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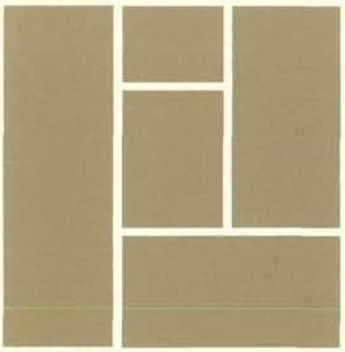

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Project Report

ECONOMIC ANALYSIS OF EFFECTS OF BUSINESS CYCLES ON THE ECONOMY OF CITIES

EFFECTS OF BUSINESS CYCLES ON CITY FINANCES--INSIDERS' VIEWS

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EFFECTS OF BUSINESS CYCLES ON CITY FINANCES--INSIDERS' VIEW

Larry Schroeder*

One method of studying the effects of business cycles on city finances is to view it from afar, either as a purely theoretical exercise or by observing what has occurred and drawing implications from the empirical results. A second alternative is to ask local business and political leaders their impressions of how business conditions affect their city.[1] A third approach, and the one followed here, is to observe what the cities themselves show in published material to be their best estimates of the relationship between the national economy and the local economy and local fisc.

Although few cities have directly addressed the question of the impact of the national economy on their locality, an increasing number of cities are producing multi-year forecasts of their revenues and expenditures under a variety of macroeconomic scenarios. Since the products of these

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[1]The series of studies conducted over the past several years for the Joint Economic Committee have been in this vein even though they have not directly addressed the question of the impact of the business cycle on cities. See "The Current Fiscal Condition of Cities: A Survey of 67 of the 75 Largest Cities," (July 28, 1977); "Trends in the Fiscal Condition of Cities: 1979-81," (May 18, 1981); "Emergency Interim Survey: Fiscal Condition of 48 Large Cities," (January 14, 1982); "Trends in the Fiscal Condition of Cities: 1980-1982," (September 30, 1982); and "Trends in the Fiscal Condition of Cities: 1981-1983" (November 1983). All were prepared for the use of the Joint Economic Committee, Congress of the United States (Washington, D.C.: Government Printing Office).

forecasts are then used for longer range budgetary planning, it is presumed that these jurisdictions place credence in the implied linkages between the national economy and their own situations. The objective of this paper is, therefore, to review the public forecasts made in a set of cities to to ascertain how local fiscal managers expect their local situation to respond to a changing national economic environment.

The paper begins with a summary of the methods localities use to generate 4-6 year forecasts of revenues and expenditures.[1] This is followed by a review of specific models used by local jurisdictions around the United States during the period 1980-1982 to project revenues and expenditures. The review is restricted to cities which make public the results of their forecast. While this limitation can bias the findings by omitting cities which, for political reasons may opt not to make the results public, the approach taken here was the only one practical.

The chosen models are then analyzed with respect to features of their formulation and use. Included is a review of the findings from cities that have attempted their own analyses of local budget sensitivity to alternative economic scenarios. Next, we review the specific models to ascertain what proportions of revenues and expenditures are deemed to be economically sensitive in order to gauge in a crude way the degree to which the budget is hypothesized to react to cycles. Then revenue and expenditure elasticities are estimated to refine this measure of cyclical sensitivity. Four models are simulated using macroeconomic data reflecting

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[1]The terms forecast, projection and prediction are used synonymously throughout this paper.

national economic conditions during the recession of 1973-75 and the long expansion of 1975-80. Finally, portions of the analysis are replicated using forecasting models built and used during 1983. Since these models were constructed as the economy began to recover from the 1981-82 recession, it is interesting to consider whether the structure of the models were themselves influenced by the changing state of the national economy.

The paper closes with an analysis of ex post forecasting errors found in three different models. Included is an in-depth study of the errors associated with the New Orleans revenue forecasting model--errors attributable to underlying weaknesses in the model and those due to poor forecasts of national business conditions. The errors are also compared with those that would have occurred had New Orleans relied simply on long-term linear growth models to produce its projections. A brief summary concludes the paper.

Multi-Year Forecasting in Local Governments

Formal multi-year forecasting models in local governments have been used extensively for only a decade or so. Among the first cities producing multi-year forecasts were the District of Columbia, New Orleans, New York and San Diego.[1] While the advent of computer technology and increased

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[1]For a discussion of the historical background of the experiences in the District of Columbia, New Orleans and New York, see Roy Bahl, Larry Schroeder and Kurt Zorn, "Local Government Revenue and Expenditure Forecasting: New York City," Occasional Paper No. 50; Roy Bahl, Larry Schroeder, Marla Share and Anne Hoffman, "Local Government Revenue and Expenditure Forecasting: Washington, D. C.," Occasional Paper No. 51; and, Larry Schroeder, Lee Madere and Jerome Lomba, "Local Government Revenue and

expertise of local government analysts may have played some role in the development of long-term forecasts, concern for the longer range implications of budgetary decisions in an uncertain economic environment is most often stated as a primary driving force behind the development of such models. Furthermore, as the forecast horizon was extended to 4-6 years it was felt that "last year's plus x percent" approach to forecasting, which has often characterized annual budget projections, was inadequate. This then led to more complex forecasting models, often using a set of exogenous explanatory variables to "drive" the determination of local revenues and expenditures. That is, the new models explicitly recognized the role played by economic variables in the determination of local fiscal conditions.[1]

Still, it must be recognized that there are a variety of techniques used to produce multi-year budgetary forecasts, each with its own particular strengths and weaknesses. Thus, before turning to a synopsis of several actual models it is useful to review briefly these alternative forecasting techniques.[2]

(cont.) Expenditure Forecasting: New Orleans," Occasional Paper No. 52, all available from Metropolitan Studies Program, The Maxwell School (Syracuse, New York: Syracuse University, September 1981).

[1]This is not to say that budget-makers never recognized the role of the macro economy in determining local revenues and expenditures. Indeed, it is probably true that the "back of the envelope" techniques used to generate annual budget forecasts contained implicit economic assumptions. The difference is that the more formal techniques require an explicit recognition of these effects.

[2]For a more complete discussion of these techniques, see Roy Bahl and Larry Schroeder, "Forecasting Local Government Budgets," Occasional Paper No. 38, Metropolitan Studies Program, The Maxwell School (Syracuse, New York, Syracuse University, December 1979).

Best Guess or Expert Forecasts

By their nature, little can be said about "expert" forecasts since there is no specific method that is used in this approach. The key to successful forecasting in this highly personal approach is, of course, the "expert." In general, the successful expert forecasters are those who are most closely involved with particular revenues and expenditures. Likely candidates include the finance director, chief assessor, or a state and Federal grants coordinator.

While this method is inexpensive and possibly accurate at least in the short-run, it suffers from its dependence upon the subjective "feeling" of the forecaster. Thus, it cannot easily be determined why next year's estimates are what they are or subsequently, why forecast errors have occurred. Furthermore, revenues and expenditures are likely to depend upon several simultaneous factors making it difficult for an expert to consider all factors when projecting several years into the future.

Trend Techniques

Reasonably accurate and low cost predictions of certain revenues and expenditures can be obtained by assuming that they depend solely upon time. The most common assumptions used in trend forecasting are those of a constant growth rate or constant absolute changes.

While this technique may be quite reasonable for projecting some revenues or expenditures, it totally ignores economic and demographic conditions. It cannot, therefore, predict "turning points" unless the basic results of the trend analysis are altered by outside expert opinion. Furthermore, the approach cannot be used to estimate effects of future economic or demographic changes that might occur in the city.

Deterministic Forecasts

Revenues or expenditures are the product of a base times an appropriate rate. For example, annual garbage collection fees may be the product of the number of pickup sites times the annual charge per site. Similarly, total spending on gasoline is the product of the gallons of gas used times the price per gallon. Once values for these entries have been estimated or assumed, the resultant forecast can be derived "deterministically."

This technique, or variants thereof, is most often used for expenditure forecasting. The technique may also provide reasonably accurate revenue predictions when the revenue base does not vary with business conditions, e.g., the number of households in a city using garbage collection services.

Econometric Forecasting

Econometric forecasting combines principles drawn from both economic and statistical theory. While conceptually more complex than the methods cited above, econometric forecasting is likely to yield information more useful to the forecaster and policy-maker than any of the previous techniques. For example, econometric forecasting allows the investigator to consider the effects of simultaneous changes in several variables on a revenue or expenditure stream and its results can be systematically analyzed using statistical techniques.

The most common approach in econometric forecasting is to forecast revenue or expenditure series independently using statistical regression techniques. The process involves specifying a functional relationship between the series of interest and appropriate independent or "causal"

variables; collecting historical data for the series being analyzed as well as each of the independent variables; statistically estimating the hypothesized relationship using regression techniques; and, finally, using projected values of the independent variables to yield forecasts of the revenue or expenditure series.

This approach has attributes not found in the previously described methods. Unlike expert or time trend techniques, an econometric model can be based on behavioral relationships that contain a theoretical foundation which can be evaluated by the user of the forecast. Also, the technique is capable of predicting turning points in revenues or expenditures.

Statistical methods also have advantages over their deterministic counterparts. Statistical inference can be used to test whether an observed relationship between variables is, in fact, statistically significant. Furthermore, unlike the simplest deterministic approaches, it permits several independent variables to be used simultaneously. This is an especially useful feature for policy analysis where, for example, it is felt that both inflation and local population changes will influence a revenue source.

The statistical approach is, however, likely to be more costly than the simpler models discussed above. It may require the skills of someone trained in economics and statistics as well as the availability of a computer. Furthermore, each of the four steps listed above present potential difficulties and possibilities of forecast error.

Given the alternative forecasting techniques available, it is not surprising to find that no two jurisdictions currently producing public forecasts have identical models. A comparison of the specific projection

methods used in different cities provides insight as to what forecasters regard to be the influence of macroeconomic conditions on the local fisc. For example, if all of a city's revenues are forecast using simple trend techniques, the forecaster is assuming either: (1) that no cyclical fluctuations are on the horizon or, (2) that the local economy is immune to cyclical fluctuations or, (3) that, no matter what happens in the economy, the revenue source will be unaffected. If econometric forecasting equations are used, the specifications of these models reveal much regarding what the forecaster suspects are the major influential forces acting upon the revenue or expenditure series. Finally, by observing the relative proportion of revenues and expenditures hypothetically influenced by macroeconomic variables, one can determine the perceived relative insulation of the local fisc from fluctuations in these business indicators. It is therefore of interest to review the types of models used by jurisdictions throughout the United States to learn what apparently are these perceptions.

Multi-Year Budget Forecasting Models--A Review

In reviewing the several forecasting models, it is important to understand the general approach taken by most jurisdictions producing public forecasts. Nearly always the primary objective of multi-year forecasting is to project whether or not a fiscal surplus or gap looms on the horizon. This objective is accomplished by independently projecting what revenues and expenditures are likely to be over the next 2-5 years given a set of consistent and well-defined assumptions. That is, the forecasts are not predictions of <u>exactly</u> what amount of monies will be

received and spent by the jurisdiction; instead they are projections of what may be expected if the set of assumptions hold. Should the projections suggest a future revenue shortfall, steps can immediately be initiated to ensure that such gaps will not occur and that the jurisdiction need not resort to last minute emergency measures to avoid the fiscal difficulties.

Because of this policy-orientation of the forecasts, normal forecast evaluation procedures are not entirely appropriate when it comes to reviewing the usefulness and accuracy of the forecasts. Indeed, when the model projects budgetary gaps, one would hope that ex post, the forecasted deficits never appeared; in fact, if the predicted shortfalls actually arise, the model might be judged a policy failure even though it was a forecasting success. At the same time, an analysis of forecasting errors and the sources thereof can provide information regarding the impact of unforeseen cyclical economic changes on the local fisc.

Table 1 summarizes the models used in a variety of jurisdictions around the United States.[1] Shown there are the general approaches used in the several cities and counties represented here including the degree of detail provided in the forecast document itself. (Some cities have found that providing detailed background information regarding the forecast creates problems in policy-maker acceptance of the projections and,

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[1]No attempt was made to conduct a census nor even a random sampling of jurisdictions to be included in this discussion. In fact, the data-gathering technique was extremely informal and was based on letters and phone conversations with fiscal managers known to be involved in multi-year forecasting. In spite of this "sampling" procedure, a reasonably wide-ranging set of forecasting methods in a variety of settings are encompassed here.

TABLE 1

MULTI-YEAR FORECASTING TECHNIQUES IN SELECTED LOCAL JURISDICTIONS, 1981 AND 1982

Jurisdiction	Forecast Period	Revenue Model		Expenditure Model		Special Policy Orientation
		Methods Employed	Detail Provided	Methods Employed	Detail Provided	
Cincinnati, Ohio	1981-1985	Econometric; Judgemental	Detailed equations shown	Econometric; Deterministic	Detailed equations shown	Only projected gap shown
Dallas, Texas	1980-81 - 1984-85	Econometric; Deterministic; Trends	Totals by revenue source	Deterministic	Totals by department	Three alternative inflation scenarios presented
Dallas County, Texas	1982-1986	Judgemental; Trends	Totals by revenue source	Judgemental; Trends	Totals by department and object	Fiscal impacts of policy strategies estimated
Fort Worth, Texas	1983-1987	Econometric; Judgemental; Trends	Totals by revenue source and detailed assumptions	Deterministic	Detailed Projections by Agency, Fund and object	Detailed alternative financial strategies given
Kansas City, MO	1983-84 - 1987-88	Econometric; Judgemental; Trends	Detailed estimating equations shown	Deterministic	Total spending by object	Gap projections
Minneapolis, MN	1982-1986	Judgemental	Totals by revenue source and fund with detailed assumptions	Deterministic	Totals shown based on aggregation of cost center projections	Alternative state aid assumptions shown; financial issues analyzed
New Orleans, LA	1983-1987	Econometric	Detailed equations shown	na	na	Predict available resources
New York, NY	1983-1986	Econometric; Judgemental	Totals shown by major revenue source	Deterministic; Judgemental	Totals shown by Agency	Gap closing measures presented

TABLE 1 (CONT.)

Jurisdiction	Forecast Period	Revenue Model: Methods Employed	Revenue Model: Detail Provided	Expenditure Model: Methods Employed	Expenditure Model: Detail Provided	Special Policy Orientation
Phoenix, AR	1981-82 - 1985-86	Judgemental; Trends	Totals by revenue source and detailed assumptions	Deterministic	Projections by Fund and Department	Impact of State expenditure limitation law
Portland, OR	1981-82 - 1985-86	Trends; Judgemental; Deterministic	Totals by revenue source	Deterministic	Totals by major categories	Budget gaps and balanced budget spending after meeting uncontrollable expenditures
San Antonio, TX	1982-1987	Econometric; Judgemental; Trends	Totals by revenue source	Deterministic	Departmental projections including review of critical issues	Alternative scenarios; analysis of policy issues; reconciliation of projections with previous forecast
San Diego, CA	1980-1985	Econometric; Judgemental; Deterministic	Detailed estimating equations shown	na	na	Analysis of past forecast accuracy[a]
Shreveport, LA	1981-1985	Econometric; Trends; Judgemental	Totals and techniques by revenue source	Deterministic	Amounts by Department and object	Strategies for eliminating gaps analyzed
Vancouver, WA	1983-1987	Econometric; Deterministic; Judgemental	Detailed estimating equations shown	Deterministic	Totals by Department	Alternative economic scenarios and policy options analyzed

TABLE 1 (CONT.)

[a]Contained in a separate report, Financial Management Department, San Diego, California, "A Retropective Look at the Success of Long-Range Revenue Forecasting" (San Diego: January 1982).

SOURCES: Urban and Regional Analysis, Inc., Forecasts of General Fund Revenues and Expenditures for the City of Cincinnati: 1981-1985 (Cincinnati: April 1, 1981); Office of Management Services, City of Dallas, Summary Long Range Financial Projections: 1980-81 to 1984-85 (Dallas: May 1981); Office of the Commissioners Court, Dallas County, Texas, FY 82 Long Range Plan for Dallas County (Dallas: April 1982); Office of Management Services, City of Fort Worth, City of Fort Worth Long Range Financial Forecast: 1983 to 1987 (Fort Worth: June 1982); Office of Budget and Systems, City of Kansas City, Five-Year Financial Forecast: 1983-84 to 1987-88 (Kansas City, MO: October 1982); Minneapolis Budget Office, City of Minneapolis, Five-Year Revenue and Expenditure Projections and Issues (Minneapolis: January 1981); New Orleans information from computer printout of 1982 model and personal conversation with its forecasting group; Office of Management and Budget, New York City, The Financial Plan of the City of New York: Fiscal Years 1983-1986 (New York: November 17, 1982); Management and Budget Department, City of Phoenix, Five-Year Forecast and City Options (Phoenix: March 1981); Office of Fiscal Administration, City of Portland, Projections: 1981-82 Through 1985-86, City of Portland - General Fund (Portland: January 1981); Department of Budget and Research, City of San Antonio, Long Range Financial Forecast: Fiscal Years 1982-1987 (San Antonio: April 1, 1982); Financial Management Department, City of San Diego, Long Range Municipal Revenue Forecasting: The City's Methodological Approach for the Period FY 1980-1985 (San Diego: June 20, 1979); City of Shreveport, City of Shreveport Multi-Year Forecast: 1981 to 1985 (Shreveport: 1981); City of Vancouver, City of Vancouver, Washington Five Year Financial Forecast: 1983-1987 (Vancouver, Washington: June 1982).

therefore, do not show this information.) The degree of detail available is, of course, important here since without certain information it is impossible to carry out some of the analysis below. Also noted in Table 1 is the policy-orientation of the forecast document since different jurisdictions have designed their efforts for different purposes. In the remainder of this section we note some of the highlights of the various models together with their business cycle implications.

Several of the jurisdictions, e.g., Dallas County, Phoenix and Minneapolis, find that judgmental or trend forecasts of revenues provide sufficient projection accuracy to forego more complex forecasting methods. The bulk of Minneapolis revenues are derived from the property tax or from state and Federal sources and it is felt that the first of these is immune to business fluctuations and that it is not possible to predict intergovernmental aid.[1] A general immunity to adverse national economic trends is specifically posited in the Dallas County document which may justify the lack of more complex forecasting techniques.[2] Additionally, the Dallas County revenue structure, with about one-half of all revenues obtained from ad valorem taxes and no sales or income taxes, supports this approach. Finally, the Phoenix model emphasizes the importance of

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[1] Minneapolis Budget Office, City of Minneapolis, Five-Year Revenue and Expenditure Projections and Issues (Minneapolis: 1981). Unless noted otherwise, all subsequent references to the "Minneapolis model" refer to this document.

[2] Office of the Commissioners Court, Dallas County, Texas, FY 82 Long Range Plan for Dallas County (Dallas, 1982), p. 11. Unless noted otherwise, subsequent references to the "Dallas County model" refer to this document.

population growth implying that this factor might outweigh any national economic variables in determination of city revenues.[1]

Spending projections are dominated by deterministic or incremental forecast methods. In nearly all of the deterministic models inflation is the primary factor driving the forecast. Some cities, however, also attempt to include the effects of local factors such as population growth or new capital facilities. Cincinnati is the only jurisdiction included here that produced econometric forecasts of spending.[2]

Also of interest from this review of forecasting models is the use to which they are put. While some forecasts still concentrate on producing an "early warning signal," some jurisdictions are using them as an integral part of fiscal planning. Thus, rather than simply show the extent of the "gap," Dallas County, Fort Worth,[3] Minneapolis, New York City,[4] San

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[1]Management and Budget Department, City of Phoenix, Five-Year Forecast and City Options (Phoenix, 1981). Unless noted otherwise, subsequent references to the "Phoenix model" refer to this document.

[2]Urban and Regional Analysis, Inc., Forecasts of General Fund Revenues and Expenditures for the City of Cincinnati: 1981-1985 (Cincinnati, 1981). Unless noted otherwise, all subsequent references to the "Cincinnati model" refer to this document. Montgomery County, Ohio (the Dayton area) has experimented with multiyear forecasting and used econometric expenditure forecasting methods. The jurisdiction is not included here since, based on a phone conversation with a Montgomery County budget officer, the model is not currently being used as a financial management tool.

[3]Office of Management Services, Fort Worth, Texas, City of Fort Worth Long Range Financial Forecast: 1983 to 1987 (Fort Worth: 1982). Unless noted otherwise, all subsequent references to the "Fort Worth model" refer to this document.

[4]Office of Management and Budget, New York City, The Financial Plan of the City of New York: Fiscal Years 1983-1986 (New York: 1982).

Antonio,[1] Shreveport[2] and Vancouver[3] each show (and in some instances in considerable detail) implications of alternative policy measures.

The concern for the effects of inflation is also apparent from this review. In three of the cities (Dallas,[4] San Antonio and Vancouver) the sensitivity of the results to alternative price scenarios are estimated. Several of the documents contain quite detailed specifications of the effects of inflation on the several components of spending, e.g., personnel, contractual services, energy, etc.

Finally, in at least two cities the concern of the model builders is exclusively on revenues. One explanation for this emphasis, as made explicit in New Orleans, is that when balanced budgets are constitutionally mandated, all that really matters is the amount of resources that are likely to be available.[5] (New Orleans does, however, have a computerized

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[1]Department of Budget and Research, City of San Antonio, Long Range Financial Forecast: Fiscal Years 1982-1987 (San Antonio: 1982). Unless noted otherwise, all subsequent references to the "San Antonio model" refer to this document.

[2]City of Shreveport, City of Shreveport Multi-Year Forecast: 1981 to 1985 (Shreveport: 1981). Unless noted otherwise, all subsequent references to the "Shreveport model" refer to this document.

[3]City of Vancouver, City of Vancouver, Washington Five Year Financial Forecast: 1983-1987 (Vancouver: 1982). Unless noted otherwise, all subsequent references to the "Vancouver model" refer to this document.

[4]Office of Management Services, City of Dallas, Summary Long Range Financial Projections: 1980-81 to 1984-85 (Dallas: 1981). Unless noted otherwise, all subsequent references to the "Dallas model" refer to this document.

[5]Larry Schroeder, Lee Madere and Jerome Lomba, Local Government Revenue and Expenditure Forecasting: New Orleans," Occasional Paper No. 52, Metropolitan Studies Program, The Maxwell School (Syracuse, NY: Syracuse University, October 1981).

spending projection program with which it can estimate the allowable growth in agency-level spending given the projected change in total revenue and assumptions regarding input prices.)

Linking National Variables to Local Forecasts

The previous discussion implies that not all jurisdictions attempt to link movements in the national economy to local events. For those that do, however, it is instructive to consider more explicitly how these linkages are made and what they imply about the sensitivity of local fiscal conditions to the macro economy. Here we consider these linkages and implications, first for the revenue models and then for expenditures.

Linking Revenue Models to the National Economy

Revenue projections based on simple past trends, as noted before, are in no way linked to the national economy. Although judgemental models may be so linked, the exact linkage mechanism is impossible to document. Therefore, we concentrate here on deterministic and econometric revenue models, emphasizing the latter.

While most model builders would agree that local economic conditions are the primary determinants of "economically-sensitive" revenues such as sales, income and utility taxes, seldom would a community be totally immune to the national economic environment. The preferred model-building approach would, therefore, include a full-scale model of the local economy and its public sector with the model linked somehow to national economic conditions. A simpler alternative links a few key local economic indicators to national variables. Finally, some models use national variables directly in the revenue equations. We consider each of these approaches in turn.

Simultaneous Equation Local Econometric Models. We know of only one case in which local revenues are linked to the national economy through a local econometric model even though this approach is theoretically the most satisfactory. The theoretical justification derives from the fact that if local revenues are determined primarily by local incomes which in turn, are affected by the spending of these revenues, a simultaneous structure is at work. To ignore this simultaneity in regression analysis results in biased estimates of the parameters and, therefore, can produce prediction errors.

To avoid this bias, it is necessary to specify a simultaneous equation model which traces the linkages among all of the local economic variables including the effects of the "external" economy. The one example of such a model is that for the City of Mobile, Alabama.[1] The model is linked to the national economy via GNP and the consumer price index. Both local government expenditures and revenues are a part of the model. However, since this model has apparently never been used as a policymaking tool within Mobile, we do not consider it in the analysis below.

Single Equation Local Econometric Models. In the absence of simultaneous equation local econometric models, several cities use a single equation (or several independent equations) to link the national economy to local economic conditions. Even these models vary greatly in their complexity.

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[1] Semoon Chang and Patrick W. Kelly, "Ten Year Economic and Revenue Forecasting With Alternative Fiscal Plans for Mobile," (City of Mobile: Finance Department, 1977). Portions of the model can be found in Semoon Chang, "An Econometric Forecasting Model Based on Regional Economic Information System Data: The Case of Mobile, Alabama," Journal of Regional Science, (November 1979), pp. 437-447; and Semoon Chang, "Forecasting Revenues to Municipal Government: The Case of Mobile, Alabama," Governmental Finance, (February, 1976), pp. 16-20.

Probably the most elaborate specification is that of New York City where several different local variables are projected through the use of linkage equations.[1] This complexity probably stems from New York's comprehensive revenue structure which includes corporation taxes, a stock transfer tax and financial corporation taxes. The structure of the auxiliary equations used to forecast New York City economic variables in 1979 are shown in Table 2. The table reveals that not only are real economic activity, prices and city employment projected from national variables, but that several financial activity variables are also forecast. New York is obviously a special case, both because of its revenue structure and the fact that more local economic data are available there than for most other local jurisdictions.

Table 3 shows the linkage equations used in the other cities which base their revenue forecasts on the econometric or deterministic models (and for which the necessary information is provided directly in the forecast document). The Vancouver model specification uses an interesting combination of local and national indicators to generate estimates of local personal income. Use of the CPI provides the direct link with the national economy while the unemployment rate used is that for the State of Washington. Finally, local population, which grew rapidly throughout the 1970s and is thus highly correlated with CPI, captures the influence of real changes in the local economy.

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[1]The New York City model is updated quarterly but is not made public. One specification of the auxiliary equations used to convert national projections to local economic conditions is found in Bahl, Schroeder and Zorn, "Local Government Revenue and Expenditure Forecasting: New York City."

TABLE 2

NEW YORK CITY 1979 NATIONAL-LOCAL LINKAGE EQUATIONS[a]

Dependent Variable	Independent Variables
New York City sales (real dollars)	Real New York City personal income; Lagged New York City retail sales (real dollars); U.S. real retail sales
Change in New York City CPI	Change in U.S. CPI; New York City unemployment rate, three year lag; Change in subway fares
New York City unemployment rate	New York City employment; U.S. unemployment rate
New York City real taxable personal income	U.S. real taxable personal income; New York City employment
New York City stock exchange volume	Interest rate on prime commercial paper; Trend; U.S. corporate profits before taxes; Strength of the dollar relative to six other countries
Commercial and industrial loans at New York City banks	Non-farm manufacturing inventories; NIA capital consumption allowance plus retained earnings less inventory valuation adjustment
State and local government securities held by New York City banks	State and local government expenditures
Savings deposits at New York City mutual savings banks and savings and loans	New York City personal income
Retail fuel price index for New York City	Oil crisis dummy; Deflator for U.S. price of electricity and gas

[a]See Source for exact specifications. More recent versions of the equations are not available since New York City does not make public its full model.

SOURCE: Roy Bahl, Larry Schroeder and Kurt Zorn, "Local Government Revenue and Expenditure Forecasting: New York City," Occasional Paper No. 50, Metropolitan Studies Program, The Maxwell School (Syracuse, New York: Syracuse University, September 1981).

TABLE 3

FQUATIONS USED TO LINK NATIONAL AND LOCAL ECONOMIC VARIABLES

Jurisdiction	Equation
Vancouver	ln(County Personnel Income) = -5.013 + 0.631 ln(CPI) - 0.094 ln (Percent Unemployment) + 1.837 ln (County Population)
New Orleans	New Orleans Personal Income = 4147 + 23.105 USPI[a]
Cincinnati	Hamilton County Payroll = -53548 + 3564.6 USPI[a] - 10597 TIME
	Hamilton County Employment = 12958 + 4.2677 USEMP[b] + 4750.7 TIME

[a]USPI = National Personal Income.

[b]USEMP = National employment.

SOURCES: Cited in Table 1.

The linkage equation used in the 1982 Vancouver model differs from that used in 1981 in a manner which deserves further comment. In 1981 the linkage model included only CPI and county population. As such it implied a lack of any direct connection between real national economic activity and the local economy, i.e., real growth in nationwide personal income would not necessarily be reflected in local incomes. Instead, national inflation was viewed as the primary exogenous determinant of local money income--a specification that probably stemed from the dominance of inflationary pressures during the 1970s which found local nominal income increases highly correlated with price increases.[1] The approach implied that a successful anti-inflationary program would be associated with a slowing in nominal incomes in the Vancouver area (assuming no population growth) even if real U.S. incomes grow during a nationwide economic recovery.

The New Orleans linkage equation shows a simple linear relationship between U.S. and local personal incomes.[2] The positive intercept term reflects the fact that over the past decade New Orleans' share of national

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[1]The dominance of inflation during the late 1970s shows up in structural equations used in other forecasting models where nominal revenues are made a function only of the CPI or one of its components. The use of such specifications probably stem from an empirically-oriented model building process. If the associated statistics from a regression equation are solely relied upon to choose the appropriate model estimated from a short time series, e.g., 1965-1980, the results are very likely to suggest that it was inflation alone that was "determining" revenues during the time period. Unfortunately, the forecasting implications of such a specification, i.e., that real variables don't matter, may be quite unrealistic.

[2]Unless noted otherwise, all subsequent references to the "New Orleans model" will refer to that found in a computer printout of the 1982 version of the model supplied by the Economic Analysis Unit, City of New Orleans, Louisiana.

income has been declining. One aspect of this formulation of the linkage model is that ordinary least squares estimates yield results equivalent to those obtained from the direct use of U.S. personal income in the revenue equation. That is, if local incomes L are used as a sole determinant of a revenue stream, R, such that

$$R = a + bL$$

while local incomes are a linear function of national income, Y

$$L = g + hY$$

then, by substitution,

$$R = a + b(g + hY)$$

Thus $dR/dY = bh$ while, if Y had been used directly,

$$R = c + eY$$

and

$$\frac{dR}{dY} = e = bh.$$

There is, nevertheless, one argument favoring the use of a supplementary linkage equation even in a simple linear form. This occurs when the estimating techniques correct for autocorrelation with the predicted values of the dependent variable adjusted to account for the estimated autocorrelation. Such an approach is used in New Orleans where, if first-order autocorrelation is found, an iterative Cochrane-Orcutt correction technique is used. Predicted values of New Orleans personal income are then generated under the assumption of a continuation of the

autocorrelation structure.[1] Use of this additional information may provide more accurate estimates of revenues than if U.S. personal income were used directly.[2]

The Cincinnati model specification incorporates a time trend factor to account for relative long-term shifts of the Cincinnati area vis-a-vis the rest of the country. The positive time trend coefficient on the employment equation suggests a long-term gain in relative employment while the negative trend coefficient on payroll implies a secular decline. Taken together these results suggest that the Cincinnati area has been losing higher skilled and higher paid workers.

The linkage equations used in New York City, New Orleans and Cincinnati have some cyclical implications. These can be most easily investigated by looking at the elasticity of local income with respect to national income. For linear specifications as used in New Orleans, the elasticity estimates vary over the range of the estimates with the elasticity growing over time. The point elasticity estimates for both New York City and New Orleans are less than unity suggesting that growth rates in national income are not matched by equal rates of growth in local incomes. (On the other hand, a recessionary slowdown in national income would be dampened by this implied relationship.)

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[1] Correction for autocorrelation is also employed in New Orleans for the revenue forecasts.

[2] C. Kurt Zorn, "The Effect of the Public Sector on an Urban Area's Structure and the Multi-Year Forecasting of Its Revenues" (Ph.D. Dissertation, Syracuse University, 1981), demonstrates the predictive accuracy of the autocorrelation correction approach.

The Cincinnati case presents an interesting conceptual question as to what exactly constitutes an elasticity estimate. When evaluated at the means, the estimated national income elasticity of the local payroll is 1.038 (Table 4). This estimate is based on the formal definition of an elasticity of Y with respect to X, i.e., $\frac{\partial Y}{\partial X} \cdot \frac{X}{Y}$ But elasticity is equivalently thought of as the percentage change in Y relative to a percentage change in X. In a time series context this implies changes in X over time. However, the Cincinnati linkage equation (Table 3) also includes a time trend in the equation. In a time series context, i.e., allowing time to increment by one year, the point elasticity falls to just below unity, 0.997, when estimated on the basis of predicted relative changes in U.S. income and county payroll between 1981 and 1982. Still, both of these estimates imply that Hamilton County payroll would move cyclically in almost exactly the same proportion as a change in U.S. national personal income.

A final method for linking local income to the national economy is that used in San Diego where county personal income is used for the estimating equations.[1] A unitary elasticity of local income with respect to national income is assumed to hold throughout the projection period. Thus personal income is projected to increase at the same rate as forecasted national personal income. This implies cyclical changes in the San Diego economy coinciding with the national experience. If population

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[1]Financial Management Department, City of San Diego, Long Range Municipal Revenue Forecasting: The City's Methodological Approach for the Period FY 1980-1985 (San Diego: 1979). Unless noted otherwise, all subsequent references to the "San Diego model" will refer to this document.

TABLE 4

IMPLIED NATIONAL INCOME ELASTICITIES

Jurisdiction	Point Elasticity of Local Income	Evaluated as of
New York City	0.964	1979-80[a]
New Orleans	0.866	Means
	0.926	1980
Cincinnati	1.038[b]	Means

[a]Based on projected data as shown in Roy Bahl, Larry Schroeder and Kurt Zorn, "Local Government Revenue and Expenditure Forecasting: New York City," Occasional Paper No. 50, Metropolitan Studies Program, The Maxwell School (Syracuse, NY: Syracuse University, September 1981).

[b]Hamilton County Payroll rather than income. The estimated equation also includes a negative time trend.

SOURCE: Computed by the author.

in San Diego is growing more rapidly than in the nation as a whole (as was the case during the 1970s), the unitary elasticity assumption on total personal income implies a less than unitary elasticity for per capita personal incomes.

Direct Use of National Variables. Some cities use national economic aggregates directly in the local revenue equations. The implication is that there is a direct link between fluctuations in the national economy and local revenues. Table 5 shows the variety of national variables used to forecast different local revenues. The consumer price index is used directly in several of the cities, at times as the sole independent variable. As was noted above, when CPI is the only independent variable, a slowdown in inflation accompanied by real economic growth could produce unrealistically low revenue forecasts.

Gross national product, national income or personal income constitute the primary set of non-price national variables used in the local forecasting models. These barometers of the general level of business activity are relied on especially for many of the more minor sources of local revenues. The implication is a unitary elasticity between national income and whatever variable determines these local revenues.

Additional national variables are also used in some cities. Both San Diego and New Orleans use national housing starts to forecast local building permit revenues. Nationwide corporate profits are used in the Cincinnati model for the business component of the local income tax. The New Orleans model contains a long list of independent variables including the national unemployment rate (which, it was felt, would affect

TABLE 5

NATIONAL ECONOMIC VARIABLES USED DIRECTLY IN LOCAL REVENUE FORECASTING MODELS

Jurisdiction	National Economic Variable	Revenues
Cincinnati	Consumer Price Index	Business Component of Income Tax Withholding Component of Income Tax Nonbusiness Licenses Revenues from other agencies
	Lagged Corporate Profits	Business Component of Income Tax
	U.S. Personal Income	Streets Beer Tax Revenues from other agencies
Kansas City	GNP	Earnings and Profits Tax
	CPI	Power and Light Franchise Tax Natural Gas Franchise Tax Telephone Franchise Tax Interest & Rental Income
Vancouver	GNP	Business and Occupation Tax
	CPI	Natural Gas Utility Tax Telephone Utility Tax
San Diego	U.S. Total Private Housing Starts	Building Permits
Shreveport	U.S. Personal Income	Telephone Franchise Tax
	CPI	Natural Gas Franchise Tax

TABLE 5 (CONT.)

Jurisdiction	National Economic Variable	Revenues
New Orleans	Unemployment Rate	Amusement Tax Occupational Licenses Sanitation Fees Other Service Fees
	AAA Bond Rate	Other Taxes Building Permits Occupational Licenses Other Licenses & Permits Sanitation Fees
	Housing Starts	Building permits
	Real GNP Growth Rate	Inspection Fees Other Fines and Fees
	Inflation Rate	Occupational Licenses Parking Meter Collections

SOURCE: Compiled by the author from sources listed in Table 1.

tourism) and an interest rate indicator which would influence local business and construction activity.

Expenditure Forecasting Models

The expenditure models which, other than Cincinnati, all rely upon deterministic techniques require assumptions regarding future input prices and service levels. While nearly all cities assume services will remain "constant", price assumptions vary in the several cities. Some rely heavily on external projections of price increases for all objects of expenditures, others rely only sparingly on such forecasts, while a few are content to make projections without the aid of any exogenously-based price forecasts.

Table 6 displays the assumptions used to project spending in the several cities reviewed here. Since most of the cities make projections on a disaggregated basis, at least by major object of spending, the different sources for these assumptions are also shown. The information in the table suggests that judgemental assumptions are relied upon greatly in deriving the spending forecasts.

One issue that arises when considering expenditure forecasts and their apparent link to the national economy is whether the spending projections are to show the cost of providing a constant level of services or are forecasts of what is likely to be spent without regard for service levels. In general, most cities opt for the former approach and try to project both the amount of real inputs required to maintain constant service levels as well as future prices. For example, this approach is employed in great detail in Dallas, Fort Worth, San Antonio and Shreveport. On the other

TABLE 6

TECHNIQUES FOR PROJECTING INCREASES BY EXPENDITURE OBJECT IN CITIES USING DETERMINISTIC FORECASTING METHODS

	Expenditure Object							
Jurisdiction	Personnel	Contractual Services	Supplies	Equipment	Petroleum	Utilities	Capital	Special Features
Dallas	Internal Assumption	Internal Assumption	Internal Assumption	Internal Assumption				Three inflation scenarios; constant inflation rates for entire projection period.
Dallas County	Internal Assumption	...One Internal Assumption for All Non-Personal Service Spending....						Constant inflation rates throughout projection period
Fort Worth	Internal Assumption	CPI[a]	CPI	Internal Assumption	Internal Assumption		Internal Assumption	Constant inflation rates for internal assumptions.
Kansas City	Internal Assumption[b]	Internal Assumption[b]	Internal Assumption[b]	Internal Assumption[b]			CPI[c]	Constant rates for internal assumptions.
Minneapolis	Internal Assumption	Single set of Assumptions Used for All Spending Other Than Personal Service (OTPS)						Differential Declining rates assumed over projection period.
Phoenix	...Implicit Price Deflator for State and Local Government Purchases[d]...							
Portland	Internal Assumption	Internal Assumption	Internal Assumption	Internal Assumption			Internal assumption	Differential declining rates assumed over projection period.

TABLE 6 (CONT.)

Jurisdiction	Expenditure Object							
	Personnel	Contractual Services	Supplies	Equipment	Petroleum	Utilities	Capital	Special Features
San Antonio	CPI[e]	CPI-Services	WPI	WPI	WPI--Fuel, Power and Related		WPI	All inflation projections from CBO
Shreveport	CPI[f]	CPI-Services	WPI[g]		WPI--Fuel, Power and Related	WPI-Fuel, Power and Related	WPI	All inflation projections from CPI
Vancouver	90% of CPI[h]	90% of CPI	120% of CPI		...200% of CPI...			Information shown here is that for "Moderate" scenario; two additional scenarios projected.

[a] Congressional Budget Office, Conservative Assumption.

[b] As determined in City Council Resolution

[c] CBO estimates.

[d] Assumed to exceed the GNP implicit deflator by 1 percent per year.

[e] Health insurance projected at CPI--Medical care; Social Security projected using legislated increases.

[f] Group insurance projected using a judgemental rate tied to the CPI.

[g] Street maintenance materials projected as the average of the WPI (Fuel, Power and Related) and the CPI.

[h] Medical/Dental insurance projected at 120 percent CPI.

SOURCE: Compiled by the author from sources listed in Table 1.

hand, the Kansas City model projects expenditures on the basis of rates of increase in object-level spending with the rates not necessarily related to the price increase assumptions used on the revenue side of the model.[1] Furthermore, the Kansas City method differs a bit from the others in that these projected rates of increase were imposed on the forecasters by a City Council resolution.

Some cities made no attempt to factor any cyclical price changes in the expenditure forecasts. Both the City and County of Dallas and City of Fort Worth assumed constant inflation rates throughout the projection periods. Whether this is because the forecasters felt the jurisdictions were immune to cyclical movements in prices or simply that no five year inflation forecasts are sufficiently accurate to base policy-making on their implications is uncertain from a review of the documents.

On the other hand, some cities have gone to great lengths in using exogenous inflation rate projections. While the consumer price index (CPI) or particular components thereof serve as primary price indicators, the implicit price deflator for state and local governments purchases and the wholesale price index (WPI) and its components are used in some areas. Most interesting are the detailed estimates performed in San Antonio and Shreveport where the several objects of expenditures are inflated by different price indexes.

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[1] Office of Budget and Systems, City of Kansas City, Five-Year Financial Forecast: 1983-84 to 1987-88 (Kansas City, MO.: 1982). Unless noted otherwise, all subsequent references to the "Kansas City model" will refer to this document.

Although not directly related to the issue of business cycle impact on city spending, it is of tangential interest to observe the projected relative changes in prices by object of expenditure used in the several cities. Table 7 shows the average assumed price increases of different nonpersonnel objects of expenditure relative to the assumed wage increases. In all but one case (Fort Worth petroleum spending) non-labor expenditures are assumed to increase by more than are wages. While this may reflect some "game playing" with the projections (to keep labor unions from becoming overly optimistic regarding future wage levels), it may also reflect past experience where the jurisdiction found that non-labor prices are uncontrollable and played important roles in increasing spending during inflationary periods.

The Cincinnati model relies both upon statistical relationships and deterministic methods to produce expenditures projections. Non-personnel spending attributable to individual departments, such as supplies and materials, are projected deterministically using either the GNP deflator or linear combinations of it and other price indexes. For example, material expenditures are projected to increase as a weighted average of gasoline prices and the GNP deflator.

Wage increases of the AFSCME bargaining unit are forecast from a statistical relationship using as one independent variable the difference between the previous year's wage increase and the current year's rate of inflation. This directly ties local public wage increments to the national economy with the estimated relationship showing that, if current inflation exceeds the previous year's wage increase, there would be a positive pressure to raise local wages. Also included in the model is the carryover

TABLE 7

ASSUMED INFLATION RATE DIFFERENTIALS IN EXPENDITURE FORECASTS

Jurisdiction	Assumed Average Inflation Relative to Wage and Salary Increases					
	Contractual Services	Supplies	Equipment	Petroleum	Utilities	Capital Outlay
Dallas[a]	1.43	1.43	1.43	---	---	---
Fort Worth	1.05	1.05	1.80	.81	3.27	1.05
Kansas City	1.17	1.17	1.17	---	---	1.06
Minneapolis	1.05	1.05	1.05	1.05	1.05	---
Portland	1.04	1.04	1.04	---	---	1.01
San Antonio	1.29	1.25	1.25	1.64	---	1.25
Shreveport	1.02	1.08	---	1.53	1.53	1.08
Vancouver	1.00	1.30	1.30	2.20	2.20	2.20

[a]Data in table based on inflation scenario projection using the medium inflation rate assumptions.

SOURCE: Compiled by author from sources listed in Table 1.

surplus from the previous year although the estimated coefficient is not statistically significant. The statistical relationship is not a particularly strong one with an adjusted R^2 of only 0.33.[1] The projected wage increases of the AFSCME pay group are then used judgementally to project wage increases for the other nine pay divisions applicable in Cincinnati.

Local government expenditures not attributable to individual departments are projected statistically in Cincinnati using either trends or national economic aggregates. For example, pensions are projected using both the CPI for the U.S. and a time trend as independent variables while professional service forecasts are based on a linear relationship with U.S. personal income. The cyclical implication of the inclusion of income in the spending equations is that, while national price movements may dominate changes in future spending, real growth in the national economy will also push spending upward.

Effects of National Economic Conditions on the Local Fisc

Given linkages between the national economy and local revenues and expenditures, it should be possible to empirically analyze the effects of the business cycle on local fiscal conditions. Unfortunately, the amounts of information provided in the published forecasting models is such that indirect estimates must be relied upon heavily to reach many conclusions. Nevertheless, several different techniques can be used to derive these

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[1] R^2 statistics have generally been omitted throughout this paper since for the bulk of the time series relationships estimated, the coefficients of determination are very close to one.

estimates. In what follows we first review a study of the impact of inflation on revenues and expenditures in Dallas and then review the findings of three other cities which have addressed the question of how national economic conditions might affect their revenues or expenditures. We then consider the degree to which the revenue and expenditure sides of the budget are assumed to respond to economic forces in the forecasting models of several cities. Finally, we analyze the elasticities found in several forecasting models and use the results to simulate the effects of cyclical economic conditions.

Internal Estimates of the Impact of Economic Conditions on the Local Fisc

At least four cities have attempted to estimate the effects of alternative business conditions on their own fisc--Dallas, Kansas City, Vancouver and San Antonio.

Dallas. In its 1980-81 through 1984-85 forecast, the City of Dallas was particularly interested in the impact of inflation on its revenues and expenditures. Included in its forecasting document are estimates of all revenues and expenditures under three different inflation scenarios. (Recall from Table 6 that Dallas did not attempt to build cyclical inflation scenarios into its expenditure forecast; instead, constant inflation rates were used for the entire 5-year projection period.) Table 8 shows the results of this experiment. The simulations show that the fate of the Dallas budget is closely tied to inflation levels. While each inflation scenario results in projected deficits even in the first year of the forecast, the high inflation scenario leads to forecasted deficits in the first projection year three times greater than under the low inflation scenario. By the final year of the forecast period this differential grows

TABLE 8

PROJECTED SENSITIVITY OF REVENUES AND EXPENDITURES TO INFLATION, CITY OF DALLAS
(in thousands of dollars)

Fiscal Year	Inflation Scenario[a]					
	Low		Medium		High	
	Revenues	Expenditures	Revenues	Expenditures	Revenues	Expenditures
1981	325,401	325,396	325,401	325,396	325,401	325,396
1982	349,949	352,985	352,759	358,831	355,566	364,684
1983	374,823	381,610	380,941	394,314	387,143	407,265
1984	404,043	409,545	413,982	430,064	425,290	451,394
1985	433,439	436,001	447,796	465,224	462,961	496,178

[a]The assumed inflation rates for the three scenarios were:

	Low	Medium	High
Personnel	5%	7%	9%
Non-Personnel	8%	10%	12%

They were assumed constant throughout the projection period.

SOURCE: City of Dallas, Office of Management Services, "Summary Long Range Financial Projections, 1980-81 to 1984-85" (May 1981).

to deficits under high inflation rates twelve times greater than under the low inflation scenario.

The low inflation scenario produces deficits that decline over the projection period from about $3 million in 1982 to $2.5 million in 1985. This improvement in fiscal conditions, in spite of inflation rates in the range of 5-8 percent, is due to the projected growth in real revenues being driven by national variables and quite rapid growth in the trend-projected revenues. For example, the forecast shows Dallas Power and Light utility tax receipts growing by 106 percent between 1981 and 1985 period with Lone Star Gas utility taxes growing by nearly 50 percent during the same period. Using this sensitivity analysis one would conclude that the City of Dallas has a critical inflation rate of about 7-8 percent. Inflation rates higher than this will produce fiscal gaps while slower increases in prices would provide the city with a cushion of revenues allowing for further increases in city services or a lowering of tax burdens.

Greater detail regarding the underlying effects of inflation on Dallas revenues and expenditures can be found in Table 9. There several major sources of revenue and agency expenditures are listed together with the estimated effect of an increase of one percentage point in the inflation rate. The Dallas model assumes a linear relationship between inflation and revenues and expenditures; therefore, the dollar impact of a one unit change in the inflation rate is constant although the relative impact depends on the base of comparison.

Table 9 reveals why the estimated effect of inflation results in greater impact on expenditures than on revenues. Three major tax sources--the ad valorem tax, Dallas Power and Light utility franchise tax

TABLE 9

ESTIMATED IMPACT OF ONE PERCENTAGE POINT INCREASE IN INFLATION RATE FOR DALLAS, TEXAS

Impact on	Single Year Impact[a]	
	Thousands of Dollars	Percent[b]
Ad Valorem Taxes	$ 0.0	0.00
Sales Tax	874.5	1.11
Alcoholic Beverage Tax	10.0	0.36
Dallas Power & Light Utility Tax	0.0	0.00
Lone Star Gas Utility Tax	0.0	0.00
S.W. Bell Utility Tax	116.5	1.10
Total Revenues	1405.0	0.40
Fire Expenditures	501.0	0.95
Parks Expenditures	263.0	0.94
Police Expenditures	772.5	0.95
Sanitation Expenditures	427.0	0.94
Total Expenditures	2923.0	0.82

[a]Estimated as one-half the difference in projected amounts for 1981-82 between the low and medium inflation scenarios.

[b]As percent of amount projected for 1981-82 under low inflation scenario.

SOURCE: Computed by author.

and Lone Star Gas utility franchise tax--are all projected under the assumption of invariance to inflation while all spending is assumed to be sensitive to price increases. Indeed, only 47 percent of the revenue side of the Dallas budget is assumed to be responsive to inflation while all expenditures other than debt service are assumed to respond to higher inflation rates. In general, the Dallas model suggests that for each $1 of additional revenues generated by price increases, spending will increase by $2.08. All of these estimates are, of course, for only a single year therefore the compounded effect of continued inflation results in ever increasing divergence between the revenue and spending sides of the budget.

Dallas, like most cities, views the property tax as invariant to inflation. It is a bit harder to believe the assumed zero inflation elasticity of the two utility taxes since each is a gross receipts tax.[1] For both the sales tax and the Southwestern Bell utility tax a one percentage point increase in the inflation rate results in greater than one percent rise in revenues (relative to projected amounts under the low inflation scenario). Note, however, that the inflation rate elasticity of these two taxes is still far from one (approximately 0.08) since an increase in the rate of inflation from 7 to 8 percentage points amounts to

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[1]Time trends were probably used to project these revenues thereby implying unresponsiveness to inflation. Such projection techniques were used for each of these revenues in earlier versions of the Dallas model. Roy Bahl, Larry Schroeder, and Kurt Zorn, "Local Government Revenue and Expenditure Forecasting: Dallas, Texas," Occasional Paper No. 49; Metropolitan Studies Program, The Maxwell School (Syracuse, New York: Syracuse University).

a 1.4 percent increase in inflation.[1] Still, the overall inflation elasticity of Dallas revenues is only about one-half of that for expenditures.

The 0.82 percent increase in total expenditures is less than that projected for each of the major spending categories shown in the table since debt service charges, which are included in the total, are assumed to be invariant to inflation. This assumption runs counter to the expectation that greater inflation would result in higher nominal interest rates thereby requiring greater debt service spending on new debt.

Kansas City. Kansas City provides an interesting estimation of the relative response of revenues to alternative business conditions, but does not consider the expenditure side of the budget. Table 10 shows the three alternative sets of national economic scenarios under which the projections were made while Table 11 displays the results obtained for major revenue categories.

As in Dallas, Kansas City assumes that property tax revenues are invariant to anything that happens to the macro economy. Earnings and profits tax projections are based on GNP therefore experience largest growth rates under the low inflation/high GNP growth scenario. Utility and franchise taxes, which are based on gross revenues, are projected as linear functions of CPI thus grow most rapidly under the high inflation scenario.

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[1] Unfortunately, the exact inflation rates used for the three scenarios on the revenue side of the budget are not documented in the Dallas summary report. The elasticity estimate was based on an increase in inflation from 7 percent to 8 percent.

TABLE 10

ALTERNATIVE ECONOMIC ASSUMPTIONS, KANSAS CITY

Year	CBO "Moderate" Inflation	CBO "Moderate" GNP ($billions)	CBO Low Inflation/High GNP Inflation	CBO Low Inflation/High GNP GNP ($billions)	CBO High Inflation/Low GNP Inflation	CBO High Inflation/Low GNP GNP ($billions)
1983	6.9%	3,515.1	6.4%	3,556.3	7.6%	3,483.6
1984	6.9	3,881.7	6.2	3,965.3	8.0	3,825.0
1985	6.4	4,259.0	5.7	4,386.6	7.6	4,176.8
1986	6.0	4,658.8	5.3	4,811.0	7.2	4,548.6
1987	5.7	5,082.6	5.2	5,248.8	6.9	4,935.2
Average	6.4	10.1%[a]	5.8	10.2%[a]	7.5	9.1%[a]

[a]Average annual growth rate.

SOURCE: Office of Budget and Systems, Kansas City, Missouri, Five-Year Financial Forecast: 1983-84 to 1987-88 (Kansas City: 1982).

TABLE 11

KANSAS CITY REVENUE GROWTH UNDER ALTERNATIVE MACRO-ECONOMIC ASSUMPTIONS
(in percents)

Revenue	Average Annual Growth Rates, 1982-1987		
	CBO "Moderate"	CBO Low Inflation/ High GNP	CBO High Inflation/ Low GNP
Property Tax[a]	1.9	1.9	1.9
Earnings and Profits Taxes[b]	3.8	4.0	3.7
Sales and Services Taxes[a]	4.8	4.8	4.8
Utility and Franchise Taxes[c]	7.4	6.6	8.7
Federal and State Grants[d]	---	---	---
All Other Revenues[e]	6.6	6.3	7.2
TOTAL	4.7	4.5	5.0

[a] Time trend projection.

[b] Function of GNP.

[c] Function of CPI.

[d] Assumed constant in nominal terms.

[e] Functions of time and CPI.

SOURCE: Computed by author from source cited in Table 10.

Since sales taxes are projected via trend techniques, Kansas City assumes this revenue source to be invariant to economic conditions.[1]

Overall, the revenue forecasting model in Kansas City suggests that the city's revenues will grow most rapidly under a high inflation/low GNP growth scenario although the annual percentage increases in revenues do not keep pace with the average annual increases in inflation. Thus, if one were to assume that Kansas City expenditures rose just to match increases in prices, the city would find expenditures surpassing revenues under each of the scenarios. The absolute difference between average rates of increase in revenues and expenditures (under the strong assumption that expenditures rise at just the rate of inflation), is smallest under the low inflation/high GNP scenario.

Vancouver. This relatively small city produces an extensive analysis of the effects of alternative economic scenarios on the local fisc; however, the complexity of the alternative assumptions makes it difficult to ascertain the partial effects of any particular exogenous variable. Table 12 displays the three sets of assumptions used in the 1983-87 forecast and shows that not only are national economic assumptions altered, but local conditions are likewise manipulated under the three scenarios. Furthermore, the expenditure projections are based on differential CPI multipliers for the several objects of spending using considerable greater multipliers for medical/dental, communications and energy spending under the pessimistic vis-a-vis the optimistic projection.

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[1] According to the Kansas City document, alternative structural models were tried but rejected in favor of the trend method.

TABLE 12

ALTERNATIVE ECONOMIC ASSUMPTIONS, VANCOUVER
(in percents)

Economic Variable	Average Annual Rates of Change Under Alternative Scenarios		
	"Optimistic"	"Moderate"	"Pessimistic"
CPI	4.9	7.1	11.6
Nominal GNP	9.9	9.1	11.0
County Population	3.5	2.0	0.0
County Personal Income	10.9	8.9	7.2
Unemployment[a]	6.5	7.6	10.0
New Construction[b]	4.5	2.5	1.0
Spending Categories			
Salary	.9 x CPI	.9 x CPI	.9 x CPI
Medical/Dental	CPI	1.2 x CPI	1.5 x CPI
Extra Help	.8 x CPI	.9 x CPI	CPI
Communications	CPI	1.2 x CPI	1.5 x CPI
Energy	1.2 x CPI	2.0 x CPI	3.0 x CPI
Data Processing	1.2 x CPI	1.2 x CPI	1.2 x CPI

[a]Average rate.

[b]As percent of assessed valuation.

SOURCE: Vancouver, Washington, City of Vancouver, Washington Five Year Financial Forecast: 1983-1987 (Vancouver: 1982).

A summary of the results for Vancouver are shown in Table 13. Projected average annual rates of change for major revenues and expenditures are shown for each of the three scenarios. Since many of the revenues are projected judgementally or deterministically, it is not possible to ascertain the reasons underlying the results. For example, the property tax is projected to be invariant to alternative economic assumptions even though different growth rates in new construction were assumed; likewise, the judgementally-based pattern of growth in state-shared revenues is difficult to understand.

Sales taxes are projected to grow most slowly under the pessimistic assumptions in spite of their linkage to the CPI. This result is due to the assumed stagnation in local population growth--a key factor in the sales tax projection equation. On the other hand, business and occupation taxes grow most rapidly under the pessimistic scenario due to their assumed linkage to nominal rather than real GNP. Finally, total revenues grow most rapidly under the pessimistic set of assumptions primarily because in Vancouver approximately one-quarter of all revenues are in the form of cost reimbursement fees, e.g., permits, park fees, cemetery fees, etc., and the forecast assumed that these revenues would grow to match spending increases. But this spending increases most rapidly under the high inflation rates associated with the pessimistic scenario.

The inclusion of differential inflation rates for the several expenditure objects had little impact on differential projections of

TABLE 13

PROJECTED GROWTH IN REVENUES AND EXPENDITURES UNDER ALTERNATIVE ECONOMIC ASSUMPTIONS: VANCOUVER
(in percents)

Revenue Expenditures	Average Annual Rates of Change Under Alternative Scenarios		
	"Optimistic"	"Moderate"	"Pessimistic"
Property Tax[a]	4.0	4.0	4.0
Sales Tax[b]	8.9	7.3	5.9
State Shared Revenues[c]	9.1	9.1	6.9
Business & Occupation Tax[d]	15.3	14.1	17.0
Water/Sewer Tax[e]	12.2	13.4	11.0
Total Revenues	8.1	8.5	11.0
Public Works Spending	5.0	6.6	10.7
Fire Department	5.0	6.6	10.7
Police Department	5.0	6.6	10.7
Parks & Recreation	5.4	7.5	13.7
Total--Continuing Services[e]	5.1	6.8	11.2
Total--All Inclusive[f]	6.3	7.9	12.3

[a] "Deterministic" method.

[b] Econometric method; revenues dependent on CPI, unemployment and local income.

[c] "Expert" judgement.

[d] Econometric method; revenues dependent on GNP.

[e] Excludes capital outlays and new services.

[f] Includes capital outlays and new services.

SOURCE: Vancouver, Washington, City of Vancouver, Washington Five Year Financial Forecast: 1983-1987 (Vancouver: 1982).

agency-level spending. Inclusion of anticipated service changes did, however, increase greatly the projected growth rates in expenditures.[1]

The crucial role of inflation shows up in the overall revenue gap results with expenditure growth outpacing that of revenues when double-digit inflation assumptions are assumed. Under more moderate inflation rates and with either rapid (5.0 percent) or moderate (2.0 percent) real growth in GNP, the Vancouver fisc could be expected to remain solvent (at least when combined with the additional assumptions regarding population growth in the locality).

San Antonio. In San Antonio's 1982 forecast there is no attempt to document the exact state of the economy under alternative assumptions. Instead, margins of error are estimated for the major revenue sources with the "best" case showing how much greater revenues might be if the necessary conditions were to hold as well as what might occur under the "worst" case. Similarly, three alternatives were produced on the spending side allowing for a total of nine different sets of results. While possibly helpful to risk-minimizing policy-makers, the results reveal little about the impact of economic conditions on the city budget.

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[1]The information regarding average annual increases in prices mask the impact of differential patterns in the assumed changes in CPI. Thus, Vancouver assumed CPI increases of 5.8, 4.8, 4.6, 4.7, and 4.5 percent for 1982-87 under the optimistic scenario while the moderate set of assumptions used inflation rates of 6.9, 7.4, 6.9, 7.0, and 7.1 percent. This difference accounts for the fact that the average annual rate of increase in continuing service expenditures (5.1 percent) would exceed the average CPI increase (4.9 percent) while under the moderate set of assumptions the average rate of increase in spending of 6.8 percent fell below the average rate of increase in prices (7.1 percent).

Proportions of Revenues and Expenditures Assumed Affected by External Conditions

A less direct approach for ascertaining the influence of the national economy on local revenues and expenditures is to determine the extent to which the revenue and spending sides of the budget are modeled to be affected by national variables. As was noted above, a trend technique of forecasting implies that, no matter what happens nationally, the revenue (expenditure) series will continue to change as in the past. On the other hand, an econometric model that is linked to national variables implies that the national economy affects the local fisc. Likewise, deterministic techniques often rely upon national variables to drive forecasts implying a local dependence on national economic conditions. Unfortunately, for expert judgement techniques, at least if not fully documented, it is impossible to determine whether economic conditions are seen as being relevant to the local revenue or expenditure series.

Table 14 summarizes the findings of a review of eight different models for which sufficient information was available to determine the extent of exogenous influence of economic variables on local revenues and expenditures. (It must be kept in mind that these findings are based upon what the forecasts imply to be the influence of national business conditions, not what, in fact, are those influences.) In constructing the table, revenues projected from trend techniques were assumed to be insensitive to economic conditions even though one might argue that the forecasters were assuming the future to be sufficiently similar to the past to render trend techniques superior to alternative projection methods.

TABLE 14

ASSUMED SENSITIVITY OF BUDGETS TO NATIONAL ECONOMIC VARIABLES

	Sensitive to National Economy			
	Revenues		Expenditures	
Jurisdiction	Percent of Total Revenues	Influences	Percent of Total Expenditures	Influences
Cincinnati	88.2	CPI; Personal Income; U.S. Corporate Profits; U.S. Employment; Interest Rates (90 day bills)	86.3	CPI; Employment; Personal Income; GNP Deflator; Gasoline Prices
Dallas	47.0	n.a	100.0	Prices
Fort Worth	20.2[a]	CPI	100.0	Prices
Kansas City	50.85[b]	GNP; CPI	5.3[b]	Prices
New Orleans	57.0[c]	Personal Income; Housing Starts; Unemployment; AAA Bond Rate; Real GNP Growth; CPI; Crude Oil Price Index; Production Price Index	n.a	n.a
San Diego	33.3-52.2[d]	Nominal and Real Personal Income; Oil Prices; Housing Starts	n.a	
Shreveport	53.8[a]	Nominal Personal Income; CPI	100.0	Prices
Vancouver	46.8[a]	CPI; Unemployment; GNP	100.0	Prices

TABLE 14 (CONT.)

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[a]Percent of General Fund in base year.

[b]As percent of Operating and Debt Fund in 1981-82.

[c]As percent of base year in 1980-85 forecast.

[d]As percent of total city revenues in first projection year before interfund transfers. Lower percentage excludes projections made by Water Utilities Department, higher percentage includes these as economically sensitive.

SOURCE: From sources listed in Table 1 except for New Orleans which was taken from Larry Schroeder, Lee Madere and Jerome Lomba, "Local Government Revenue and Expenditure Forecasting: New Orleans," Occasional Paper No. 52, Metropolitan Studies Program, The Maxwell School (Syracuse, New York: Syracuse University, October 1981).

Likewise, judgementally-based projections were assumed invariant to business conditions.

The results, based on this indirect inferential approach, suggest that economic conditions influence all or nearly all of the spending side of the budget mainly through its effect on prices. The one exception to this statement, Kansas City, is explainable from the City Council resolution mandating specific cost increase assumptions for the bulk of city expenditures. Salaries and benefits were to grow 6.0 percent annually, contractual services were projected at a 6.3 percent annual growth rate and supplies and equipment were projected to grow annually at a 7.0 percent rate. Only capital improvement spending was tied specifically to national prices indexes.

The revenue results are remarkably similar for at least five of these eight jurisdictions. About one-half of the revenues earned by five of the cities examined here were seen to be "economically sensitive." One of the exceptions is Cincinnati. One likely reason for the greater sensitivity of revenues to economic conditions in this Ohio city is that about two-thirds of the projected 1981 revenues were expected from the local income tax. Again, however, property taxes were projected judgmentally rather than being tied to national aggregates.

The Fort Worth model relied extensively on simple trend analysis together with judgemental projections thereby explaining the extremely low proportion of "dependent" revenues. Only the local sales tax and interest earnings were seen to be influenced significantly by external economis forces with prices and interest rates viewed, respectively, as the principal determinants of each. In the San Diego case it matters greatly

what one assumes to be the projection method used by the Water Utilities Department which was called upon to project water revenues. In any event, the overall conclusion that can be drawn from this analysis is that most cities producing forecasts assume that 40 percent or more of their revenues are sufficiently immune from major economic events to ignore their influence in multi-year forecasts but that expenditures are closely tied to the national performance of prices.

Elasticity Estimates

Only a few of the published models contain sufficient information to examine in any depth the estimated response of local revenues to national economic conditions. Here we examine the elasticities implied by the five models for which sufficient information is available. Table 15 contains the estimated revenue elasticities (unless otherwise noted in the Table all have been estimated at the mean of the observations used in generating the regression results).

The Kansas City model relies on GNP and the consumer price index as the only two macroeconomic variables driving the forecasts. The earnings and profits tax equation is of a rather unique variety specified as:

$$\ln(tax) = a + b(1/GNP)$$

The forecasters note that while more common linear forms using per capita personal income or GNP as independent variables produced good statistical fits, the projections were felt to yield unrealistic growth rates in revenues.[1]

[1] Such "judgemental" conclusions even with statistical models is not uncommon among municipal forecasters.

TABLE 15

SELECTED ELASTICITIES FROM REVENUE FORECASTING MODELS

		Elasticity[a] With Respect to					
Jurisdiction	Revenue Source	GNP	CPI	U.S. Personal Income	City Personal Income	County Personal Income	Unemployment
Kansas City	Earnings and Profits Tax	1.13					
	Power and Light Franchise Tax;		2.03				
	Natural Gas Franchise Tax;		2.26				
	Telephone Franchise Tax;		1.40				
	Interest and Rental Income;		2.49				
San Diego	Sales Tax				0.398[b]		
Vancouver	Sales Tax		[0.52[c,d]]			0.819	[-0.077[c,d]]
	Business and Occupation Tax	1.47[c]					
	Natural Gas Franchise Tax		2.18[c]				
	Telephone Franchise Tax		1.13[c]				-0.166[c]

TABLE 15 (CONT.)

Jurisdiction	Revenue Source	U.S. Personal Income	Inverse of Percentage Change in US Unemployment	City Personal Income	Percent Change in Producer Price Index	Producer Price Index	Inverse of Unemployment Rate	Number Families in City	Mean City Family Income
New Orleans	Sales Tax	0.838							
	Occupational License	0.610	-0.001						
	La. Power and Light Franchise	[1.908][d]		2.203	0.026				
	New Orleans Public Service Franchise	[0.527][d]		0.609		0.778			
	South Central Bell Franchise	[0.431][d]		0.498		0.645	-0.038		
	Sanitation Service Charge	[-0.115][d]		-0.133				0.637	
	Tobacco Tax (Intergovernmental Revenue)								0.254

TABLE 15 (CONT.)

Jurisdiction	Revenue Source	CPI	County Employment Lagged	U.S. Employment	U.S. Corporate Profits	County Payroll	U.S. Personal Income	Treasury Bill Interest Rate	Other Variables
Cincinnati	Income Tax: Major Components Business and PRofessions	0.703	1.115	[0.948][d]	0.224				Quarterly dummies; time trend
	Individual Employees		0.179	[0.152][d]					Quarterly dummies
	Withholding	0.162				0.455	[0.472][d]		Quarterly dummies
	Previous Year Collections		1.711	[1.454][d]					Quarterly dummies
	Interest Earnings							0.502	Withholding Tax Revenues

[a]Unless noted otherwise, all elasticities estimated at the mean.

[b]Constant elasticities assumed. Equation also includes average of prior two years sales tax revenues.

[c]Constant elasticities assumed.

[d]Indirect estimates.

SOURCE: From sources cited in Table 1.

The point elasticity with respect to nominal GNP is found to be 1.13; however, in a non-linear equation such as this one it matters considerably whether the elasticity is evaluated at the mean or at another point on the estimated equation.[1] For example, when estimated at 1981 GNP (the last observation in the Kansas City data), the elasticity is only 0.60 suggesting a less than proportional increase in earnings and profits taxes in response to changes in GNP.

Similar differences in alternative elasticity estimates are found in the four equations based on CPI. Again, the differences are due to an inherent non-linearity in the estimated equations. While the equations are linear in CPI, a one unit change in CPI has considerably different inflation implications if CPI is near 100 than, say, if it is near 200. Given the non-linearity in the equation, when evaluated as of 1981 the CPI elasticities for these four revenue sources are: Power and Light Franchise Tax, 1.26; Natural Gas Franchise Tax, 1.33; Telephone Franchise Tax, 1.06; and Interest and Rental Income, 1.36. Even then, each of the franchise taxes as well as interest and rental earnings suggest a more than proportional response to an increase in prices. This is certainly reasonable in the case of the franchise taxes which are based on total receipts of the utilities since utility prices and, hence, revenues have recently been increasing more rapidly than the general price level. The

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[1] The elasticities shown in the table are generally those evaluated at the mean. This was done for two reasons. First, in several instances they were the only estimates available and insufficient information was provided to allow alternative estimates. Second, while for predictive purposes the most recent elasticities may be most relevant, to judge <u>average</u> responsiveness to changing economic conditions, elasticities at the mean may be more appropriate.

overall implications of the estimates derived from the model are that while approximately one-half of Kansas City's revenues are invariant to national economic conditions (Table 14), approximately one-quarter of the city's revenues (earnings and profits taxes) respond elastically to real or nominal national growth while the remainder respond elastically to changes in prices.

The San Diego model projects sales tax as a function of city incomes. For forecasting purposes, however, the San Diego model specifies that growth in local incomes will just match in percentage terms the growth in nationwide income. Thus, the results shown in Table 15 can also be considered as projected national income elasticities.

The abnormally low income elasticity of the sales tax may be due to the inclusion of lagged endogenous variables in the equation. In fact, the effect of lagged values of sales taxes (more properly, the natural log of the mean of the past two years' values of sales taxes) probably swamps the independent effects of income in the equation thereby accounting for a large elasticity (0.740, with a low standard error) of the lagged tax variable and the low elasticity estimate on personal income with a fairly high standard error (0.187).

The Vancouver sales tax forecasting model is particularly interesting in that it uses a linkage equation (see above) which projects local (county) income as dependent upon the national CPI and unemployment thereby providing three different elasticity estimates. The direct local income elasticity of the sales tax is found to be 0.819, not an unreasonable estimate of the responsiveness of local sales taxes to incomes. Since local income is linked in the model to CPI and unemployment, the

responsiveness of local sales taxes to these national economic indicators is the product of the elasticity found in the linkage equation times the local income elasticity of revenues. The resulting coefficients show that, when county population is included in the personal income equation along with CPI and unemployment, a 10 percent increase in prices is expected to result in only about a 5 percent increase in sales taxes (cet. par.) while a 1 percent increase in unemployment is associated with a decline in sales taxes of 0.077 percent (again, cet. par.).

Business and occupation taxes in Vancouver are found to be especially elastic with respect to GNP. As was the case in Kansas City, utility franchise taxes are found to be quite price elastic. This was especially the case for the natural gas utility where gas prices, and therefore gross utility receipts, have grown substantially faster than CPI during the past several years.

Elasticity estimates for seven major New Orleans revenues are given in the table.[1] The functional specifications in the New Orleans model are considerably more complex than those for the three cities previously discussed. However, since national personal income acts as a major driving force behind most of the revenue estimates (either directly in the revenue equation or indirectly through the national-local income linkage equation), national personal income elasticities are shown for six of the revenue sources. The U.S. personal income elasticity of the sales tax suggests that New Orleans would not share fully in real or nominal increases in

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[1]These seven revenues account for about 82 percent of the econometrically forecasted revenues in New Orleans.

national growth, probably reflecting the fact that, while located in the Sunbelt, New Orleans resembles older cities of the North. While the Power and Light franchise tax is highly elastic to changes in national income, the same is not found for the other two franchise levies. But this is probably due to the inclusion of prices indexes together with nominal income in the Public Service and South Central Bell equations which, in effect, provide two price indicators in each functional relation.

The final city model considered here, Cincinnati's, is unique in that it contains a model designed to project the local income tax. Furthermore, unlike the other models, it was estimated on a quarterly basis, an especially attractive feature for shorter term fiscal planning. The model disaggregates total income taxes into seven component parts; but the four components shown in the table accounted for over 98 percent of all income tax revenues in 1980. Interest revenues constitute the next most important revenue source econometrically projected so the five sources shown in the table account for about 84 percent of all economically sensitive revenues and about 74 percent of total General Fund revenues.

The withholding component of the Cincinnati income tax is, by far, the most important portion of this revenue source. The indirectly estimated U.S. personal income elasticity of the tax (0.471), may at first glance seem unreasonably low suggesting a quite small response to changes in national economic activity. It should be noted, however, that the tax is a flat rate levy and that the independent variable used in the equation is Hamilton County payroll, not payroll or income within Cincinnati itself. Thus, to the degree that the city has lost economic activity to the

outlying areas, county payroll has been growing more rapidly than city incomes (and income taxes) thereby producing a seemingly low income elasticity of the local tax.[1]

The second most important component of Cincinnati's income tax is collections based on previous year's income. The model suggests this source is highly sensitive to changes in local employment and, when linked to the national economy, to changes in the U.S. employment. Of the revenue sources represented in the table, interest earnings have recently constituted the third most important revenue source. Since interest income depends on both the interest rate and free balances, the specification uses both the Treasury bill rate and withholding tax revenues, the latter of which serves as a proxy for available balances. Unlike most cities that have had difficulty fitting a reasonable interest earnings equation, the results of the Cincinnati model are plausible (both coefficients are statistically significant at least at the 0.10 level of significance and yield reasonable elasticity estimates) and the statistical fit is acceptable (R^2 = 0.86) for this highly variable revenue source.

As noted above, unlike most cities producing multi-year forecasts, Cincinnati also projects expenditures econometrically. The estimated elasticities derived from the five components of spending projected statistically are shown in Table 16. The wage increase equation

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[1]Cincinnati lost about 15 percent of its population during the 1970s. Furthermore, analysis of firm relocation within the city suggests that it faced the same kind of firm migration experienced in most older central cities. See Paul Blackley, "An Empirical Application of a General Bid-Rent Model of Urban Manufacturing Location: The Case of Cincinnati," (Ph.D. dissertation, Syracuse University, 1982).

TABLE 16

EXPENDITURE ELASTICITIES: CINCINNATI

Type of Expenditure	Elasticities[a] With Respect to: Previous Wage Gain Less Inflation	Carry-Over Balance	County Employment	U.S. Employment	CPI	U.S. Personal Income
Rate of Increase in Wages	0.057	0.007				
Government Services			0.801	[0.681][b]		
Pensions					0.468[c]	
Professional Services						1.525

[a]Evaluated at the mean.

[b]Indirect estimate.

[c]Equation includes a time trend.

SOURCE: Computed by the author.

represents, of course, the quantitatively most important determinant of total expenditures. While the elasticity coefficient appears low, the estimated coefficient implies a plausible wage reaction equation. The absolute value of the coefficient is 0.54, suggesting that if the previous year's rate of increase in wages trails current inflation by 1 percent, the rate of increase in public employee wages will, on average, make up about one-half of that difference. The standard error associated with the coefficient is, however, quite high and implies that there is a 95 percent chance that the catch-up in wages in such a situation would range from 0.10 to 0.98 percent.

The elasticities on the other expenditure equations are quite plausible with the fairly large personal income elasticity of professional or contractural services reflecting a policy followed by many large cities whereby, in the face of fiscal difficulties, services have been contracted out instead of making additions to the permanent work force.

Differential Reactions to Expansion and Contraction

While the preceding analysis has shed some light on the reactions of cities to cyclical business conditions as reflected in their multi-year forecasting models, a simple simulation may be the most effective way to summarize the results. One reason for this is that, while elasticity estimates provide comparable measures of the responsiveness of different revenue or expenditure series to changes in national economic indicators, they do not reflect the movement of total revenues or spending. For example, even though a particular revenue source may be found to be elastic in its response to increased prices, if this revenue source constitutes

only 10 percent of total revenues with the remaining sources totally unresponsive to inflation, the city will find itself facing a fiscal gap if the entire spending side of the budget responds fully to these inflationary pressures.

Sufficient information is available to carry out these simulations for only four jurisdictions--Cincinnati, Kansas City, New Orleans and Vancouver. Still, the sample is a varied one both in terms of revenues and economic base. Cincinnati relies heavily on the income tax while Kansas City and New Orleans each have a more varied menu of revenue sources at their disposal. Each of these three cities have suffered the problems common to many larger cities during the past decade. Vancouver, on the other hand, is a small, slowly growing city located in a county where population grew by nearly 50 percent during the 1970s. Unlike the other cities in this group, about one-third of Vancouver's General Fund revenues are earned from the property tax.

In order to carry out the simulation it is necessary to derive assumptions for a set of national economic aggregates representing both recessionary and expansionary conditions. If the results are to be comparable across the several cities, it is necessary that these aggregates be consistent in their representation of the macro economy. Therefore, rather than attempt to derive a set of ad hoc assumptions for the entire set of macro variables used in the diverse forecasting models of the four cities, they have been constructed from a recent actual cycle.

Table 17 shows the average annual rates of change in ten different macro variables used in the four models. The averages have been

TABLE 17

CYCLICAL PERFORMANCE OF MACROECONOMIC INDICATORS USED IN THE REVENUE FORECASTING MODELS
(in percents)

Macro Variable	Recession[a]	Expansion[b]
Nominal GNP	5.8	11.9
GNP Deflator	11.0	7.0
Real GNP	-5.2	4.9
U.S. Personal Income	7.7	11.1
Total Employment[c]	-1.5	3.1
Interest Rate on Treasury Notes[c]	-20.1	21.7
Consumer Price Index[c]	10.8	8.3
Wholesale Price Index[c]	17.1	8.5
Unemployment Rate[c]	48.8	-5.6
Corporate Profits Before Taxes	-9.0	20.9

[a]Based on 4th quarter 1973 through 1st quarter 1975.

[b]Based on 2nd quarter 1975 through 1st quarter 1980.

[c]Estimates based on annualized quarterly growth using February, May, August and November data.

SOURCES: U.S. Department of Commerce, Survey of Current Business (selected issues); U.S. Department of Labor, Monthly Labor Review (selected issues) (Washington, D.C.: U.S. Government Printing Office); and U.S. Department of Treasury, Treasury Bulletin (selected issues).

constructed from quarterly estimates of the variables observed during the 1973 (4th quarter) through 1975 (1st quarter) recession and the subsequent expansion which extended through 1980 (1st quarter). While it could be argued that this business cycle was somehow "different" from others due to events affecting energy, it is probably more reasonable to expect that no two business cycles are ever identical in all respects, thus the arbitrary choice of any one is as good as another.

The data on the downside and upside of the business cycle show, as expected output proxies growing more rapidly during the expansionary period with prices increasing more rapidly during the contractionary period than they did during the recovery. The one possible unexpected differential is between changes in the wholesale price index on the two sides of the cycle. This was due in great part to the very large increases experienced in this index in the wake of the oil embargo. It will affect the results, however, in only New Orleans since none of the other models relies upon this indicator.

Kansas City. Table 18 displays the simulation results for Kansas City. Shown there are the percent of total revenues attributable to each of the five revenue sources that are projected econometrically in Kansas City together with the projected annual growth rates for each revenue source under conditions of recession and expansion. It must be kept in mind throughout the discussion of this and the other models that these estimated growth rates are not indicators of what happened to the city's revenues during the two phases of the 1973-1980 business cycle, but what the city's model would predict under similar economic conditions. Given that

TABLE 18

CYCLICAL SENSITIVITY OF REVENUES: KANSAS CITY
(in percents)

Revenue Source	Percent of Total Revenues[a]	Percentage Change	
		Recession	Expansion
Earnings and Profits Tax	23.62	6.55	13.45
Power and Light Franchise Tax	9.22	21.92	16.85
Natural Gas Franchise Tax	5.46	24.41	18.76
Telephone Franchise Tax	3.83	15.12	11.62
Interest and Rental	6.33	26.89	20.67
(Total of Above)	(49.15)	(11.96)	(12.64)
Other	50.85	---	---
Total[b]	100.00	7.18	7.51

[a]As percent of 1981-82 actual revenues.

[b]Computed under the assumption that all other revenues are not cyclically sensitive.

SOURCE: Computed by author.

assumption, the results suggest that the earnings and profits tax in Kansas City would grow twice as fast under expansionary conditions than during a recession--a result of the use of nominal GNP in the forecasting equation.[1] On the other hand, based on its model, Kansas City would find franchise taxes growing more rapidly during a recession than in the expansionary phase of the cycle (in this case due to the use of CPI in the estimating equations). But these reactions to the business cycle do not reflect changes in total revenues since each constitutes only a fraction of all city revenues. Indeed, in Kansas City about one-half of the revenue structure is believed to be invariant to the cycle. Thus overall, while the cyclically sensitive revenues will grow a bit more rapidly during expansion than in a recession, the difference in total revenue growth rates during the two phases of the cycle is only 0.33 percent. The implication is that, based on its forecasting model, the revenue side of the budget in Kansas City is nearly invariant to business conditions.

Vancouver. Table 19 displays the simulation results for Vancouver and show that, under expansionary economic conditions, the four main cyclically sensitive taxes would be expected to grow about twice as fast as during a national slowdown. But these revenues constitute only 23 percent of total revenues with the remainder being either cost-reimbursable income to the City or revenues which are assumed to be economically insensitive to

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[1]The results have been constructed using the elasticities (evaluated at the mean) shown in Table 15 together with the average changes in the macro variables displayed in Table 17.

TABLE 19

CYCLICAL SENSITIVITY OF REVENUES: VANCOUVER
(in percents)

Revenue Source	Percent of Total Revenues[a]	Percentage Change	
		Recession	Expansion
Sales Tax	10.19	1.86	4.75
Business and Occupation Tax	7.58	8.53	17.50
Natural Gas Franchise Tax	1.37	23.53	18.09
Telephone Franchise Tax	4.09	4.10	10.31
(Total of Above)	(23.23)	(5.71)	(10.68)
Cost Reimbursable[b]	23.50	10.91	8.38
Other Revenues	53.27	---	---
Total[c]	100.00	3.89	2.50
Total (excluding cost reimburseable)[c]		1.73	3.24

[a]As percent of 1982 base year data.

[b]Growth rates based on expenditure CPI elasticity of 1.01 as impiied in 1982 forecast.

[c]Computed under the assumption that Other Revenues are not cyclically sensitive.

SOURCE: Computed by author.

cycles.[1] For the cost reimbursable component of revenues it was assumed that, as was specified in the latest Vancouver forecast, spending would be linked to the national CPI. Continuing expenditures (omitting new spending) in the 1982 forecast show a CPI elasticity of 1.01; therefore, the same CPI elasticity was assumed for this revenue component in the simulation.

When the cost reimbursable revenues are included in the results, the overall revenue growth rate under recessionary conditions exceeds that of the expansion. On the other hand, if the cost reimbursable revenues are omitted from the analysis, revenues are found to grow 1.5 percent faster under expansionary conditions than during a recession. As in the Kansas City case, this differential is a small one suggesting that the fiscal condition of Vancouver is relatively insensitive to the business cycle.[2]

New Orleans. Table 20 shows the results obtained when the same simulations were performed on the more important econometrically projected revenues in New Orleans. The wide variety of model specifications used there provide for a greater diversity in the results from the individual revenues. The growth rates for both the sales and occupational license taxes are nearly 50 percent greater under expansionary economic conditions

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[1]This assumption implies that state-shared revenues derived from motor vehicle excise taxes, liquor taxes, etc., which constituted about 10 percent of Vancouver's budgeted revenues in 1982 are insensitive to the national economy.

[2]This conclusion is in line with the results of the simulations Vancouver itself performed which showed deficits arising only under the most pessimistic of assumptions (see Table 13).

TABLE 20

CYCLICAL SENSITIVITY OF REVENUES: NEW ORLEANS
(in percents)

Revenue Source	Percent of Total Revenues[a]	Percentage Change	
		Recession	Expansion
Sales Tax	29.16	6.45	9.30
Occupational License Tax	2.39	4.70	6.77
La. Power and Light Franchise Tax	0.11	11.83	20.55
New Orleans Public Service	3.52	17.38	12.46
South Central Bell	1.95	15.92	10.00
Sanitation Charge	3.09	-0.88	-1.28
Tobacco Tax	6.46	1.69	2.44
(Total of Above)	(46.68)	(6.45)	(7.82)
Other Economically Sensitive[b]	10.31	6.45[c]	7.82[c]
All Other	43.01	---	---
Total	100.00	3.68	4.45

[a]As percent of 1979 revised revenue estimates of General Fund Revenues.

[b]Consists of 12 additional revenue sources.

[c]Relative responsiveness to economic conditions assumed to be equal to that of the revenue sources listed.

SOURCE: Computed by author.

than during a recessionary period; however, as was the case with the Kansas City model, recessionary growth in the major franchise taxes exceeds the expansionary growth.

Since the selected equations do not account for all of the econometrically projected revenues, it was arbitrarily assumed that the twelve other economically-sensitive revenues in New Orleans would respond to the business cycle in the same manner as that found for the revenue sources listed.[1] This assumption, together with the assumption that all other revenues are insensitive to the business cycle, results in less than a 1 percent difference in growth rates of total revenues during recession and expansion. Thus, again, the model suggests an overall relative unresponsiveness to the cycle.

Cincinnati. Unlike the three other cities reviewed here, the Cincinnati model suggests that local revenues are rather sensitive to business conditions (Table 21). In great part this may be attributed to the role played by the local income tax. Withholding tax revenues, which constitute about one-half of the City's revenues, are found to increase about 1 percent more rapidly under the expansionary scenario than under recessionary conditions. Unlike the other models, certain revenues in Cincinnati are projected to decline in nominal terms during recessionary periods. Furthermore, the results seem reasonable, e.g., that interest

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[1] These equations were omitted because the printout of results provided by New Orleans continued alternative specifications of some minor revenue sources and the complex specification of others were impossible to replicate.

TABLE 21

CYCLICAL SENSITIVITY OF REVENUES: CINCINNATI
(in percents)

Revenue Source	Percent of Total Revenues[a]	Percentage Change	
		Recession	Expansion
Business and Professions[b]	4.42	3.91	13.97
Individual Employees[b]	0.50	-0.26	0.56
Withholding Tax[b]	50.52	5.39	6.59
Previous Year's[b]	10.33	-2.57	5.30
All Prior Years[b]	0.59	-3.26	6.74
Interest and Penalty[b]	1.08	-1.71	3.53
Intangibles	2.36	3.41	8.34
Street Permits	0.52	6.40	9.23
Beer Licenses	0.42	0.30	0.44
Building Permits[c]	0.31	-4.63	10.77
Non-business Licenses	0.54	-4.60	10.71
Interest Earnings	7.41	-1.07	21.90
Sales[d]	2.83	23.74	17.76
Financial[d]	3.57	8.54	14.39
X-Sales[d]	0.68	9.07	18.74
Estate[d]	2.33	-2.00	4.14
(Total of Above)	(88.41)	(4.05)	(8.79)
Other	11.59	---	---
Total	100.00	3.45	7.26

[a] As percent of initial projection since historical data not available.

[b] Component of local income tax.

[c] Due to lack of documentation, one variable with elasticity of 0.06 was not included.

[d] Taxes shared with other agencies.

SOURCE: Computed by author.

earnings would decline absolutely during recessions but grow dramatically during an expansionary period.

Overall, the findings indicate a cyclical sensitivity of revenues considerably greater than that found in the other three cities simulated. The Cincinnati results show revenues growing twice as fast in an expansion than during a recession. Of course, this result is influenced by the fact that nearly 90 percent of all revenues are projected econometrically and are, therefore, viewed as being economically sensitive. This means that, unlike the other cities examined, there is little dampening effect on the results due to assumptions that large proportions of total revenues are cyclically insensitive.

Although Cincinnati projects a portion of total expenditures econometrically, the model is not amenible to simulation under alternative business conditions in the same manner as is the revenue side of the budget. A primary independent variable in the wage change equation is a local policy variable--last year's rate of wage increase. The results of the equation show that approximately 50 percent of the difference in this year's inflation less last year's rate of wage increase are reflected in current year's rate of increase in wage rates. Thus, in order to use the model for cyclical simulation purposes, wage rate increments would have to be assumed.[1]

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[1]The three other econometrically-projected components of spending were simulated and it was found that they would increase by 5.46 percent under the recession assumptions and only 4.97 percent under the expansionary scenario. While these three constitute only about 16 percent of total expenditures, the differential growth rates, when combined with the revenue results, suggest greater fiscal difficulties during recession than expansion.

While a full simulation of spending cannot be performed in the same manner as was done for revenues, it is interesting to note that during the 1973-75 recession the rate of inflation rose. This, together with the finding that a portion of the decline in real wages are captured through raises suggests that wage increases would grow more rapidly during a recessionary period thereby adding more to spending. At the same time, the previous simulation shows the rate of growth in revenues to be less in recession than during an expansion. On the other hand, during the long expansion of the later 1970s, the rate of inflation first fell and then began to rise. This would suggest that in the first part of a business upturn there would be less pressure on wages to increase thereby yielding low pressures on the budget; however, late in the expansion, greater pressures would be placed on the budget through increases in wages.

Do Fiscal Forecasting Models Reflect the Current Economic Environment?

Before closing this discussion of the linkages between national business cycles and the local fisc, it is useful to consider the degree to which the forecasting models themselves are altered as the economic situation changes. That is, the conclusions presented above were based upon a set of fiscal forecasting model constructed in 1981 or 1982. Yet the empirical results of any model are inherently tied to its assumptions.[1] It may be that, with different economic conditions facing the forecaster, assumptions would be altered thereby resulting in different implied linkages between national and local outcomes. Here we investigate the

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[1]For a discussion of the importance of assumptions in forecasting models see William Ascher, Forecasting, An Appraisal for Policy-Makers and Planners (Baltimore: Johns Hopkins University Press, 1978).

degree that the general form of the forecasting models were changed as the health of the national economy changed.

In order to investigate this possibility we have assembled city forecasts produced during 1983 and will compare various aspects of these forecasts with those produced in 1981 and 1982. Readers will recall that by early 1983 (February or March) most economists were concluding that the economy had turned around from its deepest recessionary point in December 1982 and were predicting a period of sustained economic growth with relatively little inflation.

While it is not possible to assemble a set of forecasts from jurisdictions identical to those represented above in Table 1, there are several comparisons that can be made across the models, the assumptions used and their implications regarding the impact the national economy would have upon local fiscal conditions. Table 22 shows the jurisdictions represented in this second wave of forecasts and the degree of detail contained in the information made available.

A comparison of the basic approaches used in the more recent forecasts with those used previously suggests no radical changes in model building philosophy. Combinations of econometric, deterministic, judgmental and trend methods continued to be used and cities did not, in general, greatly alter the format of their forecast documents.[1] While basic approaches were

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[1]One exception to this generalization is Shreveport, LA which we learned dropped the multi-year forecast after a new administration was elected. Such events dramatize the fact that these forecasting exercises are still performed within a political environment.

TABLE 22

MULTI-YEAR FORECASTING TECHNIQUES IN SELECTED LOCAL JURISDICTIONS, 1983

Jurisdiction	Forecast Period	Revenue Model		Expenditure Model	
		Methods Employed	Detail Provided	Methods Employed	Detail Provided
Cincinnati, OH	1983-87	Econometric, Judgmental	No detail provided	na	na
Dallas, TX	1984-85 1988-89	Econometric, Deterministic	Totals by revenue source	Deterministic	Totals by department and object
Dallas County, TX	1983-87	Judgmental, Trends	Totals by revenue source	Judgmental, Trends	Totals by department and object
Kansas City, MO	1984-85 1988-89	Econometric, Judgmental, Trends	Detailed estimating equations shown	Deterministic	Total spending by object
New Orleans, LA	1984-88	Econometric	No detail provided	na	na
San Antonio, TX	1983-88	Econometric, Judgmental, Trends	Totals by revenue source	Deterministic	Departmental projections (including a review of critical issues)
San Diego, CA	1984-88	Econometric, Judgmental, Deterministic	Detailed estimating equations shown	na	na
Vancouver, WA	1984-88	Econometric, Deterministic Judgmental	Detailed estimating equations shown	Deterministic	Totals by department

TABLE 22 (CONT.)

SOURCE: Office of Research, Evaluation and Budget, City of Cincinnati, Forecasts of General Fund Revenues: 1983 to 1987 (Cincinnati: July 26, 1983); Office of Budget and Research, City of Dallas, Long Range Financial Forecast (General Fund and Debt Service): 1984-85 to 1988-89 (Dallas: February 15, 1984); Office of the Commissioners Court, Dallas County, Texas, Long Range Plan for Dallas County: Fiscal Years 1983-87 (Dallas: March, 1983); Office of Budget and Systems, City of Kansas City, Five Year Financial Forecast: 1984-85 to 1988-89 (Kansas City, MO: October 1983); New Orleans information from computer printout of 1984 model and personal conversation with its forecasting group; Department of Budget and Research, City of San Antonio, Long Range Financial Forecast: Fiscal Years 1983-88--Summary Document (San Antonio: April 15, 1983); Financial Management Department, City of San Diego, Long Range Financial Forecast: FY 1984-1988, Methodology (San Diego, 1983); and, City of Vancouver, City of Vancouver, Washington--Five Year Financial Forecast: 1984-1988 (Vancouver: September 1983).

not changed, it is instructive to document how particular aspects of the models were altered, especially as those alterations reflect the changing business conditions that characterized the economy in early 1983.

Linkages to the National Economy. While the general approaches regarding linking the local budget forecasting models to the national economy did not change substantially between 1982 and 1983, there were some minor changes in the specific revenue models used. Information supplied by Kansas City and Vancouver indicate that neither city retained exactly the same model as had been used the previous year. In Kansas City, GNP is now used to project sales taxes, restaurant licenses and hotel/motel licenses whereas in the past each was projected using a time trend model. This alteration would result in the Kansas City model displaying a greater sensitivity to business fluctuations. Indeed, nearly 70 percent of projected 1984-85 revenues in Kansas City are now hypothesized to be related to the national economy compared to about 50 percent in the previous model (Table 14).

The Vancouver revenue model was altered only slightly from its previous formulation but in a manner which would result in revenues being less sensitive to changes in the national economy. Telephone utility taxes, which previously had been projected as a function of CPI, are now assumed to remain constant in nominal terms over the projection period.

None of the expenditure models was altered dramatically. Various measures of general price levels such as the CPI or WPI continue to dominate the spending side of the multi-year forecasting models. At the same time, the particular assumptions used regarding future inflation rates were dramatically reduced in the 1983 forecasts. For example, Kansas

City's 1982 projection had used inflation rates ranging from 5.8 to 7.7 percent on average (Table 10) whereas in the new forecast the rates ranged from 3.9 to 4.9 percent. Likewise, Vancouver used CPI inflation assumptions of 3.0 (optimistic) to 8.8 (pessimistic) percent in the 1983 forecast compared to 4.9 to 11.6 percent in the previous year (Table 12).

Projected Changes in Fiscal Position. Since the models were changed slightly and since the assumptions regarding inflation were altered rather dramatically, one wonders if considerably different projections of fiscal position are obtained. The findings from the simulation of both the Vancouver and Kansas City models (vintage 1982) in the previous section would suggest that altering the assumptions would have no profound effect on the outcome. And, indeed, that is the general conclusion here.

Vancouver's "moderate" assumption scenario under the 1983 forecast reflects a more optimistic view of real GNP growth than did the 1982 forecast (Table 23). While the previous forecast did not suggest any major difficulty with long-term deficits in Vancouver, the more optimistic assumptions made in 1983 resulted in quite large surpluses during the final three years of the multiyear forecast. Interestingly, these more optimistic results stem from the spending side rather than from revenue growth. In the 1982 forecast, revenues in 1987 were anticipated to be 36.3 percent greater than in 1983 whereas the projected growth in revenues over that same time period as forecasted in 1983 was only 30.7 percent. The implication of this is, of course, that the greater surpluses anticipated in the middle years of the 1980s in Vancouver can be attributed to anticipated lessening of inflationary pressures on spending.

TABLE 23

FORECAST ASSUMPTIONS AND RESULTS: VANCOUVER
1982 AND 1983 FORECASTS
(in percents)

	Assumed[a]				Projected Surplus (Deficit) as Percent of Projected Revenues	
	Percent Change GNP[b]		Percent Rate of Inflation			
	1982 Forecast	1983 Forecast	1982 Forecast	1983 Forecast	1982 Forecast	1983 Forecast
1984	9.2	7.0	7.4	4.0	(2.1)	(0.5)
1985	9.1	8.0	6.9	5.1	(0.3)	1.4
1986	9.2	8.0	7.0	4.8	0.8	4.3
1987	9.1	8.0	7.1	5.2	2.8	6.6
1988	---	8.0	---	4.9	---	9.3

[a]Using "moderate" assumption for both years.

[b]Nominal terms.

SOURCE: See Tables 1 and 22.

The combination of assumptions and model used in Kansas City produce a bleaker fiscal picture than in Vancouver with deficits on the horizon throughout the forecast period. But, even Kansas City forecasted a slightly better future fiscal condition in 1983 than it did in 1982 (Table 24). Again in Kansas City this slight improvement can be attributed to the expectation of cooling inflation since in the 1982 forecast revenues were projected to increase at an annual rate of 4.7 percent in the subsequent five years whereas in 1983 the projected annual growth in revenues was only 4.5 percent (in spite of the alteration in the model which made sales taxes a function of GNP).

It is, therefore, obvious that the changes in the national economy experienced between the construction of the 1982 and 1983 forecasts did not result in dramatic changes in city's views of the impact of the national economy on the local fisc. Thus, the models still suggest that inflation is the primary driving force in determining fiscal health. Whether several years of relative price stability will alter this perception which is reflected in the models remains to be seen.

Summary

None of the revenue forecasting models reviewed here attempt to project property taxes econometrically suggesting little or no major cyclical sensitivity of this revenue source. Franchise taxes, on the other hand, appear in all the models to be cyclically sensitive to inflation, implying that their inclusion in a local government revenue menu provides a budgetary cushion during an inflationary period. Spending- and income-based taxes are quite prone to cyclical fluctuations (although not always with income elasticities exceeding unity) suggesting that as the

TABLE 24

FORECAST ASSUMPTIONS AND RESULTS: KANSAS CITY
1982 AND 1983 FORECASTS
(in percents)

	Assumed				Projected Surplus (Deficit) as Percent of Projected Revenues[b]	
	Percent Change GNP[a]		Percent Rate of Inflation			
	1982 Forecast	1983 Forecast	1982 Forecast	1983 Forecast	1982 Forecast	1983 Forecast
1984	10.4	9.2	6.9	4.4	(1.4)	(1.7)
1985	9.7	9.0	6.4	4.7	(2.5)	(2.1)
1986	9.4	8.7	6.0	4.5	(3.8)	(3.0)
1987	9.1	8.7	5.7	4.5	(5.5)	(4.5)
1988	---	8.6	---	4.4	---	(6.1)

[a]Nominal terms.

[b]Under assumption of 5 percent annual wage and salary increases.

SOURCE: Tables 1 and 22.

menu of revenues made available to localities has been broadened, the local sector finds itself more prone to cyclical uncertainties. Nevertheless, this review suggests that the forecasters often assume only about one-half of all revenues to be sufficiently responsive to changes in national or local socio-economic conditions to justify their projection via methods other than simple trends or expert judgement.

The review of the spending forecasts reveal a great concern about price increase impacts on the local fisc. All of the models tie spending in some way to what they feel may happen to national prices. Furthermore, the Dallas simulation shows that the fiscal health of this Sunbelt city is tied to inflationary conditions in the economy. On the other hand, the Vancouver scenario showed that only when annual price increases rise to the order of 11 to 12 percent is its local budget sufficiently affected to yield deficits. Thus, with cooling inflationary pressures, city fiscal positions are seen to be improved vis-a-vis the first two years of this decade.

Forecasting Performance of Selected Models

While the preceding analysis has focused upon some of the more recent products of local forecasting efforts throughout the nation, additional information about the effects of cycles can be gained by a study of how past forecasts have performed in the face of changing business conditions. The analysis can also shed a bit of light on what is probably the most often asked question by policy-makers--can the formal forecasting techniques improve our ability to respond to a changing national economic environment? Still, this question cannot be answered fully here since it

would require, at the very least, a set of in-depth case studies of several cities to ascertain how behavior was altered by using a multi-year forecasting model.[1]

The approach used is to examine the forecasting outcomes in several cities that have produced multi-year forecasts for a sufficient period of time to permit an evaluation of their efforts. Unfortunately, the analysis is constrained again by a lack of data; nevertheless, some information is provided by a study of forecasting successes in New Orleans, Dallas, and San Antonio. We consider each in turn.

New Orleans.

The original New Orleans model was produced in late 1976 and early 1977 and was considerably simpler than its current model.[2] It does have the advantage that it is fully documented with the individual forecasting equations as well as the raw data included in the report.

Evaluation of forecasts can be approached in several different ways. Policy-makers are, of course, likely to be interested primarily in the accuracy of the point forecasts. Yet it is realized that no matter how good an underlying model is, the accuracy of the forecast is likely to be

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[1] It is possible to cite some anecdotal information such as delays in a major capital project in San Antonio when the recurrent costs associated with the facility were shown to be especially burdensome or the passage of a referendum providing for additional revenue measures in New Orleans when the dismal budgetary picture painted by the long-term forecasts were shown to voters. Such incidents do not, of course, constitute definitive evidence regarding the fiscal worth of longer term forecasting.

[2] See Madere, Municipal Budget Projections: Econometric Revenue Forecasting. It is this model which is evaluated here. For a comparison of the original 1976 model and the 1980 version, see Schroeder, Madere and Lomba, "Local Government Revenue and Expenditure Forecasting: New Orleans."

no better than the assumptions that underlie the projection. Therefore, it is also of interest to consider how well the model would have performed had the future course of the U.S. economy been known with certainty. Finally, if the data are available, one can observe forecasting errors on both the down- and up-side of the cycle to see if the model seems to track each equally well.

The 1977 New Orleans model used two principal measures of macroeconomic conditions--U.S. personal income and the consumer price index.[1] It also specified a linear linkage equation between U.S. and New Orleans personal incomes and used the predicted values of New Orleans income in nearly all of the forecast models. Thus, it is of interest first to examine the accuracy of the macroeconomic assumptions and the linkage equation.

Table 25 displays both the assumed and actual levels of U.S. personal income for the forecast period 1977-1980. While much of this period was characterized by economic expansion, there was a short but severe economic downturn between the first and second quarters of 1980. The national economy was also characterized by increasing inflation during the period. These two phenomena therefore account for the errors made in the underlying economic assumptions as shown in Table 25. By 1979 the original assumed level of U.S. personal income was nearly 12 percent below the actual, but the 1980 slowdown decreased that error to slightly less than 10 percent. On the other hand, the actual value of CPI exceeded the assumed level by

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[1]The model also relied upon interest rates and local population; however, in the revenue series examined here, neither of these variables were used.

TABLE 25

NEW ORLEANS' 1976 FORECAST ASSUMPTIONS

Economic Variable	Year 1977	1978	1979	1980
U.S. Personal Income (in billions)				
Assumed	$1513.7	$1652.2	$1719.1	$1951.1
Actual	1540.4	1732.7	1951.2	2160.4
Percentage Error[a]	-1.73%	-4.64%	-11.90%	-9.69%
CPI				
Assumed	$ 180.9	$ 192.2	$ 205.0	$ 217.9
Actual	181.5	195.3	217.7	247.0
Percentage Error	-0.33%	-1.59%	-5.83%	-11.78%
New Orleans Personal Income (in millions)				
Assumed	$3846.9	$4160.1	$4312.1	$4837.5
Revised[b]	3907.4	4342.9	4837.7	5311.4
Actual	3886.0	4308.0	4858.0	5543.0
Percentage Error				
Original Assumption	-1.00%	-3.44%	-11.24%	-12.74%
Revised Estimate	0.54%	0.81%	- 0.41%	- 4.18%

[a] Defined as $\left(\frac{\text{Predicted-Actual}}{\text{Actual}}\right) \times 100$

[b] Computed using original linkage equation and actual U.S. personal income.

SOURCES: L.E. Madere, Economic Analysis Unit, Municipal Budget Projections: Econometric Revenue Forecasting, New Orleans, Louisiana (New Orleans: July 1977), p. 80; U.S. Department of Commerce, Bureau of the Census, Survey of Current Business (Washington, D.C.: Government Printing Office, selected issues).

only 5.8 percent in 1979 but, in the face of dramatically increased prices during 1980, the error ratio had risen to nearly 12 percent.

Given downward bias in assumed levels of U.S. personal income, it is not surprising that by 1980 the New Orleans model was underpredicting local incomes by nearly 13 percent. On the other hand, when actual U.S. personal income is used in the linkage equation, that same error ratio drops to only 4.2 percent. The fact that the equation still underestimates New Orleans' income suggests that the local economy did not suffer from the early 1980 recession as severely as did the national economy. This may be attributed to the role played by oil and gas extraction in the New Orleans economy. Still, the overall implications of the data in Table 25 are that the initial linkage equation was a reasonably good one and that the relationship between the U.S. and New Orleans did not change significantly during the last several years of the 1970s. Furthermore, it shows that one major problem associated with long-term revenue forecasting is obtaining accurate projections of the national economy.

Table 26 contains the forecasting accuracy results for six of the more important revenue sources in New Orleans. Shown in the table are forecast errors associated with the original forecast together with the forecasts and associated errors if correct values of the independent variables were known at the time the projections were originally made. Thus, the total forecasting error can be decomposed into that due to the poor forecasts of the independent variable(s) and that due to the underlying structure of the model.

Additionally, projections of these revenue sources have been made using a naive simple linear growth rate "model". The growth rates were

TABLE 26

NEW ORLEANS' 1976 FORECAST ERRORS
(dollar amounts in millions)

Revenue Source	Basis of Data	Year 1977	1978	1979	1980
Sales Tax	Actual	$47.014	$53.550	$57.973	$61.637
	Original Forecast	$46.565	$50.444	$52.412	$58.992
	Percentage Error[a]	-0.95%	-5.80%	-9.59%	-4.29%
	Correct U.S. Income[b]	$47.312	$52.777	$58.987	$64.933
	Percentage Error	-0.63%	-1.44%	1.75%	5.35%
	Correct New Orleans Income[c]	$47.043	$52.340	$59.242	$67.839
	Percentage Error	0.06%	-2.26%	2.19%	10.06%
	Constant Growth[d]	$45.938	$49.705	$53.781	$58.191
	Percentage Error	-2.29%	-7.18%	-7.23%	-5.59%
Occupational License Tax	Actual	$ 4.134	$ 4.374	$ 4.690	$ 5.050
	Original Forecast	$ 3.883	$ 4.091	$ 4.284	$ 4.552
	Percentage Error	-6.07%	-6.47%	-8.66%	-9.86%
	Correct U.S. Income[e]	$ 3.904	$ 4.168	$ 4.550	$ 5.020
	Percentage Error	-5.56%	-4.71%	-2.98%	-0.59%
	Correct New Orleans Income[f]	$ 3.899	$ 4.161	$ 4.554	$ 5.059
	Percentage Error	-5.68%	-4.87%	-2.90%	0.18%
	Constant Growth	$ 3.927	$ 4.149	$ 4.383	$ 4.630
	Percentage Error	-5.01%	-5.14%	-6.54%	-8.32%

TABLE 26 (CONT.)

Revenue Source	Basis of Data	Year 1977	1978	1979	1980
New Orleans Public Service Franchise	Actual	$ 6.044	$ 6.337	$ 7.018	$ 7.833
	Original Forecast	$ 5.078	$ 5.428	$ 5.597	$ 6.184
	Percentage Error	-15.98%	-14.34%	-20.25%	-21.05%
	Correct U.S. Income	$ 5.147	$ 5.632	$ 6.184	$ 6.713
	Percentage Error	-14.84%	-11.12%	-11.88%	-14.30%
	Correct New Orleans Income	$ 5.122	$ 5.593	$ 6.207	$ 6.971
	Percentage Error	-15.25%	-11.74%	-11.55%	-11.00%
	Constant Growth[g]	$ 5.475	$ 6.320	$ 7.297	$ 8.424
	Percentage Error	-9.41%	-0.27%	3.98%	7.54%
Louisiana Power and Light Franchise	Actual	$ .169	$ .178	$ .217	$ .311
	Original Forecast	$ .141	$ .155	$ .162	$ .184
	Percentage Error	-16.57%	-12.92%	-25.34%	-40.84%
	Correct U.S. Income	$ .147	$ .164	$ .184	$ .202
	Percentage Error	-13.02%	-7.86%	-15.21%	-35.05%
	Correct New Orleans Income	$ .146	$ .163	$ .184	$ .211
	Percentage Error	-13.61%	-8.43%	-15.21%	-32.15%
	Constant Growth	$ .143	$ .155	$ .169	$ .183
	Percentage Error	-15.38%	-12.92%	-22.12%	-41.16%

TABLE 26 (CONT.)

Revenue Source	Basis of Data	Year 1977	1978	1979	1980
South Central Bell Franchise	Actual	$ 3.193	$ 3.322	$ 3.788	$ 4.212
	Original Forecast	$ 3.045	$ 3.315	$ 3.446	$ 3.899
	Percentage Error	-4.63%	-0.21%	-9.03%	-7.43%
	Correct U.S. Income	$ 3.097	$ 3.472	$ 3.899	$ 4.308
	Percentage Error	-3.00%	4.52%	2.93%	2.28%
	Correct New Orleans Income	$ 3.078	$ 3.442	$ 3.917	$ 4.508
	Percentage Error	-3.60%	3.61%	3.40%	7.03%
	Constant Growth	$ 3.199	$ 3.549	$ 3.937	$ 4.367
	Percentage Error	0.19%	6.83%	3.93%	3.68%
Tobacco Tax	Actual	$11.990	$12.244	$12.959	$12.774
	Original Forecast	$12.586	$13.246	$13.565	$14.670
	Percentage Error	4.97%	8.18%	4.68%	14.84%
	Correct U.S. Income	$12.715	$13.630	$14.670	$15.666
	Percentage Error	6.05%	11.32%	13.20%	22.64%
	Correct New Orleans Income	$12.670	$13.557	$14.713	$16.153
	Percentage Error	5.67%	10.72%	13.53%	26.45%
	Constant Growth[h]	$12.437	$13.065	$13.725	$14.418
	Percentage Error	3.73%	6.70%	5.91%	12.87%
Weighted Average Error of Forecasting Methods[i]					
	Original Forecast	-1.71%	-4.16%	-8.28%	-3.63%
	Correct U.S. Income	-1.12%	-0.20%	1.98%	5.47%
	Correct New Orleans Income	-0.81%	-0.94%	2.51%	9.72%
	Constant Growth	-1.96%	-3.83%	-3.89%	-1.75%

TABLE 26 (CONT.)

[a]Computed as $\left(\frac{\text{Predicted-Actual}}{\text{Actual}}\right) \times 100$.

[b]Based on original forecasting equation for revenue source but using actual U.S. personal income to project New Orleans personal income.

[c]Based on original forecasting equation for revenue source and actual New Orleans personal income.

[d]Based on average annual compounded growth rate in the revenue source between 1970 and 1976.

[e]Based on actual CPI and actual U.S. personal income.

[f]Based on actual CPI and actual New Orleans personal income.

[g]Based on average annual compounded growth rate in revenue source between 1970 and 1975.

[h]Based on average annual compounded growth rate in revenue source between 1971 and 1976 since there was a large increment in the revenue source between 1970 and 1971.

[i]The average errors have been based on only the six revenue components included in the table.

SOURCE: L.E. Madere, Economic Analysis Unit, Municipal Budget Projections: Econometric Revenue Forecasting (New Orleans: 1977); City of New Orleans, Econometric Software Package Computer Printout (unpublished, 1982).

based upon the calculated compounded rate of growth observed in the revenue source between 1970 and 1976 with the projections derived under the assumption that this growth rate would continue into the future. By comparing the errors from this naive method with those obtained under the previously-described methods, one can obtain another crude measure of the impact of the business cycle on these revenues since this linear growth approach ignores entirely the effects of exogenous events. Based on the analysis above, which concluded that New Orleans' revenues were quite insensitive to business cycles, it may be that this simpler method will project as well as the more complex alternatives.

The original sales tax equation was of a linear form and used New Orleans personal income and the sales tax rate as independent variables (the latter "cleans" the revenue series for rate changes over the estimation period). The first year forecast was exceptionally accurate underestimating revenues by only 1 percent. As one might expect, forecast errors have the tendency to grow as the forecast horizon is lengthened. This was the case for the New Orleans sales tax forecast through 1979, but in 1980, as the national economy turned downward, forecast accuracy improved so that even four years out there was still only a 4 percent error on this revenue source which constitutes the largest proportion of total revenues in the New Orleans budget.

Forecasts from the structural model have been made under two alternative assumptions. In the first, the correct values of U.S. personal income have been used in the New Orleans' linkage equation to simulate forecasted sales tax under the assumption that national forecasts had been perfect. For the second simulation, actual values of New Orleans personal

income have been used. When the forecast errors from this second alternative projection are compared with those from the original forecast, insight is gained concerning the structural stability of the revenue generating process.

For each of the years 1977-1979, use of accurate U.S. or local income data would have improved the accuracy of the forecast considerably. Interestingly, however, for the 1980 projection the original forecast was more accurate than had either actual U.S. or New Orleans' personal income data been available. The results suggest that in 1980 the underlying structural relationship between income and sales taxes had changed sufficiently such that the error due to these structural changes more than offset the use of inaccurate assumptions about the independent variable. Apparently, sales taxable consumption had fallen in New Orleans, possibly due to the severe downturn in the U.S. economy during the first half of the year, such that even though total personal incomes were still growing, consumption spending had fallen off. In part this may be due to the reliance of the New Orleans' economy on tourism.

The simple linear growth model performed very poorly relative to the econometric approaches during the first two years of the projection period. However, the apparent structural change which occurred in the relationship between personal income and sales tax revenues by 1980 allowed this simpler approach to perform nearly as well as the original model using inaccurate income estimates and do much better than would have occurred if accurate local income estimates had been available.

The occupational licenses tax was estimated in the original New Orleans' model as a linear function of both local real personal income and

the CPI. As shown in the table the original model consistently underestimated this revenue source. Use of the actual CPI together with actual values of either real U.S. or real New Orleans personal income did improve the forecast accuracy, especially in the out years of the projection. The lack of the same improvement in forecast accuracy for 1978 stems from the fact that the originally assumed level of CPI in that year was quite accurate therefore little was gained from the additional accuracy in the assumed level of personal income. By 1980, however, the gain from accuracy of assumptions was sufficient to make the original structural equation nearly perfect in its predictive power. The simple growth model predicted a bit better than did the original econometric approach throughout the projection period.

The New Orleans Public Service franchise tax equation used local personal income and two dummy variables representing the imposition of a fuel adjustment clause in utility billing and a rate increase dummy (each of which were assumed constant throughout the projection period and, as well, in the simulations here). Still, large prediction errors were obtained both from the original forecast and in the updated simulations. The reason for these errors, all of which show underestimates of the actual level of revenues, stem from two phenomenon. First, the rate change had taken effect only in 1976 therefore its full revenue implications may not have been captured by the equation. Furthermore, as has been noted above, the franchise tax is a gross receipts levy therefore the greater than average increase in utility prices during the last several years of the 1970s meant that the original model was unable to capture this structural change. This has been recognized in the 1982 version of the New Orleans

model where a measure of producer prices has been added to the forecasting equation.

The Public Service franchise tax is one instance where the simple growth model performs better than any of the alternatives.[1] The reason for this is, of course, due to the continual rise in utility incomes. The period 1970-75 saw New Orleans tax revenues from this source increasing at over a 15 percent annual compounded rate. A conservative model builder during the mid-1970s would probably have doubted a continuation of this trend; however, the error rates show that, with the benefit of hindsight, such an assumption would have been more accurate than tying these revenues to local incomes.

A similar phenomenon was affecting the results of the Louisiana Power and Light franchise tax which, in the original model was projected as a simple linear function of personal income. Again, this resulted in large underestimates of revenue. More accurate forecasts of the independent variable is still unable to overcome the errors associated with an altered behavioral structure. In this instance the extremely rapid growth in revenues during the projection period vis-a-vis the early 1970s resulted in forecast errors from the linear growth model nearly identical to those obtained from the original equation.

The South Central Bell franchise tax was forecast as a linear function of local personal incomes and a rate dummy variable. The simulation results suggest, however, that correcting for errors in assumptions

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[1] The growth rates there were computed for the period 1970-1975 rather than through 1976 since there had been a rate change in 1976 which would have yielded unrealistically high growth rates.

overcompensate such that their use in the original model produces overestimates of revenues. The implication here is that during the years 1978-1980 South Central Bell revenues were no longer as responsive to changes in U.S. or local personal incomes as had been the case during the estimation period. Again, the linear growth assumption was not consistently better or worse than the econometric alternatives.

The final simulation experiment was performed on the tobacco tax, an intergovernmental revenue received by New Orleans from the State of Louisiana. It was projected as a linear function of local personal income and a dummy variable set equal to one year (1973) when there was a change in State legislation. It has been included here for several reasons. First, it demonstrates that intergovernmental revenues can be projected econometrically although the results suggest structural accuracy may be difficult to attain since the linear growth approach produced results as accurate as were obtained from the models. Second, the fact that the original equation was based upon only six observations shows the potential problem of extrapolations based on only a handful of data points. Finally, it demonstrates that, contrary to some opinion, forecasters do not always underestimate future revenues.

A summary view of the forecasting errors of the New Orleans model are shown at the bottom of Table 26 and provide some interesting insight into the implications of the business cycle on city finances. The projections for 1977 show each of the methods underestimating revenues with the simple trend technique being the least accurate. Cyclical conditions probably brought about these low estimates. The final observation period prior to the forecast was 1976 and New Orleans was hard hit by the 1973-1975

recession and was recovering slowly relative to the nation in 1976. Thus, tying revenues to U.S. personal incomes would yield downward estimates of the structural relationship thereby producing underestimates of revenues by 1977 when the local economy began recovering more fully. Finally, the lower projection errors using actual income data rather than the assumed levels of income implies the structural model was still performing well in 1977.

The same general finding held through 1978. But by 1979 and certainly in 1980, with its short-lived recession, the underlying structural relationships determining local revenues had apparently changed sufficiently to allow the simple trend techniques to outperform the econometric forecasts, even when using actual income information. Nevertheless, for shorter term projections, the econometric techniques did perform quite well and provide insight not attainable from the trend technique. Indeed, local policy-makers in New Orleans judged the model sufficiently accurate to begin using it to produce revenue estimates for the annual budget and continue to do so. Furthermore, the single year predictive accuracy of the model (using updated estimates of the coefficients) has been exceptionally good with forecast errors of only 0.11 percent in 1979 and 0.22 percent in the recession year of 1980.[1]

Dallas

Multi-year forecasting in Dallas has had a shorter history than in New Orleans, yet it has been used for a sufficiently lengthy period to allow

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[1]Schroeder, Madere and Lomba, "Local Government Revenue and Expenditure Forecasting: New Orleans."

for some forecast accuracy analysis.[1] Although the necessary data are not available to replicate the same experiment performed for New Orleans, it is possible to review both the spending and revenue sides of the forecast. (It should be kept in mind, however, that as was stated above, formal evaluation of expenditure forecast accuracy can be misleading since one would hope that if deficits are projected and revenues are locally uncontrollable, the necessary cutbacks would force the spending projections to be in error.)

Table 27 shows 1980-81 budget data for a set of major revenue and spending categories as well as the amounts originally forecast in 1978. The 1978 projection indicated that a small surplus would occur in the Dallas General Fund and, not unexpectedly, the FY 81 budget also shows a small surplus.

Unlike the recently built models reviewed above, in 1979 Dallas projected property taxes via an econometric model specifying market value of taxable property as a function of the natural log of national personal income. The resultant predictions of market values were then adjusted by an assumed assessment ratio and multiplied by the current property tax rate to yield forecasted property tax revenues. Interestingly, this model performed quite well, underestimating FY 81 budgeted revenues by only 3.5 percent.

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[1] For a review of the early history of the Dallas model, see Roy Bahl, Larry Schroeder and Kurt Zorn, "Local Government Revenue and Expenditure Forecasting: Dallas, Texas," Occasional Paper No. 49, Metropolitan Studies Program, The Maxwell School (Syracuse, NY: Syracuse University, September 1981). The information in this section is based on Office of Management Services, City of Dallas, City of Dallas Long Range Financial Plan: 1978-79 to 1982-83 (Dallas: 1979).

TABLE 27

FORECASTING ERRORS: DALLAS, 1980-81
(dollar amounts in millions)

Revenue Source	1980-81 Budget	Forecast in 1978	Percent Error
Ad Valorem Taxes	$136.133	$131.264	- 3.58
Sales Tax	72.000	61.049	- 15.21
Power and Light Franchise Tax	20.703	18.314	- 11.54
Total Revenues	325.401	295.205[a]	- 9.27
Expenditure Categories			
Police	77.225	60.738	- 21.35
Fire	48.314	38.498	- 20.32
Streets and Sanitation	42.583	32.970	- 22.57
Building Services	15.411	12.692	- 17.64
Debt Service	44.603	41.789	- 6.31
Salary and Benefit Reserve	0.399	12.079	2927.32
Total Expenditures	325.396	294.965[b]	- 9.35
Surplus/Deficit	0.005	0.240	

[a]Excludes projected self-generated revenues of the Dallas Transit System, since it is not a part of the 1980-81 budgeted revenues.

[b]Includes only the projected net transfer to the Dallas Transit System since it was included in the 1980-81 budgeted expenditures.

SOURCES: Office of Management Services, City of Dallas, City of Dallas Long Range Financial Plan: 1978-79 to 1982-83 (Dallas: January 1979); Office of City Manager, City of Dallas, Summary Long Range Financial Projections: 1980-81 to 1984-85 (Dallas: May 1981).

Less successful were the projections of sales taxes and revenues from the Dallas Power and Light franchise tax. The sales tax forecasts were based on a function specifying the log of sales tax revenues dependent on total U.S. personal income. Unfortunately, the Dallas document provides no specific information on the numerical assumptions underlying the forecast other than a constant inflation rate of 6 percent. It is, therefore, impossible to ascertain the degree to which the structural model or assumed levels of U.S. incomes were the cause of these errors. It is interesting to note, though, that while Dallas used a time trend model to predict the Power and Light franchise tax (using a 12 percent annual rate of growth), the model still underestimated tax revenues.

The expenditure side of the budget was also underpredicted in Dallas with individual departmental spending underestimated on the order of 20 percent. Since total expenditures were underpredicted by only about 9 percent, the question arises as to where the compensating errors were made. In great part it is due to the projection method used in the Dallas forecast whereby, rather than attempt to tie wage increase forecasts to individual departments thus providing information in a collective bargaining environment, a special "salary reserve" spending category was created.[1] Therefore, while the table entries suggest that police spending was underestimated by over 20 percent, much of this "error" can be attributable to wage increases earned by police personnel. Still, it is not possible to determine whether the 9 percent underestimate of total

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[1]See Bahl, Schroeder and Zorn, "Local Government Revenue and Expenditure Forecasting: Dallas, Texas" for a further discussion of this technique.

spending was due to an unrealistically-low assumed inflation rate of 6 percent or to discretionary budget decisions that permitted spending to rise given that revenues were increasing.

San Antonio

The first multi-year forecast of revenues and expenditures in San Antonio was performed in early 1978.[1] Here we compare the projections of 1979-80 General Fund revenues and expenditures from that first forecast with what actually occurred. The results, shown in Table 28, indicate that the forecast projected a budget gap to occur in FY 80 even though a small general fund surplus actually resulted.

The San Antonio revenue model relies on structural equations only tangentially in that results from regression estimates (unpublished) are combined judgementally with an examination of past trends and likely future events to derive the final forecasted amounts. The technique led to a small overestimate of sales tax revenues but underestimates of the other two major revenue sources in San Antonio. The sales tax error may have been due to overly optimistic assumptions made in the forecast including the expectation of real GNP growth of between 4 and 5 percent from 1978 through 1980 and an inflation rate ranging from 4 to 7 percent. Projected

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[1] For a review of the San Antonio model, see Roy Bahl, Larry Schroeder and Marla Share, "Local Government Revenue and Expenditure Forecasting: San Antonio," Occasional Paper No. 48, Metropolitan Studies Program, The Maxwell School (Syracuse, NY: Syracuse University, September 1981). The information in this section is based on Department of Budget and Research, City of San Antonio, Long Range Financial Forecast: Fiscal Years 1978-1983 (San Antonio: 1978).

TABLE 28

FORECASTING ERRORS: SAN ANTONIO, 1979-80
(dollar amounts in millions)

Revenue Source	1979-80 Actual	Forecast in 1978	Percent Error
Sales Tax	$ 29.987	$ 31.027	3.47
Property Tax	39.964	32.094	-19.69
C.P.S.[a]	48.700	39.827	-18.22
Total Revenues	149.313	137.397	- 7.98
Expenditure Categories			
Police	36.244	35.096	- 3.17
Fire	19.943	20.174	1.16
Public Works	29.081	29.468	1.33
Parks and Recreation	12.355	16.353	32.36
Total Expenditures	149.115	141.510	- 5.10
Surplus/Deficit	.198	-4.113	

[a] C.P.S. is the City Public Service and Water Board.

SOURCE: Department of Budget and Research, City of San Antonio, Long Range Financial Forecast: Fiscal Years 1978-1983 (San Antonio, Texas: April 1978); Office of the City Manager, City of San Antonio, Proposed Consolidated Annual Budget of the City of San Antonio, Texas for the Fiscal Year October 1, 1981 Through September 30, 1982 (San Antonio, Texas: July 1981).

property tax revenues were less than the actuals since the forecast did not anticipate a change in local assessment practices implemented in 1979 and the fact that a much smaller proportion of total property tax collections were required to support the G.O. Debt Service Fund.[1] The underestimate of City Public Service revenues (a fixed proportion of the income earned by the city-owned utility) probably stemmed from unanticipated large increases in utility rates. Unfortunately, without a formal model, there is no way to evaluate formally the underlying causes of the forecasting errors.

For the most part spending was quite accurately projected with police expenditures slightly underestimated while both fire and public works spending was overestimated. The interesting projection error was the large overestimate of parks and recreation spending. In part this was apparently due to a policy decision to delay some service improvements that had been assumed in the original forecast. This decision has been attributed to the fact that the 1978 forecast showed explicitly a $1 million operating and maintenance cost increment in FY 80 attributable to planned new capital improvements within parks and recreation.[2] Thus, even if not totally accurate, the multi-year forecasting model may have helped San Antonio achieve its balanced budget in 1979-80.

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[1] By statute the local property tax in San Antonio is dedicated first to debt service with the remainder of the revenues flowing to the General Fund. The data in the table reflect only the General Fund portion.

[2] Maybe the most outstanding feature of the San Antonio forecasting document is the detailed cost estimates made by each agency for the entire projection period. Included in these estimates are the dollar and personnel impacts of new capital projects.

Summary

This paper has addressed the issue of the effect of the business cycle on the local fisc from the perspective of local multi-year budgetary forecasting models. Unfortunately, none of the models are identical and all contain different kinds and amounts of information. Therefore, a variety of analytical approaches have been used including: an examination of the particular methods used to link local revenue and expenditure forecasts with the national economy; a review of city-specific simulations; a discussion of the proportions of revenues and expenditures considered by forecasters to be linked to the national economy and the elasticities associated with these linkages; a simulation of four models through the down and upside of a national business cycle; and an examination of forecasting errors made in three older models. Reaching a well-defined conclusion from this wide variety of techniques is, therefore, difficult.

It should also be emphasized that the results regarding the effects of business cycles on the local fisc are based solely upon the implications drawn from what the forecasters specify as being those linkages (or lack thereof). Furthermore, spending projections are usually based on the assumption of a "constant level of services" rather than a prediction of how policy-makers will respond to external events. These caveats imply that the findings here cannot be interpreted as a measure of how past cycles actually influenced local budgets; instead, they are indirect findings as drawn from the models.

As might be anticipated, the single national measure most often linked to local budgetary forecasts is prices. While localities may view

themselves as essentially immune to national changes in real economic variables, price changes are perceived as beyond their control. This then suggests a direct impact of national economic events on the spending side of their budgets.

For those forecasts that attempt to link the national economy to local revenues, only a few do so by first formally estimating the national impact on the local economy. In great part this may stem from the lack of good up-to-date local economic data rather than the expectation that the locality is immune to national events since those forecasting documents which discuss the local economic environment seldom fail to mention the probable future course of the U.S. economy and its potential local impact.

From this review of the forecasting efforts it does appear that the concern for inflation is well-founded. A simulation of the impact of inflation on the Dallas budget suggested that for every additional dollar in revenues generated by increased prices, expenditures were expected to increase by over $2. Similarly, the other available models imply that prices affect directly nearly all expenditures whereas only about one-half of the revenue side of the budget is influenced by national economic events. Furthermore, when a recession and expansion were simulated on the models of Kansas City, Vancouver, New Orleans and Cincinnati, only in the last of these jurisdictions were revenues seen to grow at a significantly slower pace during recession than during expansion. The fact that Cincinnati's revenues depend heavily on the local income tax suggests the importance of the local revenue structure in determining the cyclical sensitivity of revenues. Interestingly, property taxes were viewed in all

of the models examined as being insensitive to fluctuations in economic conditions.

The bulk of this analysis was conducted on models constructed in the early 1980s when inflation was probably the foremost economic issue facing local jurisdictions. It is, therefore, interesting to find that the forecasting models were not substantially changed in 1983 when inflation had cooled and the U.S. economy was beginning to expand.

The ex post forecast accuracy analysis of the New Orleans revenue model supports the general conclusion of relatively little local revenue sensitivity to the national business cycle in that Louisiana city (although the time period encompassed by this analysis contained only one brief national economic downturn). Still, the econometric model performed very accurately in the first two projection years and would have performed even better had accurate forecasts of economic conditions been available. By the fourth out year in the projection period, however, sufficient structural changes had apparently occurred to weaken the predictive powers of the model such that simple trend techniques forecasted as accurately. Yet, this should not be considered a call to return to simple extrapolation forecasting techniques since, while exogenous forces may weaken the predictive power of the more complex models over time, the statistical approaches can capture the more immediate impacts of business cycles on the local fisc.