**Title:** Forecasting U.S. Consumer Sentiment; Can a Sufficiently Robust Forecasting Model Be Developed?

**Team:** Team 7 - Andrew Sommers

**Project Summary:** The project will determine if a sufficiently robust forecasting model for U.S. consumer sentiment can be developed based on factors typically cited as influencing sentiment (‘Factors Determining Consumer Sentiment – Evidence From Household Survey Data’, Lahiri and Zhao, Economics, 2011). If a factor based forecasting model does not appear viable, forecasting based on historical time series consumer sentiment data will be explored. If a sufficiently robust forecasting model for U.S. consumer sentiment can be developed, user input will be allowed to develop a short-term forecast.

**Project Description:**

Objective: The project will determine if a sufficiently robust model for forecasting U.S. consumer sentiment can be developed using either a factor based model or historical consumer sentiment time series data. Evaluation criterion will be used to evaluate and compare possible models. If a sufficiently robust model is identified, the model will be used to generate a short-term forecast for U.S. consumer sentiment. However, a viable model might not be identified, and if no sufficiently robust model can be defined, this result will be reported. The scope of this project is determination and analysis of a forecasting model for U.S. consumer sentiment and will not extend into forecasting models for consumer spending or economic activity based on consumer sentiment.

Usefulness: Consumer sentiment is widely considered a predictor of forward consumer spending, and therefore, forward economic activity (‘Why Does Consumer Sentiment Predict Household Spending’, Mehra and Martin, Federal Reserve Bank of Richmond Economic Quarterly, Fall 2003; ‘Does Consumer Confidence Forecast Household Expenditure? A Sentiment Index Horse Race’, Bram and Ludvigson, FRBNY Economic Policy Review, June 1998). If consumer sentiment can be predicted with a sufficient level of confidence, models that rely on current consumer sentiment as a predictive factor could be extended to include forecasts of consumer sentiment, and therefore, build more robust forecasts of consumer spending and economic activity.

An application that provides a viable model for forecasting consumer sentiment could be leveraged for multiple purposes. If a factor based model is viable, policy makers could use the model to study the economic impact of different policy decisions by setting expectations of the underlying model factors based on a policy decision and forecasting the impact on consumer sentiment.

The application could also be leveraged by stock market analysts who could set their expectations of the underlying model factors to study expected impacts on consumer sentiment. Based on the consumer sentiment forecasts, market analysts could leverage additional forecasting models, beyond the scope of this project, to forecast expected economic activity and related stock market pricing levels.

Studies have been conducted to attempt to determine the relationship of specific economic factors with consumer sentiment such as the relative value of the U.S. dollar and its relationship with consumer sentiment (‘The Influence of Consumer Sentiment on the Sales of Durables’, Jennings and McGrath, The Journal of Business Forecasting Methods and Systems, October 1994). Additionally, multiple factor models to predict consumer sentiment have been researched with inconclusive results (‘Consumer sentiment: its causes and effects’, Throop, Economic Review, Federal Reserve Bank of San Francisco, 1992). Because the research on predictive factors of consumer sentiment is either focused on relationships between economic measures or appears to provide inconclusive forecasting results, this project will provide a specific analysis of the relationship between underlying economic factors and U.S consumer sentiment and determine if a multiple factor forecasting model is feasible.

**Datasets:**

General Comments on Data – Because the forecasting model will focus on the impact of underlying factors on consumer sentiment, all datasets will either be collected as monthly percent change data or converted from monthly data to monthly percent change data. Because economic data is based on collection and verification by various agencies, verified data is only available to January 1, 2022. The project will use January 1, 2022 as the current date for forecasting.

While economic and U.S. consumer sentiment date is available before January 1, 2002, this date will be used as the starting point for the analysis because during the last two decades, substantial changes in the structure of the U.S. economy, financial regulatory landscape, global trade, and liquidity markets have occurred. While selecting a cutoff date for the data is arbitrary, a twenty year range provides enough data for the study and a better representation of the recent economic environment. Additionally, some of the underlying economic factor data has a limited history, and a twenty year data limit will allow for all selected factors to be studied.

Because all datasets will cover the range of January 1, 2002 to January 1, 2022, all datasets will contain 241 monthly values. Any adjustments to the data will be discussed for each dataset.

University of Michigan Consumer Sentiment – The data is available from the St. Louis Federal Reserve FRED Economic Data site and represents a well known and commonly referenced representation of U.S. consumer sentiment. The source data is monthly and covers the time range from January 1, 1952 to January 1, 2022. Only data from January 1, 2002 will be used for the analysis. The resulting dataset contains the date and the relative sentiment score using the first quarter end measurement of 1966 as a baseline value of 100. No values are missing. The data is not seasonally adjusted. Seasonality of the data will be reviewed to determine if seasonality exists, and if so, the data will be seasonally adjusted. The data will be converted from monthly scores to monthly percentage change. Because monthly percentage change will be used, the December 1, 2001 sentiment score will be used as the basis to calculate the initial percentage change.

Consumer Price Index – The dataset is available from the United States Department of Labor and contains the monthly percentage change in the consumer price index (‘CPI’). This index provides a representation of changes in the prices of consumer goods, and therefore, represents changes in consumer purchasing power from January 1, 2002 to January 1, 2022. The United States Department of Labor CPI data is only available from January 1, 1999, and again, supports the need to limit the historical data for this analysis. The data contains the month and the monthly percentage change in the CPI. No data is missing. The data is not seasonally adjusted. Seasonality of the data set will be reviewed to determine if seasonality exists, and if so, the data will be seasonally adjusted.

U.S. Unemployment Rate - The dataset is available from the St. Louis Federal Reserve FRED Economic Data site and provides the U.S. unemployment rate. The data is available monthly, is seasonally adjusted, and contains no missing values. The data is available for the selected analysis date range of January 1, 2002 to January 1, 2022. The data contains the date and unemployment rate and will be converted from the monthly unemployment rate to the monthly percentage change in the unemployment rate. Because monthly percentage change will be used, the December 1, 2001 unemployment rate will be used as the basis to calculate the initial percentage change.

Real Disposable Personal Income – The dataset is available from the St. Louis Federal Reserve FRED Economic Data site and provides a measure of U.S. consumer purchasing power. The data is available monthly, is seasonally adjusted, and contains no missing values. The dataset provides the month and consumer disposable income in relative terms using 2012 dollars as a basis for the measurement. The data is available for the selected analysis date range of January 1, 2002 to January 1, 2022. Because monthly data will be converted to monthly percentage change in consumer disposable income, the December 1, 2001 disposable income value will be used as the basis to calculate the initial percentage change.

U.S Gross Domestic Product - The dataset is available from the St. Louis Federal Reserve FRED Economic Data site and provides a measure of economic activity in the U.S. The data is available quarterly, seasonally adjusted, and contains no missing values. The dataset provides the quarter and gross domestic product in relative terms using 2012 dollars as a basis for the measurement. Because the data is quarterly, a straight-line interpolation will be applied between each quarterly observation to generate missing monthly observations. The monthly observations will be converted to the percentage change in gross domestic product for the date range of January 1, 2002 to January 1, 2022. Because monthly percentage change will be used, the October 1, 2001 gross domestic product value will be used as the basis to interpolate the December 1, 2001 value for calculating the initial monthly percentage change.

**Description of Functionality:** The resulting product will provide statistical and correlation analysis of the datasets. Multiple forecasting models will be explored. If a sufficiently robust forecasting model is identified, the product will provide an overview of the selected forecasting model including evaluation criterion. Finally, user input will be allowed to set forward expectations of the forecasting model factors to interactively create a resulting short-term forecast of U.S. consumer sentiment.

**Task Divisions and Timeline:** The project will be developed by a single project participant, Andrew Sommers.

Week 8 Project definition and plan development

Week 9 Initial analysis of the data, adjustments to data, and analysis of data relationships

Week 10 Exploration of forecasting models based on data relationships

Week 11 Completion of analysis of forecasting models including evaluations

Week 13 Base functionality of data handling, forecasting, and evaluation

Week 14 Web application overlay

Week 15 Deployment and submission

**GitHub repository:** https://github.com/aesommersX999/D590Project