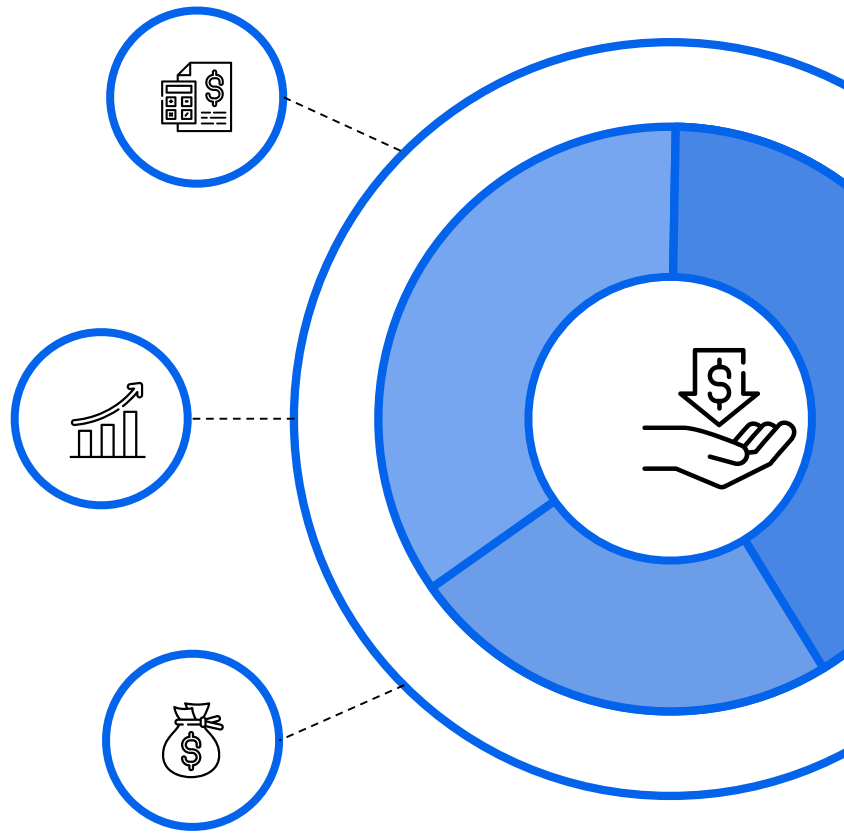




Python Final Project

Randolph, Sergio, Alexander, Konstantinos,
Aditi





OBJECTIVE

To analyze the stock price information (Open, High, Low, Close, Adj. Close, Volume) for the following companies.



Luckin Coffee Inc.



Domino's Pizza Inc.



Restaurant Brands International Inc.



The Wendy's Company



Yum! Brands, Inc.



McDonald's Corporation



Berkshire Hathaway Inc.



Papa John's International Inc.

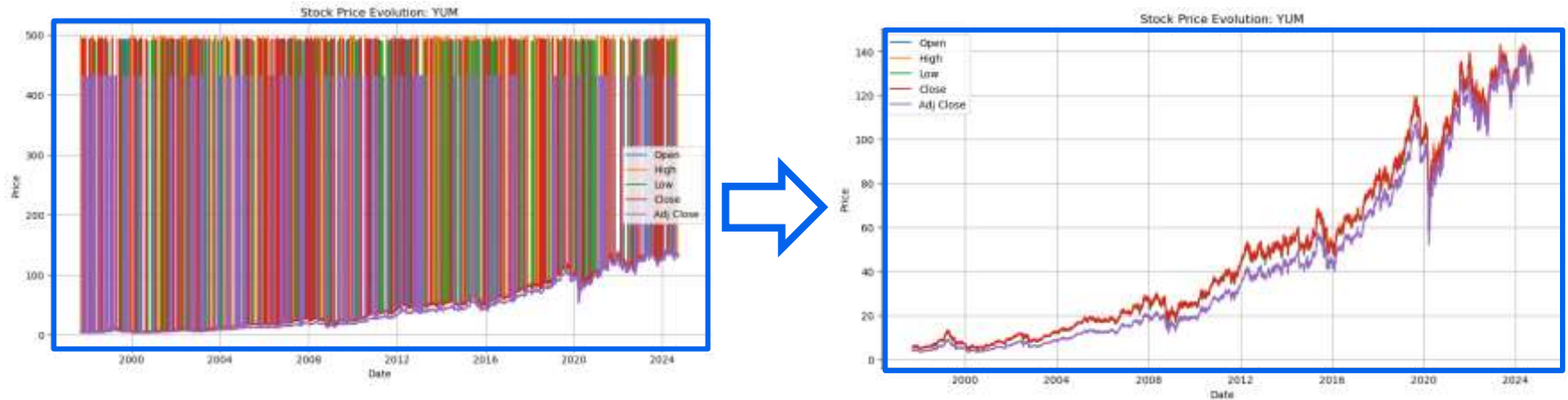


Starbucks Corporation



Krispy Kreme Inc.

PREPROCESSING OF DATA



Preprocessing involved cleaning and normalizing the raw stock price data to remove noise and improve interpretability. The left chart illustrates the raw data with overlapping price metrics, while the right chart demonstrates the clean, consolidated view of key stock price trends over time. This step ensures accurate analysis and insights.



CHALLENGES FACED : MISSING VALUES & OUTLIERS

- Around 5% of missing values for each metric of each company, except for QSR, which had no missing values.
- We detected the outliers using the rolling median method. For price metrics, we used a threshold of 25% and a window of 10 days.
- For volume, since it can fluctuate significantly more and there is no clear correlation between consecutive days, we used a threshold of 100% and a window of 30 days.
- We identified outliers and replaced them with NaN values, to perform imputation to both NaN and outliers.

	Company	Date	Open	High	Low	Close	Adj Close	Volume
	LKNCY	0.0	0.0	10.07	10.81	8.70	10.37	15.56
	DPZ	0.0	0.0	7.70	7.51	7.65	7.43	13.35
	QSR	0.0	0.0	0.00	0.00	0.00	0.00	7.36
	WEN	0.0	0.0	7.84	7.43	7.76	7.53	20.76
	YUM	0.0	0.0	7.40	7.54	7.68	7.54	12.15
	MCD	0.0	0.0	7.66	7.39	7.40	7.32	11.46
	BRK-A	0.0	0.0	7.39	7.36	7.46	7.38	18.87
	PZZA	0.0	0.0	7.36	7.52	7.43	7.66	15.87
	SBUX	0.0	0.0	7.56	7.44	7.92	7.70	12.50
	DNUT	0.0	0.0	7.48	8.22	9.69	7.61	17.06

DATA IMPUTATION

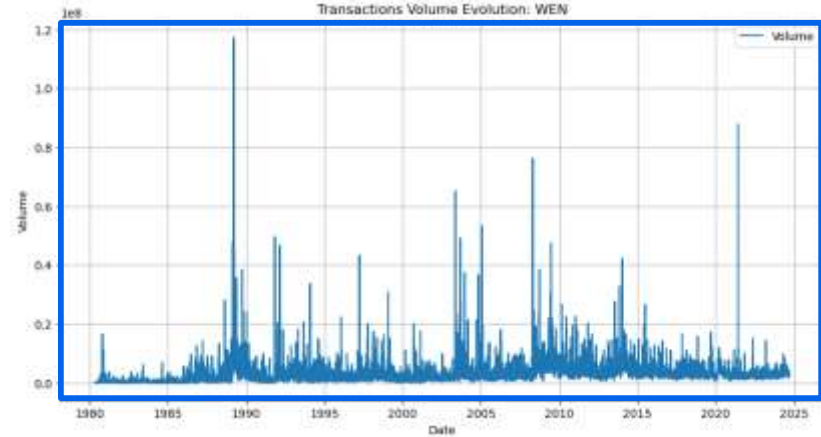
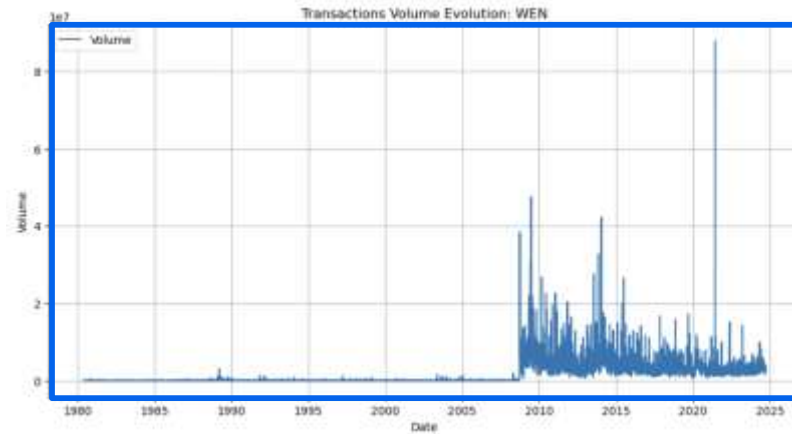


We observed a high correlation between Close and Adj. Close. To impute the missing values, we used the observed ratio between the two.

For High, Low, Open, Close we used the method of Interpolation, since we assumed a uniform change between known data points. For edge cases where sufficient data was unavailable, forward and backward propagation techniques were applied.

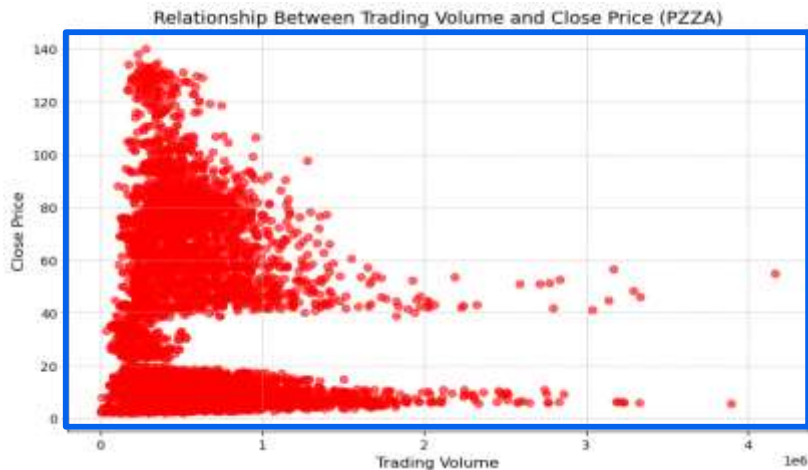
Missing values in Volume were replaced using a 30-day rolling median. This choice reflects the high daily variability and event-driven nature of trading volume.

VOLATILITY & VOLUME



For Wendy's (WEN) and Berkshire Hathaway (BRK-A), we observed a scale inconsistency in the data. Therefore, we adjusted the periods using the factor by which the values were minimized or enlarged.

INSIGHTS & FINDINGS



High Trading Activity: Notable between the \$0-20 and \$40-60 price ranges, indicating significant investor interest at these levels.

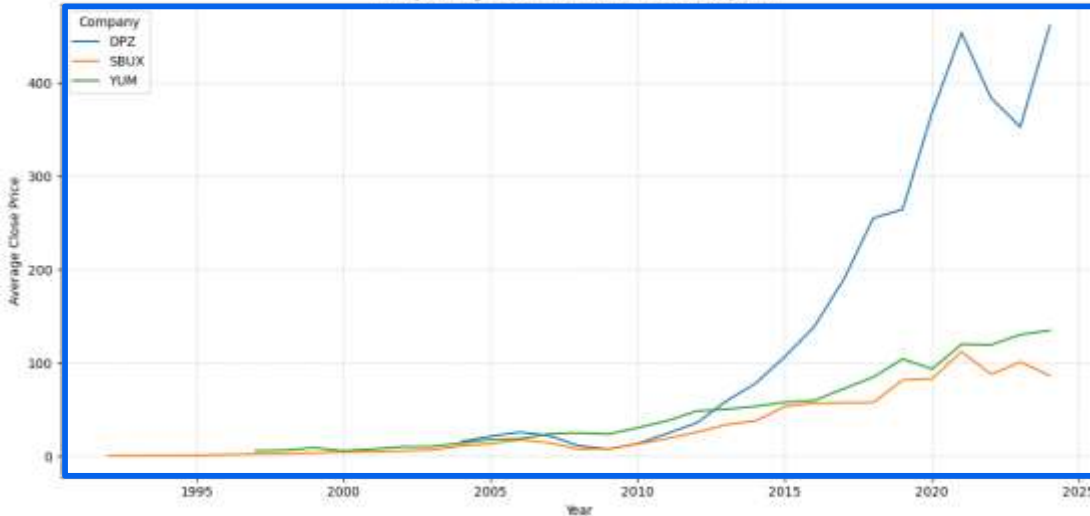
Historical Support Level: The stock rose from \$10 to \$20 between 2010 and 2012 and hasn't fallen below \$20 since, suggesting a strong support level reinforced by high trading volumes.

Recent Decline: This year, the stock fell to around \$47, aligning with established volume territories. There's a concern that if it continues downward and breaches the \$40 support zone, it might lead to decreased trading volume and investor interest.

VOLATILITY & GROWTH



Yearly Average Close Prices for Selected Companies



Domino's Pizza (DPZ): A clear standout with rapid stock price appreciation after 2010.

Starbucks (SBUX): Stable but less aggressive growth, likely reflecting its niche focus.

(YUM): In line with SBUX performance.

HIGHEST VOLUME BY MONTH-YEAR

COMPANY	MONTH-YEAR	TOTAL VOLUME
LKNCY	January 2020	315.51M
DPZ	August 2011	27.29M
QSR	March 2020	110.31M
WEN	June 2009	5.09M
YUM	January 2008	170.39M
MCD	October 2008	319.16M
BRK-A	April 2024	31.27M
PZZA	August 2018	40.22M
SBUX	January 2008	790.03M
DNUT	May 2024	52.34M



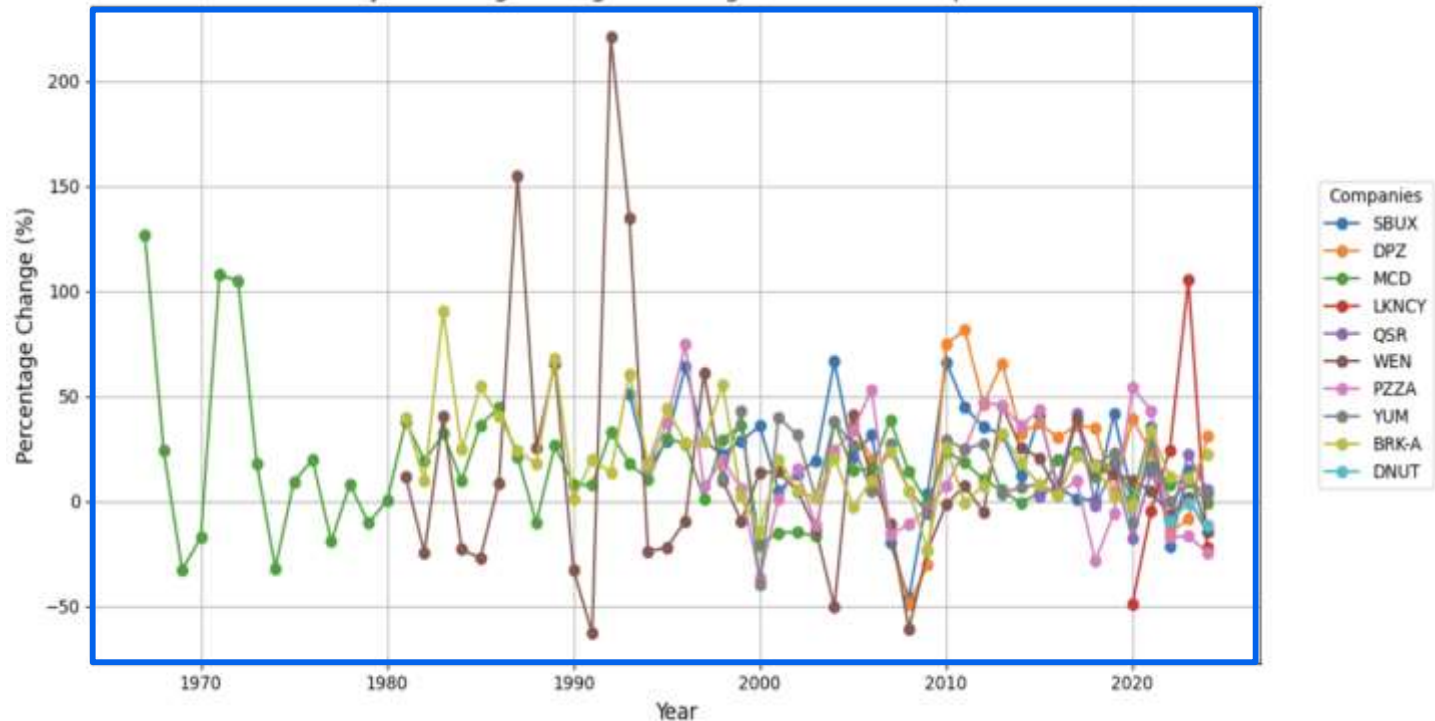
6 out of 10 companies had their highest volume in 2008-2009 or 2020, implying a high sell-off of the F&B industry during crisis periods.

BRK-A had its highest trading volume in 2024.

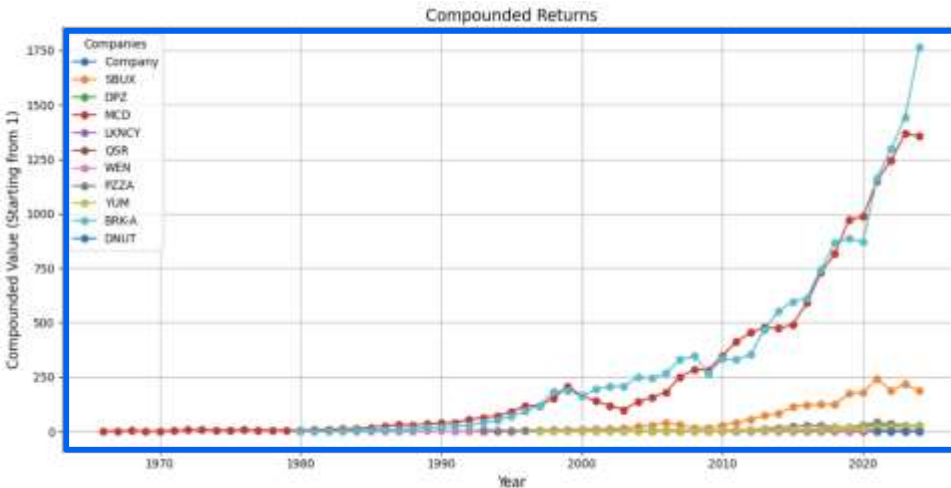
ANNUAL RETURN PERFORMANCE

Maturity, Economic Cycles (Booms and Recessions)

Yearly Percentage Change in Average Close Price Comparison



COMPOUNDED RETURNS



Berkshire Hathaway (BRK-A) and McDonalds (MCD) have the highest compounded return.

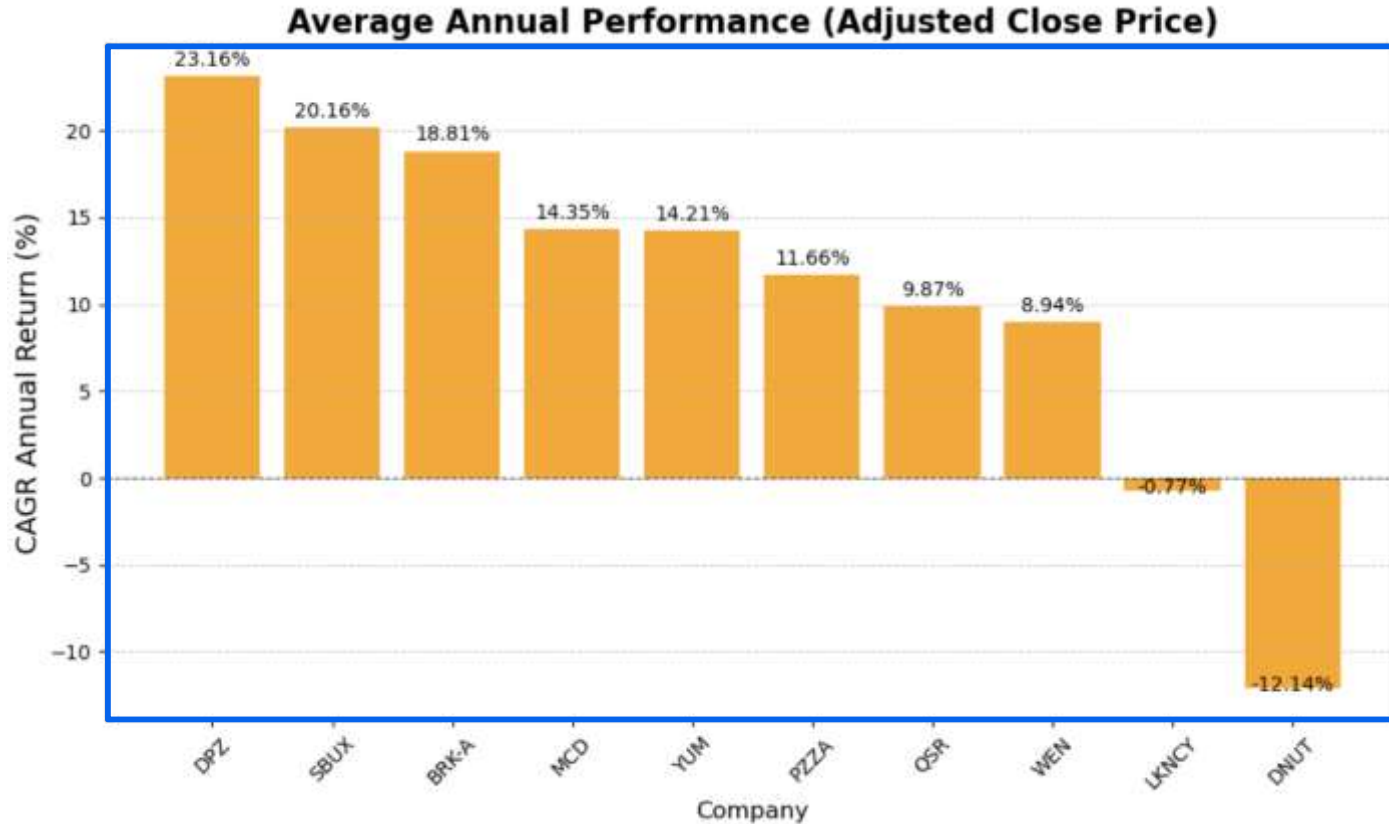
They are also publicly listed the longest.

Changing to a logarithmic scale shows us a more complete picture of the performances of the individual stocks.





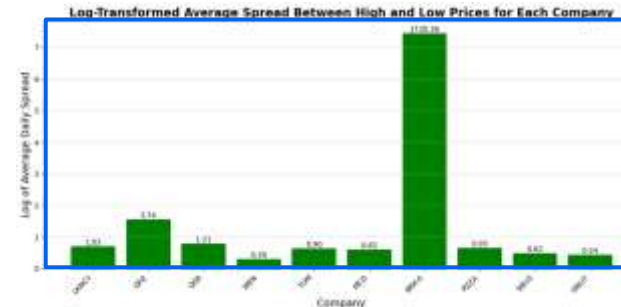
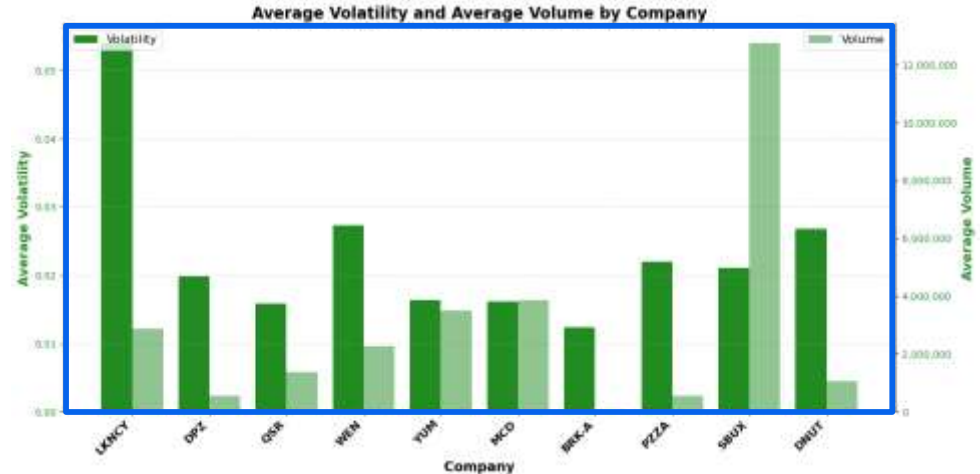
AVERAGE CAGR RETURN



AVERAGE VOLATILITY AND VOLUME



- **LKNCY** shows the largest volatility, which can be explained by their accounting problems within the past years.
- **SBUX** has high volume, as it is a well-known company with high share interest.
- **BRK-A** stock has the lowest volume due to the high share price, constituting a high-barrier for many investors.



you vs. the guy she tells you not to worry about

INVESTORS OF DNU BE LIKE:



THANK YOU!



SUBMISSION
3 DAYS
AHEAD



SUBMISSION
AFTER
PRESENTATION

13 GROUPS PRESENTING THE
SAME THINGS:

