

## Project 2

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### Introduction:

During the pandemic, consumers increased their purchases of durable goods while decreasing their purchases of services. The article “Why has Durable Goods Spending Been So Strong During the Pandemic”, published by the Federal Reserve Bank of Cleveland in early 2021, explains this shift in consumption as a combination of two factors: restrictions brought about by the pandemic have made it harder for consumers to spend money on services, shifting their spending to durable goods; and excess income due to government stimulus and a hot labor market has increased the propensity to consume in general. The article attributes the two forces as having about an equal effect on the shift in consumer activity. As we start to exit the pandemic economy, the question of how goods spending will level out becomes essential for our understanding of future inflation.

Normally, the trajectory of consumption expenditure following previous recessions could help inform predictions for consumption expenditure following current recessions. However, in a FED research note on January 14, 2021, Aditya Aladangady and Daniel Garcia explain how the pandemic has created a unique situation. During normal recessions, demand for services usually remain steady while demand for goods decrease and stay depressed for some time. The pandemic recession saw a brief drop in all forms of consumption, followed by a quick rebound in goods consumption that has surpassed pre-pandemic levels. Demand for services have only now started to rebound, as the Federal Reserve Bank of Cleveland predicted, and as a Wall Street Journal article published on February 2<sup>nd</sup> confirms.

This memo seeks to understand whether consumer expenditure patterns following previous recessions, specifically the 2009 recession, can still inform our current forecasts of goods spending. The central focus will be on trying to understand whether consumer expenditure will return to the pre-pandemic trend, or whether it will follow a newly established path due to new market forces created by the pandemic. Both deterministic and stochastic forecasts will be made addressing the 2009 recession and the current pandemic-related recession. These forecasts will then be compared and contrasted in order to determine whether there are similarities between the post-recession and post-pandemic economic environments, and whether the same forecast model from 2009 might work to explain current future goods spending.

### Methods:

The data used to create the forecasts is the “Personal Consumption Expenditures: Goods” dataset off the FRED website. The data was logged in order to perform the analysis, and then anti-logged in order to present results. Model specifications and the reasoning behind the model selections are explained below:

**2009 deterministic forecast:** An ARMA (1,1) model was chosen because it had the lowest BIC and AIC of all the models tried, and the Ljung-box test performed on it output a p-value of .34, meaning that autocorrelation was not evident.

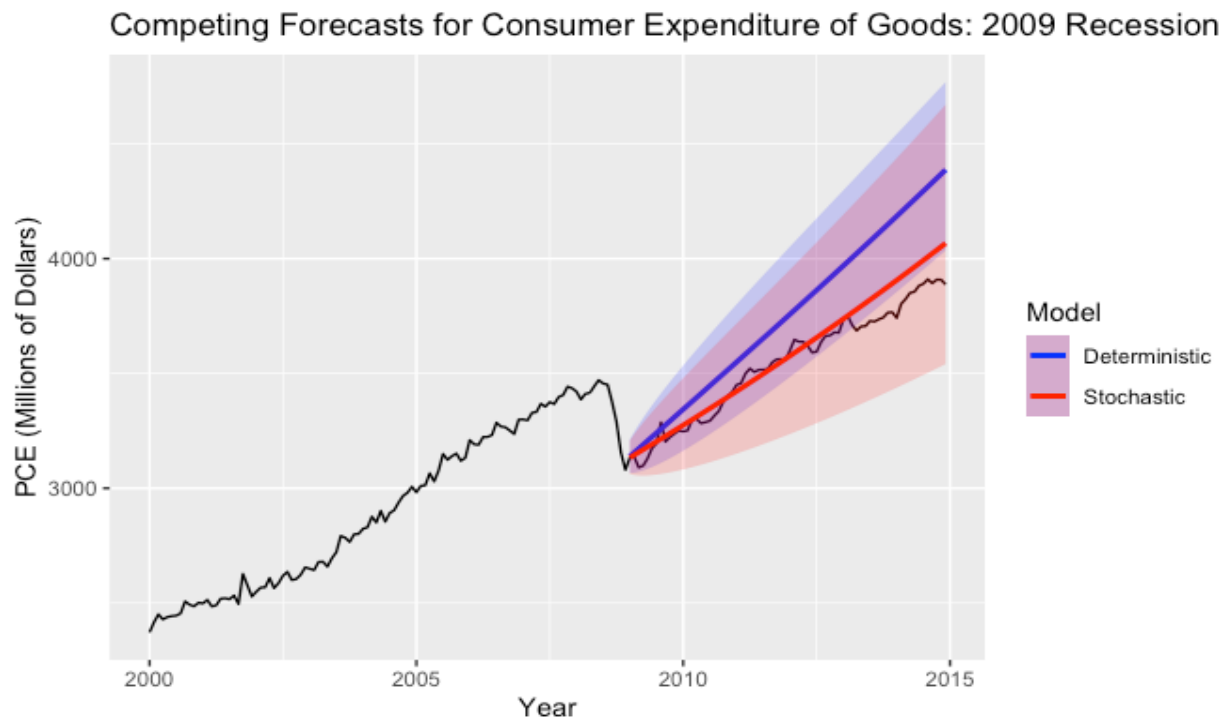
**2009 stochastic forecast:** An ARIMA (0,1,1) model was chosen because it had the lowest BIC and a p-value of .40 on the Ljung-box test. An ARIMA (3,1,2) had the lowest AIC and an equally

low p-value on the Ljung-box test, but the model with the smaller number of components was selected.

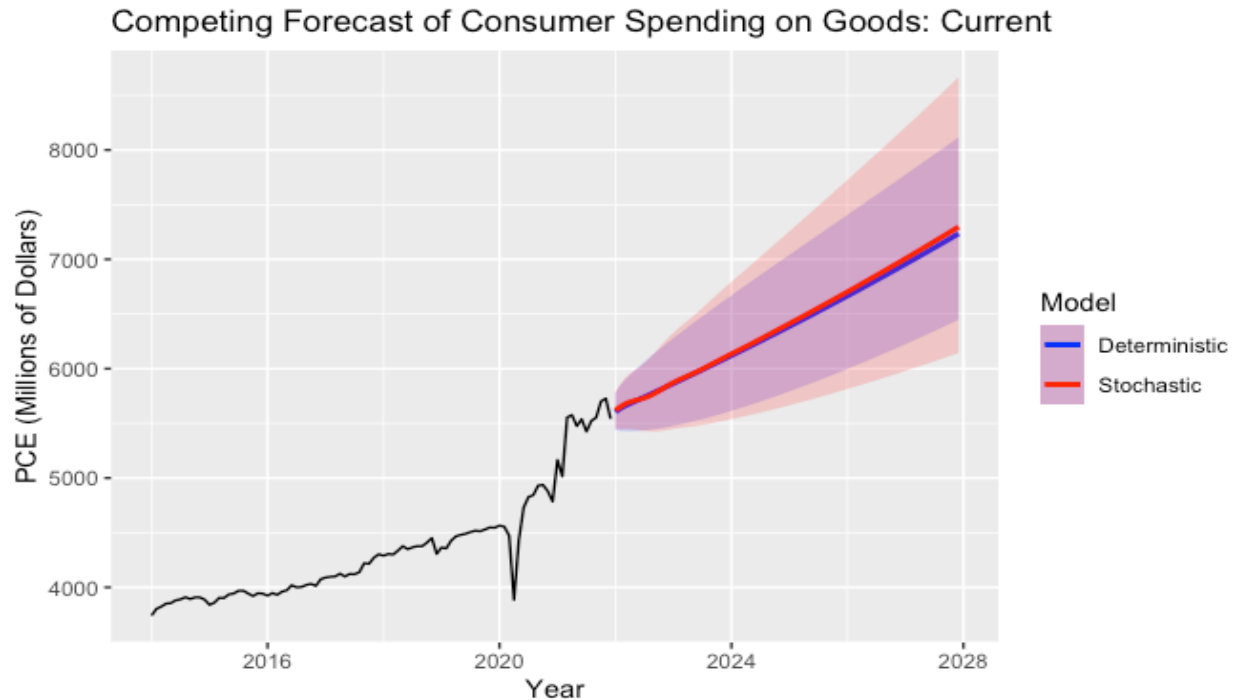
**Current deterministic forecast:** No model was able to eliminate autocorrelation without also eliminating pandemic data. An ARMA (1,1) model was eventually chosen since it had the lowest BIC and was the simplest model that got the closest to eliminating autocorrelation. The model with the lowest AIC was an ARMA (2,1) model, but it had a lower p-value on the Ljung-box test and had more components than the ARMA (1,1) model, so it was not selected.

**Current stochastic forecast:** No model was able to eliminate autocorrelation without also eliminating pandemic data. However, an ARIMA (3,1,2) model was close to eliminating autocorrelation, with a p-value of .045 on the Ljung-box test and the lowest AIC of all models tried. An ARIMA (0,1,1) model had lowest BIC, and was a less complex model, but it was much further from eliminating autocorrelation, with a p-value of .0006 on the Ljung-box test.

## Results:



The stochastic forecast of consumer expenditure following the 2009 recession was much more accurate than the deterministic forecast. This means that consumer expenditure did not return to the established pre-recession trend but was permanently affected.



The current deterministic and stochastic forecasts were very similar. Both forecasts predicted that consumer expenditure would level out from the jump following the pandemic recession, but neither forecast predicted that it would return to the pre-pandemic trend. The deterministic forecast predicted consumer expenditure would grow *slightly* slower, but it does not appear to return to the pre-pandemic trend.

## Conclusion:

Neither of our current forecasts predict consumer expenditure to return to pre-pandemic levels, like the deterministic model did for our 2009 forecast. Both forecasts predict consumer expenditure to remain at a higher level and establish a new trend. This makes sense in the context of increased inflation following the pandemic. In his speech on December 17, 2021, Governor Christopher Waller of the Federal Reserve discusses the threat of persistent inflation following the pandemic, pointing out that inflation has increased to over 6% in the second half of 2021. With increased inflation, we would expect there to be increased spending on goods as well, at least in absolute terms. When the FED starts tapering asset purchases and increasing interest rates, as Christopher Waller suggests they should do, we should see a return to normal increases in consumer spending. Also, consumers shift back toward the service economy with the elimination of pandemic restrictions should encourage a drop in the pace of goods spending. That being said, unless we enter a period of deflation, we would not expect to see a return to pre-pandemic levels of spending, just a leveling of the rate of growth.

The nature of the pandemic recession is inherently different from the nature of the 2009 recession. In 2009, normal recessionary activity caused a sharp decline in consumer expenditure. It then returned to a similar trend as pre-recession, but at an entirely new level, captured by the stochastic forecast. In our current situation, we are seeing a sharp increase in consumer expenditure on goods due to consumers shift toward goods instead of services, and an increase in income due to government stimulus and a tight labor market. However, just like we did not see a return to the pre-recession trend in 2009, we should not expect to see a return to the pre-pandemic trend in our current situation, since inflation has permanently affected the

level of consumer expenditure. I think there is reason to be relatively confident in this forecast, since our stochastic and deterministic models, as well as the theory surrounding them, all seem to converge around a similar prediction.