Case Study: Predicting U.S. Saving Behavior after the 2008 Financial Crisis

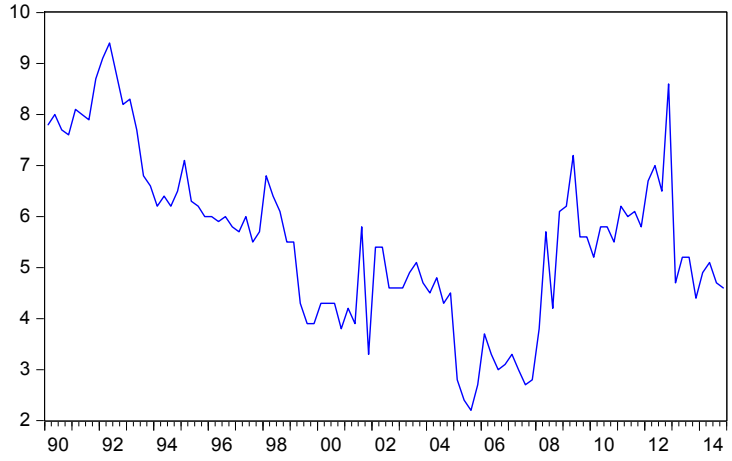
Introduction

Figure 1 shows the behavior of the U.S. household sector's saving rate (in percent of disposable nominal income) since 1995:1 using quarterly data.[1] It suggests a gradual decline in the U.S. household's saving rate during 1995:1-2007:4. Analysts have attributed this decline to the use of housing equity by the household sector to finance (and hence increase) consumption expenditure together with its household disposable income.

The decline in the saving rate ended abruptly in 2007:4, following an 18 month period of nominal house price declines in the U.S., growing concern about the state of the U.S. housing market (nominal house prices were falling) and perhaps most importantly the onset of the global financial crisis.

The economic uncertainty associated with the global financial crisis and the need to rebuild household balance sheets encouraged U.S. households to increase their saving in the near term, possibly[2] contributing to the severity of the financial crisis and raising questions as to whether the significant increase in the saving rate was temporary. Whether or not the increase in the saving rate is temporary would have implications for whether one should attempt to stabilize the crisis solely by using monetary and/or fiscal policy.

Figure 1: U.S. Household Saving Rate, 1995:1 - 2014:4



[1] Most of the data was downloaded from the St. Louis FRED database, which is available online and directly accessible from EViews (see "M1_Getdata.prg"). The data was downloaded January 31, 2015.

[2] The change in saving may have been an outcome of the financial crisis rather than a direct cause of the crisis.

For the major course assignment, you are tasked with constructing a forecasting model of U.S. saving behavior using the VAR/VECM approach. You will use your model to assess whether or not there has been a structural break in the U.S. saving function since the onset of the financial crisis in the last quarter of 2007. You will need to demonstrate the model's usefulness by showing that it is able to predict, within sample, the behavior of the actual saving rate for 1961:1–2007:4.

After you have formulated your preferred model for the saving (or consumption) function, assess its out-of-sample forecasting performance (i.e., for 2008:1-2014:3) and whether the U.S. saving rate will revert to its pre-crisis levels. This requires you to decide whether the parameters of your preferred model have changed since 2007:4 using appropriate statistical tests.

Broad Guidelines:

1. Data on U.S. consumption, income, and saving can be found in **M1_Data.WK1**, in the pagefile **USA_CY**. Note that some of the series have missing values (i.e., NA terms).

2. Series names and their definition are:

Variable Name	Definition
assets	Total wealth (gross) of the household sector.
assets_financial	Total financial wealth (gross) of the household sector.
assets_non_financial	Total non-financial wealth (gross) of the household sector.
cpi	Consumer price index (Base year: 1983 = 100.00)
house_prices	House price index, SA (Federal HFA).
liabilities	Liabilities of the household sector.
mortgage_30y	Long-term mortgage rate (30 year loan)
nc, ndc, ndy, nsc, ny, nly	Nominal consumption (nc), non-durable consumption (nominal, ndc), nominal disposable income (ndy), nominal consumption of services. Nominal household income (ny), nominal labor income.
net_worth	Nominal net worth (actual).
net_worth_d11	Nominal net worth (deseasonalized)
Prime_rate	Short run prime (interest rate)

rc, rdy, saving, saving_rate, rly, rnw	Real consumption (chained, rc), real disposable income (chained, rdy), nominal saving (saving), saving rate (% of income, saving_rate), real disposable labor income (rdy), real net worth (rnw)
consumer_sentiment	Household confidence/sentiment index, University of Michigan.
unemp	Civil unemployment rate.
y_deflator	Implicit price deflator for household income.
gov_transfers, interest_payments	Government transfers (gross); h/h interest payments (interest_payments).
sb_1975_4	Dummy variable that equals 1 prior to 1976 (0 otherwise)
gov_debt	Federal debt held by the public (non-seasonally adjusted)

3. To get a feel for the data, plot log(rc/rdy) against log(rnw/rdy) for 1952:1 to 2014:4, using both a time plot and a scatter plot (the latter may make more sense using $\Delta\log()$ rather than the log level). Also regress log(rc/rdy) on a constant and log(rnw/rdy) using data for 1961:1 to 2014:3 and then examine the fitted residuals, looking for evidence of any changes in the relationship between consumption, disposable income and net wealth. Is there a structural break in the relationship before 1975:4? If so, use the dummy variable called sb_1975_4 to allow for it.

4. Specify a long-run model for *real* consumption using real disposable income, and any other variables from the table that you feel can explain the long-run behavior of consumption. Be sure to state your priors for the correct signs of the coefficients before estimating the model. Also, it would be helpful if your model was expressed in "log" form, so that the parameter estimates are elasticities.

5. The sample period for model specification (selection of your best model for forecasting purposes) must end at 2007:4. In preliminary work, we have found that workable specifications for the aggregate consumption function can be found using data from 1961:1 onwards.

6. Determine the statistical properties of the variables used in your analysis (i.e., I(0) or I(1)). Formally test for unit roots in the data and cointegration if appropriate, and estimate the long-run model using an appropriate estimator given the statistical properties of the data. The model could be expressed in levels form if you feel that the data supports that specification.

7. Starting from the "long-run" specification, construct an equation (e.g., an error-correction equation) that can explain the actual behavior of consumption during the sample period. Justify the ECM specification using standard regression diagnostics, including robustness of the parameter estimates, lag-length selection, and residual diagnostics (actual versus fitted).

8. Use your preferred model and the EViews' solver to produce dynamic, static, and "fit" forecasts for the *U.S. saving rate*[3] for 2008:1-2014:3 (depending on availability of data). Given your findings, discuss whether the increase in the U.S. saving rate that occurred around 2007:4 is permanent or transitory.

9. Lastly, using your long-run model for the consumption function and the actual data for the explanatory variables, conduct a standard Chow Forecast Test to determine the forecasting properties of the long-run model out-of-sample. Assume that the structural break occurred in 2008:1.

Please support your analysis with graphical representations of the saving rate out of sample. Given that you are working with real aggregate consumption, the implied saving rate will need to be calculated using the standard NIPA tables definition (see Table 2.1 and the definition provided immediately below).

[3] The saving rate (percentage points) can be derived from total real consumption and real household disposable income using the following formula:

saving rate=100*(rdy - (rc + ((gov_transfers + interest_payments)/y_deflator)))/rdy

Please refer to NIPA Table 2.1 for the definition of the saving ratio using nominal variables. Note that the saving rate must be expressed in real terms because these are the variables that the model will forecast.