

# Addendum : Goyal-Welch Graphs of the strategies with nonnegativity constraints

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This document contains the Goyal-Welch plots, using the forecast strategies which impose non-negativity constraints. Each plot graphs the function which is the difference in the sum of squared errors between the historical mean and the predictive regression forecast. To use our notation, where  $\bar{r}_{t+1} = (\sum_{k=0}^t y_k)/(t+1)$  is the historical average and  $\hat{r}_{t+1}$  is the time  $t$  predictor of the premium at time  $t+1$ , we define

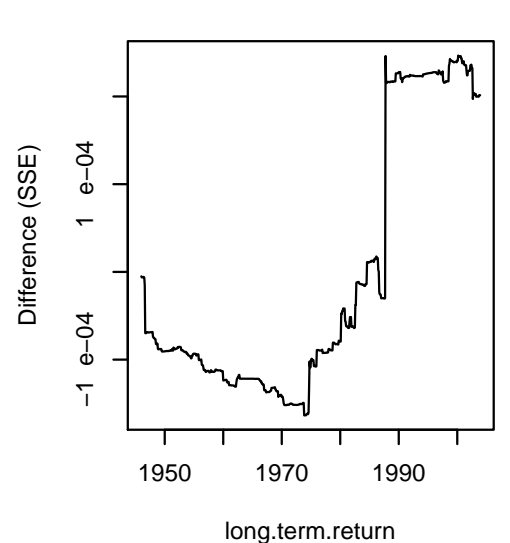
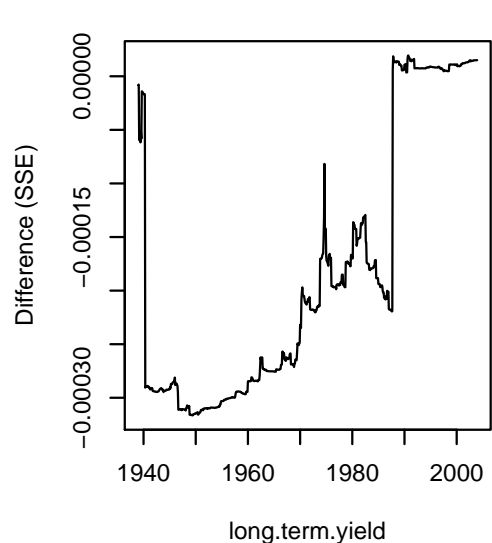
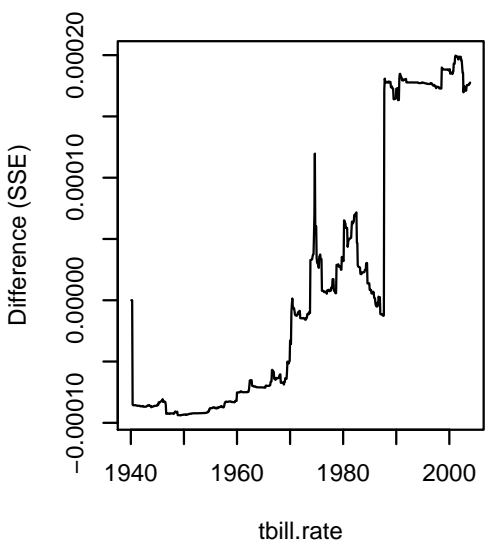
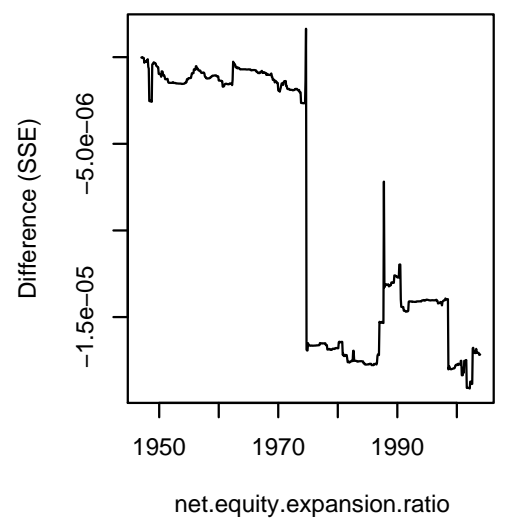
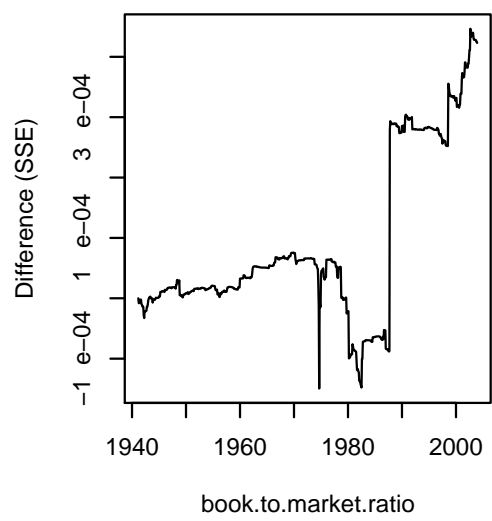
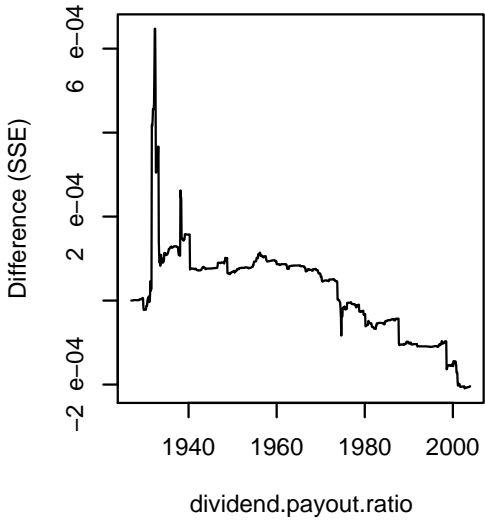
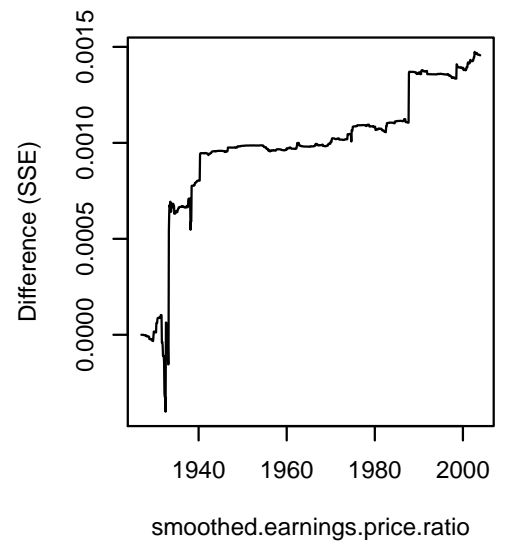
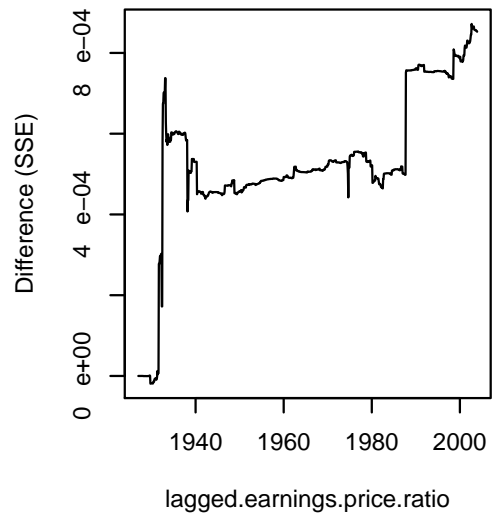
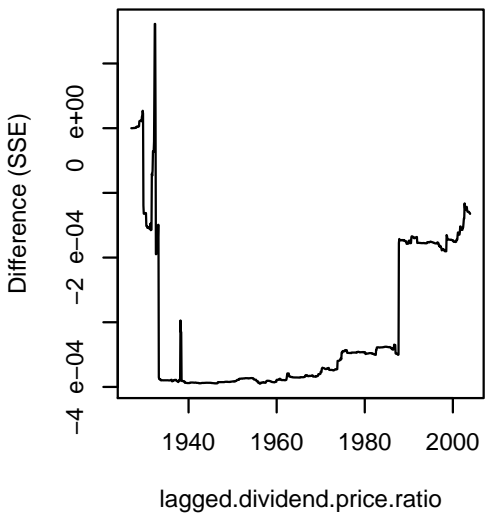
$$\Delta SSE_s \equiv \left[ \sum_{k=1}^s (r_k - \bar{r}_k)^2 \right] - \left[ \sum_{k=1}^s (r_k - \hat{r}_k)^2 \right]$$

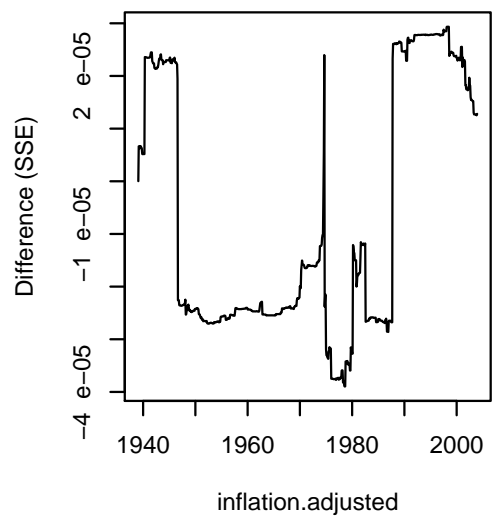
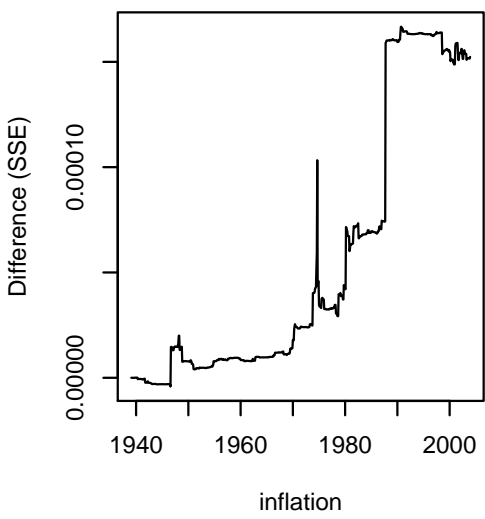
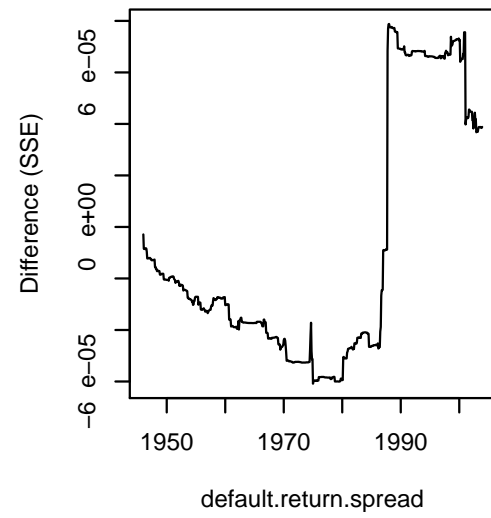
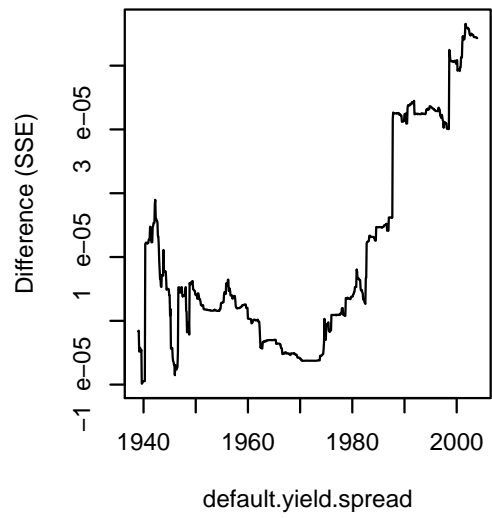
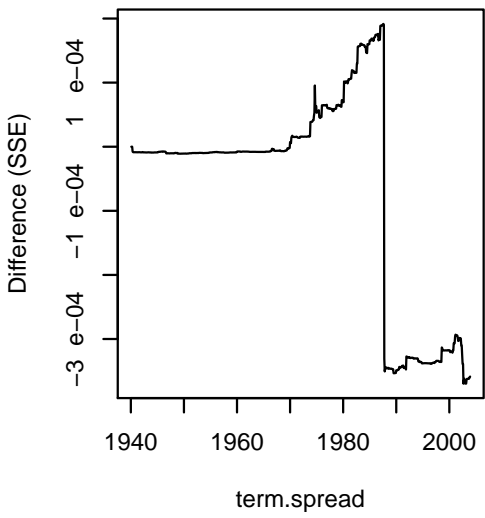
Positive  $\Delta SSE$  shows that our forecast  $\hat{r}_{t+1}$  beats the historical mean on a sum of squared residual errors comparison.

The graphs are graphical representations of a measure of robustness to sub time interval selection. If the predictor is good, the  $\Delta SSE$  should be increasing steadily.

## 1 Campbell and Thompson, panel C

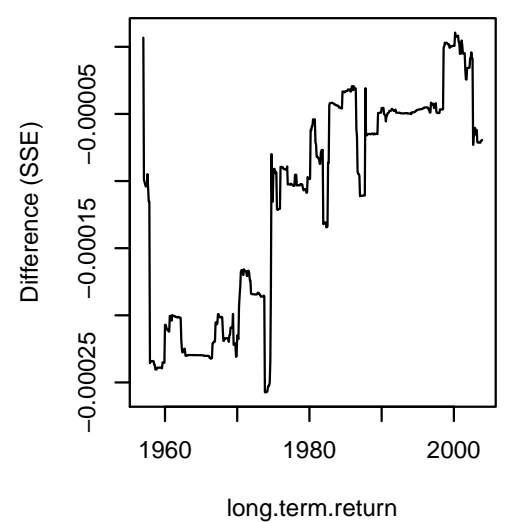
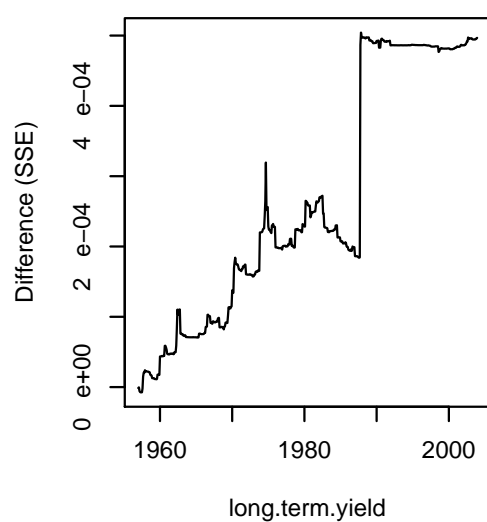
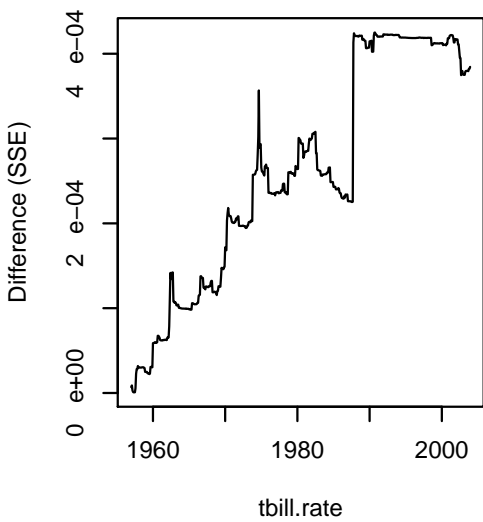
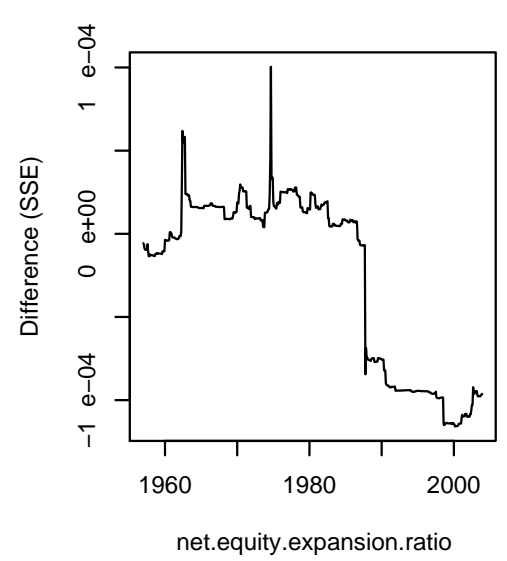
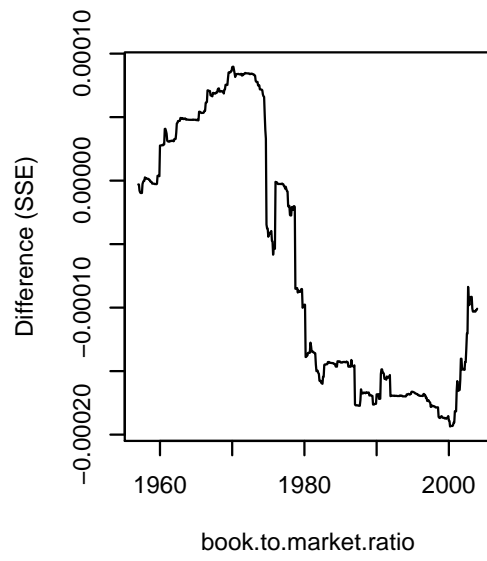
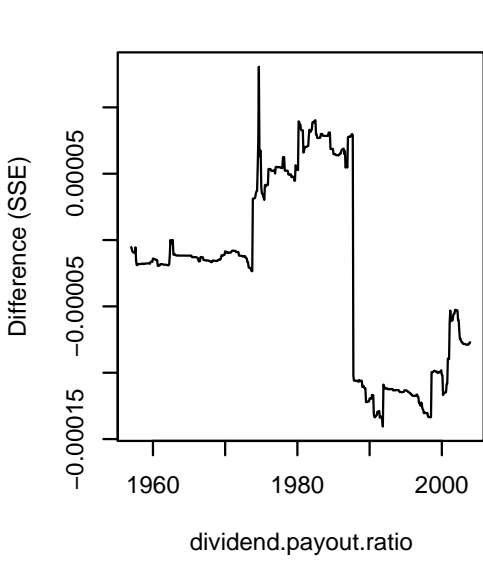
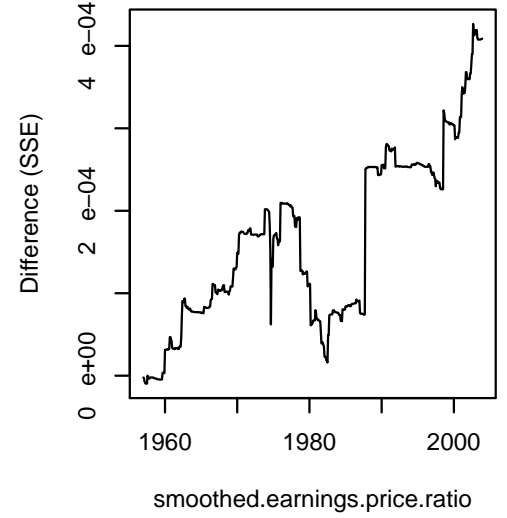
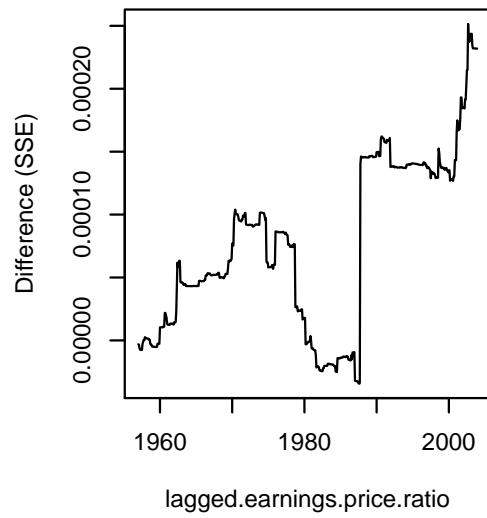
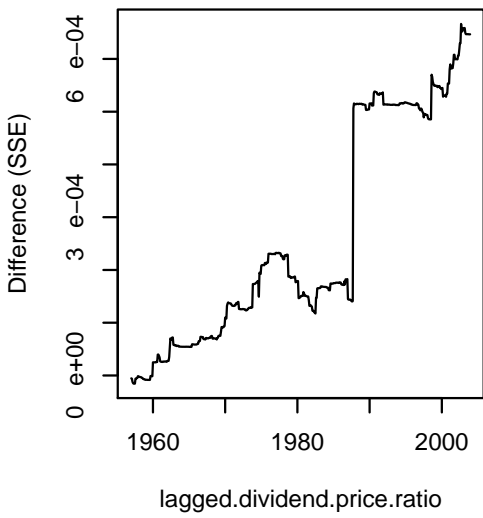
The first set of graphs show the results from the “panel.C” strategy of Campbell and Thompson. This has the non-negativity constraint on the forecasts.

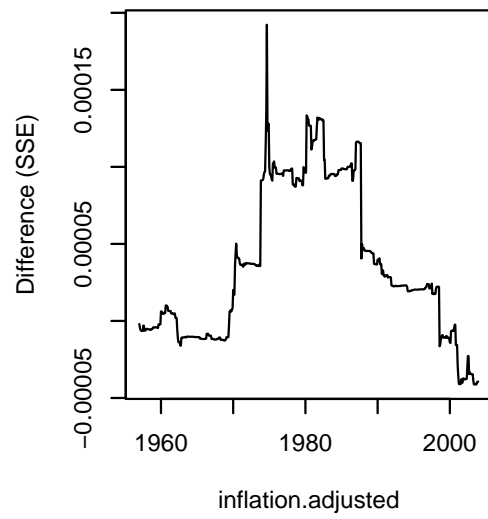
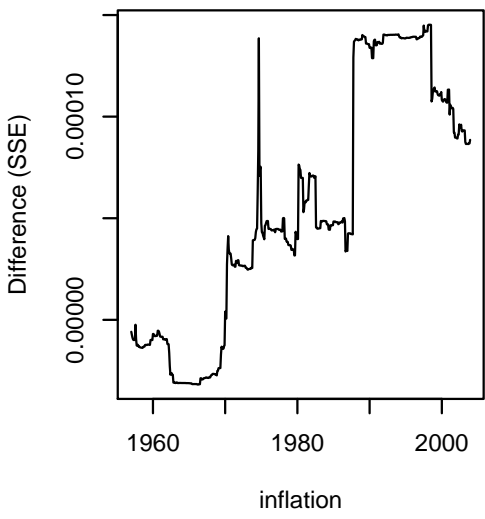
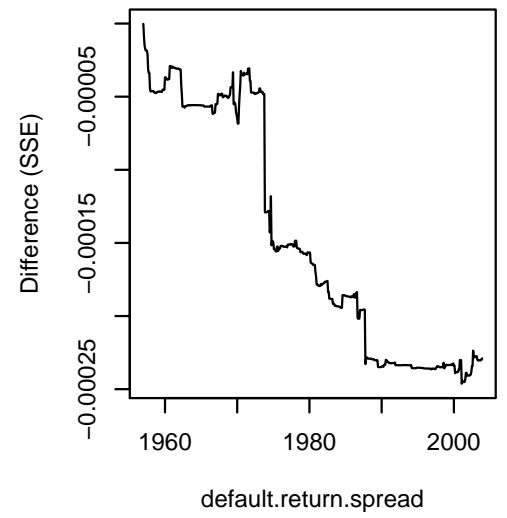
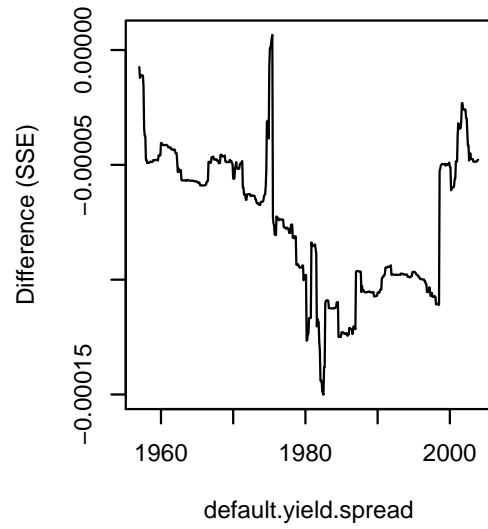
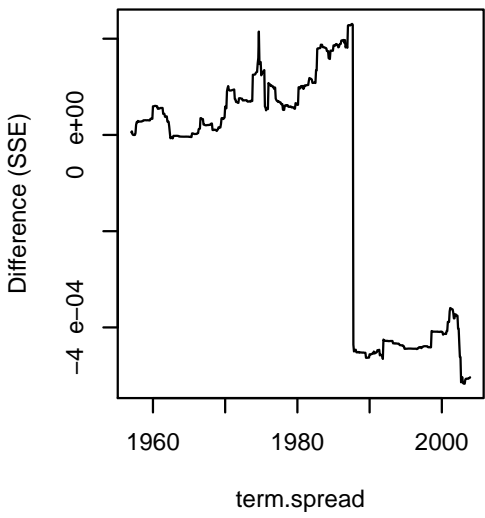




## 2 Growth Regime, with non-negativity constraint

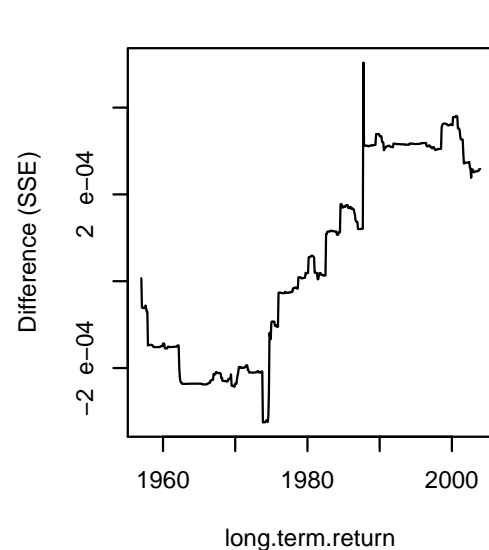
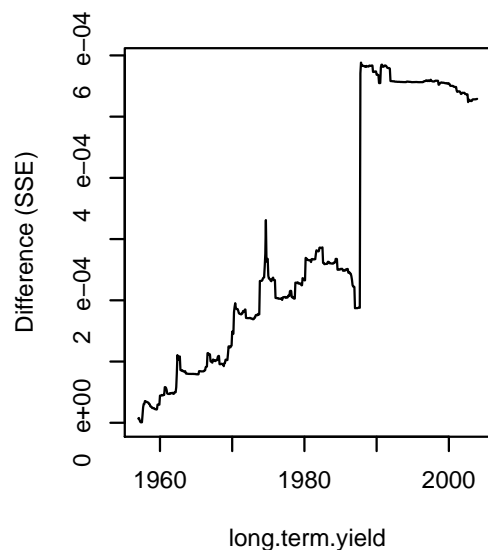
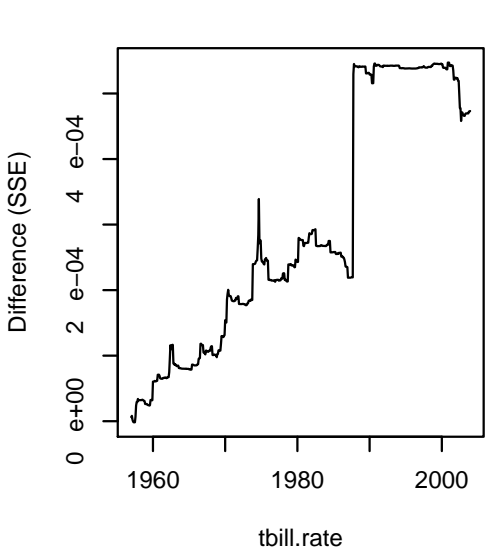
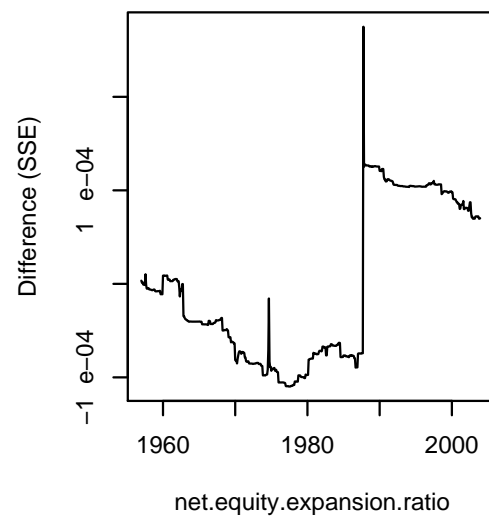
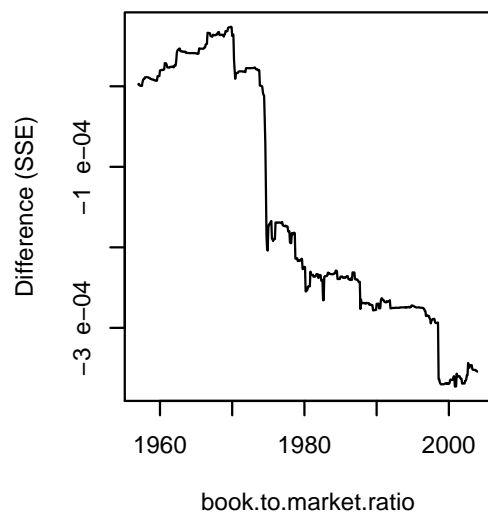
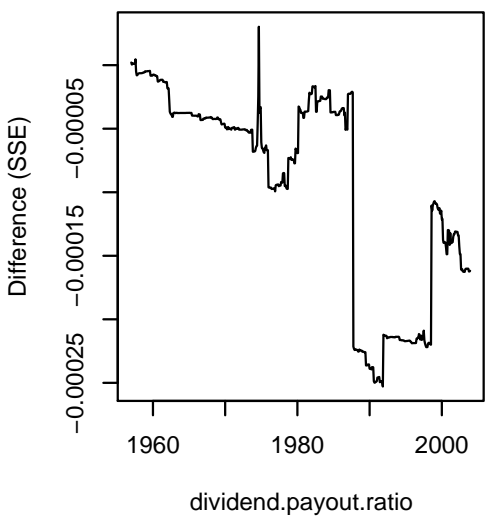
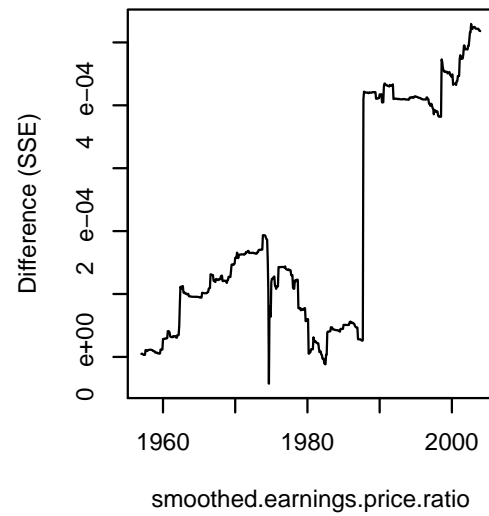
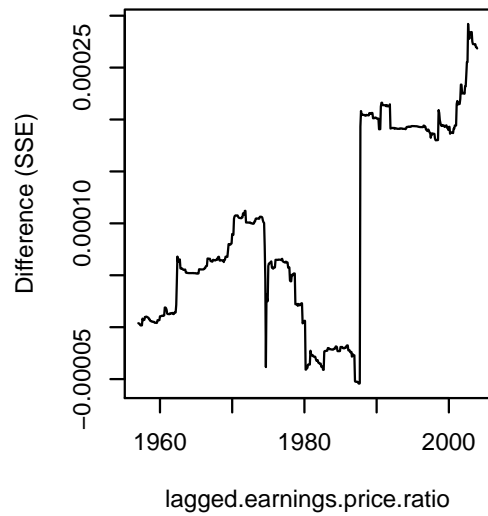
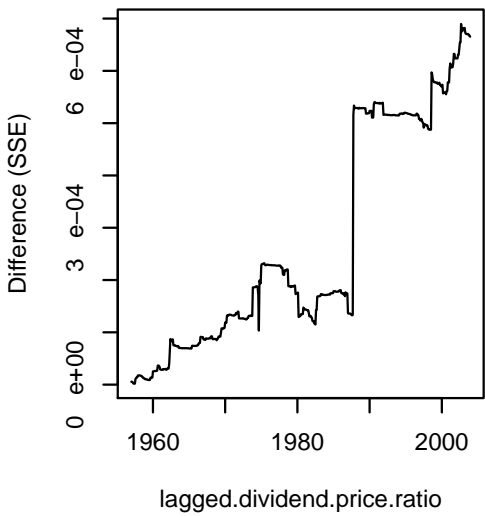
We next present the graphs for the growth regime switching strategy, with the nonnegativity constraint. (This uses the past quarterly GDP growth as the threshold variable). The T-bill rate and the long term yield were the best predictors, and as a robustness check, we check to ensure that the graphs are steadily increasing.

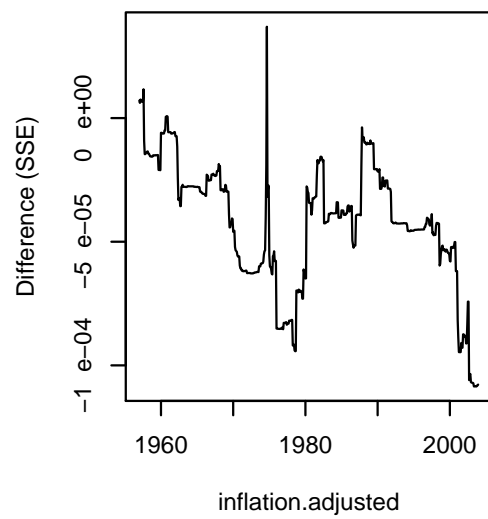
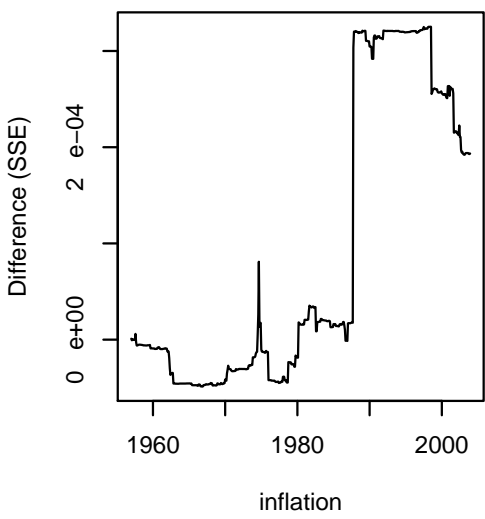
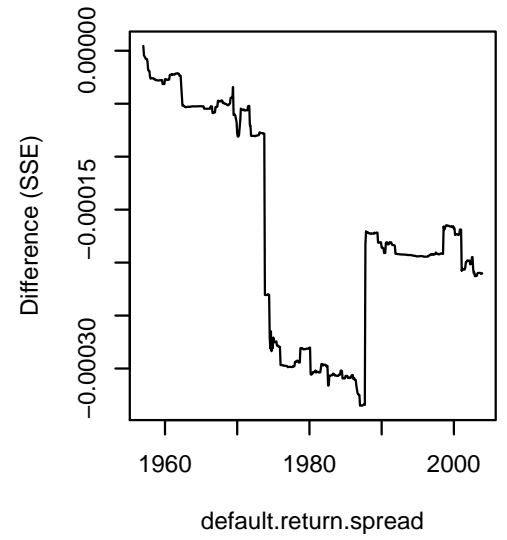
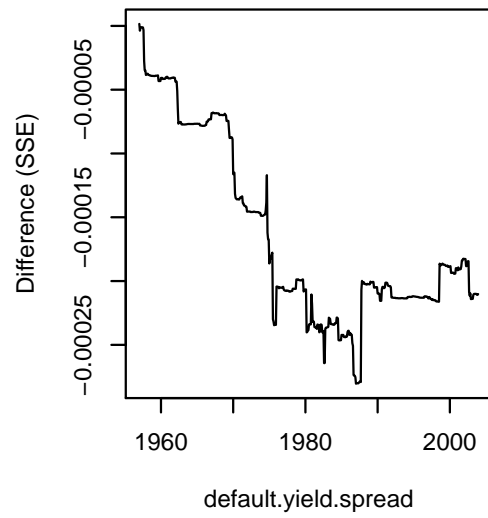
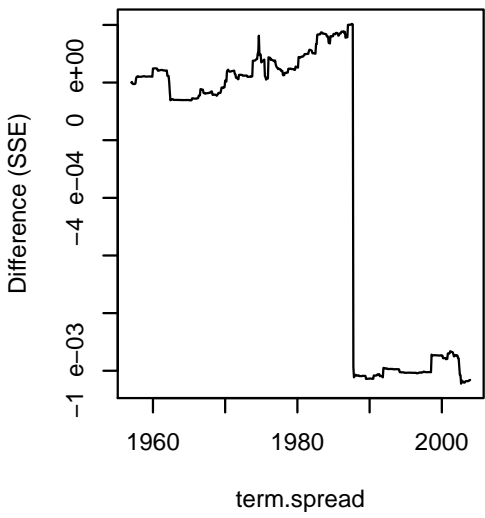




### **3 Market Regime (1947 on), with non-negativity constraint**

Now we present the graphs for the market regime switching strategy, with the non-negativity constraint. (This uses the current month's equity premium as the threshold variable).





## **4 Market Regime (CT timeframes), with non-negativity constraint**

Finally, we include the graphs where the timeframe for each variable matches the timeframe mentioned in Campbell and Thompson. (There are various start dates for the different variables).

