Forecasting the Effect of Crude Oil Prices on Real Personal Consumption Expenditures

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INTRODUCTION

- This paper studies and forecasts the effects of the real price of crude oil on real personal consumption expenditures, holding constant other macroeconomic indicators that often influence consumption patterns, including the S&P/Schiller Home Price Index, Consumer Price Index, Consumer Sentiment, and total U.S. population.
- Crude oil plays an essential role in the American economy as the United States' oil industry spurs economic growth through investments of hundreds of billions of dollars, while also creating millions of jobs for American workers.
- Due to this inelasticity, historically, when oil prices change, consumers are forced to change their personal consumption patterns. Therefore, I hypothesized that there would be a positive relationship between the changes in the price of crude oil on changes in personal consumption expenditure.

OBJECTIVE:

- The objective of this paper is to examine the relationship between crude oil prices and real personal consumption expenditure in the United States and to predict future trends in the price of crude and consumers' spending habits. This has implications on how policy makers, such as those in Congress or at the Federal Reserve, make decisions about how to precede when the economy is suffering from volatile oil price shocks

β_1= Growth Rate of Real Price of Crude Oil
β_2= Growth Rate of US Consumer Sentiment
β_3= Growth Rate of Consumer Price Index
β_4= Growth Rate of US Population
β_5= Growth Rate of S&P/Case-Shiller U.S. National Home Price Index
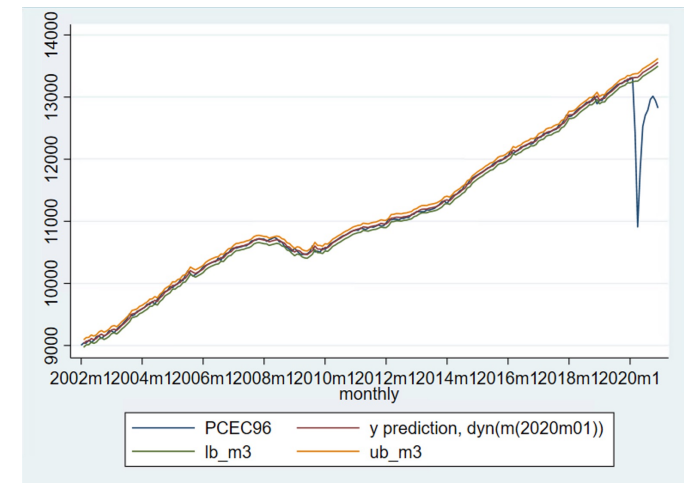β_6= 2008 Financial Crisis Dummy

ARIMA Forecasting Model:

	Regression	ARIMA(2,0,2)	ARIMA(1,0,1)	ARIMA(0,0,2)
ϕ's (p-value) Θ's (p-value)	N/a	ϕ_1 = 1.0570 (0.000) ϕ_2 = -0.1577 (0.466) Θ_1 = -1.3737 (0.000) Θ_2 = 0.4628 (0.017)	ϕ_1 = 0.0977 (0.701) Θ_1 = -0.3891 (0.097)	Θ_1 = -0.2926 (0.000) Θ_2 = 0.0266 (0.715)
Covariance - stationary	N/a	Yes	Yes	Yes
Invertibility	N/a	Yes	Yes	Yes
White noise residuals Q-statistics (p-value)	N/a	d.PCEC96 is not a white noise process.	d.PCEC96 is not a white noise process.	d.PCEC96 is not a white noise process.
Residual Variance	N/a	29.7965	29.8065	29.8081
AIC	N/a	2093.846	2089.972	2089.992
BIC	N/a	2134.294	2123.678	2123.699
Beta	β_1=0.3963 (0.154) β_2=-0.1273 (0.774) β_3=-13.06 (0.137) β_4=-4.10 (0.671) β_5=4.07 (0.416) β_6=-30.744 (0.000)	β_1=0.4167 (0.098) β_2= 0.0865 (0.837) β_3= -12.72 (0.101) β_4 = -2.47 (0.810) β_5 = 4.79 (0.190) β_6 = -29.90 (0.000)	β_1=0.4254 (0.087) β_2=0.0921 (0.825) β_3=-12.92 (0.091) β_4=-2.35 (0.816) β_5=4.69 (0.187) β_6=-29.29 (0.000)	β_1=0.4272 (0.084) β_2=0.0942 (0.821) β_3=-12.98 (0.086) β_4=-2.30 (0.819) β_5=4.68 (0.187) β_6=-29.83 (0.000)

Autocorrelation and Partial Autocorrelation Function Graphs to Determine Appropriate Models

CONCLUSION

- My forecasted model did produce the effects that I had hypothesized, with changes in the price of crude oil having a positive impact on changes in people's personal consumption expenditures, the consumer price index having a negative effect, and the 2008 financial crisis having a very statistically significant negative effect. Therefore, my research and modeling procedures contribute to the previous literature suggesting that consumers' spending patterns remain largely inelastic in regards to the price of oil because oil is an essential good that has no easy substitutes and people and businesses rely on refinable oil products to heat their homes, power their cars, etc. Though, in the coming years, as people become more environmentally conscious and switch to more sustainable energy sources, it remains to be seen if this strong, positive relationship will remain this inelastic.

FORECAST GRAPH: