Research Department
Federal Reserve
Bank of
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Weekly Letter

Foretelling the Future

In this time of constant change, private and public policymakers are increasingly demanding quantitative forecasts of the economy. This demand has not gone unnoticed by the economics profession; indeed, many individuals and organizations now regularly make predictions of economic conditions. The most widely followed forecasts are based on large econometric models, which attempt to measure the structural relationships among various economic variables.

The importance of these econometric models cannot be overstated. All major private firms and public agencies use models to indicate how different policy actions might influence the economy. Still, policymakers frequently have difficulty in deciding which policy actions to take because different models forecast different results.

Structural modelling

The building of econometric models involves economic theory as well as statistical measurement. Economic theory is needed in order to specify behavioral relationships in the model. However, model builders may choose from a number of theories concerning the structure of the economy.

There are Keynesian models, monetarist models, expectations models, supply-side models, and models incorporating elements of all these theories. When an economist predicts that a change in a policy variable (such as tax rates or the money supply) will induce a change in another variable (such as gross national product or the inflation rate), the reader must realize that the prediction is influenced by the assumptions about theoretical linkages that the economist builds into his econometric model.

No model has the power to foretell the future, because of the many uncertainties affecting the future. The predictions of such modern-day oracles as Otto Eckstein (Data Resources), Lawrence Klein (Wharton), or John Rutledge (Claremont) are always subject to question. Indeed, econometric modelling is at a point where models can be built to predict almost any set of numbers. This might explain the difference of opinion concerning the Administration's forecasts for 1982, which show the inflation rate slowing to 8.3 percent (measured by the consumer price index) and real GNP growth rising to 4.2 percent. According to some critics, the Administration's forecast is over-optimistic because its underlying assumptions don't coincide with generally accepted economic theory or the past behavior of the economy.

Some critics widen their attack to model building generally. According to this view, the restrictions placed on econometric models are based on arbitrary choices among reasonable alternatives. Economic theory allows a great deal of flexibility in modelling the economy, so that each model builder's individual viewpoint determines which specification is most representative of the true economic relationships. Some observers are even more critical, such as Robert Lucas and Thomas Sargent, the "rational expectations" theorists. Lucas and Sargent assert that "probabilistic microeconomic theory almost never implies either the exclusion restrictions suggested by Keynes or those imposed on macroeconomic models."

The economics profession is aware of the potential unreliability of structural macroeconomic modelling. Economists thus use many other procedures in forecasting, both independently and in conjunction with structural macroeconomic models. They frequently make judgmental adjustments in their forecasts from macroeconomic models. These adjustments, known technically as "add factors", take into account factors not considered in the models.

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Time-series alternative

An alternative procedure, time-series analysis, does not rely on detailed theoretical relationships but instead attempts to capture empirical regularities in the data. Economists using this approach typically model the past behavior of a variable, either independently or in conjunction with other variables that are felt to be leading indicators. Forecasters choose a model primarily on the basis of statistics that indicate how variables are related, according to "reasonable" specifications of the data.

Time-series modelling is a method of estimating "reduced-form equations". Reduced-form equations differ from structural models in that they reflect the combined impact of different influences. Every structural model has a reduced-form representation, which is simply a different representation of the model. Reduced-form models have the potential to forecast more accurately than structural models, because they are not constrained by possibly spurious restrictions. Additionally, time-series modelling can be performed with vastly fewer resources, both in time and money.

A structural model builder would forecast GNP by formulating equations which describe GNP components and their interactions with various sectors of the economy. The equations would be specified on the basis of assumed economic theory. A time-series analyst, in contrast, might argue that the theory used to identify these equations is not valid. Instead, that analyst typically would model GNP by using statistics which show how GNP is related to its own past values and to other variables that might indicate upcoming economic conditions, such as the index of leading indicators.

Small time-series models have been developed at the Federal Reserve Bank of San Francisco and elsewhere to produce forecasts of real GNP, the GNP deflator, and the unemployment rate. While these models are still in an embryonic state, tests indicate that they are capable of producing forecasts as accurate as those produced by the large structural models. A comparison of such a time-series forecast with the composite forecast of the American Statistical Association-National Bureau of Economic Research (ASA-NBER) reveals that both are about equally accurate, as measured either across variables or time horizons (on the basis of mean absolute forecast error over the last five years). The ASA-NBER forecast can be viewed as a consensus opinion, being the median forecast of some 40 to 50 economists who forecast on a regular basis.

A number of studies have found time-series forecasts to be roughly as accurate as those based on large structural models with add factors. However, forecasting accuracy is not the only issue. First, time-series models have undergone far less analysis than structural models. It may be surprising that such models have performed as well as they have. As more research is directed towards time-series analysis, forecasting accuracy should be substantially improved. Moreover, the different modelling approaches should be considered complementary. By taking account of the different information contained in the different forecasts, economists should be able to gain greater insight into future economic conditions.

Comparison of forecasts

What does a typical time-series macroeconomic model actually predict for 1981? The time-series model of the Federal Reserve Bank of San Francisco is predicting an increase in real GNP of about 2.5 percent for the year (4th quarter over 4th quarter), an inflation rate of 10.0 percent, and an average unemployment rate of about 7.3 percent (see table). This forecast can serve both as a prediction of the future and as a benchmark to gauge other forecasts.

The time-series forecast shown here does not indicate as sharp a slowdown as other forecasts do. The "Blue Chip" (Eggert) consensus of 42 private economic forecasters, as of

March, calls for an increase in real GNP of 1.3 percent for the year, an inflation rate of 9.9 percent in the GNP deflator, and an unemployment rate of 7.7 percent in the fourth quarter of 1981. However, some widely quoted forecasts are in tune with the time-series predictions.

Which of the many forecasts will be most accurate in predicting the 1981 economy? A variety of events, both controllable and uncontrollable, may take place to alter the performance of the economy. Indeed, a great deal of uncertainty is attached to any forecast. Much depends on the assumptions in each forecasting model, as well as the degree to which new events in 1981 are similar, or dissimilar, to those in the past. All forecasts thus should be viewed with a degree of skepticism. Correctly foretelling the future course of economic conditions requires a combination of technical skills and clairvoyance. Skill is reflected in the various models, while clairvoyance is needed to foresee 1981's surprises.

Robert Jacobson

Time Series Forecast
1981 I – 1981 IV

	1981 I	1981 II	1981 III	1981 IV
Real GNP ($ billions)	1494.4	1502.7	1512.5	1523.3
Annual rate of change (%)	2.1	2.2	2.6	2.9
GNP Deflator (1972 = 100)	188.2	192.6	197.3	202.2
Annual rate of change (%)	9.9	9.7	10.1	10.3
Unemployment Rate (%)	7.4	7.3	7.2	7.1

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BANKING DATA—TWELFTH FEDERAL RESERVE DISTRICT

(Dollar amounts in millions)

Selected Assets and Liabilities Large Commercial Banks	Amount Outstanding 3/11/81	Change from 3/4/81	Change from year ago Dollar	Change from year ago Percent
Loans (gross, adjusted) and investments*	146,418	– 470	7,807	5.6
Loans (gross, adjusted) — total#	123,927	– 585	7,465	6.4
Commercial and industrial	36,290	– 504	2,022	5.9
Real estate	51,320	84	6,308	14.0
Loans to individuals	23,424	– 104	– 1,042	– 4.3
Securities loans	1,446	57	466	47.6
U.S. Treasury securities*	6,821	131	85	1.3
Other securities*	15,670	– 16	257	1.7
Demand deposits — total#	41,408	–1,208	– 2,586	– 5.9
Demand deposits — adjusted	29,758	434	– 2,257	– 7.0
Savings deposits — total	29,908	16	2,297	8.3
Time deposits — total#	77,035	464	16,663	27.6
Individuals, part. & corp.	67,929	514	16,173	31.2
(Large negotiable CD's)	29,767	318	8,353	39.0

Weekly Averages of Daily Figures	Week ended 3/11/81	Week ended 3/4/81	Comparable year-ago period
Member Bank Reserve Position			
Excess Reserves (+)/Deficiency (–)	n.a.	n.a.	11
Borrowings	40	35	182
Net free reserves (+)/Net borrowed(–)	n.a.	n.a.	– 171

* Excludes trading account securities.
\# Includes items not shown separately.

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