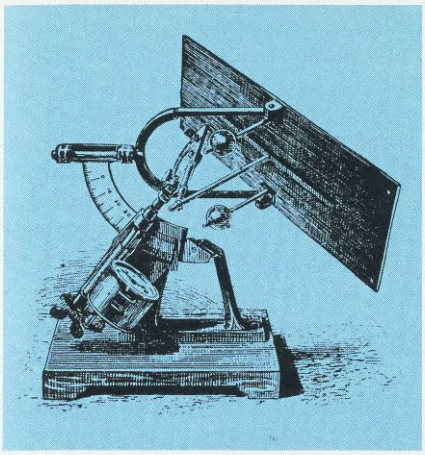


Economic Forecasting for Southeastern States

Major econometric models exist in all six southeastern states. Despite problems with availability and accuracy of data, these models are capable of producing detailed forecasts for legislatures, state agencies, and private clients. The models' most appropriate application, say forecasters, is in simulating the results of specific economic events or policies.

With the development in the 1960s of computerized models of the national economy, it was only a matter of time before economists built models for regional, state, and substate economies. Public interest in econometric models was stimulated in 1980 when Lawrence R. Klein of the University of Pennsylvania Wharton School won the Nobel Prize for his work in the development of models. And even though blindfolded newspaper reporters throwing darts have been known to do as well as some of the better known national forecasting firms, demand for national forecasts remains strong.[1]

State and substate models, while not as well established, are in a growth stage. Private industry represents the largest potential market for the state models. Utilities, banks, S&Ls, developers, energy firms, and large retail firms are all interested in projections of state income, employment, and economic patterns. The projects at the University of Florida and Georgia State University are among the region's leaders in attracting business from private industry.

At present, however, the largest part of the market for state forecasts comes from the public sector. State legislatures and planning agencies have a continuing need for forecasts of various state tax revenues. The Tennessee model, for example, is mandated by the state legislature to establish the rate of anticipated growth of the state economy. Similarly, the Mississippi project provides estimates of revenue for the state Commission of Budget and Accounting and also maintains a cash-flow model for the state government.

State models are also potentially useful in some states whose constitutions require a balanced budget. In Georgia, for example, state spending is tied to expected tax revenues. Even states not required to balance their budgets need reasonably accurate revenue projections for budgetary purposes--i.e., to determine their credit needs. (For their own reasons, state budget committees may not always use the exact forecast produced by the model, but that is another story.) State planning agencies also use models to forecast highway construction costs, gasoline consumption and tourist expenditures.

Utility companies, important clients of forecasting projects, use the state models to study the

impact of changes in rate structures on employment and income. Substate models (satellites to the state models) have been used to estimate the effects of new industry on employment.

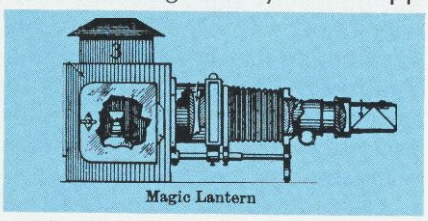
State Forecasting Models in the Southeast

Although econometric models exist for several states and regions in the U. S., modeling efforts in the Southeast are among the most vigorous.[2] State universities are the primary suppliers of state forecasting models in the Sixth Federal Reserve District, but substantial modeling programs are also underway at the Mississippi Research and Development Center (a state agency) and at the Tennessee Valley Authority (Table 1).

TVA's program, the oldest in the region, was developed in response to federal water pollution control needs in 1968. It is currently under the direction of Robert A. Nakosteen, with Juan Gonzalez. Hubert Hinote coordinates forecasting for TVA's office of Planning and Budget. The newest model, at the University of Alabama's Center for Business and Economic Research, issued its first forecast in 1980. The Alabama model is directed by Carl E. Ferguson with David Cheng.

Funding arrangements vary. Many combine university support with grants from state planning agencies. Others, like the University of Georgia's project, are entirely self-supporting through private contracts and memberships or subscriptions. The Georgia Economic Forecasting Project is directed by John B. Legler. Albert W. Niemi is responsible for the estimation of gross state product and output. The Mississippi model, directed by Huntley H. Biggs, is funded completely by the state; TVA supports its model primarily for in-house use.

Models' structural emphases typically reflect the shape of each state's economy and the interests of each project's particular clientele. Thus, TVA's model concentrates on long-term energy demand, while the Mississippi model focuses on manufacturing activity. Mississippi also features forecasts of 12 different state taxes, an unusually large amount for a state model. The Tennessee project, directed by David Hake, emphasizes manufacturing and electrical output. Henry H. Fishkind at the Florida project has pioneered in estimating population growth, migration patterns, construction, and tourism. Louisiana's model, not surprisingly, focuses largely on oil and gas production, but soon will be expanded to full-scale. Loren C. Scott and James Richardson have been the primary developers of the Louisiana model thus far.


Magic Lantern

Some Theoretical Skepticism

Nobel Prize Winner Sir John Hicks has pointed out that many of the "economic facts" buttressing macroeconomic arguments "are subject to errors and ambiguities...far in excess of those which in most natural sciences would be regarded as tolerable."[3] The precise predictive ability of a science like physics, in other words, is somewhat lacking in economics. Economists can, however, use statistical analysis of historical trends to test the degree of probability of a prediction. In a 1979 study for the American Enterprise Institute, W. Allen Spivey and William J. Wrobleski concluded that "the jury is still out assessing the forecasting performance of econometric models and their use in policy assessment." And if national econometric models have difficulty hitting a large target like aggregate economic growth, can we expect them to have more success with a smaller target? Some economists remain unconvinced. Why?

Most state models assume that a state's economy is similar to the economy of a small nation. Yet states cannot be analyzed exactly as small nations because, among other things, states cannot erect trade barriers, cannot control labor and capital flow across state lines, and cannot control their own money supplies. Economic events outside the state (the "foreign sector," populated by mysterious "exogenous variables"), rapidly and powerfully affect state income and employment.

Harvard's Robert Dorfman describes the model's relation to the real world this way: "A growth model resembles the economy that it purports to portray about the way that a map on a scale of one inch to five hundred miles resembles the United States. Only the broadest outlines and the grossest structural characteristics can be discerned. For some purposes, such a map and

such a portrayal are very useful, but we mustn't take inferences from either of them too literally."[4]

As a result, the most difficult and creative aspect of state modeling ("the biggest can of worms," in the words of one forecaster) is to identify the particular economic characteristics of the state and chart them against expected national and regional developments.

Since each state has a different mix of industries, labor force, and natural and financial resources, state economic cycles can occur earlier or later and be more or less severe than national patterns. "A state model...must be designed to include both national and state factors," say LSU's James A. Richardson and Loren C. Scott, "a task complicated at times by the fact that many state peculiarities are not quantifiable, or, if they are, they are not recorded systematically."[5]

Generally, state models use a national forecast to "drive" equations which contain state data. A simplified example is:

$X_m/X_{us} = f\ (C_m/C_{us})$

X_m = mfg output in Mississippi

X_{us} = mfg output in U. S.

C_m = unit cost in Mississippi

C_{us} = unit cost in U. S.

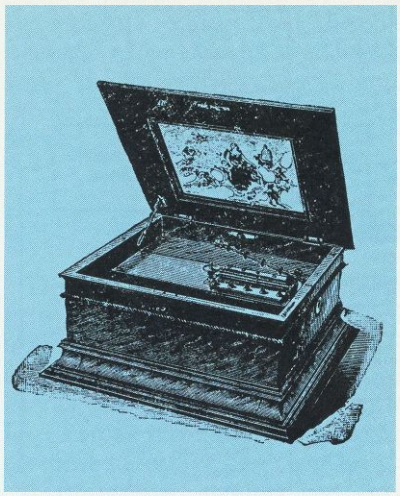
In English, this equation says that the expansion of manufacturing industry in Mississippi (X_m) depends on the predicted growth of the relevant market nationally (X_{us}) and on the competitiveness (unit cost) of production in Mississippi versus the U. S.

Unfortunately, since state data are notoriously incomplete, unavailable, or undisclosed, forecasters must often resort to data "smoothing," "massaging," or "fabricating" to estimate their equations.

Yet, the adjustments which the state forecasters make (based on historical trends and available current data) are often crucial to the model's ultimate success. To see how these adjustments are made, we need to take a closer look at the structure of a state model.

Inside an Econometric Model

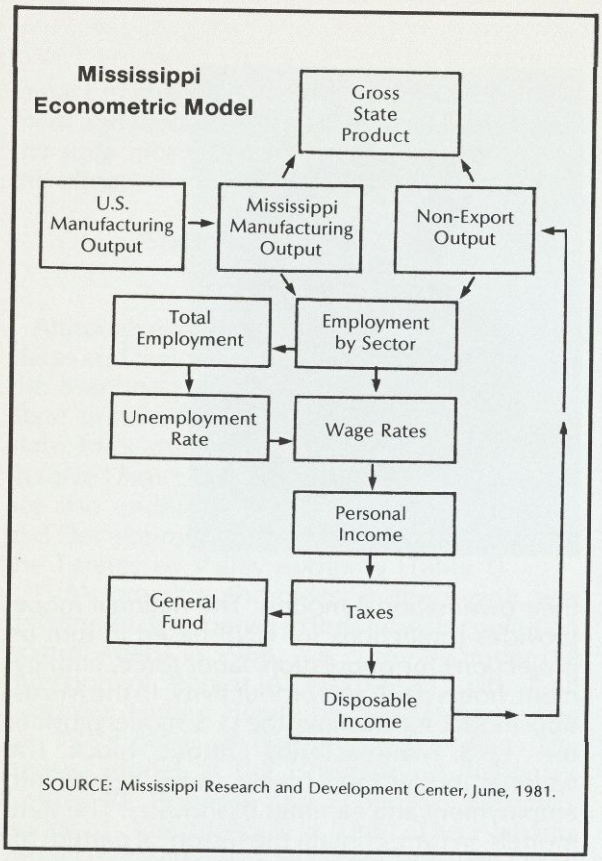
Most state models begin with input from a national model (or "drive"). Many of the southeastern states use the model developed by Wharton Econometric Forecasting Associates (WEFA). Florida and Georgia State have developed



their own national models. The national model provides projections for GNP based in turn on projections for population, labor force, employment, hours paid, and productivity. In the Mississippi model, for example, the U. S. model provides the "U. S. Manufacturing Output" block. The national model then breaks those figures into employment and earnings by industry. The state models, in turn, contain the historical pattern for the state's share of these industries.

The state share of an industry, however, is continually changing. To account for this, the forecaster must adjust his historical trend continually. If national demand in an industry is known, for example, the state market share will depend on how current output prices in the state compare with output prices in the nation. These relative output prices may not be available for some industries. If not, the forecaster may substitute "input prices" (e.g., costs of labor, energy and taxes) with an adjustment for how closely these input prices approximate final prices. The result is a figure for current market share which can be used to adjust the historical market share for the state.

Once the forecaster has determined his state's historical share of a given industry, he is ready to make his projections. Since some industries depend on others, however, he cannot project them all separately. One method of accounting for these dependencies and other differences among industries is to identify "basic" industries and "service" industries. A state's "basic" industries (for example, farming, mining, manufacturing, federal military, and transportation) derive earn-



SOURCE: Mississippi Research and Development Center, June, 1981.

ings from exports to other states. Many state forecasters modify this list to suit the particular characteristics of their states. Huntley Biggs at Mississippi, for instance, includes only manufacturing, farming, and government as "basic" industries, which appear as "Mississippi Manufacturing Output."

A state's "service" industries derive mainly from purchases by businesses and households within the state, e.g., construction, communication, public utilities, trade, finance, real estate, and civilian government. Again, forecasters generally modify these sectors. Hotels, which might be a "service" industry for Carl Ferguson in Alabama, would be a "basic" industry for Henry Fishkind in Florida (where most hotel earnings come from out-of-state consumers). In the Mississippi model, the "service" industries are the "Non-Export Output" block.

A state's relative growth in earnings depends principally on the demand for the output of its "basic" industries, which in turn stimulate the "service" industries in the state.

In a state model, "basic" industry trends are projected by extending into the future the historical trend in the state's share of the national industry. Models typically assume that the factors which affected the share historically will continue to affect it in the future, but less strongly, so the projected change in share decelerates. (Except for special cases like tourism in Florida or oil in Louisiana, most state models assume that, over the long run, states' shares of the national market will move toward equilibrium.)

To arrive at earnings, the model multiplies the projected state share for each "basic" industry by projected earnings in the corresponding industry nationally.

To project earnings in each service industry, the models rely more on internal (state or regional) variables such as personal disposable income (PDI), Gross State Product (GSP), and state population.

The "basic-service" method projects earnings by industry for the state. To project personal income, the state model first determines employment in each industry, again using national data, historical state shares, and current state data.

Projections for population, wage rates and unemployment are then applied to the employment data to project personal income figures for the state. Once personal income is established, the model applies various tax rates to arrive at projected state tax revenues (the "General Fund" block in the Mississippi model).

Problems: The Orange Juice Function

A basic problem plaguing state forecasters is that as national data is broken down into smaller units (regional, state, local), the data's volatility expands dramatically.

In fact, "some of the data," according to Florida's Henry Fishkind, "is bologna." Until recently, for example, Florida tourism figures were based on visits to welcome stations at state borders. Closer analysis revealed that welcome station stops were actually a function of orange juice prices, not tourist traffic. Even today, Fishkind says, the tourism data is not particularly reliable.

A big stumbling block to developing state (and especially substate) models is disclosure problems. In an area dominated by a few businesses, financial data for individual companies might be derived from the disclosure of local statistics. (To reduce the burden of reporting, data is collected from a sample of businesses in each area.) For this reason the Census Bureau and BEA are prohibited from releasing much data on local areas.

According to Georgia State's Donald Ratajczak:

"we don't have good data for consumption, investment, or inventories in the region." In addition, there is little accurate consumer price data that is comparable throughout the region. As an example of the volatility of sub-state data, Ratajczak points to the recent revision of employment growth figures for Atlanta, from 1.6 percent to 9 percent. Labor input for the region, he says, tends to be "sloppily defined."

The Tennessee model has been revised to correct a problem endemic to state models: the calculated elasticities (relative responses to change) relevant at the national level are often inappropriate at the state level. Before this revision, the Tennessee model linked Tennessee wages to national wages in a fixed way, without accounting for growth in Tennessee vis-a-vis the nation. As a result, the earlier model forecast "growing dominance of Tennessee in the nation over a long (20 years or longer) horizon." In some industries, this deficiency caused the model to predict a 1.5 to 2 percent output growth in Tennessee for every one percent growth in U. S. output.

A further difficulty facing southeastern economic forecasters is the uncertainty about whether recent growth rates can be sustained. "Will the Sunbelt growth mystique be maintained for a prolonged period," asks one forecaster, "or will it be short-lived, killed by increasing relative Sunbelt costs?" Tennessee's present model predicts an eventual convergence of southeastern and U. S. economic growth.

How Good Are They?

Despite these theoretical difficulties and data problems, state forecasting models seem to work fairly well. The Mississippi project's forecast for general state revenues, for example, has always been within 3 percent of actual revenues, and its 1980 forecast was within one-half percent of actual revenues. The Alabama model, in its first forecast, came within 1.3 percent for Gross State Product and 5.6 percent for tax revenues. From 1976-1978, the Tennessee model projected changes in personal income within 1.9 percent (on average) and changes in employment within 1.5 percent (on average).

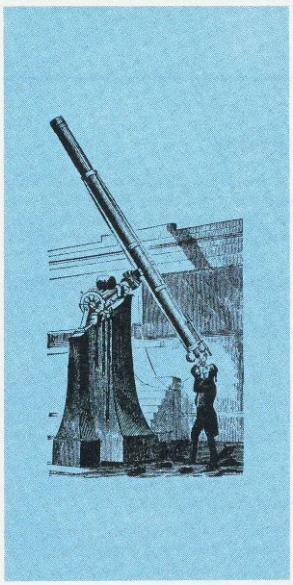
In a recent study, David Hake and Carl Brooking concluded that plus or minus three percent error for a one year forecast for personal income and employment was a reasonable expectation from any regional model.[6] The Hake-Brooking study, one of the few comparative evaluations of state model forecasts published thus far, found that over four years, three southeastern state models had average errors of 2.1 percent for personal income and 2.7 percent for employment. This is significantly better than the plus or minus 3 percent error deemed acceptable, and Hake says "it can be reasonably assumed that the models will do about as well on revenue projections."

The Future of State Forecasting Models

Despite skepticism from peers and competition from large national forecasting firms, the state forecasting projects in the Southeast are producing useful estimates for a variety of purposes and clients. The demand for their products is increasing. Like a small-scale road map, however, the models are best-suited for particular uses.

Econometric models can be used in three basic ways. The first and most widely used is the short-term forecast for a few major economic indicators ("macrovariables"), like tax revenues, personal income, and employment. "Short-term" generally means not much longer than one year. "Long-term" forecasts range from three up to (in the case of TVA's long-range energy projections) 20 years.

Forecasters caution that the models best suit is not long-run forecasts. A ten year forecast for state economic growth, says one District forecaster, is "pretty speculative." In fact, he would prefer to "forget anything over five years." Yet, state legislatures, utilities, and other planning agencies continue to request 10 and 20 year projections.



The third application of state models is simulation studies. These are usually short-term analyses which show a hypothetical scenario for a very specific economic event—the impact of pari-mutual horse racing on Georgia's tax revenues, for example. To do simulations, a model must be reasonably "disaggregated" (the major economic sectors must be broken down geographically and structurally). The model thus becomes considerably more complex to develop and maintain.

The state models' real strength is in these simulation studies. What effect would a proposed railroad merger have on the Tennessee economy? How will cutbacks in a major shipbuilding plant in Mississippi affect local and state employment and tax revenues? What will be the impact of the federal spending cuts at the state level? Because the state models generally have much more detailed data and equations on state tax structure, state and federal spending in the state, and state employment patterns than do the national models, the state forecasters are in good position to analyze very specific economic events.

For state planners, the state models also offer a way of simulating the results of different policy options. Since all state models derive from a national forecast, these simulations can incorporate the effects of national economic policy decisions.

As mentioned, most but not all of the southeastern state models use the Wharton model for their national input. Unfortunately, definitions of terms, weighting of variables, and methods for calculating state inputs often vary among state models. As a result, no meaningful aggregation of the state forecast data has been possible. Even if such a combined effort were possible, forecasters express doubt about the demand for regional projections, since few official regional agencies have decision-making powers. Regional and national corporations might represent a potential market for such forecasts, but not until a solid track record has been established.

More consistency among state models might facilitate some comparative studies. Are some states, for example, suffering more than others from outflows of money into money market funds? Are there variations in home financing strategies from state to state and, if so, are they influencing migration patterns?

Since the primary market for the state modeling projects thus far has been state legislatures, agencies, and state-oriented utilities and corporations, the models are likely to remain strongly oriented to the special features of the individual states. Since all the models in the Southeast are still in the early stages of development, they can be expected to become even more detailed and more accurate (especially in simulation studies) than they are now. The new federal block grant program to states should provide more funding from state planning agencies. Data on employment, revenue, retail sales, and energy consumption are becoming increasingly accurate and comprehensive. The "road maps" remain small in scale, but they are being filled with more and more detailed information. All signs point to continuing demand and expansion for the state econometric models in the Southeast.

—Gary W. Tapp

FOOTNOTES

1 Victor Zarnowitz, in "How Well Do Economists Forecast Growth, Recession, and Inflation?" **Economic Outlook USA** (AnnArbor: Survey Research Center, University of Michigan), concluded that "at the present time, the predictive value of detailed forecasts reaching out further than a few quarters ahead must be rather heavily discounted."

2 This article is based on a workshop on Forecasting in the Southeast held at the Federal Reserve Bank of Atlanta on June 19, 1981.

3 Cited by Adam Smith (George J.W. Goodman), "Why Not Call Up the Economists?" **Across the Board**, July/August 1981, p. 60.

4 Robert Dorfman, "Comment" on a paper by Edmund S. Phelps, "Some Macroeconomics of Population Levelling," Research Reports from the Commission on Population Growth and the American Future, **Economic Aspects of Population Change**, edited by Elliott R. Morss and Ritchie H. Reed, 1972, p.89.

5 "Income and Employment in a State's Econometric Model: The Case of Louisiana," **The Journal of Economics**, IV, 1978, p. 151.

6 Carl G. Brooking and David A. Hake, "The Impact of the Regional Econometric Model on the Policy Formation Decision Process," **Modeling the Multiregional Economic System**, F. Gerard Adams and Norman J. Glickman, eds., Lexington, Mass: Lexington Books, 1980, pp.223-237.

REFERENCES

F. Gerard Adams, Carl G. Brooking and Norman J. Glickman, "On the Specification and Simulation of a Regional Econometric Model: A Model of Mississippi," **The Review of Economics and Statistis**, 1977, pp. 286-298.

Comptrolier's Office, State of Illinois, "The Illinois Economic Model: Phase I, "November 1977. Unpublished paper.

J.W. Kendrick and C.M. JayCox, "The Concept and Estimation of Gross State Product," **The Southern Economic Journal**, Vol. 32, October 1965, pp.153-168.

L.R. Klein, "The Specification of Regional Econometric Models," **Papers and Proceedings of the Regional Science Association**, 23, 1969.

James A. Richardson and Loren C. Scott, "Income and Employment in a State's Econometric Model: The Case of Louisiana," **The Journal of Economics**, IV, 1978, pp.151-155.

_____, "A Short-Run Regional Oil and Gas Model for Louisiana," **Growth and Change**, Vol. 10, No. 3, pp. 19-24.

"Regional and State Projections of Income, Employment, and Population to the Year 2000," U.S. Department of Commerce, Bureau of Economic Analysis, **Survey of Current Business**, November 1980, pp.44-70.

State Econometric Modeling Projects in the Southeast

State	Organization	Address	Director
Alabama	Center for Business and Economic Research	Univ. of Alabama Box AK University, AL 35486	Carl E. Ferguson, Jr.
Florida	Bureau of Econ. and Business Research	221 Matherly Hall Univ. of Florida Gainesville, FL 32611	Henry H. Fishkind
Georgia	Georgia Economic Forecasting Project	Division of Research College of Bus. Admin. Univ. of Georgia Athens, GA 30602	John B. Legler
	Georgia State Univ. Economic Forecasting Project	Georgia State Univ. University Plaza Atlanta, GA 30303	Donald Ratajczak
Louisiana	Division of Research	Louisiana State Univ. College of Business Baton Rouge, LA 70803	James Richardson Loren C. Scott
Mississippi	Mississippi Research and Development Center	P.O. Drawer 2470 Jackson, MS 39205	Huntley H. Biggs
Tennessee	Center for Business and Economic Analysis	Suite 100, Glocker Business Building Univ. of Tennessee Knoxville, TN 37916	David Hake
	Tennessee Valley Authority Regional Analysis Staff	321 Summer Place Bldg. Knoxville, TN 37902	Robert A. Nakosteen
U.S. Army	U.S. Army Corps of Engineers	510 Title Building 30 Pryor Street, S.W. Atlanta, GA 30303	Owen D. Belcher