

Finance 462 Project #1

In class, we have discussed two classes of interest rate models. Economic models use economic data to explain/forecast interest rate movements while statistical models rely purely on past behavior to explain/forecast interest rates. In this assignment, you will use two specific interest rate models to perform *in sample forecasting*. In other words, you will be forecasting interest rate movements assuming that that you have perfect foresight with respect to future economic data.

The two models we will be experimenting with are:

Economic Model (Mehra)

$$\Delta R_t = -.22 + .71(\Delta\pi_t) + .61(\Delta RFR_t) + .12(\Delta \ln y_t) + .34(RFR_{t-1}) - .37(R_{t-1}) + .37(\pi_{t-1}) \\ - .23(\Delta R_{t-1}) + .07(\Delta R_{t-2}) - .04(\Delta R_{t-3}) + .15(\Delta R_{t-4})$$

Where

ΔR_t = Current change in the interest rate

$\Delta\pi_t$ = Current change in the inflation rate

ΔRFR_t = Current change in the Real Federal Funds Rate

$\Delta \ln y_t$ = Current percentage change in real GDP

R_{t-1} = Prior period's T - Bill Rate

π_{t-1} = Prior period's inflation rate

ΔR_{t-i} = Change in TBill Rate i periods ago

All the data in the above model is quarterly and all variables are annualized and expressed as percentages.

- 1) You will first need to do some transformations of the data to match the above model:
 - Calculate the annualized inflation rate (percentage change in the CPI)
 - Calculate the change in the inflation rate
 - Calculate the percentage annualized change in GDP
 - Calculate the real Federal Funds Rate (Nominal Fed Funds – Inflation)
 - Calculate the change in the Federal Funds Rate
 - Calculate the change in the TBill Rate

2) Now you are ready to predict the one Year TBill Rate. Suppose you are living in January 1960 and would like to predict the TBill Rate in March of 1960. You would need the following:

- The change in inflation, change in Real Fed Funds Rate, and Percentage change in real GDP for March 1960
- The TBill Rate, Real Fed Funds Rate, and Inflation Rate in January 1960
- The Change in the TBill Rate in January 1960 as well as the previous three quarters

Entering everything into the above formula will give you the January 1960 one quarter ahead forecast for the change in the TBill rate. Copying the formula down the column will give you the one quarter ahead forecast for change in TBill rates from 1960 – 2004. To generate the actual interest rate path,

Forecasted Interest Rate = Actual Interest Rate + Forecasted Change

Statistical Model (Vasicek)

This is the easy part. The Vasicek model simply assumes that the interest rate always returns to a long run mean. Therefore, the change in the interest rate is equal to:

$$\Delta R_t = .2(6 - R_t)$$

- 3) Use the above formula to calculate the one quarter forecast for the TBill rate from 1960 to 2004.
- 4) Plot each of your forecasts with the actual interest rate path. What do you see?
- 5) For each method, calculate some sample statistics (mean, standard deviation, and autocorrelation). What do you see?
- 6) For both methods, calculate the Mean Squared Error
 - Calculate the difference between the forecasted interest rate and the actual interest rate for each date
 - Square the above differences
 - Average the above squared differences

What do you see?