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Measuring Prices of Durable Goods

When the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA) calculate aggregate price statistics, they first adjust any change in the price of a product by the change in the quality of the product ("quality change"). In other words, they ask how much of the increase in the price of a product is due to the fact that the product is improved. For years now, these agencies have been measuring quality changes on the basis of production costs. That is, if production cost is higher for a new model than for an old model in a given period, the quality of the new model is assumed to be higher.

However, it is also possible to measure quality changes by using value to the product's user ("user value") as the criterion. That is, if the consumer values a new model more, then its quality is judged to be greater. The BLS and BEA make no attempt at all to measure user value in determining quality change. While it is true that some such changes cannot be objectively measured, others—for example, those that involve higher performance without an increase in cost or those that increase energy efficiency—can be taken into account.

In some cases, the production cost and user value criteria lead to the same result because changes in user value are exactly proportional to changes in production costs. However, when changes in user value and production cost are nonproportional, then the production-cost criterion may understate quality change.

Consistent with NBER's tradition of reexamining, from time to time, the analytic basis of price and output statistics, Research Associate **Robert J. Gordon** discusses price measurement in cases where increases in a product's user value are in different proportion than increases in production costs. In **Energy Efficiency, User Cost Change, and the Measurement of Durable Goods Prices,** *NBER Working Paper No. 408,* Gordon points out a number of industries in which this is the case. "Examples of quality changes that have increased user value by a greater proportion than production cost," Gordon writes, "include the increased calculation ability of electronic computers of given size and resource content; the superior performance of the jet aircraft engine compared to the propeller it replaced; the improvement in the picture quality of color TV sets without increases in costs; and the improved fuel economy of automobile engines of given size and performance characteristics." In these and similar cases, Gordon recommends measuring quality change, for use in price deflators and output indexes, in terms of user value.

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Gordon's paper includes a case study of the commercial aircraft industry that has some striking results. Between 1957 and 1972, the official price index for that industry rose at an annual rate of 2.5 percent. For the same period, the user value approach yields a price index that declines by 7.1 percent (annual rate). The implication, he states, is that output and productivity actually grew much faster than is officially recorded in the aircraft industry. In addition, total factor productivity in the airline industry grew less rapidly than believed.

Based on this and other evidence, Gordon's conclusion is threefold: (1) that properly defined input and output price indexes can treat nonproportional quality change consistently; (2) that quality adjustments

should be based on user value, not production costs; and (3) that improvements in the energy efficiency of a product should be reflected in price adjustments.

Wages and International Adjustment

One of the most striking features of the world economy over the last four years has been the failure of the major industrial countries to recover fully from the 1974–75 recession. While there have been several attempts at recovery, the outcome has been persistent stagnation. The major exception has been the U.S. economy, but its recovery gave rise to a massive current account deficit and a sharp depreciation of the dollar. As a result, the United States shifted to a policy of fiscal and monetary restraint to defend the dollar in November of 1978.

The principal factor behind the worldwide stagnation apparently has been the difficulty of recovery—or the reluctance to stimulate demand—in Europe and Japan. In 1976 and 1977, the United States was urging Germany and Japan, the countries with strong trade surpluses, to apply more stimulus in order to lead the industrialized world out of the recession. Germany and Japan argued, however, that vigorous stimulus would merely bring on more inflation. The tightening of U.S. policy a year later amounted to acceptance of the fact that one country cannot attempt to recover at a significantly faster rate than its major trading partners. What used to be known as the "balance of payments" constraint on uncoordinated recovery reappeared as an "exchange rate" constraint.

One popular explanation for the policy dispute and the slow recovery is that Europeans, and particularly Germans, are more sensitive than U.S. officials to the danger of high inflation. Another is that the German policy analysis is based on a textbook "classical" economic model, in which there is no money illusion and wages and prices are fully flexible. In that case, fiscal and monetary stimulus would lead to higher inflation but would not increase output.

Two NBER associates, **William H. Branson** and **Julio J. Rotemberg** of Princeton, have put forth a third explanation. They believe that the policy differences and stagnation may both result from differing wage behavior. Their hypothesis is that real wages may be rigid in the short run in Germany and other countries, while nominal wages may be rigid in the United States. Rigid, or "sticky," real wages, would give the classical result that stimulus raises prices without affecting output, but not in the flexible wage-price context. In contrast, stimulus would bring about higher output and employment in an economy with sticky nominal wages because real wages would fall as prices rose.

Branson and Rotemberg develop a theoretical model of a world economy with differing types of wage rigidity across countries in **International Adjustment with Wage Rigidity,** (*Working Paper No. 406*). They also report the results of empirical tests that are consistent with their hypothesis that differing wage behavior has been an important factor in economic policy disputes and stagnation.

Branson and Rotemberg first explore the simple case of a world with only one good and two countries, one with sticky real wages and the other with sticky nominal wages. They show that an increase in economic stimulus is more inflationary if real wages are rigid. Moreover, stimulus in the country with sticky real wages reduces that country's trade surplus while it increases output in the *other* country. Thus, if Germany had sticky real wages and the United States had sticky nominal wages, expansive measures in Germany would be inflationary and would reduce its trade surplus, but all the resulting output gains would occur in the United States.

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These results are considerably weakened when countries produce goods that are imperfect substitutes for each other. Then it is reasonable that the real wage that is relevant for labor supply decisions is the nominal wage deflated by a price index. This price index is a function of the price of both the home goods and the foreign goods. In this case expansionary policies in countries whose real wage (as perceived by the workers) is fixed will increase output at home while reducing output in other countries whose real wage is fixed.

The empirical evidence is consistent with the theory that sticky real wages have made Japan and European countries reluctant to stimulate their economies in the 1970s, while sticky nominal wages have made stimulus attractive to the United States. For one thing, of five major industrial countries (the United States, Germany, Japan, Italy, and the United Kingdom), the United States was the only one that experienced a protracted decline in real wages during the 1973–75 period.

Branson and Rotemberg make a more rigorous test of real and nominal wage rigidity by estimating labor supply equations. Real wages are made a function of: lagged real wages; the ratio of the expected price level to the previous nominal wage; and real GNP relative to

trend (a proxy for labor demand). If the coefficient on GNP is insignificant, current labor market conditions do not affect the real wage. If the coefficient of the lagged real wage is significantly different from zero while the coefficient of the ratio of the expected price level to the previous nominal wage is insignificant, one accepts the hypothesis that the real wage is sticky. If instead the former coefficient is near zero while the latter one is significantly different from zero, then one can say that nominal wages are sticky.

Branson and Rotemberg apply their test to data for the period from 1962 through 1978 and for 1971 through 1978. They find that the coefficient for GNP was statistically significant in each of the five countries for the overall period, but insignificant for 1971 through 1978. This implies that wages became less sensitive to demand in the 1970s. In terms of nominal versus real wages, the United States is the only country for which the data support the hypothesis that nominal wages are rigid. In Germany, Japan, Italy, and the United Kingdom, real wages appear to be rigid. AE

Forecasting Interest Rates

Published forecasts of short-term movements in long-term interest rates ought to be regarded with a healthy degree of skepticism, according to a recent study by NBER Research Associate **James E. Pesando.** In *Working Paper No. 410,* **On Forecasting Interest Rates: An Efficient Markets Perspective,** Pesando tests the theory that forecasters should do reasonably well in predicting movements in short-term interest rates, but should not be nearly as successful in predicting movements in long-term rates.

He analyzes three sets of published Canadian forecasts—Data Resources Inc. of Canada (DRI); McLeod, Young, Weir (MYW); Conference Board in Canada—and compares them with the naive prediction that the current value of the relevant interest rate remains unchanged. Pesando finds that "the recorded forecasts of long-term rates in general failed to outperform the no-change prediction. This was not the case for the recorded forecasts of short-term rates." Specifically, the DRI and MYW forecasts of short-term rates were superior to the no-change predictions, and the Conference Board forecast was about as accurate as the no-change prediction. However, the published forecasts of long-term rates were inferior to the no-change predictions in all cases except the DRI two-quarter-ahead forecast that, as Pesando notes, may have had an informational advantage.

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Moreover, when Pesando translates the three published forecasts of long-term rates into *ex ante* holding-period returns on long-term bonds, the results are entirely unreasonable. The most extreme example is a Conference Board forecast that implies a 32.6 percent *ex ante* return on long-term bonds. He therefore cautions that "both forecasters and those who monitor forecasts would be well advised to focus on *ex ante* returns in assessing the likely path of long-term interest rates during their forecast horizons." In fact, Pesando suggests using *ex ante* changes in long-term rates (that are implicit in the term structure) "as a means of refining the predictions of the martingale model [a no-change prediction]."

Given the observed difficulties that exist in forecasting changes in long-term interest rates, Pesando suggests two rules for forecasters: (1) predicted changes in long-term rates must be small, at least over short forecast intervals; and (2) predicted changes in long-term rates ought to be translated into *ex ante* returns on long-term bonds, in part to facilitate comparison with *ex ante* returns on short-term securities.

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