



The Correlation of S&P 500 Companies to the Index

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Agenda



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Hypothesis

How **correlated** are the **closing prices** of S&P 500 companies to the **index** and is there a **pattern** depending on the **weight of the stock**?



Methodology

Using **several correlation tests** depending on the **patterns** including **linearity** within the data to find values representative of the set

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The Significance

The Idea of
Constantly
Investing Money



What You
Are **Actually**
Investing In



Better **“Safe”**
Investment
Over The Index



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Introduction to Dataset

Companies

S&P 500 (GSPC)
Apple (AAPL)
JP Morgan (JPM)
Costco (COST)
American Express (AXP)
Target (TGT)
Hershey (HSY)

Date Range

Jan 1st 1990 - Nov 1st 2022

Closing Price

All Open Market Days



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GSPC Time Series Data (Jan 1990 - Nov 2022)



Goal of this Step

Determine correlation based on weight of stock in the S&P500

Percentage of S&P 500

AAPL: > 2%

AXP: 0.25% - 0.5%

JPM: 1% - 2%

TGT: 0.1% - 0.25%

COST: 0.5% - 1%

HSY: < 0.1%

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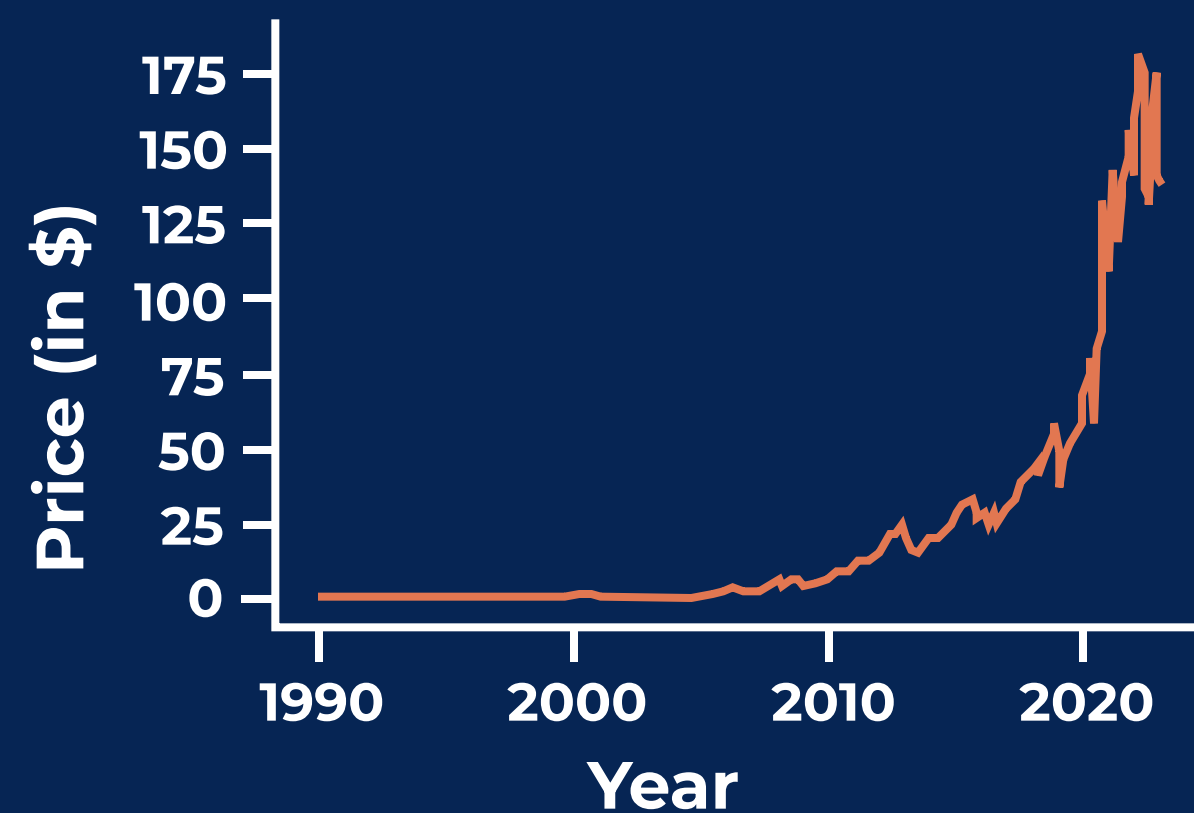
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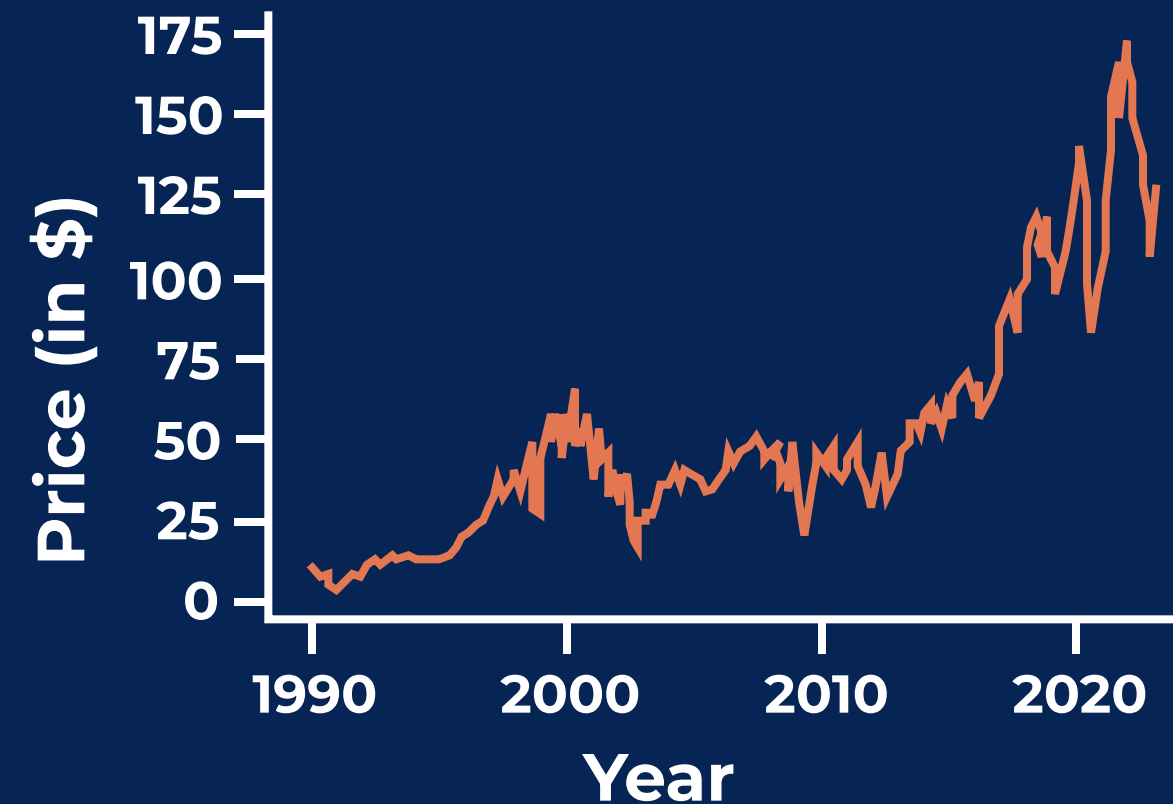
Visual Analysis (APPL, JPM, COST)

An Exponential Trend...

APPL Time Series Data



JPM Time Series Data



COST Time Series Data



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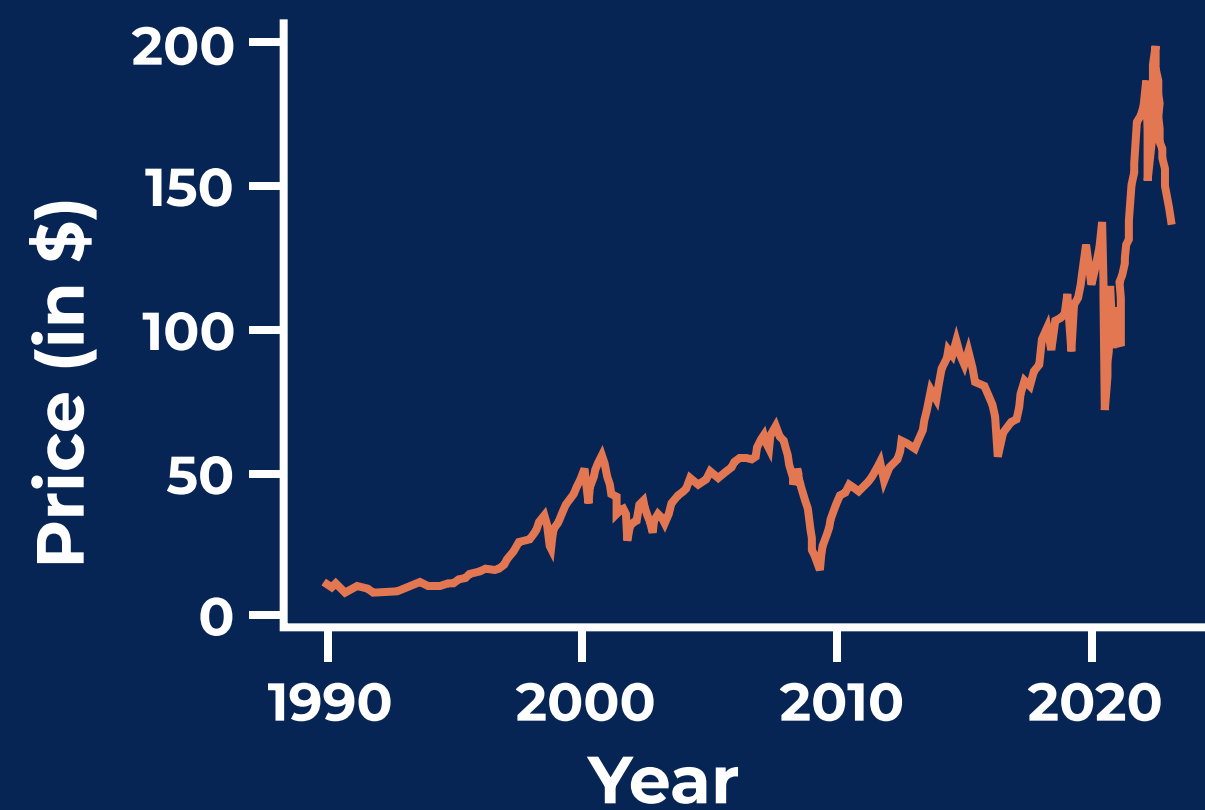
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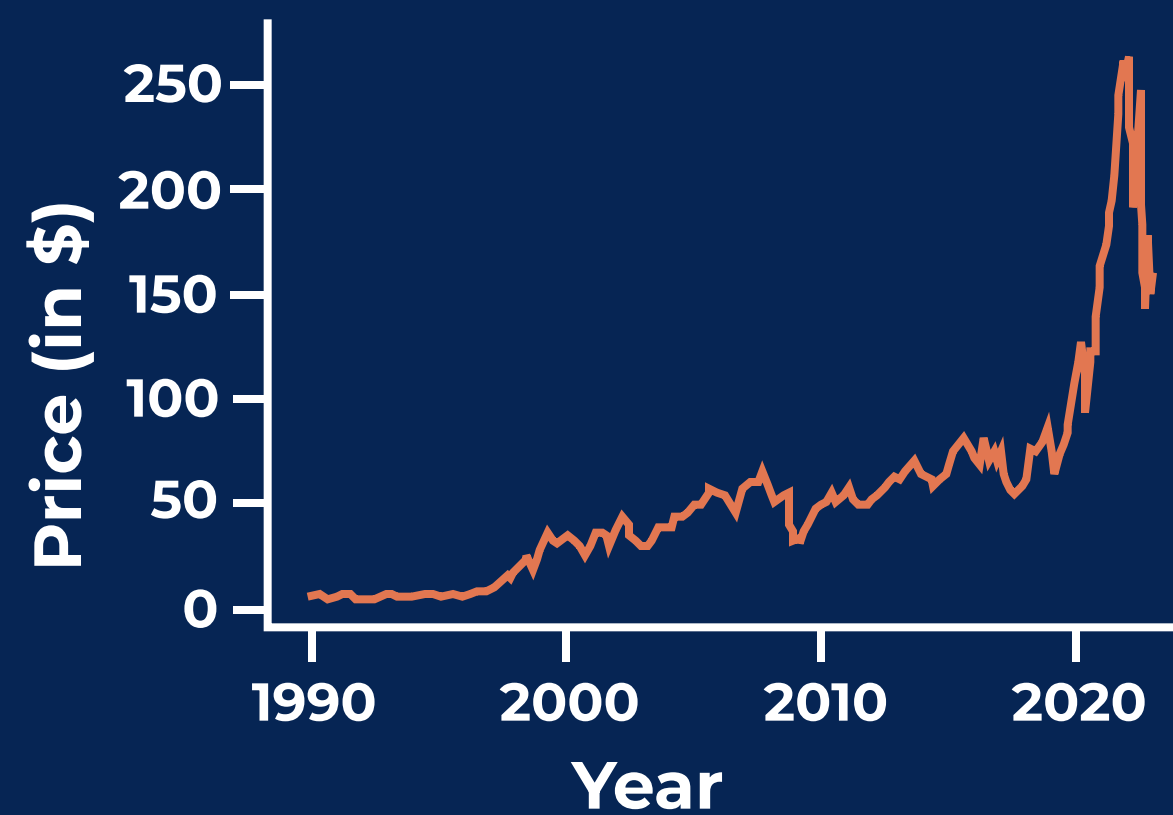
Visual Analysis (AXP, TGT, HSY)

Cont.

AXP Time Series Data



TGT Time Series Data



HSY Time Series Data



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The Correlation of Closing Prices

Lower Correlation Values with AAPL...

	Pearson	Spearman	Kendall Tau
AAPL	.9172	.8471	.6728
JPM	.9780	.9645	.8563
COST	.9605	.9355	.7944
AMX	.9768	.9725	.8675
TGT	.9385	.9305	.7900
HSY	.9570	.9099	.7734

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Important Takeaways

Pearson Value Accuracy



According to the calculated values, the Pearson correlation had the **greatest accuracy** with an average correlation of **0.9547**

Kendall Tau Inaccuracy



This correlation was the **worst** amongst the three tests, with **no values** being above **0.9** and a **majority** landing under **0.8**

AAPL's Lower Correlation



Out of the 6 companies that were tested, AAPL, although the **largest** company by weight, **considerably** had the **lowest values**

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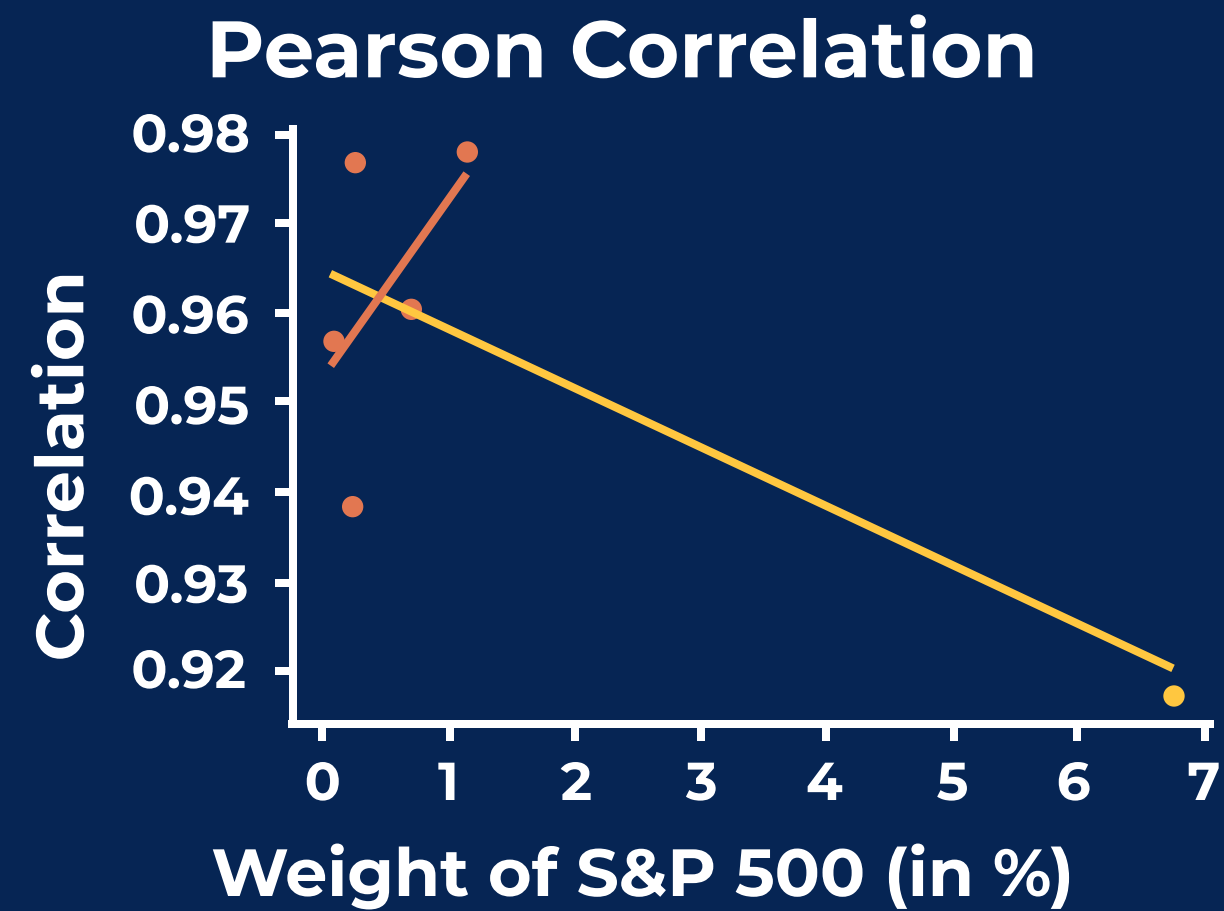
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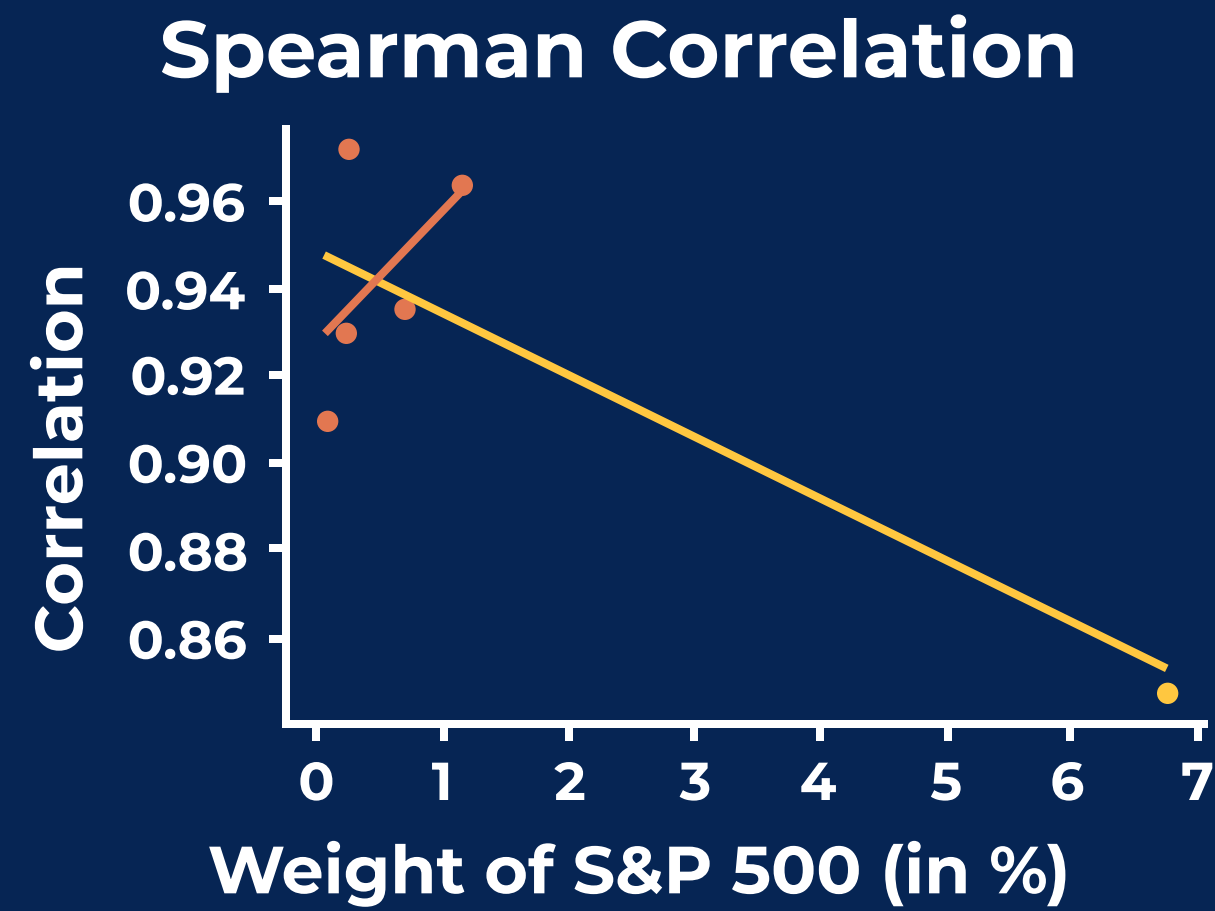
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Graphical Analysis

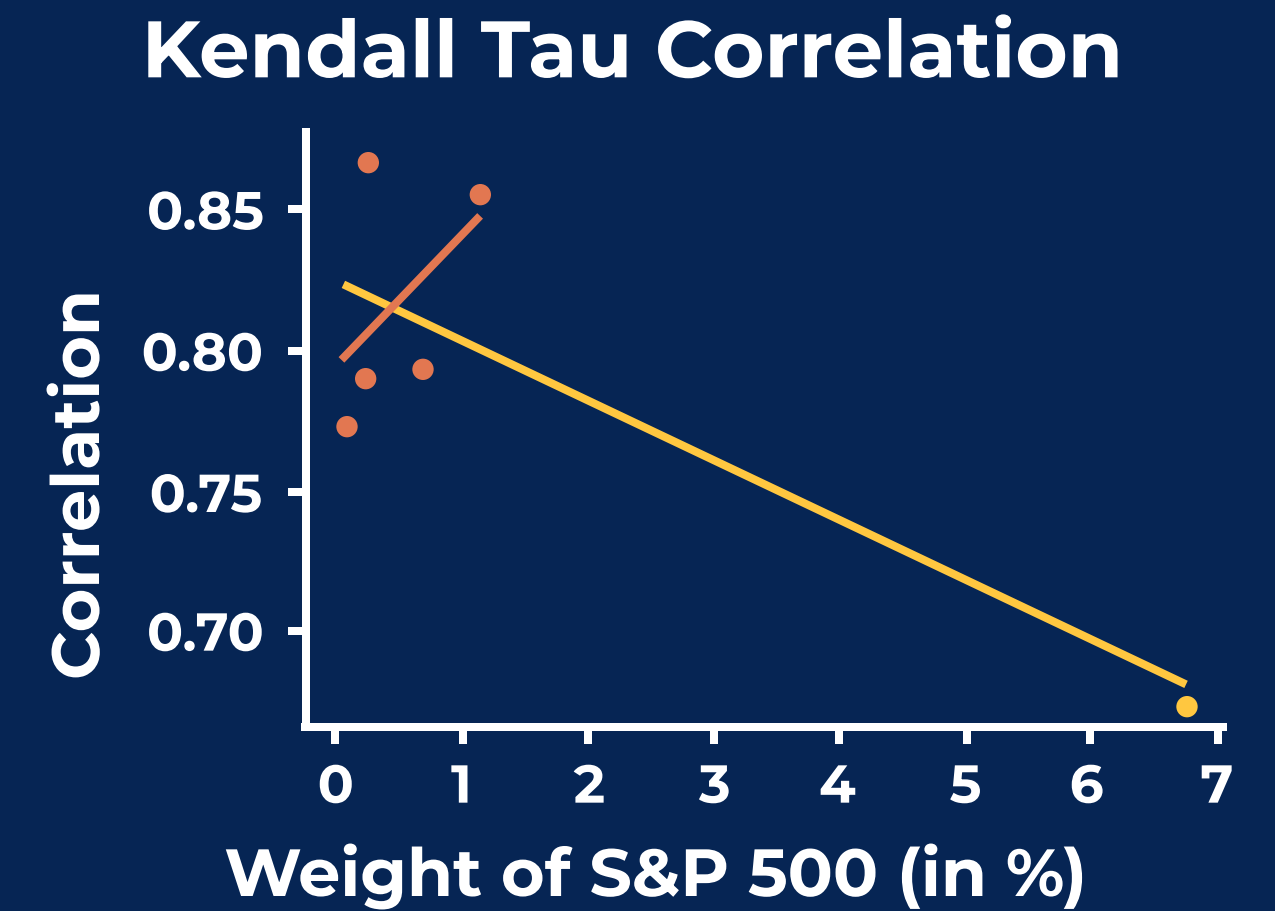
A Change in Sign and Quantity



Correlation w/ AAPL: **-0.726**
Correlation w/o AAPL: **0.530**



Correlation w/ AAPL: **-0.813**
Correlation w/o AAPL: **0.508**



Correlation w/ AAPL: **-0.791**
Correlation w/o AAPL: **0.470**

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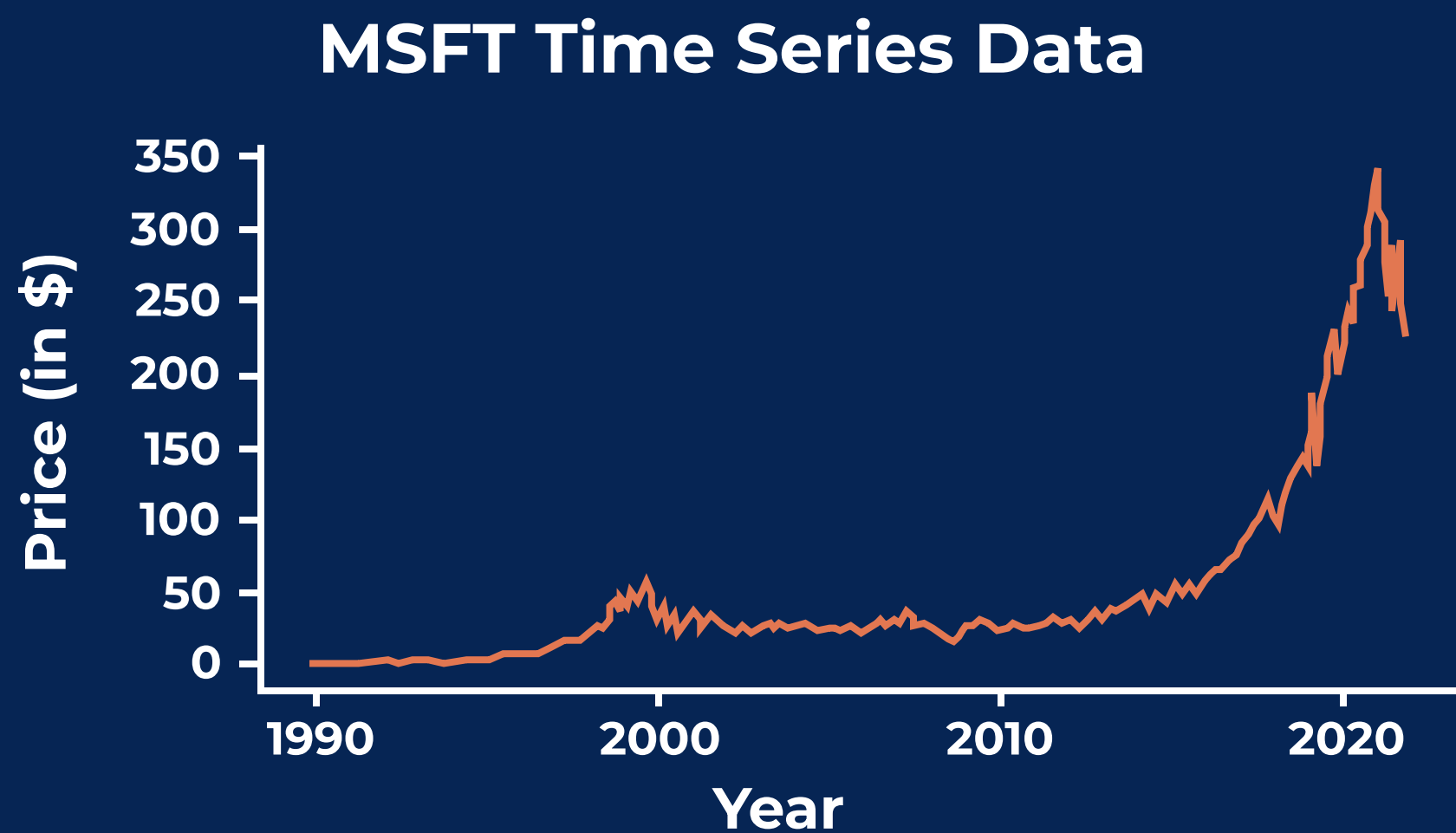
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Questionability of AAPL

Second Largest Weight in the
S&P 500 - 5.37%



Correlation Comparison

	MSFT	AAPL
Pearson	.9378	.9172
Spearman	.9557	.8471
Kendall Tau	.8476	.6728

Not enough of an explanation..

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Percent Changes

Is Apple a Better Investment?

S&P 500



Percent Change

976.968%

Apple



Percent Change

44,897.0%

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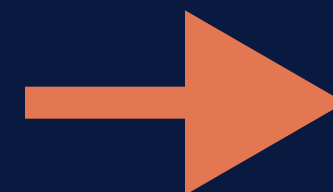
An Exploration Limitation

Why was the Percent Increase Much Higher?

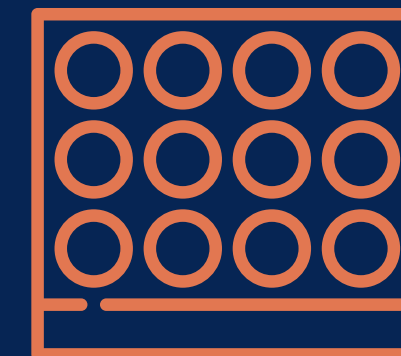
A Comparison of Time Ranges



APPL IPO'd in 1980 which was only 10 years prior to when the data set was taken while the S&P 500 was introduced in 1957. This results in the S&P 500 having more time to develop



Take Smaller Samples



By doing this, it allows Apple to get more time to develop past their introductory stages. This test can even be replicated with smaller and recent time frames for the most accurate takeaways

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General Limitations

Statistical Significance



Increase Sample Size

Use at least 40 companies if not all for a holistic view

Holding All Others Constant



Analyze in Groups

Increases depth and accuracy of calculations

Correlation vs. Causation



Read Specific News

Can point to certain events which may be influential

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Business Insights

Using these Companies as Indicators of the Market



Firms would potentially be able to look at a company within the S&P 500 and be able to dictate the status of the market due to the fairly strong correlation. This can be improved through the increased sample size to denote a true correlation and seeing the role that outliers play in the final results.

A Safer Investment for Businesses



Noting the percentage growth that Apple had in comparison to the S&P 500, it can be concluded that for businesses, it would be more wise to invest in Apple than in the general index without taking additional risks. Smaller businesses can certainly benefit significantly more than larger firms from this.

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Final Reflections

Potentially Unreliable Correlation with AAPL Stocks

Large growth/loss for Apple is weighed down by the other companies for the index value

Decent Correlation Assuming Normal Distribution

Calculated correlations were all above $|-0.70|$ including AAPL with Spearman being the most indicative

AAPL as a Better Safety Option than the Index

AAPL underwent a far greater percent change than the index in the time range from 1990-2022

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Q&A



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