Changes in Market Attributes Before and After 08-09 Recession

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Background Information

The equity markets crashed in early 2008. Can we look at market attributes to determine how different the market was before and after the recession?

Can we examine the size of those differences and determine their statistical significance?

The Attributes we Examined and When

- Standard Deviation and Return for both the NYSE and NASDAQ
- For the time periods 1997-2007 (before), 2008-2009 (during), 2010-2018 (after)

Quick Results Summary

Std Dev:
NYSE - Before: 12.164
NYSE - During: 14.843
NYSE - After: 10.671

NASDAQ - Before: 19.432
NASDAQ - During:17.319
NASDAQ - After: 15.2

The Data that we used:

- 20 years of daily price data for each stock listed on the NYSE and NASDAQ, taken from Kaggle

- Formatted to find average price for stock, per year and standard deviation per stock, per year, broken down by exchange

- List of all stocks on the NYSE and NASDAQ over the past 20 years

- API call on AlphaVantage

How did we go about getting our results?

We looked at the mean std-dev for each stock, by year, and the average of the composite as a whole, and determined if they were statistically different in each period studied

We looked at the mean return for each stock, by year, and the composite as a whole, and determined if they were statistically different in each time period

How did we perform our EDA?

Technologies used to get results:

-Python
-Pandas
-Numpy
-Scipy
-API call on AlphaVantage
-Seaborn
-Matplotlib

Deep Dive of our Results

Standard Deviation

-We can see that prior to the recession, standard deviation was decreasing

-During the recession, standard deviation increased significantly, and then decreased following the recession due to tighter controls and more normal market conditions

-We can see that for the NASDAQ, prior to the recession, st. dev. values were higher, due to the more volatile nature of techs stocks

Return

-Prior to the recession, on average, stocks were producing higher returns

-Returns crashed and turned negative during the recession

-Following the recession, although returns were positive again, they were at a lower level, on average, than prior to the crash

Standard Deviation for NYSE Stocks

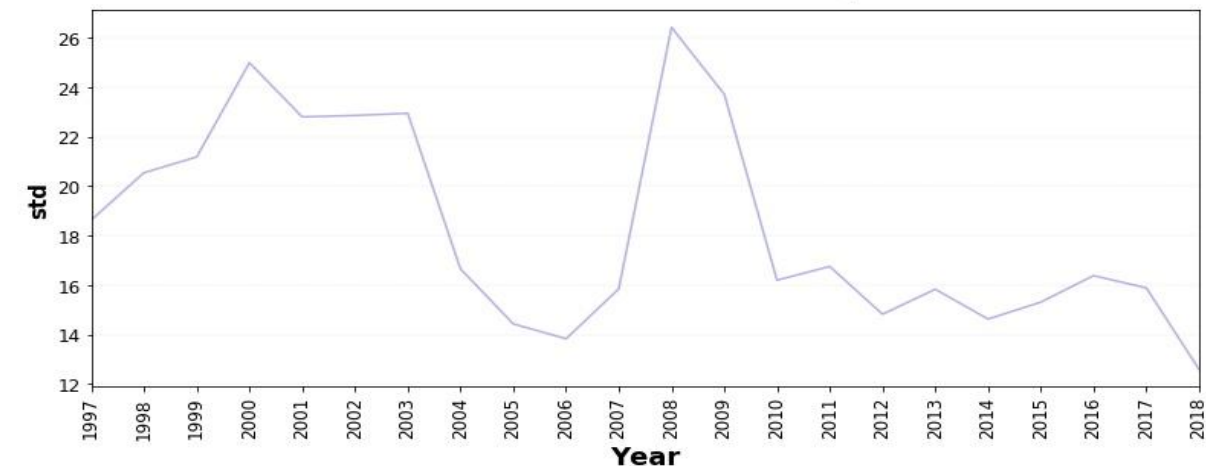
Standard Deviation for NASDAQ Stocks
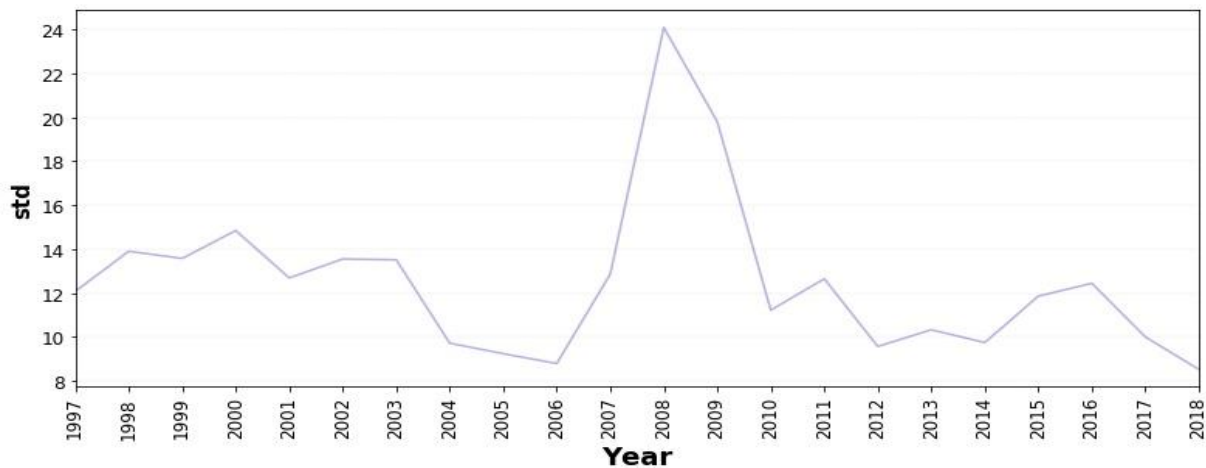
For both composites, volatility was low leading up to the crash

Volatility spiked during the recession

There was a decline in volatility until 2010, when the market began to display more normal activity

Tests Performed

ANOVA test to analyze statistical significance of changes in standard deviation prior to and following the recession

ANOVA by YEAR for NYSE BEFORE RECESSION

	df	sum_sq	mean_sq	F	PR(>F)
year	1.0	2.479543e+04	24795.425483	109.313721	1.705612e-25
Residual	14551.0	3.300576e+06	226.828116	NaN	NaN

ANOVA by YEAR for AFTER RECESSION

	df	sum_sq	mean_sq	F	PR(>F)
year	1.0	3.109379e+03	3109.378632	15.540819	0.000081
Residual	21756.0	4.352901e+06	200.078172	NaN	NaN

Tests Performed

ANOVA test to analyze statistical significance of changes in standard deviation prior to and following the recession

ANOVA by YEAR for NASDAQ BEFORE RECESSION

	df	sum_sq	mean_sq	F	PR(>F)
year	1.0	9.437597e+04	94375.967853	268.501267	9.876027e-60
Residual	12685.0	4.458672e+06	351.491705	NaN	NaN

ANOVA by YEAR for NASDAQ AFTER RECESSION

	df	sum_sq	mean_sq	F	PR(>F)
year	1.0	2.711834e+03	2711.833857	9.534442	0.002019
Residual	23056.0	6.557703e+06	284.425012	NaN	NaN

Tests Performed

ANOVA test to analyze statistical significance of changes in standard deviation prior to and following the recession

ANOVA NYSE RECESSION

	df	sum_sq	mean_sq	F	PR(>F)
period	2.0	5.062981e+07	2.531491e+07	123.976436	1.439145e-54
Residual	17270411.0	3.526467e+12	2.041913e+05	NaN	NaN

Real World Application

Who can use your model and how would they use it?

Useful for looking at risk relationships through time, and how they changed leading up to the recession

Can use recent/current volatilities to predict and manage risk

Room for Improvement

Look at domestic equity indices

Extend analyses to other asset classes

Look at correlations between indices and correlations between asset classes

Can do Sharpe ratio analyses across indices and asset classes to determine how excess reward per risk changed over time