Stock Market Correlations to Economic Indicators

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Stock Market Correlations to Economic Indicators

An Undergraduate Honors Thesis

Submitted in Partial fulfillment of

University Honors Program Requirements

University of Nebraska-Lincoln

by

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12/8/2020

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Abstract

For this project, I researched how representative the S&P 500 (a common index of choice to represent the market) is of the economic well-being of the US. I found that stock market data can be used an as indicator of the economic well-being of the U.S.. The results do not indicate that the stock market leads to recovery, but it does suggest that it is correlated with recovery. In my analysis, I compared the S&P 500 performance to four different economic indicators: Real Gross Domestic Product (GDP), The Consumer Price Index (CPI), Average Weekly Private Wages, and Unemployment Rate. A notable correlation was observed between the market and these variables except for Unemployment Rate.

Introduction

In March of 2020, it was announced that due to Covid-19, classes at the University of Nebraska-Lincoln would be canceled for the next week, and then after Spring break, they would resume online. As I write this in November 2020, things have not been the same since. Along with social distancing guidelines and several new rules that needed to be followed, Covid-19 brought a recession that some have compared to the Great Recession of 2007-2009. A few months ago, I referenced the S&P 500 and how it had been largely recovering from its recent lows. I wanted to suggest that while the pandemic is not over, the US has come a long way towards economic recovery. I was also saying that it appeared that we have largely adapted to operating with Covid-19 in mind. I was challenged to reconsider this idea. It was explained to me that the stock market only gives you an indication of how corporations and the wealthiest people in the U.S. are doing, not the U.S. as a whole. This motivated me to look into what economic well-being measures are generally used to represent the economy as a whole and then test to see if these are correlated with stock market returns. Is the stock market a valid indicator of economic well-being? How applicable is it to recessionary times?

For this analysis, I am curious about correlation, not causation. To say, "I would expect that we are recovering because the markets have largely recovered" implies that whatever forces that caused the markets to recover are also causing the economy to recover. Framing the analysis like this makes it a little easier to find an answer, and depending on the results, gives you another way to observe/forecast economic well-being. The tradeoff is that you cannot identify anything as the cause, so recommendations on improving recovery are harder to form.

The S&P 500 is an index that tracks 500 large U.S. stocks. It is commonly held as an excellent representation of the market as a whole. Many quote this index when citing how the stock market is trading. That is what makes the S&P 500 an excellent variable to use to represent the market. Data from the S&P 500 is readily available from many sources, and anyone can reference its current price at their leisure. This is unlike other economic indicators like the unemployment rate, which takes time to release.

Next, to represent the economy as a whole, I needed to find some variables I could use to describe the economy as a whole. Economic indicators referenced regularly are the unemployment rate, wages, Real Gross Domestic Product (RGDP), and the Consumer Price Index (CPI), which measures inflation. These variables all have different and significant economic implications, and they are all relatively easy to access.

If the S&P 500 correlates with these indicators, it could be used to get a general idea of the U.S.'s economic well-being as a whole. Does the S&P 500 performance correlate to the mentioned economic indicators in a meaningful way?

Methodology

First, I collected monthly data on the five variables (S&P 500 index price (Yahoo, 2020), the unemployment rate (FRED, 2020), Average Weekly Private Wages (BLS, 2020), RGDP (BEA, 2020), and CPI (BLS, 2020) from 2005 to the most recently available data. I collected data for this in late October 2020. This period intentionally covers the recession of 2008 and recent pandemic related events while staying reasonably close to the present.

S&P 500 data was collected from Yahoo Finance; wage data was collected from the Bureau of Labor Statistics (BLS); the unemployment rate was collected from Federal Reserve

Economic Data (FRED); RGDP was collected from the Bureau of Economic Analysis (BEA), and; CPI was collected from the BLS. Some data was only available quarterly (RGDP and Wages). These variables were translated to monthly variables by giving the months that a quarter represented the same value (so if Q1 2005 was $777 for Average Private Weekly Wages, January, February, and March of 2005 would receive a value of $777).

Second, I ran an ordinary least squares linear regression of each economic indicator individually against the S&P 500 price. The resulted in then be four separate regressions showing one indicator's relationship with the S&P 500, and thus the nature and strength of each correlation. I did this because I am interested in the relationship of the market to each of the variables. This way, I did not include the dependent variables' effect on each other.

Finally, I compared the nature of each relationship and, more importantly, each correlation's strength. The intent was to make sure growth in the market was correlated to each variable in the way that supports the economy. If growth in the stock market was correlated with the unemployment rate going up, it would be easy to say that the market is not a good overall indicator of the economy. I included the strength to ensure that each regression results were reliable enough to answer the question. I also created four scatter plots with the S&P 500 on the x-axis and the four indicators on the y axis to visualize each relationship.

Results

Going into this, I had a feeling that RGDP would be strongly correlated, and the unemployment rate would be the weakest. With the ordinary least squares regression technique, I was able to find out to what degree those assumptions were valid. The strongest correlation with

the S&P 500 is, in fact, RGDP. It has a positive relationship and an R^2 of 0.9174. (The closer R^2 is to 1, the stronger the correlation). Refer to the appendix for visualizations of the results.

The next strongest correlation was the CPI. It also had a positive relationship and an R^2 of 0.7597. This also makes sense, as you would expect inflation to drive up the stock market value (or vice versa).

The third strongest correlation was Average Weekly Private Wages. It had a positive relationship and an R^2 of 0.7045. This one was the most surprising to me. I expected RGDP and CPI to be stronger and unemployment and wages to be weaker. However, wages are much closer to the strong group.

The weakest correlation was The Unemployment Rate. It had a negative relationship and an R^2 of 0.2125. This was somewhat expected, but it does confirm that for the four variables the nature of the relationship is what you would expect (a positive economic change in the stock market leads to what a positive economic change would be in the four variables).

The first three indicators showed a strength of relationship that I think is worth noting. It leads me to believe that the S&P 500 can be a forecaster of these variables. This is especially valuable since data on the S&P 500 is continually updated and easily accessed. S&P 500 data is continuously updated and very easy to access, especially compared to the other variables I gathered. When I collected data for this project, the most recent data available for wages were from March of 2020 (more than six months difference from the market data). The trend for unemployment could be stronger, but it still moves the direction that you would hope. The most recent month available for unemployment data was September 2020's value, so this data is updated frequently, so the need for a forecaster is not as apparent.

Implications

I believe I showed sufficient data to conclude that stock market performance is a worthy indicator of economic well-being. It is not a perfect indicator, but it has readily available data. Using S&P 500 data along with unemployment data (both of which are kept up-to-date) helps to form a good idea of economic health. However, economists evaluate the economy in many other ways. It would be good to analyze how some of these indicators are forecasted and if market data could supplement these methods.

Another way to expand this project would be to find out the market's correlation with more indicators. Other variables could include bank interest rates, consumption/spending, and many others. It would be interesting to see how these impact individuals and how they interact with the variables collected above. This may also allow you to make some statements on causality.

Finally, I think that there is still some potential to model unemployment using the S&P 500. The reason for high unemployment earlier this year was largely Covid-19 related, which would not be reflected in the market. For reference, the highest unemployment rate as a result of the recession of 2008 was 10 percent. In April 2020, it got to 14.7 percent, and the month prior was only 4.4 percent. Removing the time-period involving Covid-19 raises the R^2 value to 0.4825 (instead of 0.2125). Adjusting the S&P 500 for inflation also raises the R^2 (0.2859). Then if you incorporate both of those, the R^2 gets to 0.5915. While it may not be appropriate to shorten the timeframe, this may indicate that adding some controls for seasonality (even a variable that represents the month of the year) could improve the modeling capabilities of market data for unemployment estimates.

References

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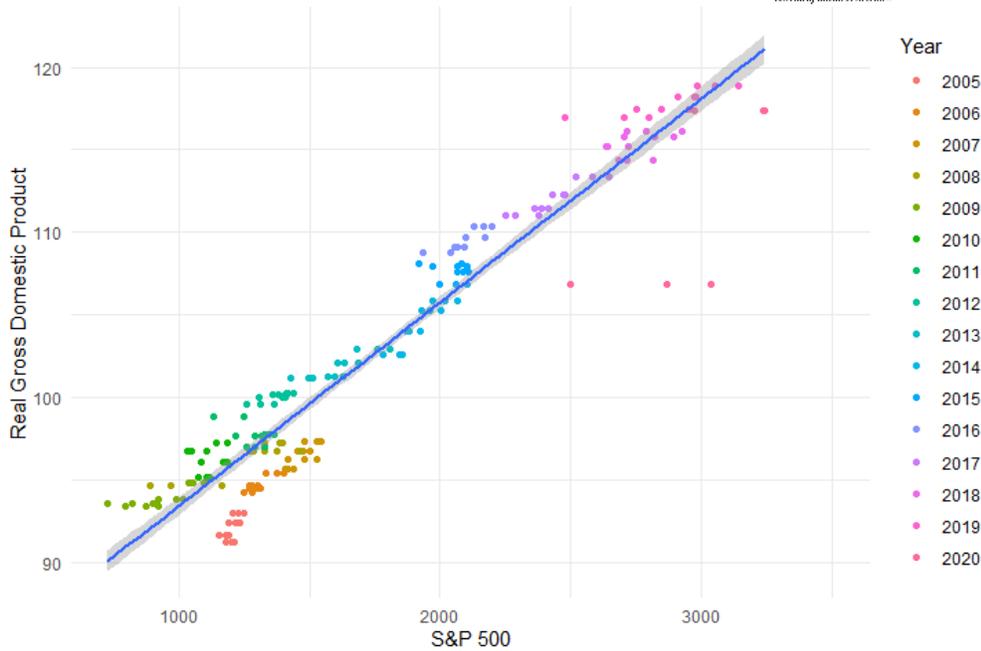
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Appendix

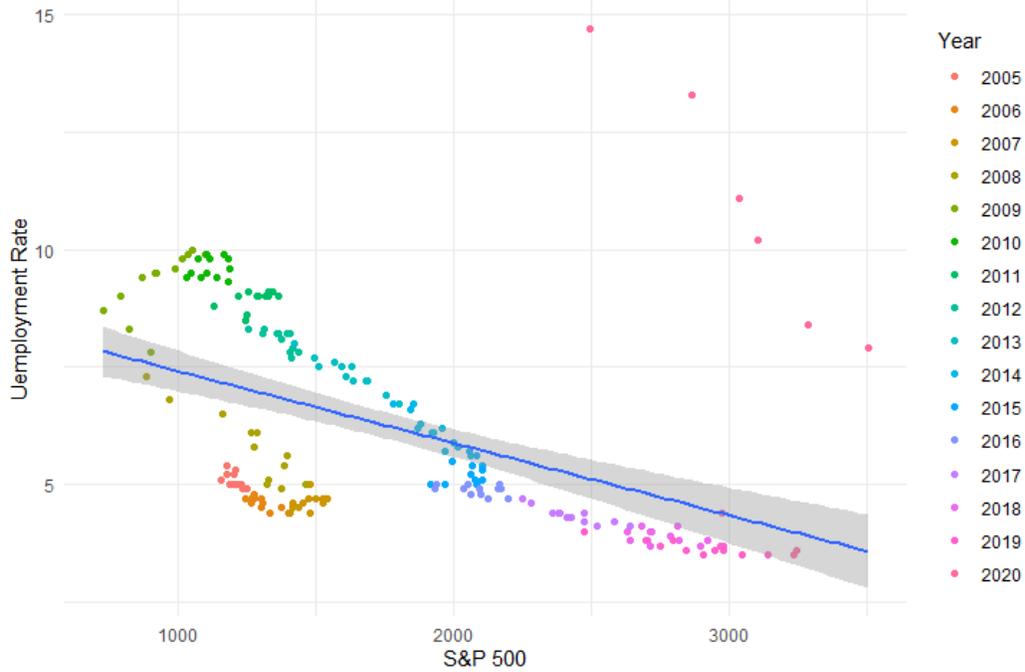Consumer Price index VS S&P 500
RSquared = 0.7597
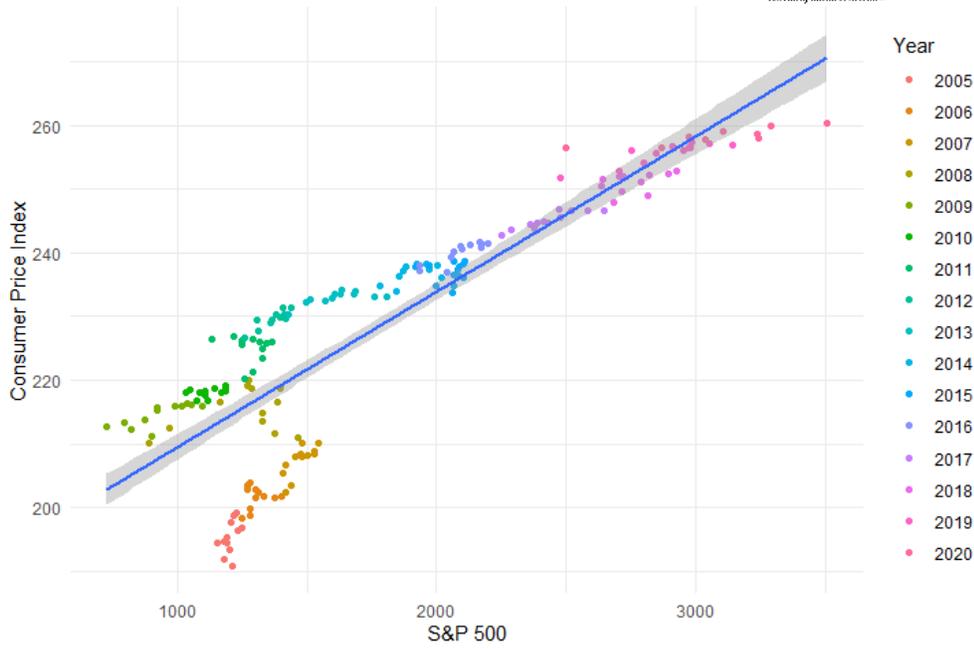
RGDP VS S&P 500
RSquared = 0.9174

# Unemployment Rate VS S&P 500
RSquared = 0.2125

# Private Wages VS S&P 500
RSquared = 0.7045