Asset Class Performance Against the Stock Market During the Past Three Recessions

Andrew Bader
Kunal Srinivasan
Max Accurso
Evelyn Nazginov

Executive Summary

- Our group conducted an in-depth analysis of various asset's performance throughout the previous three recessionary environments.
- We utilized the S&P 500 as the benchmark to measure each other asset against. We included a diverse group of assets in attempt to capture the entirety of the market. Of the twelve assets analyzed, we chose six equity sectors, the ten-year treasury, gold, oil, USD, and the CBOE volatility index.
- The goal : to reveal the overall impact of a recession on each asset and define any trends or relationships among classes and across recession periods.
- Our group aimed to discover market tendencies which could lead to further insight into future recessions and guide capital providers on how to protect their investments.

Background- What exactly constitutes a recession?

The definition of recession: two consecutive quarters of negative GDP growth would signal a recession, which would have started in the summer of 2022.

However, the National Bureau of Economic Research (NBER), the organization responsible for defining US business cycles, does not agree with this definition and it's assessment.

- The NBER views a recession as a substantial decrease in economic activity across the country that persists for more than a few months, and does not believe that a recession occurred in the summer of 2022.

The Federal Reserve has expressed its intention to increase interest rates until inflation begins to cool down from its current state, which could trigger a downturn in the economy that would be universally recognized as a recession.

Economic Data from the Most Recent Reports:

- GDP Q4 2022 +2.9% (good)
- CPI December +6.5% (bad)
- Treasury Yield Curve 10Y/2Y Spread -0.66% (inverted, bad)
- Unemployment Rate December 3.5% (good)
- Initial Jobless Claims January 190,000 (good)
- Housing Starts December -1.4% (bad)

Objectives

- Analyze the performance of major indices, sectors, and securities throughout past recessions
- Calculate steepest decline (or incline) for the assets from peak to trough in each recession
- Calculate the percentage of value decrease (or increase) over the course of the recession
- Calculate the time to recovery (pre-recession levels) for each asset
- Report any intermarket relationship or correlations findings
- Utilize findings to provide guidance into future recessionary environments

- Time Frame Being Analyzed: 08/22/2000 – 1/2/2023
- The 2001 Recession a.k.a 9/11 Recession (March-November 2001)
- The 2008 Recession a.k.a Great Recession (December 2007 - June 2009)
- The 2020 Recession a.k.a COVID-19 Recession (February-April 2020)

Project Operations

Data Collected:

- Stocks: S&P 500 (SPX)
- CBOE Volatility Index (VIX)
- Bonds: Treasury Yield 10 Years (TNX)
- Gold: LBMA Gold Price
- US Dollar: USDX Index (DX-Y.NYB)
- Technology Sector: SPDR Fund (XLK)
- Financial Sector: SPDR Fund (XLF)
- Energy Sector: SPDR Fund (XLE)
- Utilities Sector: SPDR Fund (XLU)
- Health Care Sector: SPDR Fund (XLV)
- US Real Estate ETF: iShares (IYR)
- Oil Prices: Crude Oil WTI Futures

Data clean-up:

- From the raw csvs, pandas read_csv function was used to import the data.
- The index column was set to the first data column of each csv.
- Dates were parsed and standardized amongst each data set using pandas' csv functions.
- The axis column was renamed and standardized across data sets for ease of concatenation, joining, and subsequent analysis.
- Each file required specific cleaning algorithms.
- Looping algorithms were also used to convert the imported string data into floats for subsequent analysis.
- The pandas .head function was used to visualize columns of the data
- Column renaming functions were used across data sets in order to standardize and ease analysis and data manipulation.
- Each set of data was plotted using hvplot in order to check "plotability"
- The to_csv pandas function was then used to save the resultant cleaned data as csvs in a directory with a specified path.

Approach

The technologies used include:

- **Python:** the sole development language of the analysis
- **pathlib library:** to access and import csv files for various processes
- **hvplot:** for plotting interactive and informative plots
- **pandas:** for key functions and data manipulation as needed throughout the analysis and processing
- **git and github:** for local and external version control as well as data storage
- **numpy:** library was used for data manipulation, analytics and processing

Tasks:

- **Andrew Bader:** Cleaning data and processing for analysis, setting up github version control
- **Kunal Srinivasan:** Data manipulation, processing and recession analysis
- **Max Accurso:** Project ideation, data collection, recession analysis, Readme
- **Evelyn Nazginov:** Recession analysis and powerpoint presentation

Challenges and Successes

- Finding complete and matching data sets
- managing version control
- developing meaningful analytics and corresponding processing algorithms
- cleaning the data with appropriate algorithms
- asymmetric data structure resulted in process errors when the code was deployed for recession periods other than on which it was built

- Developed a number of interesting plots describing our findings and analysis
- Found complete sets of data for all desired assets which were successfully cleaned for analysis
- Parametrized code design allowed different users to use the master code uniformly with simple parameters changes
- Came up with interesting observations and analyses

2001 Recession

9/11 Recession: Mar 2001- Nov 2001: Sectorwise

Technology — Financial — Energy — Utilities — Health — Real Estate — Oil
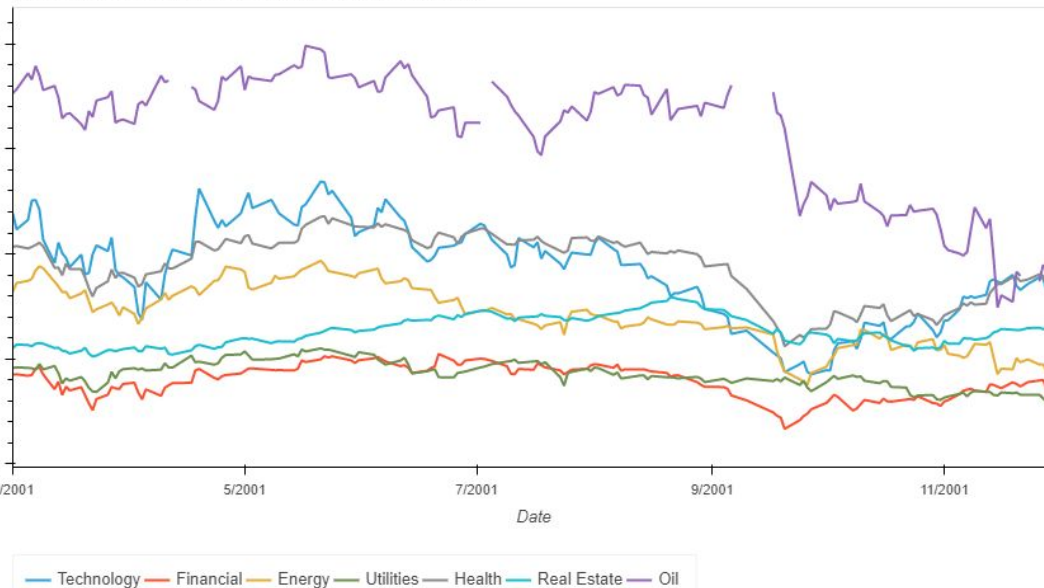
- Lasted from March to November
- The Federal Reserve played a crucial role in mitigating the recession by raising and later cutting the fed funds rate.
- By mid-2003, the benchmark rate reached a low of 1%. The dot-com bubble bust was the main cause of the recession, triggered by a boom in the dot-com industry partly fueled by Y2K concerns.
- Companies invested heavily in new software, leading to significant overvaluation and failure of many dot-com businesses.
- The 9/11 attacks added to the economic turmoil and resulted in two quarters of contraction, with the economy contracting by -1.3% in Q1 and -1.6% in Q3. Unemployment continued to rise, peaking at 6.3% in June 2003.

The Great Recession

The Great Recession: Dec 2007- Jun 2009: Sectorwise
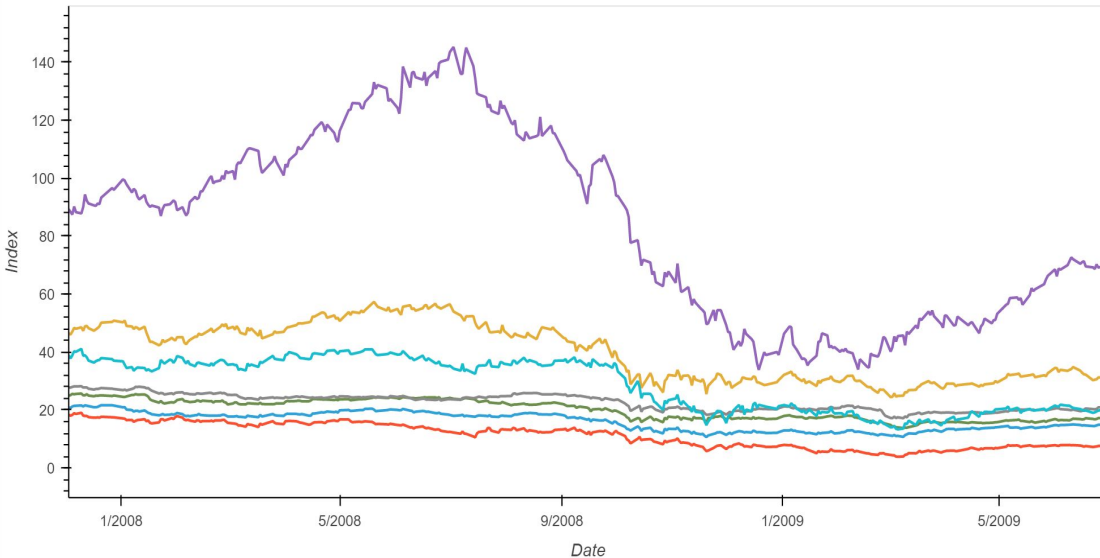
- 2007 to 2009.
- the longest period of contraction. since the Great Depression.
- The subprime mortgage market was the trigger for the crisis which quickly spread to the global banking sector. The widespread use of derivatives worsened the situation, as evidenced by a decrease in GDP over three consecutive quarters in 2008, with an 8.5% drop in the final quarter.
- Unemployment rose to 10% in October 2009, following the end of the recession.
- The recovery began in the third quarter of 2009.
- caused a global financial crisis and bear market in stocks.

The 2020 Recession

COVID 19 Recession: Feb 2020- Apr 2020: Sectorwise

Legend: Technology, Financial, Energy, Utilities, Health, Real Estate, Oil
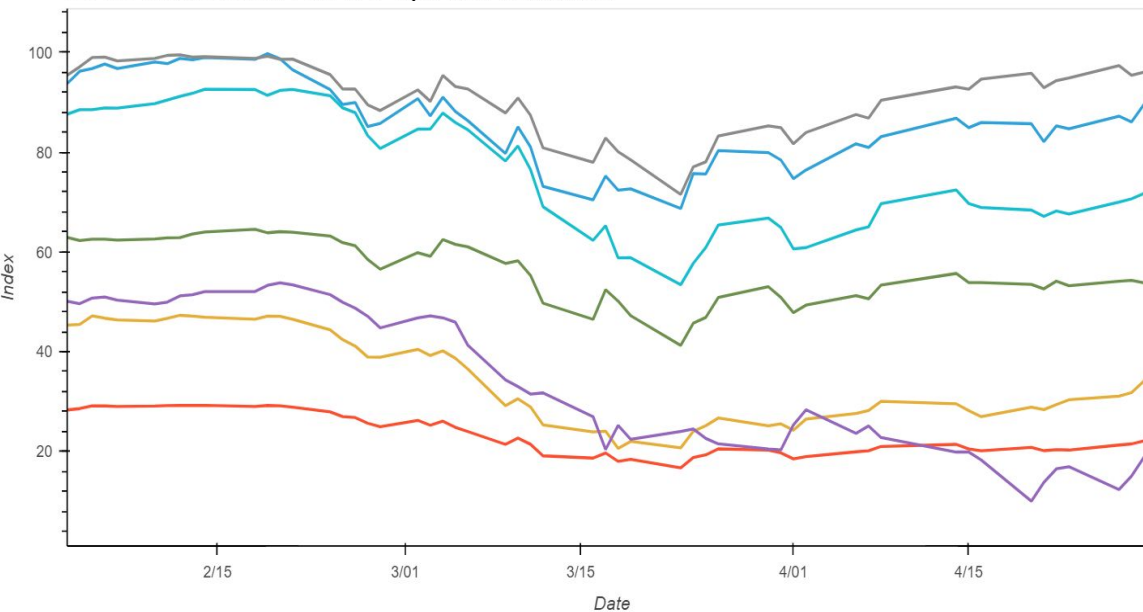
- The most severe economic downturns since the Great Depression.
- The Federal Reserve reduced the fed funds rate to nearly 0% in March.
- The government also offered substantial financial aid in the form of billions of dollars.
- The U.S. economy experienced a record contraction of 31.2% in Q2, following a 5.1% decrease in the preceding quarter.
- This resulted in loss of 20.5 million jobs in April, causing the unemployment rate to surge to 14.7%, remaining in double digits until August.
- The COVID-19 pandemic also caused a great deal of uncertainty, leading to a stock market crash.
- With a growth of 33.8% in Q3, it was not enough to fully offset the earlier losses. The federal funds rate remained near zero until March 2022.

Trends and Findings

Our group reached our conclusions by analyzing three metrics:

- The steepest decline within the timeframe, the percentage change from the start to finish, and the recovery time in days to pre-recession levels.
- We created two types of charts to visualize this data: a line chart of equity sectors to show their relative movement during a recession, and scatter plots to reveal the relationships between the stock market, gold, the US dollar, bonds, and volatility index.

Conclusion: our analysis of three recessions between 2001 and 2020 reveals that there are consistent relationships between certain metrics during economic downturns. The 10-Year Treasury Yield and the S&P 500 tend to move in tandem, the CBOE Volatility Index and the S&P 500 have a strong inverse relationship, and gold and the S&P 500 have an inflection point relationship that changes as the S&P 500 approaches its median value. Our examination of the different equity sectors revealed that the oil futures sector is the riskiest and the healthcare sector is the least risky. Gold and the US dollar emerged as the clear favorites during recessions with the quickest recovery times and positive overall change. Investors can use these findings to make informed investment decisions during economic downturns.

Data Links

1. Yahoo Finance (https://finance.yahoo.com/)
2. Crude Oil Historical (https://www.investing.com/commodities/crude-oil-historical-data)
3. Sector ETFs (https://www.cnbc.com/sector-etfs/)
4. Gold Historical (https://data.nasdaq.com/data/LBMA/GOLD-gold-price-london-fixing)
5. Past Recessions Overview (https://www.forbes.com/advisor/investing/how-long-do-recessions-last/)
6. Recession Definition (https://www.rba.gov.au/education/resources/explainers/recession.html)
7. Economic Data (https://www.bankrate.com/banking/federal-reserve/economic-indicator-survey-recession-risks-january-2023/)

Slide 1 picture:

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.cato.org%2Feconomics&psig=AOvVaw1FhwSubJvb1GVTQ1H-W1Qe&ust=1674853584313000&source=images&cd=vfe&ved=0CA8QjRxqFwoTCNDyp_qR5vwCFQAAAAAdAAAAABAE