2.5: Introduction to Business Forecasting

To prepare for this lecture, read Hirschey, chapter 6, 199 – 202, 210 – 216, 225 – end.

In this lecture we will first discuss a general approach to statistical forecasting, review three sets of forecasting tools, and introduce four common metrics for evaluating a forecast.

In practice, the forecaster is faced with the following problem: He or she must formulate a statistically based model using available data, and must use the model to extrapolate that data into an unknown future. The forecaster will only know how good their forecast is after the forecast period. We will say that, when one looks at the errors of a forecast, a good forecast produces nothing but white noise.

Expert opinion / Consensus forecasting
In general, businesses require forecasts of two broad categories of indicators: overall macroeconomic conditions and specific input prices.

The most well-known “expert” macroeconomic forecasting organization is Consensus Forecasts, which produces monthly forecasts of U.S. and global economic conditions. The business forecaster may think of such fee-based services as providing an input to a specific forecasting model.

Another “expert” macroeconomic forecast is available at no cost: The Federal Reserve’s Open Market Committee now publishes the forecast it uses in formulating monetary policy.
Barometric forecasting (and other tools)

1. **Index of Leading Economic Indicators**
   Composite indexes (such as the *Conference Board’s Index of Leading Economic Indicators*) are designed to signal peaks and troughs in the business cycle. They are essentially composite averages of individual indicators that have historically led the business cycle. For example, turning points in the Conference Board’s leading index have occurred before those in aggregate economic activity. Such indexes are constructed to summarize and reveal common turning point patterns in economic data in a clearer and more convincing manner than any individual component—primarily because they smooth out some of the volatility of individual components.

2. **Yield Curve Models**
   Before each of the last seven recessions, short term interest rates rose above long-term rates, reversing the customary pattern and producing what economists call a *yield curve inversion*. Researchers at the New York Federal Reserve expanded this observation into a crude macroeconomic forecasting model that generates a probability of recession within 12 months. (Estrella and Trubin, “The Yield Curve as a Leading Indicator: Some Practical Issues,” *Current Issues in Economics and Finance* 12:5, July/August 2006.)

3. **Prediction Markets**
   Prediction markets are speculative markets created for the purpose of making predictions. In such markets, the current market prices can then be interpreted as predictions of the probability of the event or the expected value of the parameter. For an example, see [http://www.intrade.com](http://www.intrade.com).

**Statistical Techniques and Evaluation of Forecasts**

Making use of the white noise idea, we will consider four evaluative metrics for judging forecasts:

1. **Mean Absolute Percent Error (MAPE)**
   \[
   MAPE = \frac{1}{T} \sum_{t=1}^{T} \frac{|\hat{y}_t - y_t|}{y_t}
   \]

2. **Root Mean Square Error (RMSE)**
   \[
   RMSE = \sqrt{\frac{1}{T} \sum_{t=1}^{T} (\hat{y}_t - y_t)^2}
   \]

3. **Forecast Accuracy (FA)**
   \[
   FA = 1 - \frac{\sum_{t=1}^{T} |\hat{y}_t - y_t|}{\sum_{t=1}^{T} \max(\hat{y}_t, y_t)}
   \]

4. **Bias**
   \[
   BIAS = \frac{\sum_{t=1}^{T} \hat{y}_t - \sum_{t=1}^{T} y_t}{\sum_{t=1}^{T} y_t} - 1
   \]

**Relevant Textbook Problems:** 6.1, 6.2, 6.3, 6.4, 6.5, 6.6