CFI Power BI Case Study – Stock Analysis

Project Description: Working as a business intelligence analyst in an investment bank. Import, transform, and model data using Power Query to build a stock analysis in PowerBI for the sales and trading team. Once the data is modelled, there will be two visualizations. The first visualization will show insights into the two exchanges where the securities are located, and the other visualization will show individual security performance in an investment portfolio.

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After grabbing the data from the Learner Files - Power BI Case Study.zip file, I needed to make a data model and create the relationships between the fact and dimension tables. This is the result of creating the data model, but the data needed to be transformed first in power query.
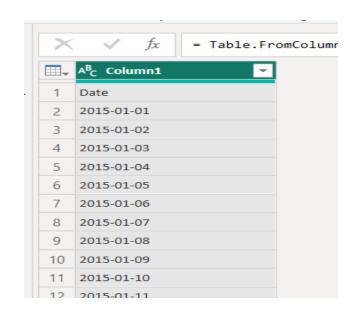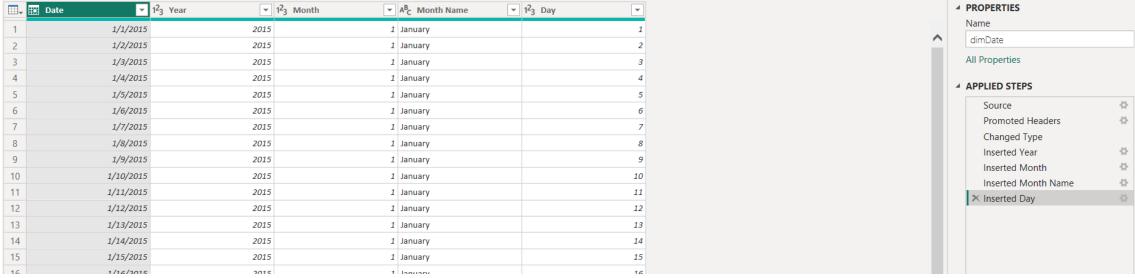
The factActivity table was the first table worked on. The measure in column4 needed to have their own separate columns with the values shown in column5. First headers were promoted, then data types were changed to their proper type. The measure column was then pivoted with the values column so that each separate measure would have its own column. New columns needed to be added to this table to use in our visualization later on, price range and price change. Price Range was calculated by subtracting the High and the Low columns, which would show the total price movement over the course of that one trading day. Price Change was calculated similarly, this time by subtracting the Open price from the Close price columns. After those columns were created, I removed the low, high, open and adjusted close columns as they were no longer needed.

	Column1	Column2	Column3	Column4	Column5
1	Fact_ID	Date	Security_ID	Measure	Value
2	45942	2015-01-01	1	Open	27.8475
3	45942	2015-01-01	1	High	27.86
4	45942	2015-01-01	1	Low	26.8375
5	45942	2015-01-01	1	Close	27.3325
6	45942	2015-01-01	1	AdjClose	24.81924
7	45942	2015-01-01	1	Volume	212818400
8	45943	2015-01-01	2	Open	160.16
9	45943	2015-01-01	2	High	162.59
10	45943	2015-01-01	2	Low	158.60001
11	45943	2015-01-01	2	Close	159.89
12	45943	2015-01-01	2	AdjClose	134.33936
13	45943	2015-01-01	2	Volume	2605400
14	45944	2015-01-01	3	Open	93.17
15	45944	2015-01-01	3	High	93.94
16	45944	2015-01-01	3	Low	92.14
17	45944	2015-01-01	3	Close	93.02
18	45944	2015-01-01	3	AdjClose	83.98235
19	45944	2015-01-01	3	Volume	2437500
20	45945	2015-01-01	4	Open	131.07001
21	45945	2015-01-01	4	High	131.84

Fact_ID	Date	Security_ID	Close	Volume	Price Range	Price Change
45942	1/1/2015	1	27.3325	212818400	1.0225	-0.515
45943	1/1/2015	2	159.89	2605400	3.98999	-0.27
45944	1/1/2015	3	93.02	2437500	1.8	-0.15
45945	1/1/2015	4	129.95	4294200	2.75	-1.12001
45946	1/1/2015	5	91.88	3767900	1.71	0.11
45947	1/1/2015	6	59.24	2796400	1.92	-0.66
45948	1/1/2015	7	27.61	22926500	0.74	-0.25
45949	1/1/2015	8	112.58	5898800	2.15	0.95
45950	1/1/2015	9	93.75	5865400	2.43	-1.16
45951	1/1/2015	11	194.41	1877700	3.03	-0.89
45952	1/1/2015	12	103.43	4323700	2.99	-1.73
45953	1/1/2015	13	95.55623	2232817	1.6684	0.0286
45954	1/1/2015	14	162.06	5525500	2.31	0.75
45955	1/1/2015	15	36.36	23605600	1.05	-0.31
45956	1/1/2015	16	104.52	5753600	1.42	-0.53
45957	1/1/2015	17	62.49	12600000	0.89	0.31
45958	1/1/2015	18	42.14	9921100	0.6	-0.12
45959	1/1/2015	19	93.26	6019700	1.95	-0.87
45960	1/1/2015	20	164.06	2116400	2.35	-0.65001
45961	1/1/2015	21	57.19	7076300	0.76	-0.03
45962	1/1/2015	22	46.76	27913900	0.88	0.1
45963	1/1/2015	23	47.515	4985800	1.42	-0.76

PROPERTIES

Name

Transform Sample File

All Properties

APPLIED STEPS

- Source
- Promoted Headers
- Changed Type
- Changed Type1
- Pivoted Column
- Reordered Columns
- Changed Type2
- Sorted Rows
- Changed Type3
- Inserted Subtraction
- Renamed Columns
- Reordered Columns1
- Changed Type4
- Inserted Subtraction1
- Renamed Columns1
- Reordered Columns2
- × Removed Columns
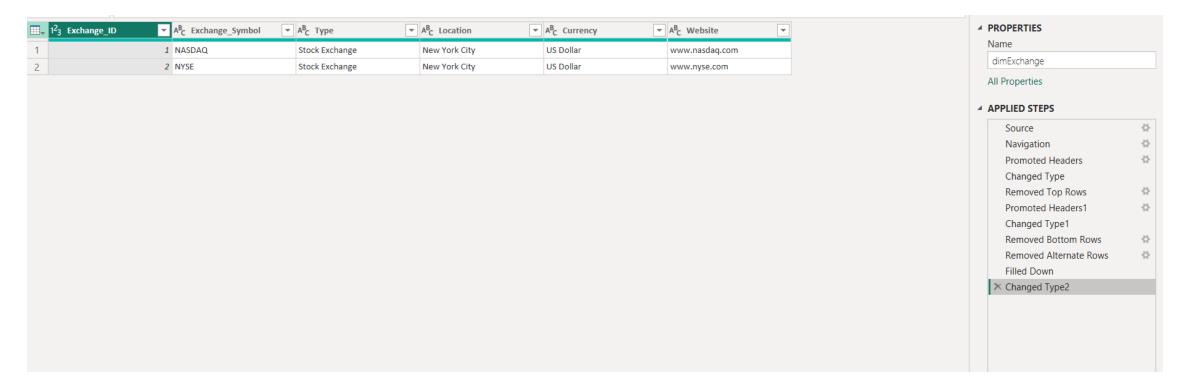
The next table was the date dimension table and only included one column of dates, which needed to show more information on separate columns: year, name of month, month and day. First, I promoted headers, then I changed the data type to a date by locale type so that there is more flexibility in working with the data depending on where someone is located in the world. Then I just added new separate columns from the add column tab, under from date and time to choose the specific portions of the date that needed to have separate columns.

	Column1
1	Date
2	2015-01-01
3	2015-01-02
4	2015-01-03
5	2015-01-04
6	2015-01-05
7	2015-01-06
8	2015-01-07
9	2015-01-08
10	2015-01-09
11	2015-01-10
12	2015-01-11

= Table.FromColumn

	Date	Year	Month	Month Name	Day
1	1/1/2015	2015	1	January	1
2	1/2/2015	2015	1	January	2
3	1/3/2015	2015	1	January	3
4	1/4/2015	2015	1	January	4
5	1/5/2015	2015	1	January	5
6	1/6/2015	2015	1	January	6
7	1/7/2015	2015	1	January	7
8	1/8/2015	2015	1	January	8
9	1/9/2015	2015	1	January	9
10	1/10/2015	2015	1	January	10
11	1/11/2015	2015	1	January	11
12	1/12/2015	2015	1	January	12
13	1/13/2015	2015	1	January	13
14	1/14/2015	2015	1	January	14
15	1/15/2015	2015	1	January	15
16	1/16/2015	2015	1	January	16

PROPERTIES

Name

dimDate

All Properties

APPLIED STEPS

Source

Promoted Headers

Changed Type

Inserted Year

Inserted Month

Inserted Month Name

✕ Inserted Day

The next table of data is the exchange dimension table. I first removed the 6 top rows, then promoted headers so the columns were correctly labeled, then I removed the bottom and alternate/middle as they were filled with null values. I then used fill down on the Type, Location and Currency Columns for the NYSE row that filled the null values for the NYSE row. This resulted in two rows of exchanges, being the NASDAQ and the NYSE.

	Column1	Column2	Column3	Column4	Column5	Column6
1	Exchange Dimension Information	null	null	null	null	null
2	-----------	null	null	null	null	null
3	null	null	null	null	null	null
4	null	null	null	null	null	null
5	null	null	null	null	null	null
6	-----------	null	null	null	null	null
7	Exchange_ID	Exchange_Symbol	Type	Location	Currency	Website
8	1	NASDAQ	Stock Exchange	New York City	US Dollar	www.nasdaq.com
9	The Nasdaq Stock Market is an American stock exchange based in New...	null	null	null	null	null
10	2	NYSE	null	null	null	www.nyse.com
11	The New York Stock Exchange is an American stock exchange based in ...	null	null	null	null	null

123 Exchange_ID	ABC Exchange_Symbol	ABC Type	ABC Location	ABC Currency	ABC Website
1	1 NASDAQ	Stock Exchange	New York City	US Dollar	www.nasdaq.com
2	2 NYSE	Stock Exchange	New York City	US Dollar	www.nyse.com

APPLIED STEPS

Source

Navigation

Promoted Headers

Changed Type

Removed Top Rows

Promoted Headers1

Changed Type1

Removed Bottom Rows

Removed Alternate Rows

Filled Down

✕ Changed Type2

The last table of data needing to be transformed was the security dimension table. First, I promoted headers, then changed the data type of all columns to their proper data type, I then added an index column, moved it to the front and renamed it to SecurityID. I removed the DateAdded column as it was not necessary for the visualizations I would be using. I then added a conditional column where the values would either be 1 or 2 depending on what stock exchange that specific security was a part of; 1 for NASDAQ and 2 for NYSE. I then renamed that column to ExchangeID and removed the exchange column from the Security table. I needed to split up the headquarters column into specific columns being the address, city, state, zip code and country. I split these columns in separate actions by using a comma delimiter, I then changed the data types of these new columns and updated the column names. Finally, I merged another into this query and took the portfolio weighting on each security, which shows what proportion that security is contained in the portfolio. I renamed the column to weighting, changed the data type, then closed and applied all my changes made to each table onto PowerBI.

|	Column1	Column2	Column3	Column4	Column5	Column6	Column7
1	Ticker Symbol	Company	Industry	DateAdded	Exchange	Headquarters	Description
2	AAPL	Apple Inc.	Information technology	3/19/2015	Nasdaq Stock Market	One Apple Park Way, CUPERTINO, CA, 95014 US	Apple Inc. (Apple) designs, manufactures and mark
3	AMGN	Amgen	Pharmaceutical industry	8/31/2020	Nasdaq Stock Market	One Amgen Center Drive, THOUSAND OAKS, CA, 91320-1799 US	Amgen Inc. is a biotechnology company. The Comp
4	AXP	American Express	Financial services	8/30/1982	New York Stock Exchange	50TH FLOOR, 200 VESEY STREET, NEW YORK, NY, 10285 US	American Express Company is a globally integrated
5	BA	Boeing	Aerospace and defense	3/12/1987	New York Stock Exchange	929 Long Bridge Drive, ARLINGTON, VA, 22202 US	The Boeing Company is an aerospace company. Th
6	CAT	Caterpillar Inc.	Construction and Mining	5/6/1991	New York Stock Exchange	5205 N. O'connor Boulevard, Suite 100, IRVING, TX, 75039 US	Caterpillar Inc. is a manufacturer of construction a
7	CRM	Salesforce	Information technology	8/31/2020	New York Stock Exchange	SALESFORCE TOWER, 415 MISSION STREET 3RD FL, SAN FRANCISCO, C...	Salesforce, Inc., formerly Salesforce.com, Inc., is a
8	CSCO	Cisco Systems	Information technology	6/8/2009	Nasdaq Stock Market	170 West Tasman Dr, SAN JOSE, CA, 95134-1706 US	Cisco Systems, Inc. is engaged in designing and sell
9	CVX	Chevron Corporation	Petroleum industry	2/19/2008	New York Stock Exchange	6001 Bollinger Canyon Rd, SAN RAMON, CA, 94583 US	Chevron Corporation manages its investments in s
10	DIS	The Walt Disney Company	Broadcasting and entertainment	5/6/1991	New York Stock Exchange	500 S Buena Vista St, BURBANK, CA, 91521-0001 US	The Walt Disney Company is a worldwide entertai
11	DOW	Dow Inc.	Chemical industry	4/2/2019	New York Stock Exchange	2211 H H Dow Way, MIDLAND, MI, 48642-4815 US	Dow Inc. is a holding company for The Dow Chemic
12	GS	Goldman Sachs	Financial services	9/20/2013	New York Stock Exchange	200 West St, NEW YORK, NY, 10282 US	The Goldman Sachs Group, Inc. is a global financial
13	HD	The Home Depot	Retailing	11/1/1999	New York Stock Exchange	2455 Paces Ferry Road, ATLANTA, GA, 30339 US	The Home Depot, Inc. is a home improvement reta
14	HON	Honeywell	Conglomerate	8/31/2020	Nasdaq Stock Market	855 S. Mint Street, CHARLOTTE, NC, 28202 US	Honeywell International Inc. is a software-industria
15	IBM	IBM	Information technology	6/29/1979	New York Stock Exchange	1 New Orchard Rd, ARMONK, NY, 10504 US	International Business Machines Corporation (IBM
16	INTC	Intel	Information technology	11/1/1999	Nasdaq Stock Market	RNB-4-151, 2200 MISSION COLLEGE BLVD, SANTA CLARA, CA, 95054 US	Intel Corporation is engaged in designing and man
17	JNJ	Johnson & Johnson	Pharmaceutical industry	3/17/1997	New York Stock Exchange	One Johnson & Johnson Plaza, NEW BRUNSWICK, NJ, 08933 US	Johnson & Johnson is a diversified healthcare prod
18	JPM	JPMorgan Chase	Financial services	5/6/1991	New York Stock Exchange	383 Madison Avenue, NEW YORK, NY, 10179 US	JPMorgan Chase & Co. is a financial holding compa
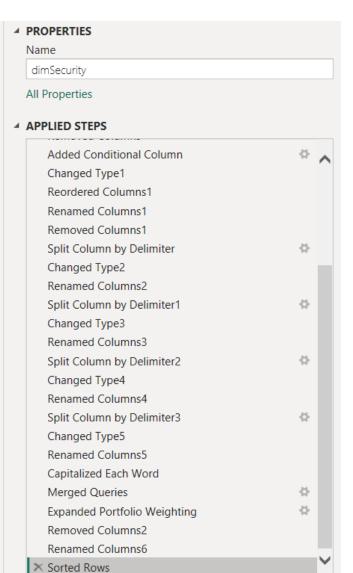
1²₃ Security ID	1²₃ Exhange ID	ᴬᴮ𝒸 Ticker Symbol	ᴬᴮ𝒸 Company	ᴬᴮ𝒸 Industry	ᴬᴮ𝒸 Address
1	1	AAPL	Apple Inc.	Information technology	One Apple Park Way
2	1	AMGN	Amgen	Pharmaceutical industry	One Amgen Center Drive
3	2	AXP	American Express	Financial services	50Th Floor, 200 Vesey Street
4	2	BA	Boeing	Aerospace and defense	929 Long Bridge Drive
5	2	CAT	Caterpillar Inc.	Construction and Mining	5205 N. O'Connor Boulevard, Suite 100
6	2	CRM	Salesforce	Information technology	Salesforce Tower, 415 Mission Street 3Rd Fl
7	1	CSCO	Cisco Systems	Information technology	170 West Tasman Dr
8	2	CVX	Chevron Corporation	Petroleum industry	6001 Bollinger Canyon Rd
9	2	DIS	The Walt Disney Company	Broadcasting and entertainment	500 S Buena Vista St
10	2	DOW	Dow Inc.	Chemical industry	2211 H H Dow Way
11	2	GS	Goldman Sachs	Financial services	200 West St
12	2	HD	The Home Depot	Retailing	2455 Paces Ferry Road
13	1	HON	Honeywell	Conglomerate	855 S. Mint Street
14	2	IBM	IBM	Information technology	1 New Orchard Rd
15	1	INTC	Intel	Information technology	Rnb-4-151, 2200 Mission College Blvd
16	2	JNJ	Johnson & Johnson	Pharmaceutical industry	One Johnson & Johnson Plaza
17	2	JPM	JPMorgan Chase	Financial services	383 Madison Avenue
18	2	KO	The Coca-Cola Company	Food industry	1 Coca Cola Plz Nw
19	2	MCD	McDonald's	Food industry	110 N Carpenter St
20	2	MMM	3M	Conglomerate	3M Center, Bldg. 220-13E-26A
21	2	MRK	Merck & Co.	Pharmaceutical industry	2000 Galloping Hill Road
22	1	MSFT	Microsoft	Information technology	One Microsoft Way
23	2	NKE	Nike, Inc.	Apparel	One Bowerman Dr
24	2	PG	Procter & Gamble	Fast-moving consumer goods	One Procter & Gamble Plaza
25	2	TRV	The Travelers Companies	Financial services	385 Washington St
26	2	UNH	UnitedHealth Group	Managed health care	9900 Bren Rd E
27	2	V	Visa Inc.	Financial services	P.O. Box 8999

ABC City	ABC State	ABC Zip Code	ABC Country	1.2 Weighting
Cupertino	CA	95014	US	0.0257
Thousand Oaks	CA	91320-1799	US	0.0487
New York	NY	10285	US	0.0288
Arlington	VA	22202	US	0.0492
Irving	TX	75039	US	0.0454
San Francisco	CA	94105	US	0.0445
San Jose	CA	95134-1706	US	0.0101
San Ramon	CA	94583	US	0.0203
Burbank	CA	91521-0001	US	0.0366
Midland	MI	48642-4815	US	0.0125
New York	NY	10282	US	0.0654
Atlanta	GA	30339	US	0.0624
Charlotte	NC	28202	US	0.0447
Armonk	NY	10504	US	0.0259
Santa Clara	CA	95054	US	0.0125
New Brunswick	NJ	08933	US	0.0312
New York	NY	10179	US	0.0295
Atlanta	GA	30313-2420	US	0.0104
Chicago	IL	60607-2104	US	0.0449
Saint Paul	MN	55144-1000	US	0.0384
Kenilworth	NJ	07033	US	0.0149
Redmond	WA	98052-6399	US	0.0498
Beaverton	OR	97005-6453	US	0.0258
Cincinnati	OH	45202	US	0.0264
Saint Paul	MN	55102	US	0.0303
Hopkins	MN	55343-9664	US	0.0733
San Francisco	CA	94128-8999	US	0.0433
New York	NY	10036	US	0.0113

PROPERTIES

Name

dimSecurity

All Properties

APPLIED STEPS

Removed Columns

Added Conditional Column ⚙

Changed Type1

Reordered Columns1

Renamed Columns1

Removed Columns1

Split Column by Delimiter ⚙

Changed Type2

Renamed Columns2

Split Column by Delimiter1 ⚙

Changed Type3

Renamed Columns3

Split Column by Delimiter2 ⚙

Changed Type4

Renamed Columns4

Split Column by Delimiter3 ⚙

Changed Type5

Renamed Columns5

Capitalized Each Word

Merged Queries ⚙

Expanded Portfolio Weighting ⚙

Removed Columns2

Renamed Columns6

✕ Sorted Rows

Before I could start making the visuals, I needed to make some DAX formulas to add to the FactActivity table to have dynamic visualizations.

Average Daily Volume : Average Daily Volume = AVERAGEX(dimDate,[Total Volume])

Average Daily Volume Year to Date : Average Daily Volume YTD = TOTALYTD([Average Daily Volume], 'dimDate'[Date])

Average Price Change : Average Price Change = AVERAGE(factActivity[Price Change])

Average Price Range : Average Price Range = AVERAGE(factActivity[Price Range])

Count Securities : Count Securities = COUNT(dimSecurity[Security ID])

Current Close Price : Current Close Price = CALCULATE([Total Close Price],LASTNONBLANK(dimDate[Date],[Total Close Price]))

Current Portfolio Value : Current Portfolio Value = [Current Close Price] * [Total Weighting]

Max Daily Volume : Max Daily Volume = MAXX(dimDate,[Total Volume])

Max Daily Volume Year to Date : Max Daily Volume YTD = TOTALYTD([Max Daily Volume],dimDate[Date])

Minimum Daily Volume Year to Date : Min Daily Volume YTD = TOTALYTD([Minimum Daily Volume],dimDate[Date])

Minimum Daily Volume : Minimum Daily Volume = MINX(dimDate,[Total Volume])

Portfolio Value : Portfolio Value = factActivity[Close] * factActivity[Weighting]

Total Close Price : Total Close Price = SUM(factActivity[Close])

Total Portfolio Value : Total Portfolio Value = SUM(factActivity[Portfolio Value])

Total Volume : Total Volume = SUM(factActivity[Volume])

Total Weighting : Total Weighting = SUM(dimSecurity[Weighting])

Weighting : Weighting = RELATED(dimSecurity[Weighting])

- factActivity
  - [ ] Average Daily Volume
  - [ ] Average Daily Volume YTD
  - [ ] Average Price Change
  - [ ] Average Price Range
  - [ ] Count Securities
  - [ ] Current Close Price
  - [ ] Current Portfolio Value
  - [ ] Max Daily Volume
  - [ ] Max Daily Volume YTD
  - [ ] Min Daily Volume YTD
  - [ ] Minimum Daily Volume
  - [ ] Portfolio Value
  - [ ] Total Close Price
  - [ ] Total Portfolio Value
  - [ ] Total Volume
  - [ ] Total Weighting
  - [ ] Weighting
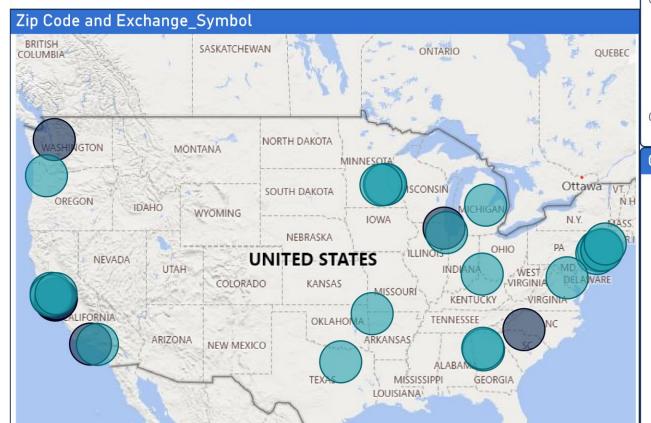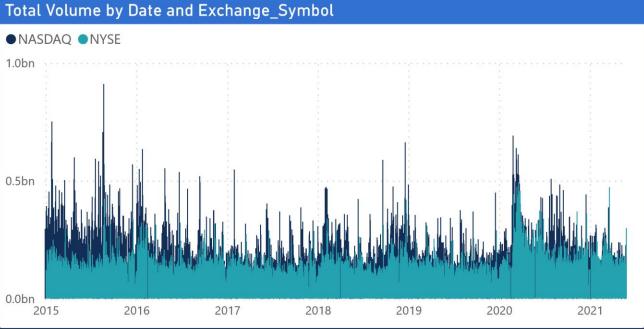
401M	124M	1bn
Average Daily Volume	Minimum Daily Volume	Max Daily Volume
379M	252M	859M
Average Daily Volume YTD	Min Daily Volume YTD	Max Daily Volume YTD

Zip Code and Exchange_Symbol

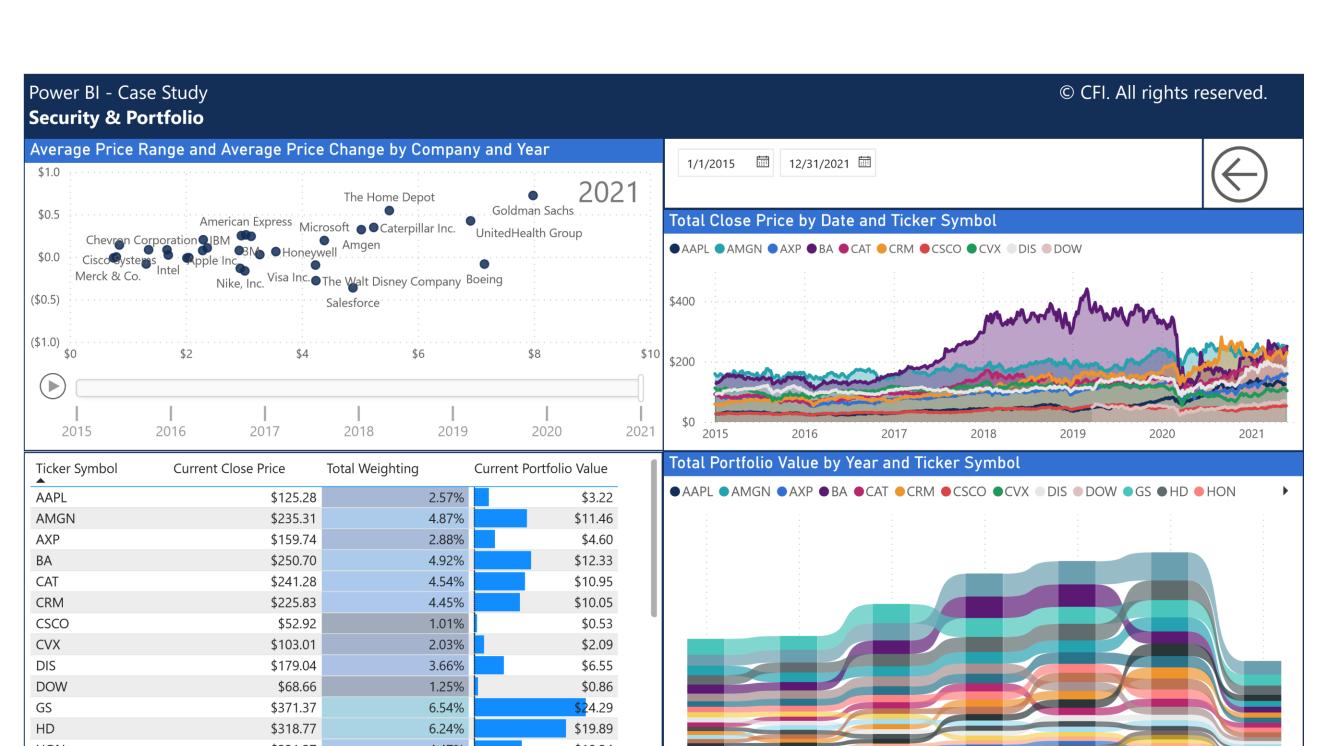## Total Volume by Date and Exchange_Symbol

● NASDAQ ● NYSE

Count of Securities by Exchange_Symbol

23

7

After creating the formulas, I started my first visuals. The first set of visuals highlighted the performance of the securities in their specific exchanges. The first visual was a BANS visual or a set of scorecards showing a snapshot of performance from the period of 2015-2021. The next visual was a stacked area chart showing the total volume of both exchanges over time and the various performance highs and lows of both exchanges. The third visual is a map chart showing which state the headquarters of these securities are in the United States. Hovering over each circle gives the zip code and the exchange that security is a part of. The final visual is a bar chart that shows the count of securities in each exchange they are traded in. The Exchange dashboard gives a broad overview of the performance of the exchanges and considers time specific insights as well. This visualization will help the sales and trading team understand the performance of each exchange, but the next visual will delve deeper into the portfolio and offer greater insight as to the performance of each security that is traded in these exchanges.

Power BI - Case Study
Security & Portfolio

Average Price Range and Average Price Change by Company and Year

2021

Companies shown: Chevron Corporation, IBM, American Express, Microsoft, Caterpillar Inc., The Home Depot, Goldman Sachs, UnitedHealth Group, Cisco Systems, 3M, Honeywell, Amgen, Apple Inc., Intel, Merck & Co., Nike, Inc., Visa Inc., The Walt Disney Company, Boeing, Salesforce

| | 1/1/2015 | 12/31/2021 |

Total Close Price by Date and Ticker Symbol

AAPL ● AMGN ● AXP ● BA ● CAT ● CRM ● CSCO ● CVX ● DIS ● DOW

Total Portfolio Value by Year and Ticker Symbol

AAPL ● AMGN ● AXP ● BA ● CAT ● CRM ● CSCO ● CVX ● DIS ● DOW ● GS ● HD ● HON

Ticker Symbol	Current Close Price	Total Weighting	Current Portfolio Value
AAPL	$125.28	2.57%	$3.22
AMGN	$235.31	4.87%	$11.46
AXP	$159.74	2.88%	$4.60
BA	$250.70	4.92%	$12.33
CAT	$241.28	4.54%	$10.95
CRM	$225.83	4.45%	$10.05
CSCO	$52.92	1.01%	$0.53
CVX	$103.01	2.03%	$2.09
DIS	$179.04	3.66%	$6.55
DOW	$68.66	1.25%	$0.86
GS	$371.37	6.54%	$24.29
HD	$318.77	6.24%	$19.89

The second visualization analyzes key performance of the securities in the investment portfolio. The first visual is a scatterplot of the Average Price Rand and Price Change of each company. The play button shows the changes over time of each company based on the date slicer that can choose a time range between the beginning of 2015 to the end of 2021. The second visual is a stacked area chart that shows the total close price of each company shown as their ticker symbol over the specified time range. The third visual is a table of each company's ticker symbol, it's last known close price, the combined weighting or percentage of that security in this portfolio and the current portfolio value that security brings based on its close price and weight within the portfolio. The final visual is a ribbon chart that shows the total portfolio value of each ticker symbol over the given period. This Security visualization helps the sales and trading team identify performance of each security, but more importantly the trends of each portfolio over time. This will help the team understand the actions needed to ensure those securities are performing positively and increasing their value to the portfolio, especially those securities that make up a higher percentage of the portfolio total.