Assignment 9, FIN 560

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1 1

The analyst's claim would have to be tested against the benchmark random walk model using the MSFE ratios in a pseudo-out-of-sample setting.

The procedure is to fit the model of the analyst on the first 50% or so of time-series data from the stock data sample. So if the total number of years in the sample is 100 then the candidate model (and the random walk) is fit on the first 50 years. Then for year 51 in the sample, predictions are generated from both the analyst's and the random walk model. Then for the 52nd year, the predictions from 2 models are made again, this time using the data from years 1 to the 51st year. This process ends at the 100th year, because predictions are generated using data from years 1-99.

After the predictions are made, the MSFE for both models is computed. If the ratio

$$\frac{MSFE_{candidate}}{MSFE_{RW}} < 1$$

then the candidate/analyst's model has greater forecasting ability than the random walk. However, if it's greater or equal to 1, then the analyst's model does not perform well in forecasting future stock prices relative to the random walk.

2 2

The OLS regression yields coefficient estimates for the following:

$$\hat{Y}_t = \hat{\beta}_0 + \hat{\beta}_1 Feb_t + ... + \hat{\beta}_{11}$$

We can show that $\hat{\mu}_{Mar}$ is an unbiased and consistent estimator for μ_{Mar}, using the OLS regression's coefficient estimates for the β values.

The population value of the average number of March housing starts is

$$\begin{aligned}\mu_{Mar} &= \mathbb{E}_t[Y_{Mar,t}] \\ &= \mathbb{E}_t[\beta_0 + \beta_2(1) + u_t] \\ &= \mathbb{E}_t[\beta_0 + \beta_2(1)] \\ &= \beta_0 + \beta_2\end{aligned}$$

By the Gauss-Markov assumptions, $\mathbb{E}[u_t] = 0$ in the second to last step.

Put the sample average number of March housing starts as:

$$\begin{aligned}\hat{\mu}_{Mar} &= \frac{1}{T}\sum_{t=1}^{T} \hat{Y}_{Mar,t} \\ &= \frac{1}{T}\sum_{t=1}^{T} (\hat{\beta}_0 + \hat{\beta}_2(1)) \\ &= (T/T)\hat{\beta}_0 + \hat{\beta}_2 = \beta_0 + \beta_2\end{aligned}$$

Because GM assumptions implies unbiasedness and consistency of OLS estimators, it follows that $\hat{\beta}_0 \xrightarrow{p} \beta_0$, $\hat{\beta}_2 \xrightarrow{p} \beta_2$, $\mathbb{E}[\hat{\beta}_0] = \beta_0$, and $\mathbb{E}[\hat{\beta}_2] = \beta_2$, then it follows that $\mathbb{E}[\mu_{\hat{Mar}}] = \mu_{Mar}$ and $\hat{\mu}_{Mar} \xrightarrow{p} \mu_{Mar}$.

If taking $t =$April, then following the same logic the formula would be $\beta_0 + \beta_3 = \mu_{Apr}$