Special Topic: Measurement Error

Where are we?

This is the first of two articles on forecasting. It deals with the topic of data measurement error. This is not an esoteric subject, since the first step in forecasting is trying to figure out where we are.

A case in point is July's revision to U.S. Gross Domestic Product (GDP) in 2000. Due to measurement error, the U.S. Bureau of Economic Analysis (BEA) lowered its prior estimate by 0.9 percentage points. This meant that real GDP increased 4.1 percent rather than 5.0 percent last year. If analysts had known the exact speed of the national economy one year ago, they undoubtedly would have done a better job of anticipating this year's slowdown.

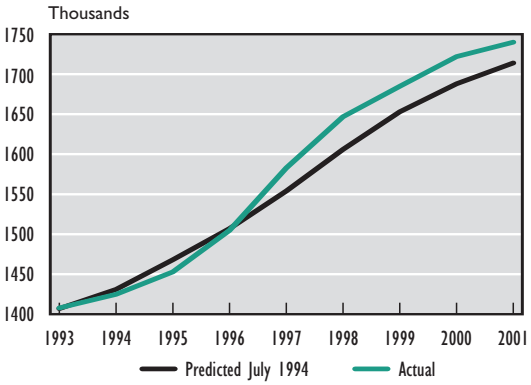
Regional employment data published by the Washington Employment Security Department (ESD) are also susceptible to measurement error, since the first round of estimates is derived from a sample of employers. Last February, armed with complete employee counts for the first six months of the year, ESD raised its initial estimate of Puget Sound employment in 2000 by 0.7 percent. Next February the estimate will be revised one more time before it becomes final. Of the regional data series that we work with, only the Seattle consumer price index is not subject to revision. Of course, this does not mean that it is always accurate.

In principle, data measurement error creates two forecasting problems. First, forecasting models estimated with inaccurate historical data tend to yield poor predictions. In practice, however, only the most recent observations in data series are prone to significant measurement error. Since forecasting models are calibrated with long time series–the Puget Sound model uses quarterly data extending back to 1970 (126 observations)–two or three inaccurate data points will have little impact on the models' estimated parameters or ability to produce accurate forecasts.

Second, the existence of measurement error means that analysts are uncertain about the economy's starting point for a forecast. Was regional employment in 2000 actually 1,721,700 or something else? We will have to wait until early next year to find out. Fortunately, in the game of forecasting, knowing the value of a variable is much less important than knowing how it is changing. A department store manager predicting next year's sales, for example, would much rather know the expected growth rate of Puget Sound personal income in 2002 (5.5 percent) than its predicted value ($129.7 billion). Indeed, forecasting is largely about predicting change.

Except in the case of personal income, measurement error has not been a stumbling block to producing reasonably accurate forecasts for the Puget Sound economy. Since 1993 we have made eight end-of-year forecasts. The average absolute error for one-year-ahead predictions of regional employment is only 0.7 percent,

Predicted and Actual Puget Sound Employment



which is acceptable. Even our first ten-year projection of employment published in July 1994 is still on track, exhibiting an error of only 1.5 percent in 2001. One-year-ahead prediction errors for the Seattle consumer price index (0.6 percent) and population (0.2 percent) are even smaller.

In contrast, the one-year-ahead prediction error for personal income is 2.1 percent, which is not acceptable. However, much of the error stems from the difficulty of measuring and forecasting Microsoft stock option income, which at its 1999 peak accounted for an astonishing 7.3 percent of Puget Sound personal income. Excluding stock option income, the one-year-ahead prediction error for personal income declines to a palatable 1.1 percent.

The next article will describe our forecasting method, which involves the use of a regional econometric model.

Selected Data Revisions

	Year	Initial Estimate	Latest Estimate	Percent Change
Puget Sound employment (thous.)	2000	1709.4	1721.7	0.7
Puget Sound personal income (bils. $)	1998	105.4	104.8	-0.6
Seattle consumer price index (82-84=1.000)	1997	1.630	1.630	0.0
U.S. Gross Domestic Product (bils. $)	2000	9965.7	9872.9	-0.9