

Project 1

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Introduction:

Just recently, a Bloomberg article titled "Is the US already in a recession", discussed a recently published paper in which the authors claim that every recession since the 1980's has been foreshadowed by a drop in consumer sentiment. They argue that if this pattern holds true then the US must be set to enter another recession, since consumer confidence has been falling since June. This argument is partially justified by a 2004 paper titled *Consumer Confidence and Consumer Spending* which studied the relationship between consumer sentiment and personal consumption. It determined that there is in fact a significant relationship, and that consumer confidence accounts for about 19% of the variation in consumer spending, confirming the fact that people spend more when they are optimistic about the future state of the economy and spend less when they are pessimistic about it.

The relationship between consumer sentiment and consumer spending could be more dramatic now than ever before. A University of Michigan survey found that the gap in a specific measurement for economic expectations between political parties during Biden's presidency has been 52.3, compared to a gap of 53.1 during the Trump presidency. These numbers stand in stark contrast to the gap of 25 for the Obama presidency and 21.3 for Bush presidency. This indicates that the American populous is currently very polarized about the future state of the economy and are highly influenced by personal beliefs that are not tied to actual indicators of economic vitality. In an environment with so much variance in economic sentiment, the variable as a whole is bound to have an increased level of influence on the consumption choices of individuals. Considering this fact, conducting rigorous analyses of the effect of consumer sentiment on consumer spending is of increased importance today.

Methodology:

The purpose of this report is to forecast Personal Consumption Expenditure if Consumer Sentiment hovers at 70 for the upcoming year. My forecast will rely upon a simple regression model using quarterly data from the FRED website, specifically "Real Personal Consumption Expenditure" (PCE), and "University of Michigan: Consumer Sentiment" (SENT). Personal Consumption Expenditure will be expressed as percentage change from the previous year, or $\log(t) - \log(t-1)$. Mathematically, my base model will be denoted as:

$$PCE \sim B0 + B1 * SENT + e$$

In my analysis, I will *not* be excluding data collected during the recent pandemic. Some people may say that including pandemic data will lead to increased volatility that does not show the true effect that consumer sentiment plays on personal consumption. However, the COVID pandemic is still happening, and therefore both consumer sentiment and personal consumption are still being influenced by it. While including pandemic data will likely increase the volatility of the model, excluding it would not account for the substratum of data that the upcoming year of data will resemble the most.

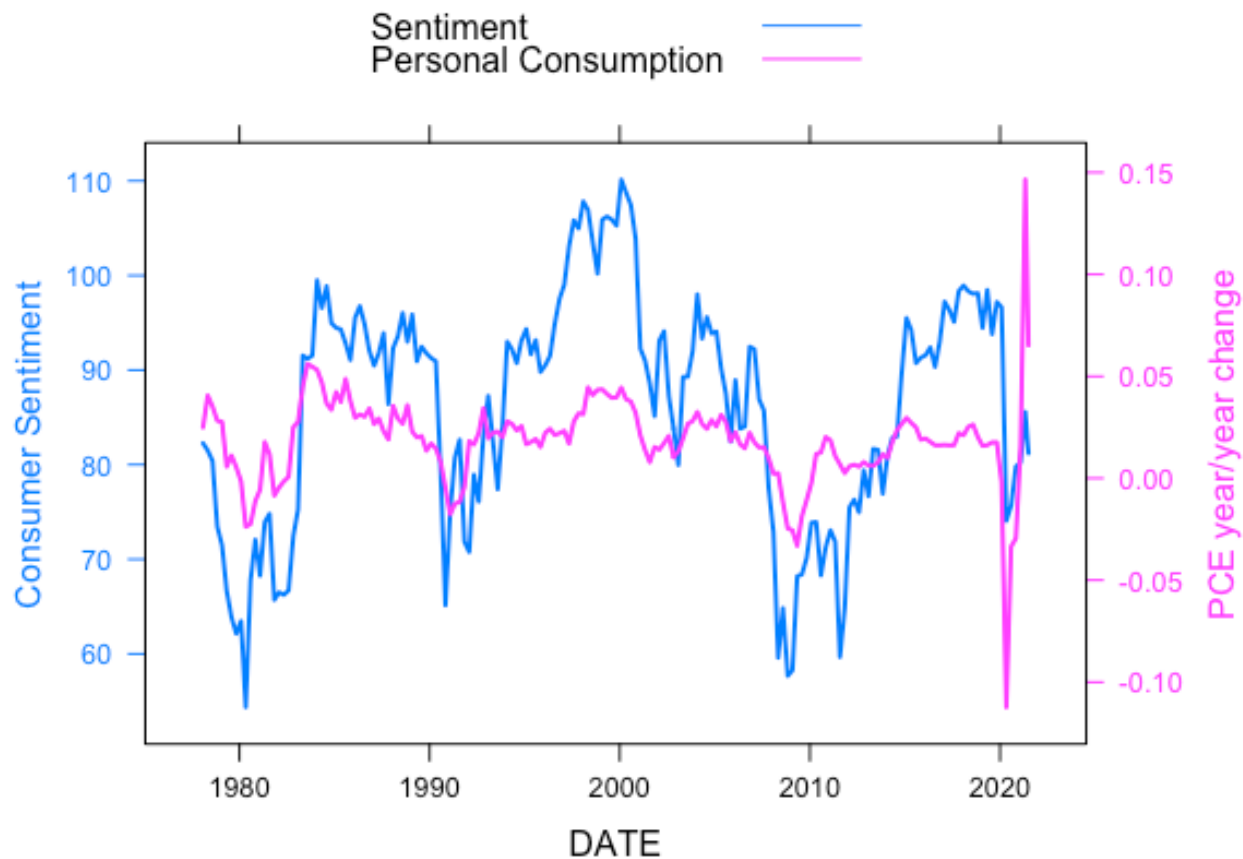
In an ideal world there would be two separate regressions, one which determined the relationship of consumer sentiment and personal consumption *prior* to the pandemic and one

which determined the relationship of consumer sentiment and personal consumption *during* the pandemic, and the combination of these two models would better account for our current situation. However, this approach is outside the scope of this work. Therefore, I will create a single model using data from the first quarter of 1978 until the third quarter of 2021, the most recent data that we have.

I will also be isolating recessionary and expansionary data in order to better predict personal consumption for two possible future states. In order to do this I will use the dataset “USREC” from the FRED website, which indicates on a month-to-month basis whether or not the economy is in a recession. Since my model uses quarterly data, a recessionary quarter was defined as any quarter in which at least one month was documented as recessionary.

Results:

The first figure shows consumer sentiment and Personal consumption graphed on top of each other. Evidently, sentiment and consumption follow similar patterns, supporting the conclusion found in *Consumer Confidence and Consumer Spending*.



The results from all three of the regression models are displayed in the table below. The interpretation of the outcomes is discussed in the conclusions section.

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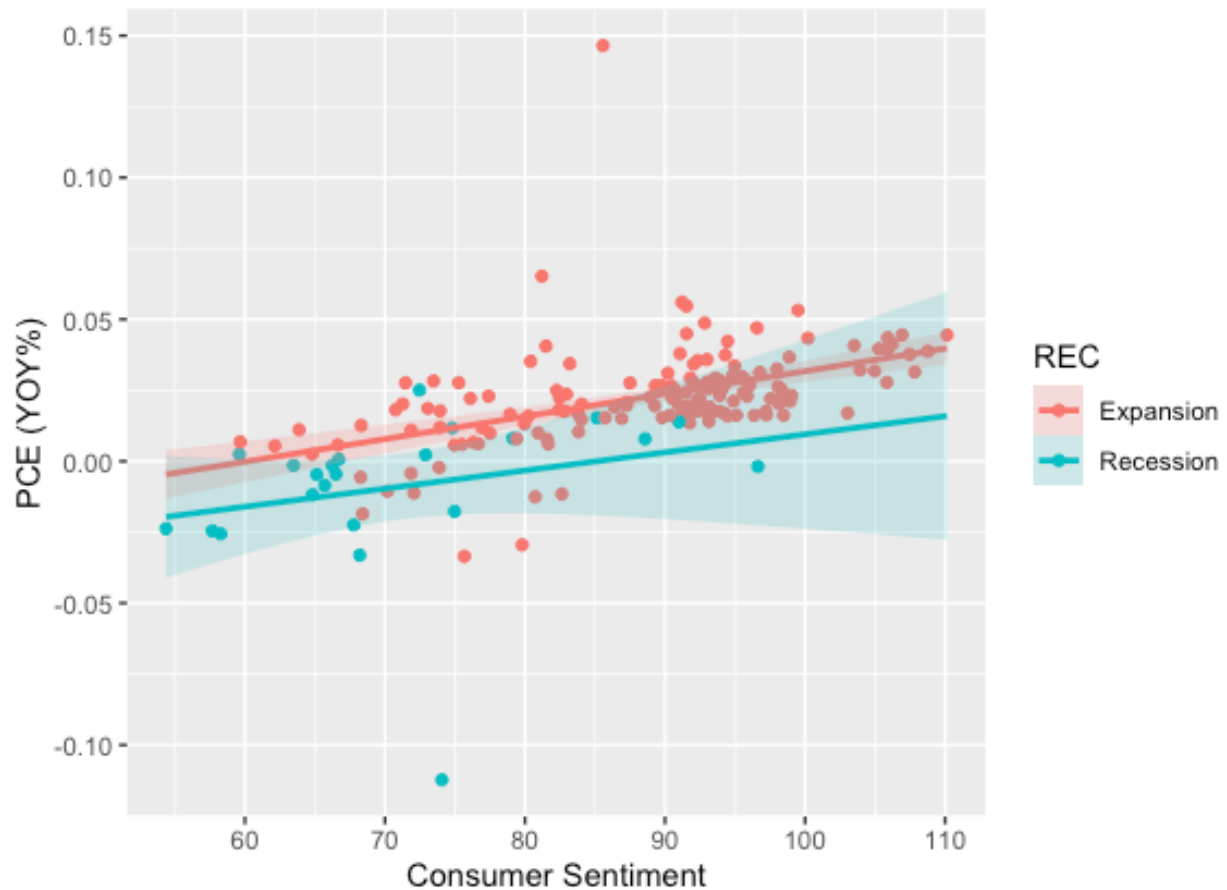
Personal Consumption Expenditure

	Overall (1)	Expansion (2)	Recession (3)
(B1) Sentiment	0.00102*** (0.00011)	0.00080*** (0.00012)	0.00064 (0.00052)
(B0) Constant	-0.06915*** (0.00985)	-0.04802*** (0.01072)	-0.05431 (0.03724)
Observations	175	152	23
R2	0.31757	0.22637	0.06733
Adjusted R2	0.31362	0.22122	0.02291
Residual Std. Error	0.01828	0.01587	0.02673
F Statistic	80.50504***	43.89194***	1.51590

Note:

*p<0.1; **p<0.05; ***p<0.01

This figure shows the Expansionary and Recessionary regression models and the confidence intervals of both. Notably, the expansionary model has a much tighter confidence interval -- expressed by shaded region -- since the number of observations is so much greater.



Conclusions:

Using the calculation $-.0691472 + (.0010160) * (70)$, my generalized model predicted that if consumer sentiment stayed at 70 through 2022, personal consumption would be .1973 percent higher than it was at the end of 2021. This translates to a real personal consumption level of 41505.84. There is a 95 percent chance that the real value of year over year percent change will fall between the lower bound of -0.2546 and the upper bound of 0.6497. The R squared value for this model was 0.3178, meaning 31.78 percent of the variance in consumer spending was due to consumer sentiment. The model's p-value was below the significance threshold of .05.

Using the calculation $-.054306 + (.000638) * (70)$, my recession specific model predicted that if consumer sentiment stayed at 70 through 2022 *and* we entered a recession, personal consumption would be .9644 percent lower than it was the at the end of 2021. This translates to a real personal consumption level of 41023.51. There is a 95 percent chance that the real value of year over year percent change will fall between the lower bound of -2.1289 and the upper bound of 0.2001. The wider confidence interval is due to the minimal level of observations available for recessionary times. The R squared value for this model was 0.0673, meaning 6.73 percent of the variance in consumer spending is due to consumer sentiment. The model's p-value was *not* below the required p-value of .05, meaning the model is not statistically significant.

Using the calculation $-.0480225 + (.0007977) * (70)$, my expansion specific model predicted that if consumer sentiment stayed at 70 through 2022 *and* we stayed in an expansion, personal consumption would be .7815 percent higher than it was at the end of 2021. This translates to a real personal consumption level of 41747.74. There is a 95 percent chance that the real value of year over year percent change will fall between the lower bound of 0.2749 and the upper bound of 1.2882. The R squared value for this model was .2263, meaning 22.63 percent of the variance in consumer spending was due to consumer sentiment. The model's p-value was below the significance threshold of .05

Taking all of these models into account, consumer sentiment can be used as a reliable predictor of consumer spending patterns *as long as the economy stays in an expansion*. If the economy stays expansionary over the course of the next year and consumer sentiment hovers around 70, we can expect there to be an increase in personal consumption expenditures of about .8 percent. If the economy does not stay in an expansion, we should not expect consumer sentiment to be a reliable predictor of consumer spending.