolutely, I am always looking for a new way to analyze stocks and see what ways I can get a leg up on the market.
  - If yes, what features would you like to see from this visualization? Ask for elaborations and detail on each feature. Dig deeper!

I would love to see stock information, connections to EPS, as well as news articles that are relevant plotted together to identify how news affects stock price action. Additionally, collecting information on where big money is going would be very helpful for me. I think following the big money is a great way to make money, and tracking this would be a good potential chart.

- What kind of flexibility would you like to see?

  I would love to be able to select specific stocks that I am interest in, as well as see a whole market view. Having the options to focus based on industry would be very nice as well. I do not know how to find financial disclosures by Congress members easily, but if there were a graph presenting this information I'd love to use it!

Persona 2 – Securities and Exchange Commission Officials

- Why do you research stock trading trends?

I research large movements in options volume and ownership percentages of publicly traded companies to ensure that there are no monopolistic practices occurring and to identify any potential insider trading. It is my job to ensure that the markets are fair for all investors regardless of buying power and industry connections. That is the only way that retail investors will trust the markets and continue investing in growth in the U.S.

- Do you follow the investment choices of US House of Representatives and Senate members?

  Yes, I look through financial disclosures made by members of Congress. The data we are presented with are .pdf uploads, often handwritten, sometimes typed. These documents vary from state to state and over the years they have taken different forms.
  - If yes, what kind of data do you analyze when researching these strategies? What are the advantages and disadvantages of this data and the way it is presented?

Advantages: The disclosures are filed on the SEC database, making them easy to access and impossible to edit post-upload. The data is laid out in a table that is easy to read and understand.

Disadvantages: The data is very basic. The dollar amount of the investment is not listed accurately (it is given as a range). Additionally, in order to compare trends between politicians or historical trends for a single politician, I must open up multiple documents and look at them simultaneously.

- Would you/your organization be interested in exploring new data presentation methods such as charts and graphs?

Yes, honestly it would make the job of comparing trends so much easier and allow our monitors to quickly identify abnormal trades or groups of trades the moment they are filed and entered into the database.
  - If yes, what features would you like to see from this visualization? Ask for elaborations and detail on each feature. Dig deeper!

We would want to be able to look at trade sizes per company, share volume per company, frequency of trades by each politician by industry, plots of trade volume on a timeline with major economic and relevant news events, etc. In short we need to be able to customize the charts to analyze trades from many different angles.

Trade size per company: a chart showing the dollar amount traded for a certain company's shares potentially as a line chart with the x-axis representing each day or week.

Share volume per company: similar to the last plot, this chart would show the number of net shares traded per day. This would include buying, selling, and options transactions.

Frequency of trades by politician: We need to be able to see how often and how large politicians are making trades. This will allow us to see periods of activity that standout about normal trade volumes and we can look into what those trades were.

Timeline plot: We would like to compile news events and political decisions such as vaccine approvals, war declarations, etc. on a chart with trading activity to see if major trades were made immediately before large news events.

- What kind of flexibility would you like to see?

  We would like to be able to create custom graphs for certain people and maybe even graphs by political party of department within Congress to see if clusters of people are making suspicious trades. On top of that we would like to see a dashboard of the standard graphs listed earlier in the last question.

  Most of the time series graphs would be line graphs. We could also explore bar charts over time for trading volume. These are definitely the easiest to create. We might also want to see pie charts showing the relative frequencies of which clusters of people (departments, political parties, groups of senior ranking politicians) are making the most trades on certain companies or industries.

8 Interview Results

- Why do you research stock trading trends?

Both of our respondents were very focused on trying to analyze the market and major transactions that might indicate insider trading or developing market trends. Our retail investor was interested in following money and understanding the overall health to inform decisions. Our SEC Official is focused on maintaining the fairness of the markets and tracking any illegal activity such as insider trading or price manipulation.

- Do you follow the investment choices of US House of Representatives and Senate members?
    - If yes, what kind of data do you analyze when researching these strategies? What are the advantages and disadvantages of this data and the way it is presented?

Both of our respondents said yes to this question. The SEC member uses this mainly has their job to be able to maintain the fairness and equality of the markets. The retail investor on the other hand is looking to follow the money of Congress members and believes they do have an insider view of what is going on. They both would like to see this information presented in a better way, and are interested in exploring new visualizations of this data.

The main disadvantage given between both of them was the lack of centrality for the data. Specifically for the Congressional data, disclosures are not made in a timely manner and the data is sparse, as reported by the SEC official. There was similar sentiment from the retail investor saying the main disadvantage was the lack of centrality of data, but enjoyed using data that are on financial sites such as Yahoo Finance already.

- Would you/your organization be interested in exploring new data presentation methods such as charts and graphs?
    - If yes, what features would you like to see from this visualization? Ask for elaborations and detail on each feature.

The main feedback we got from this question was from the SEC official, as they have a quantified need. They had asked for a visualization to track trades from the House Reps and Senators. The official wanted to see trade size, share volume, and timelines from each representative.

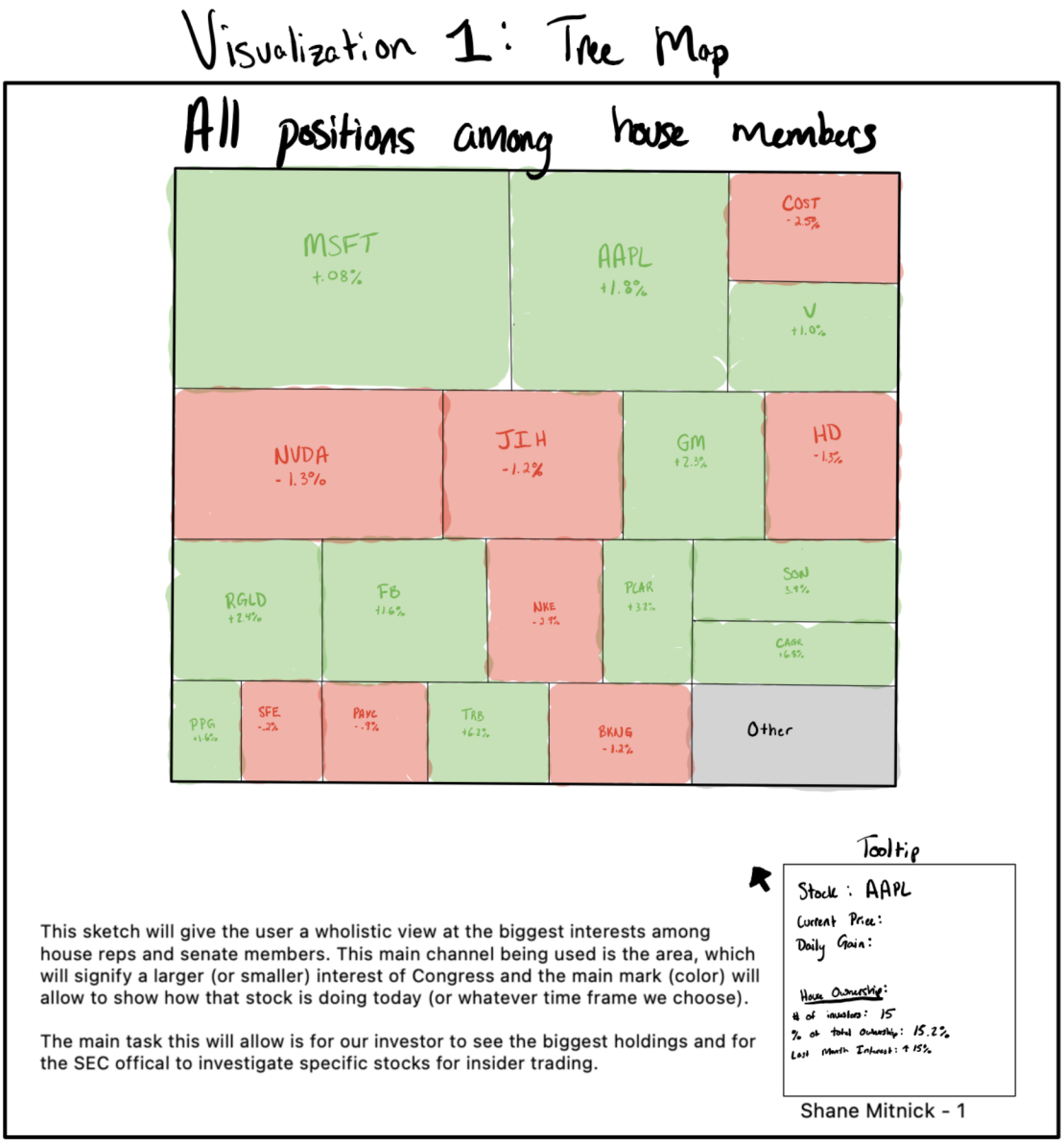
- What kind of flexibility would you like to see?

Both respondents wanted to be able to zoom in and get a closer view as well as a market view. Our SEC official was mainly invested in getting information specifically on each Senate and House member. The retail investor, on the other hand, was much more focused on getting data from specific stocks.

Both SEC and the retail investor both said they would love to see a line chart, this makes sense as stock price data is presented as a function of time. Bar charts would be useful to see volume and dollar amount changes over time. A positive negative bar chart might be especially helpful to see fluctuations in dollar amount invested over different time periods.

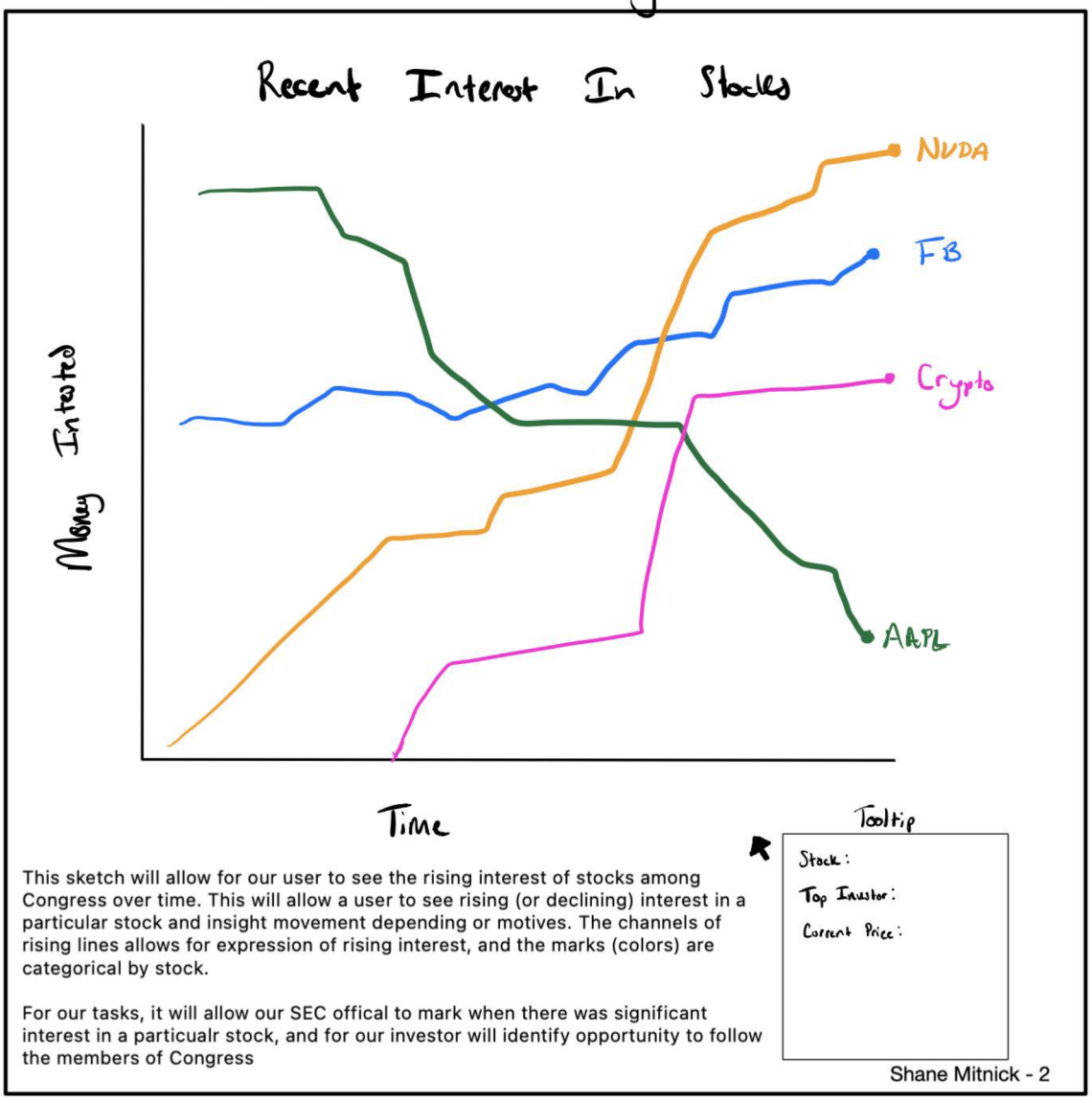
Appendix D: Design Sketches

1 Individual Sketches



Favorite

Visualization 2: Rising Stock Interest

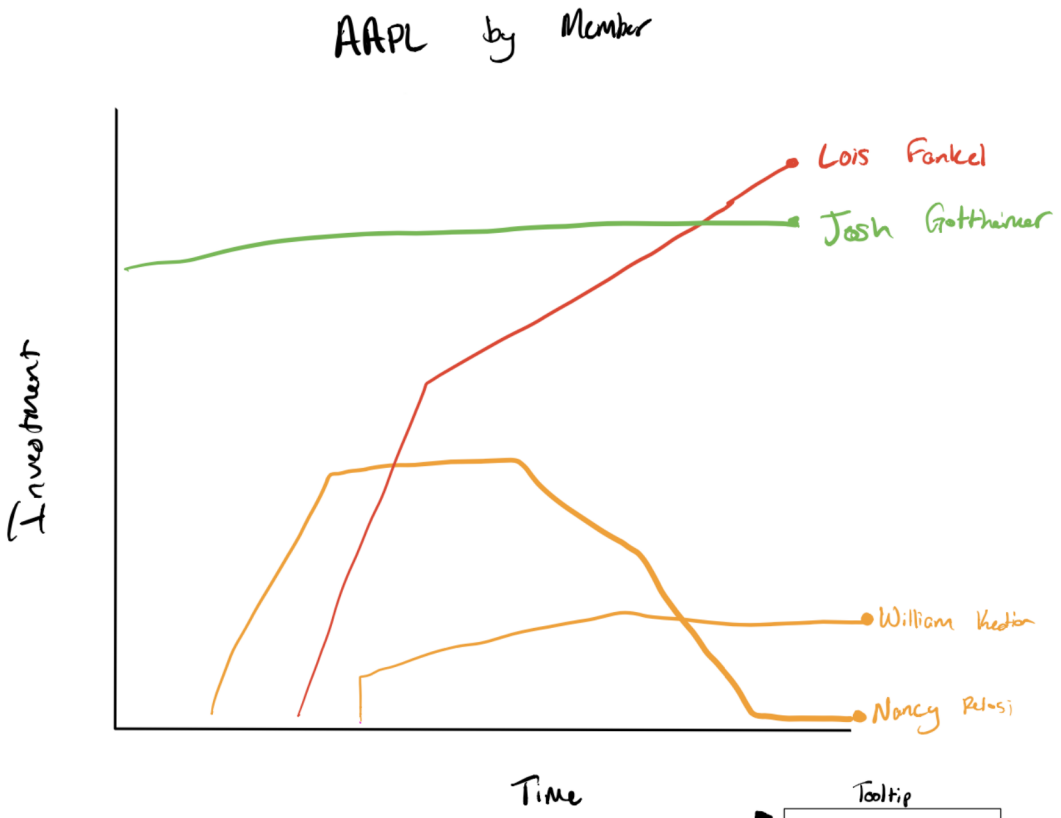


This sketch will allow for our user to see the rising interest of stocks among Congress over time. This will allow a user to see rising (or declining) interest in a particular stock and insight movement depending or motives. The channels of rising lines allows for expression of rising interest, and the marks (colors) are categorical by stock.

For our tasks, it will allow our SEC offical to mark when there was significant interest in a particualr stock, and for our investor will identify opportunity to follow the members of Congress

Shane Mitnick - 2

Visualization 2 : Individual's Interest in Stock



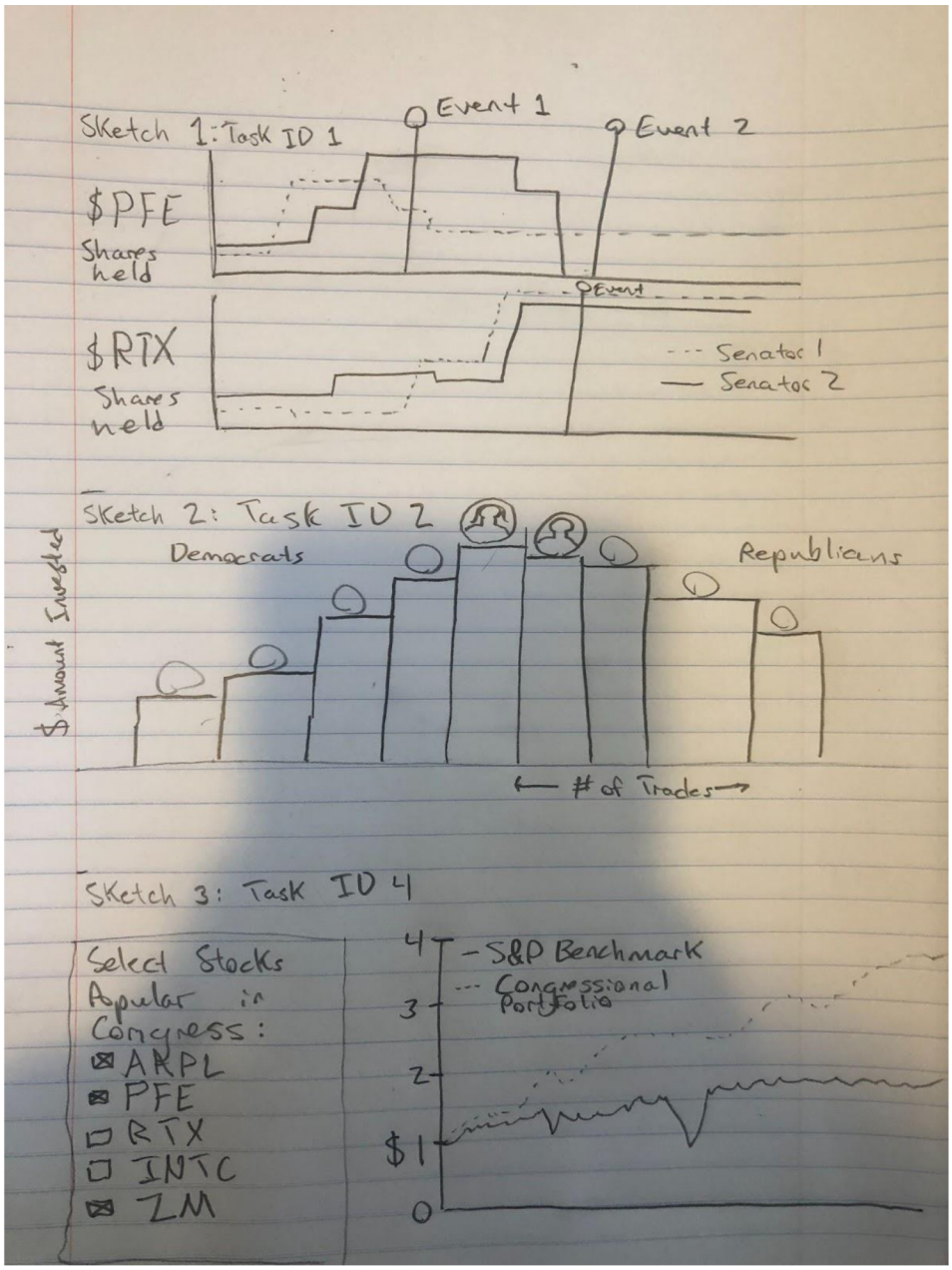
Tooltip

Stock:
Top Investor:
Current Price:

This visualization will allow a user to specifiy the particual interest of a stock by member. This stock will identify indivial increased (or decreased) interest of a particual stock. The marks (colors) are categorical by member, and the channels (lines/distance from bottom) will show an increase or decrease investment in a particular stock.

This chart will allow our SEC offical to identify particalar interest over time to see for any insider trading, and our retail investor will be able to track a particalar stocks traction among Congress to sway decision making.

Shane Mitnick - 3



From: Matt

Sketch 1:

Task: Analyze trading volume over time on a timeline with major news events

Marks/Channels/Encoding: The marks here are lines on a line graph that represent the amount of shares held in a stock by a selected congressional official over time. Additionally, vertical bars are drawn and annotated for noteworthy events related to the selected stocks.

Notes: The user will be able to filter by stock and official. Each official will add a line to the charts, and each stock will add a chart.

Sketch 2:

Task: Show which members of congress trade the most frequently.

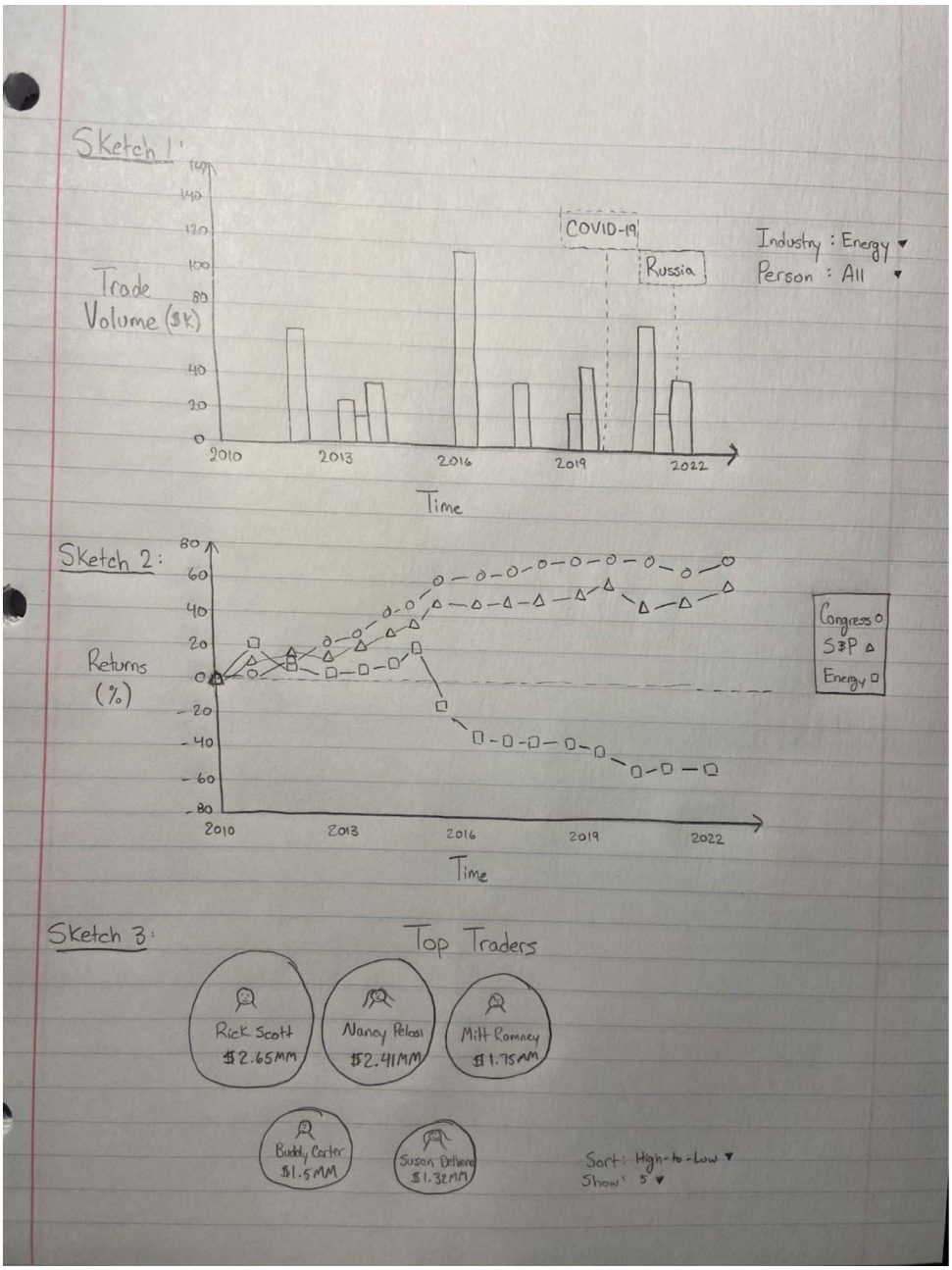
Marks/Channels/Encoding: The marks are bars which seek to directly answer the task question. The amount of money each official has invested will be represented in the height of each bar, and the width will represent how many trades they make in a year.

Notes: Democrats and Republicans will be grouped on the left and right of the chart.

Sketch 3:

Task: Compare returns of Congressmembers to the S&P 500 and industry ETFs

Marks/Channels/Encoding: This is a very simple line chart, with one line for a benchmark S&P 500 return and another for a hypothetical portfolio of the selected stocks.



From: Gary

Sketch 1:

Task: Analyze trading volume over time on a timeline with major news events

Marks/Channels/Encoding: The marks here are lines on a bar graph that represent trading volume in $K with their length and horizontal position as the channels. This is a bar chart in the simplest form.

Notes: One can filter by industry and by particular members of Congress or by political party.

Sketch 2: Favorite

Task: Compare returns of Congressmembers to the S&P 500 and industry ETFs

Marks/Channels/Encoding: The marks are points and lines together. The channels are horizontal and vertical position as well as shape to represent the index. This is a multi-line line chart with symbols to differentiate the lines.

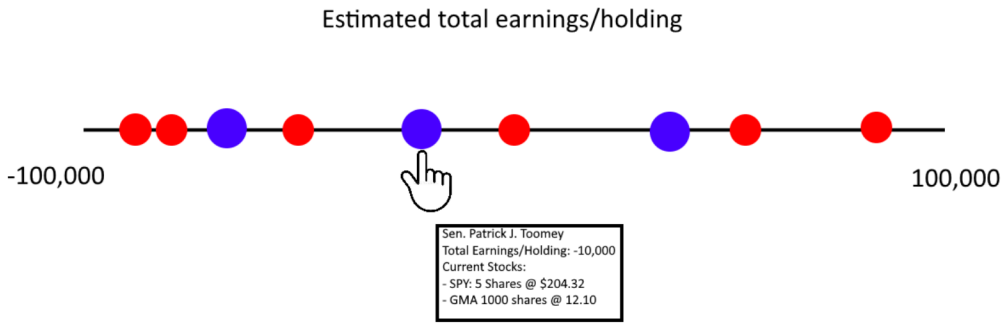
Notes: Users can compare multiple different ETFs and select individual members of congress to compare their holding returns.

Sketch 3:

Task: Show which members of congress trade the most frequently.

Marks/Channels/Encoding: The marks are areas to represent Congressmembers. The channels are size and color. The size represents the amount they trade and the color represents their political party. This will be akin to a pie chart, but not have sections. Instead, the entire circle represents the individual congress member.

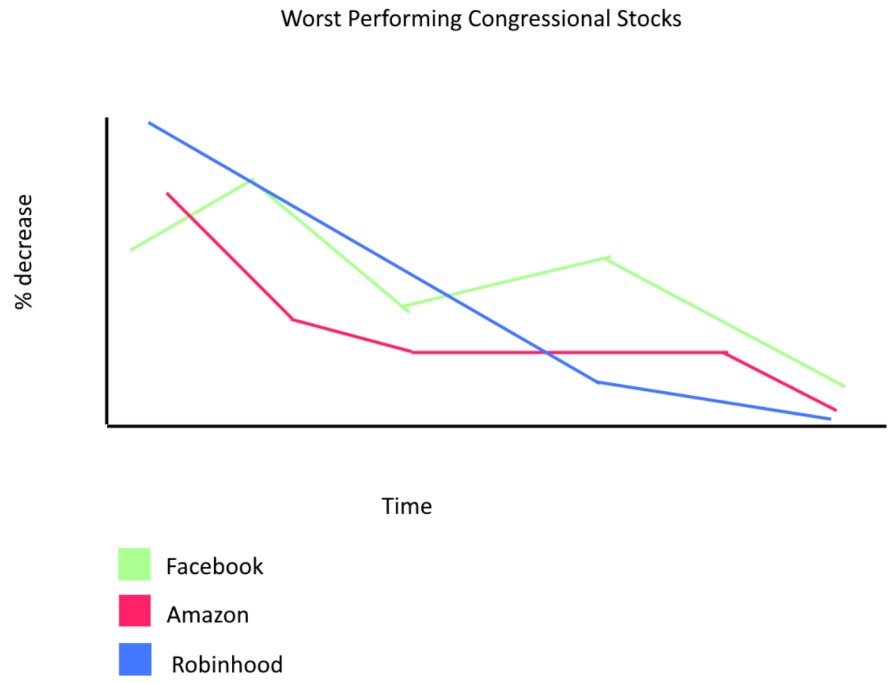
Notes: Users can sort by largest to smallest or smallest to largest and pick how many Congress Members they want to see.



From: Josh

This line graph visualizes a congress member's estimated total earnings or holdings. It is a line chart with nodes representing each congress member. The range is the maximum earnings of the highest earning member vs the minimum earnings of the lowest earning member. I choose these marks and channels to show the range of how much congress members are making/losing off stocks. If an individual node is more right, it shows the end user that perhaps the congress member is either very good at trading stocks or may abuse their power in the stock market. The color is an indication of whether or not the congress member is a republican (red) or democrat (blue). When a node is hovered, information about the congressman and their stocks are shown to the end-user.

This visualization solves "highlighting the flaws in government trading" in our use cases. This is because I suspect that most total earnings/holdings will be in extremely high positive profits and it will show the end-user how much congressional members profit off of trading with inside knowledge.

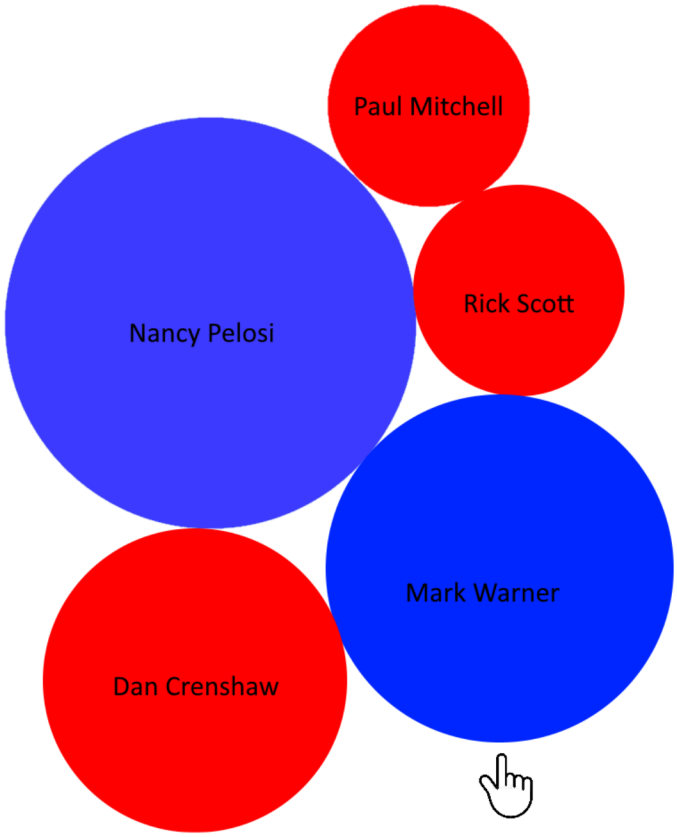


From: Josh

This chart visualizes a congress's worst earnings/holdings. It is a line graph with lines representing the worst stocks held by any member of congress. The y-range is the maximum percent decrease of the worst performing stocks. The x range is the time over the past year.

I choose these marks and channels to show the range of how much congress members are making/losing off stocks. Given our current data, even the worst performing stocks usually perform well.

This visualization solves both "highlighting the flaws/corruption in government trading" and giving "retail investors a clear view of congressional trading" in our use cases. This gives the user insight on the worst trading stocks. Given that even the worst traded stocks perform relatively well, it shows that congressional members hold too much information to even purchase bad stocks.



Favorite

From: Josh

This bubble chart visualization shows the highest earners in congress. Each bubble represents a given congressional member and their given size is representative of how much money they have made off of stock trading.

Red represents a republican congressional member and blue represents democratic. When a bubble is hovered over, their top performing stocks are shown to the end-user.

This visualization solves "highlighting the flaws in government trading" in our use cases. This is because I suspect that most total earnings/holdings will be in extremely high positive profits and it will show the end-user how much congressional members profit off of trading with inside knowledge.

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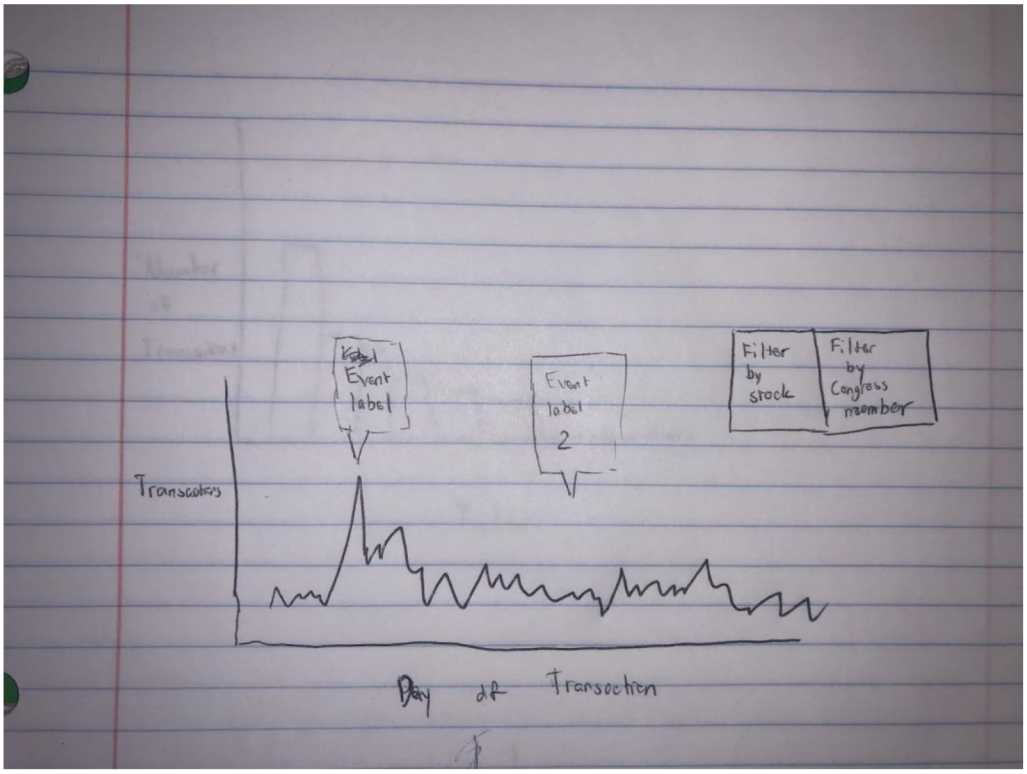
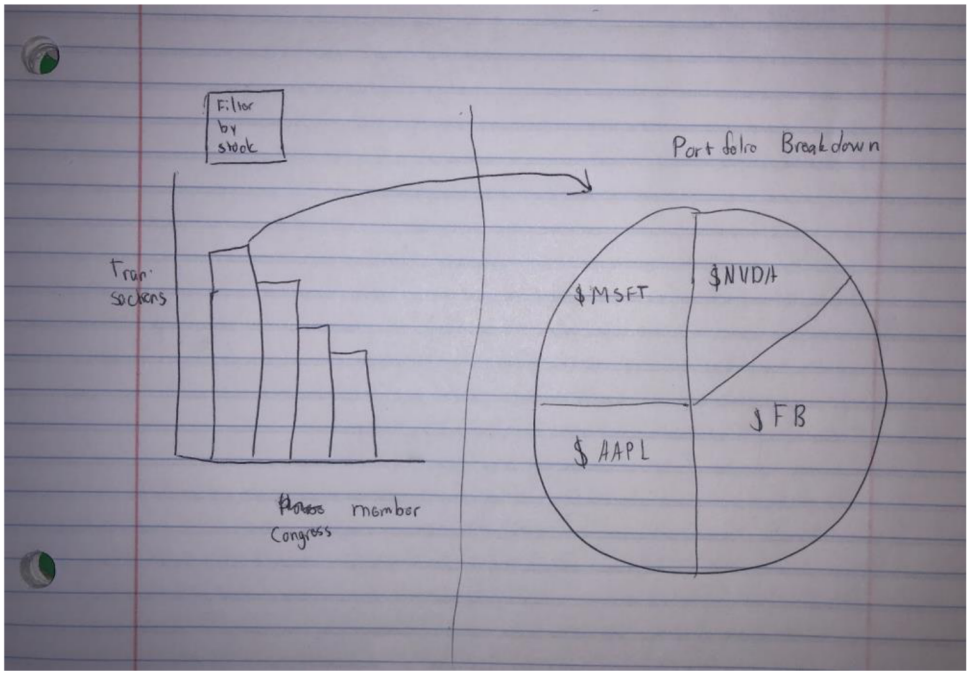


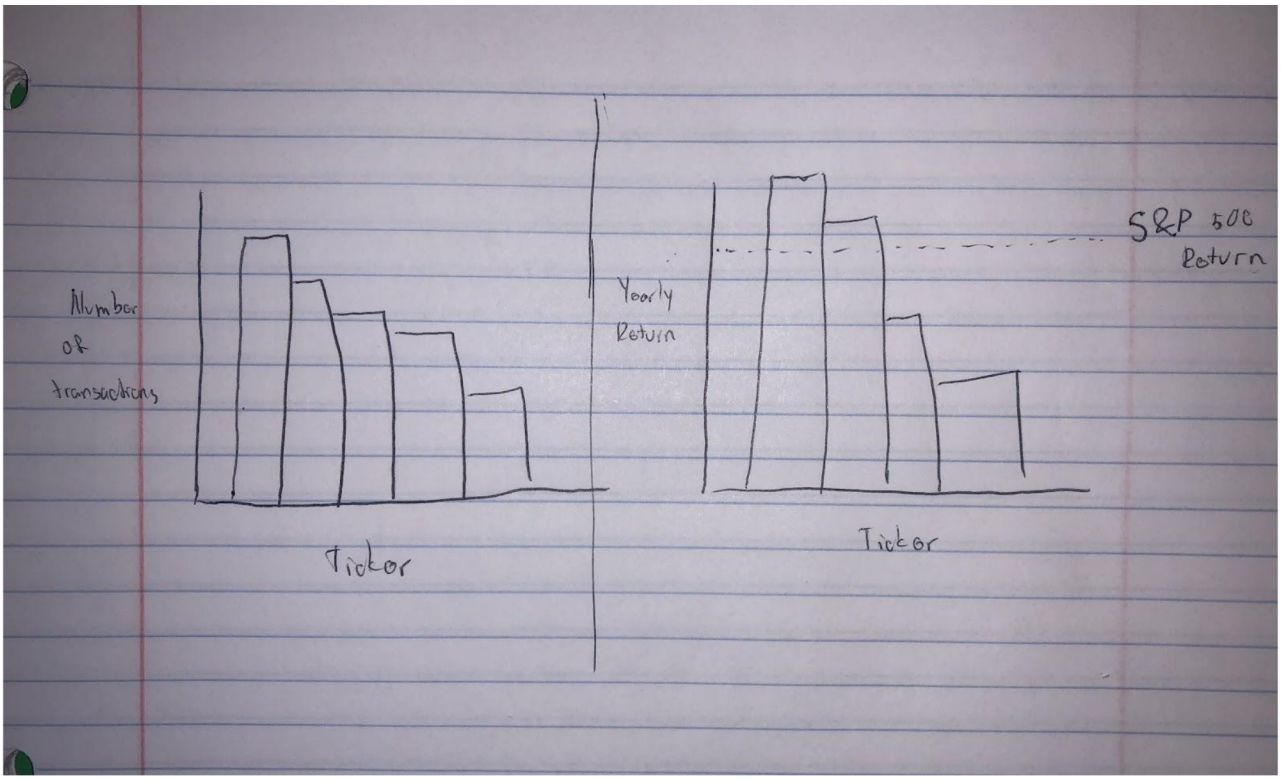
From: Nikola

This sketch shows a chart of transaction volume over time with the options to filter by stock and to filter by congress member. The visualization has marks which indicate key events in order to identify trading patterns.



From: Nikola

This sketch shows a bar graph of the Congress members which make the most transactions. The graph can be filtered by stock. Clicking/hovering over a bar graph that corresponds to a Congress member will bring up a tooltip with a pie chart that shows the portfolio breakdown of that congress member.



From: Nikola

This sketch shows one bar graph which shows the tickers with the most transactions. The other bar graph on the right compares the yearly returns of the highest yielding stocks that Congress members invested in. There is also a benchmark of the return for the S&P 500 to compare to.

2 Group Sketch Selection

Our favorite sketches, which are Shane's first sketch, Gary's second sketch, and Josh's third sketch take different approaches to answering a wide array of our domain tasks.

The first provides a great overview of congressional positions in a way that is typically used to show the weights and returns of numerous securities. Shane's suggested chart compared to an S&P 500 (or S&P ~30 to keep an equal number of squares between the charts) would be a good way to show how congressional officials invest differently than typical Americans.

Gary's second sketch is our favorite for highlighting the difference in performance between assets which are held by members of Congress and benchmark returns. It is similar to the third of Matt's sketches, but with additional customization options for adding sector returns. This will be useful for highlighting how the holdings within the portfolios of Congresspeople pivot and match the performance of relevant sectors.

For comparing the net worth and trading volumes of different elected officials, we will be taking the approach of Josh's third sketch. This interactive bubble chart – colored by political party – is a very clear wat to highlight the sizes if different investments. Additionally, it will be interactive with specific holding information embedded in each bubble.

3 Final Sketch

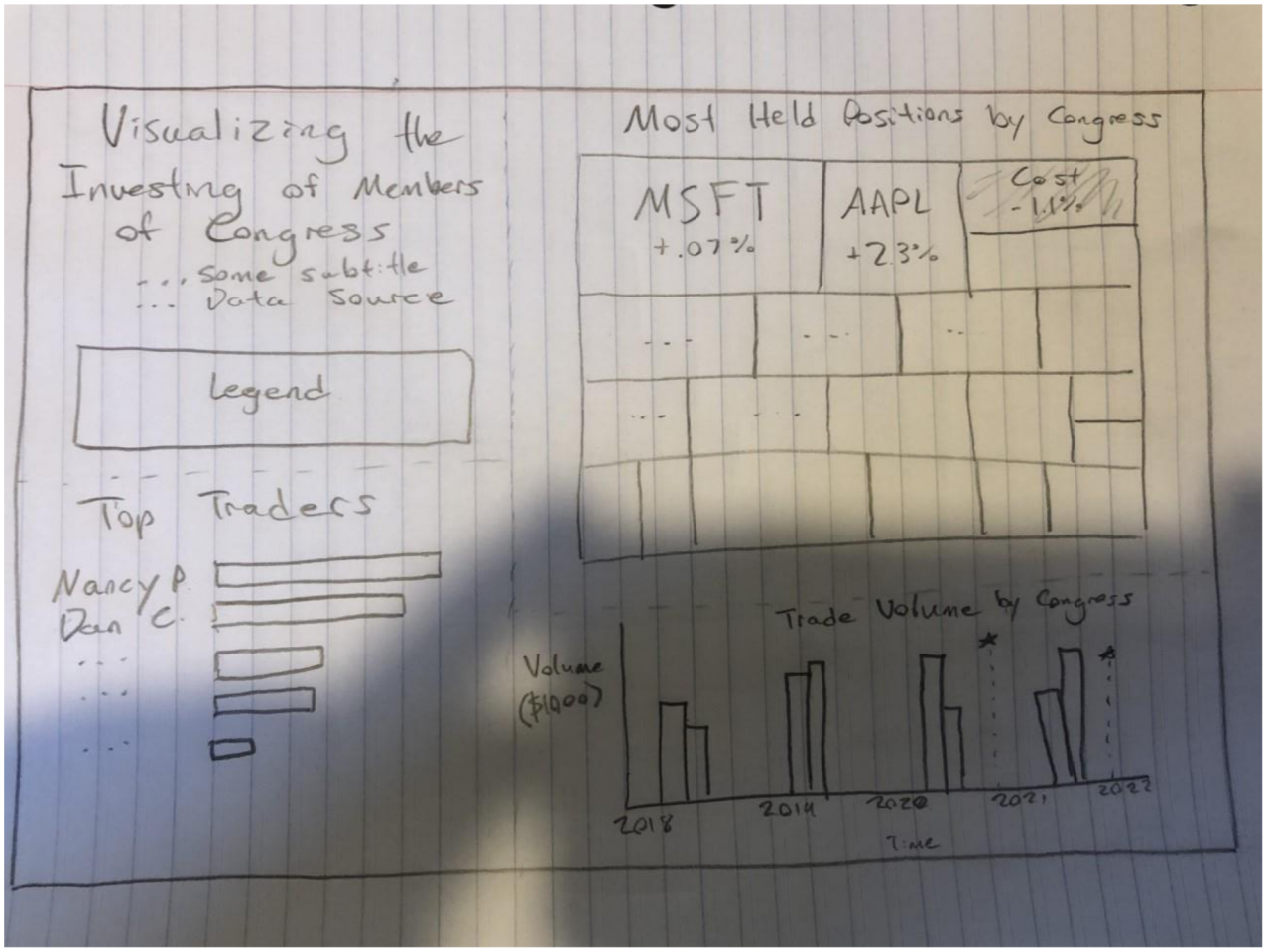
As seen below, our final sketch combines elements from each of our selected visualizations into one interface. The core overview of this interface will be the tree map of the largest holdings of Congressional officials. This will serve a summary of our dataset and be used to customize the rest of the chart.

The other two charts, which can be seen on the bottom of the sketch, are responsive to the tree map and display the top traders in Congress and how much volume Congress as a whole has traded over the period in our dataset. The "Top Traders" chart will be a horizontal bar chart in descending order of trading activity. This will allow us to display either the most activity or total amount invested in a particular security. Additionally, the bars will be colored to represent political affiliations. The "Trade Volume by Congress" chart will be a time series of volume, with a comparison between members of congress and the overall market. To put discrepancies into perspective, we will also show significant market moving events – such as COVID-19 announcements and news about the invasion of Ukraine.

Both of these charts on the bottom will be responsive to selections made within the primary tree map. We plan on having each box be selectable to filter the other charts down to a single stock. This will particularly aid with the visualization of trading volume around key

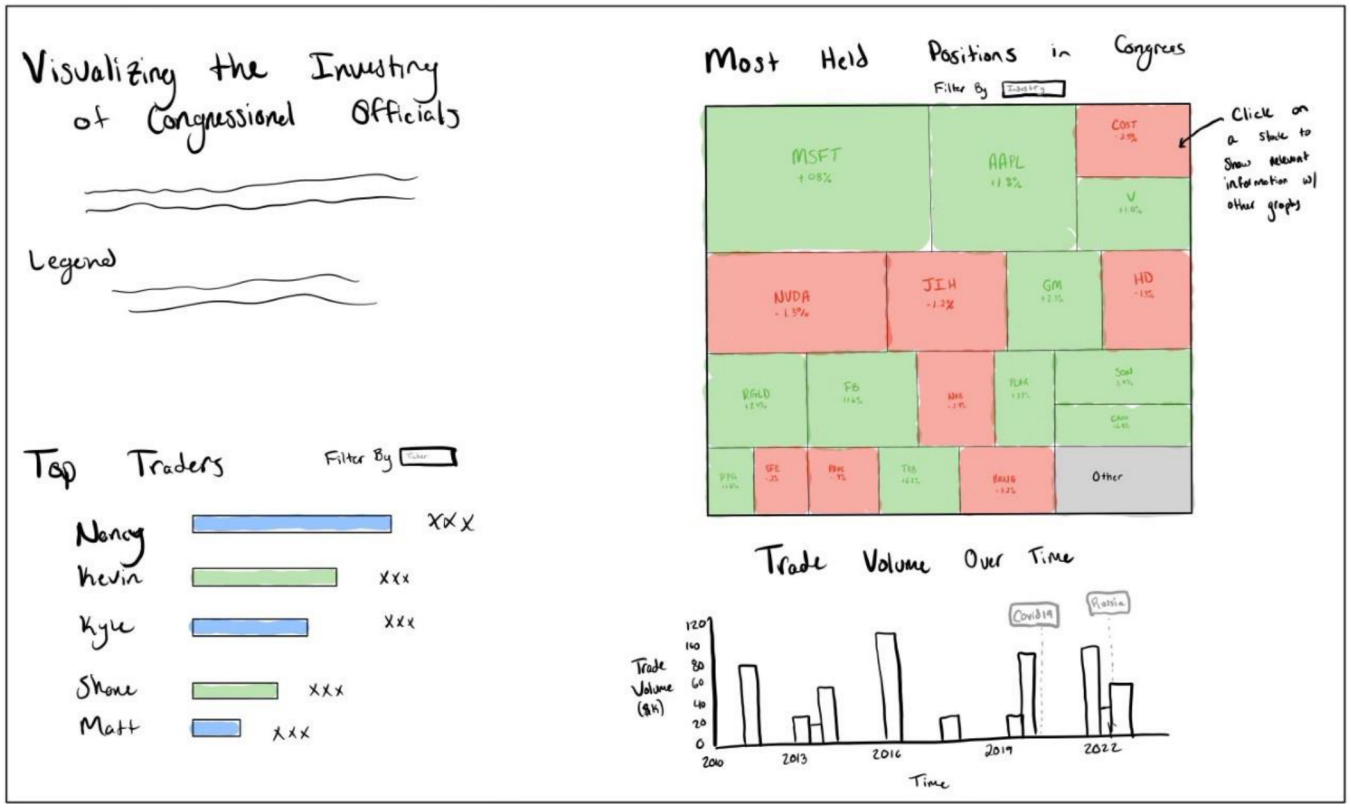
events. Our hope is that we will be able to see Congress members trading a security before news comes out, and the appropriate market-wide volatility coming after the fact.

With this approach to our final visualization, we will complete a majority of the tasks we laid out for ourselves. The tree map will demonstrate which stocks are the most popular investments of Congress members, the "Top Traders" bar chart will show which members invest with he most capital and volume, and the "Trade Volume by Congress" will demonstrate any advantage elected officials have in preempting market volatility.



Appendix E: Digital Sketch

1 DIGITAL SKETCH



As seen above, this digital sketch is a more finalized version of our final hand-drawn sketch. The primary interaction the user will have with the above dashboard will be selecting stocks from the tree map under "Most Held Positions in Congress" to filter the data shown in the bottom two charts. Before any interaction – as in, when nothing is yet selected – the visualizes will display all of our data, as if every security was selected. Once a block of the tree map is clicked, it will remain opaque while the other boxes fade slightly to show they are not longer being included. Accordingly, the bars in "Top Traders" and "Trade Volume Over Time" will change completely to represent the new selection. We would also give the user the option to search for specific members of Congress which are not in the top ~five we display in "Top Traders". This would likely move them to the first slot and compare them to the top four traders for the filtered criteria.

A user would use this dashboard to investigate how members of Congress trade with their heightened information. The tree map of popular investments could easily be compared to market-cap weighted S&P 500 holdings to see what Congress is abnormally invested in. If a user suspected elected officials invested in vaccine companies prior to mandate announcements, they could select "$PFE" in the map to show data on Pfizer below. From there, they would be able to confirm their hypothesis if the announcement for a mandate was given after Congress increased their trade volume in the stock and before the rest of the market did. The "Top Traders" would be a more specific detailing of who exactly is behind increased trading activity.

One challenge we will face is storing news events to display for various stock filtering. We will need to make a decision as to whether we will have some scraping program to pull major news events for various companies, or if we will stick to market-wide events which will be relevant to any investment. The ladder would of course be much easier, but if we have time we will attempt to implement the former.

Appendix F: Usability Testing

1 Preparation

Our visualization is a dashboard to explore the investing done by members of the United States Congress. Members of Congress are required to disclose any trades they make, and these disclosures are available online. Our dataset is made up of information extracted from all of the disclosures made by Congress in recent years.

The final visualization will be a dashboard that gives the most relevant information to understand trading done by members of Congress. The primary overview will be given through a tree map of Congress's largest holdings. An important note on this chart is that it will be used to filter other charts in the dashboard. This means that selecting a stock from the tree map will adjust the other charts to only display data for the selected stock. The next chart a user will see is a horizontal bar chart of the most prolific traders within Congress. The "Top Traders" chart is a relatively simple concept but satisfies the important need of identifying which elected officials are the most active in financial markets. The other chart that will change in parallel to the "Top Traders" visual will be our time series of "Trade Volume Over Time". While we do not have a static version of this developed yet, it will display patterns of market-wide trade volume compared to trading activity from members of Congress. Additionally, we will add marks for important events that spurred major volatility and trading activity.

Combined, we believe that these charts will give a full overview of how elected officials of the United States take advantage of their positions to outperform the stock market. This is a major area of contention and corruption that we hope to shine a light on with our visualizations. Please complete the following tests to help us advance our dashboard to that goal:

1. Please get a sense of the dataset as it is now. What is the largest holding in Congress? Which member of Congress invests the most money? When did Congress trade the most compared to the American public?
    a. Reason for Test: To ensure that the dashboard is intuitive enough that a user can quickly understand some high-level data from it.
    b. Expected outcome: We expect the participant to be able to answer all three questions within 5 seconds each.
2. Please filter the dashboard to just $AAPL data. Which members of Congress invest the most in Apple?
    a. Reason for Test: To ensure that the data filtering aspect of the dashboard is functional and the user understands its purpose.
    b. Expected outcome: We expect the participant to search for the filter selection for a moment and then quickly find Apple. The first name on the list will be the member of Congress who invests the most in Apple, so their response to the question should also come within 5 seconds.
3. Please consider a recent event that would impact a stock's price. Filter the dashboard to that stock and look into if Congress increased their trading activity in that stock before the rest of the market.
    a. Reason for Test: To check if the data in respect to high volatility trading from Congress members. Also to check if the chart is intuitive to read.
    b. Expected outcome: We expect that it will take the participant a moment to find the timeline filter. Once they filter the dates, we can provide the participant with an example event and its date and we expect that they will immediately answer yes or no as to whether or not the trading activity spiked prior to the event.

2 Results

Usability Test A (Completed in class on 4/11):

- Summary of usability test:
    - The test was very quick as most of the data is static and cannot be filtered yet. However, the majority of our questions were still relevant and we ran the usability test as planned. There were no major readability or surface level issues that were apparent through the test. A minor issue was the tooltip appears horizontally opposite from where the mouse is on the treemap. Next, the test user indicated that she wanted to be able to filter the time series graph at the bottom on the screen to "zoom" into a time period. They liked the use of a treemap as it makes identifying the most traded stocks very simple. They also liked the bar chart, however the bar chart needs a much more clear y-axis title. Overall, the participants liked the data and the visualization types we have selected. Now, we need to fine tune the filtering and tooltip information.
- Test 1 Result:
    - The test user highlighted that it was very easy to identify the most traded stock (MSFT). She was able to identify it within 5 seconds as anticipated. The test results actually showed that the graph is intuitive and easy to read. We just need to get the tooltip to work properly. Finally, the test subject was able to ballpark the number of boxes in the treemap at "around 20" which is exactly how many there were, so we know the data isn't too cluttered right now.
- Test 2 Result:
    - We cannot filter by stock yet, but the test subject was able to identify which Congress member made the most trades in the dataset through the bar graph. She did note that the y-axis titled "frequency" is very unclear as she thought it meant "number of trades in a year." The test subject was also able to answer this within a matter of 5 seconds. Our test results tell us that we need to label the axis better and we need to get the filter to work.
- Test 3 Result:
    - The test subject was correctly able to identify a spike in trading volume around December of 2020. We did not collect metrics on this test, however, the test subject was able to do so without hesitation and she identified the highest spike in trading volume. Our test did not indicate that we need to change this graph however we would like to be able to filter dates.

- How we will modify based on this test:
    - We are going to add filters for the timeline on the volume graph. We are also going to add a better y-axis title for the bar graph so that users understand what the frequency represents (number of trades). We would also like to add a selection for the number of boxes shown on the treemap. The justification for these three is that they came from the user and were in our original implementation plans. Furthermore, we would like to be able to show sales/purchases as a filter, number of top traders and number of bottom traders, and have tooltips with information on each congress member when clicking on their name. Even if we are able to get two or three of these interactions complete, our visualization will be so much easier to read and filter.

Usability Test B (Completed on 4/13 to reflect the visualization in the state it was submitted for PM-8):

- Summary of usability test:
    - I thought that the testing was able to adequately highlight the issues and scope of congressional trading. I was able to see that congressional traders consistently traded hot stocks before any news surrounding the stock was announced to the public by evaluating the frequency of trades and volume of trades over time. One thing that could be added, but is not completely necessary given that the user is a well versed retail trader, is more context for congressional trading relative to retail traders. I liked that our tool was interactive and there were precise data sets correlated with each stock. One thing that I think could be improved is the formatting and organization of the visualizations.
- Test 1 Result:
    - The largest holding in congress is Microsoft (MSFT.) Currently, Honorable Sunzan K DelBene holds the largest amount of Microsoft stock in congress. Clicking through the visualization, there are multiple congressmen that come up multiple times throughout the process. For example, Honorable Suzan K. Delbene, Honorable Nancy Pelosi, and Honorable Josh Gotthemier seem to show up for a majority of all the top stocks traded in congress. Currently, our dataset and visualizations do not support how much a stock has been traded compared to the American public.
      Through these tests, I believe that our visualizations do a very good job at showing the scope of the trading that occurs in congress. It also does a very good job at highlighting who seems to be taking advantage of congressional insider stock trading as there are glaring names that occur multiple times throughout the visualizations. One thing that could be improved would be to add more context for prices or compare the volume of a stock transaction to average retail traders.
      The resulting metrics tell us that it is possible to see the frequency and volume of stocks moved in congress and also the congressmen who frequently trade stocks in our visualization. This tells us that our visualizations do a good job at giving background in congressional trading data for the top stocks.
      I do not think that the test results necessarily indicate that we should change anything about our current design. Even without the problems I highlighted, there is still a lot of valuable information given from what we currently have. I think that the design could provide more general context for stock trading.
- Test 2 Result:
    - Nancy Pelosi, Kim Schrier, Patrick Fallon, and James R. Langevimame are the top congressional investors in Apple (AAPL).
      The positive aspects that our tool illuminated is that there is a large amount of data provided for each stock selected. There is readable, quantifiable data that allows the user to have an accurate picture of how Apple is evaluated by congressional members. I do not think there are any glaring issues with this portion of the tool as it does precisely what our project intended to display.
      The resulting metrics when filtering $AAPL data tell us the volume of transactions in USD and the frequency of trades by the top 5 congressmen who held AAPL.
      I do not think our test results indicate that we have to change anything about our design regarding filtering based on specific stocks. Our intent was to give congressional data on the top traded stocks in congress and the visualization does precisely that when filtered.
- Test 3 Result:
    - Throughout the pandemic, stock prices drastically have changed based on the severity of the COVID-19 response throughout the United States. Notoriously, at the start of the pandemic, congressional members were caught selling off large amounts of their portfolio before news of the pandemic was disseminated throughout the nation. Before news of new covid-19 regulations and restrictions, Amazon has historically had a higher volume of transactions. This is due to the fact that more people rely on delivery as opposed to breaking COVID-19 restrictions and quarantine.
      Filtering Amazon (AMZN) in our tool allows us to accurately see when restrictions were loosened and reinstated throughout the United States. When news of the pandemic first spread in March 2020, there were over 3,500,000 transactions. Then, in the late summer of 2021, the volume of transactions jumped again to over 500,000.
      One positive aspect of our tool that this task illuminates is that it shows how insider congressional information allows congressional members to get ahead of retail traders when there is information that could potentially crash/boost a stock. One issue that this tool illuminated is, again, a need for contextual data for average retail traders. That is not necessarily the end goal for our tool as experienced retail traders may be able to deduce this problem themselves. However, for a general audience, added context may be useful.
      The metrics and specific outcome of this task tells us how congressional information can give an unfair advantage for congressmen over average retail traders. Many jobs prohibit the buying and selling of stock. However, public servants with insider information are allowed to trade as freely as they want.

I do not think our test results indicate that a change to our design is completely necessary. It is possible to deduce an unfair congressional advantage by thinking of recent events and seeing that congressional traders seem to always have knowledge to buy or sell the stock before that information is released to the public. One thing that may be advantageous to get this point across is to add more context i.e a graph that compares congressional data to retail traders.

- How we will modify based on this test:
    - One common criticism is that more context could be provided for each stock relative to retail traders. Our initial thoughts are that the end-user will be a well versed retail trader that would already have the context of congressional insider trading in mind. For example, a retail trader would decide that the fact that the volume of transactions for Amazon was at an all time high in early March was unfair. This is because the information about the severity of the pandemic was exclusively disclosed to congressional members at the time and was not released to the public. Therefore, adding more context to the visualization is not inherently necessary as we envision that the end-user would already have the information. Secondly, the visualizations could be more organized. Currently, our “Trade Volume over Time Chart” is extending past our background boundary. This can be fixed by adjusting our flex boxes and ultimately will make our tool more readable.