

Joint Legislative Audit and Review Commission

The Virginia General Assembly

**Revenue Forecasting
in the Executive Branch:
Process and Models**

**A Report in a Series
on the Executive Budget Process**

**REPORT OF THE
JOINT LEGISLATIVE
AUDIT AND REVIEW COMMISSION ON**

Revenue Forecasting in the Executive Branch: Process and Models

**TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA**



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Preface

JLARC was mandated by the 1990 Appropriation Act to review the executive budget process, including revenue forecasting, and budget preparation and execution. As the study began, it became apparent that there would be unusually large revenue shortfalls for the State in fiscal years 1990, 1991, and 1992. To answer questions about why these shortfalls occurred, JLARC's review was intensified, with priority attention given to revenue forecasting issues. Therefore, this report, the first in a series on the executive budget process, focuses on detailed reviews of the accuracy of Virginia's forecasts, the revenue forecasting process, the forecast models, and the effects of tax policy changes and judgmental inputs.

The JLARC review found that, historically, Virginia's forecast accuracy has been similar to that of other states and the federal government. Although the forecasts for FY90 through FY92 were unusually far off, the State's revenue shortfall does not appear to be the result of an unsound revenue forecasting process. While improvements could be made, the process meets the majority of criteria for an optimal forecasting process.

The magnitude of recent revenue forecast reductions was not the result of unsound or inadequately administered statistical models. Most of the reductions in the forecasts for the major tax sources of the General Fund can be attributed to declines in the economic indicators which drive the forecast models. However, over 40 percent of the reductions -- about \$622 million -- cannot be attributed to the economic indicators used in the models. Rather, they may be due to the effects of tax policy changes or judgmental inputs, factors which were difficult to substantiate independently in this study.

The Virginia General Assembly may wish to increase its involvement in the forecasting process. Relative to other states, there is currently little formal legislative participation in the development of Virginia's forecast. A variety of options are presented for further study and consideration.

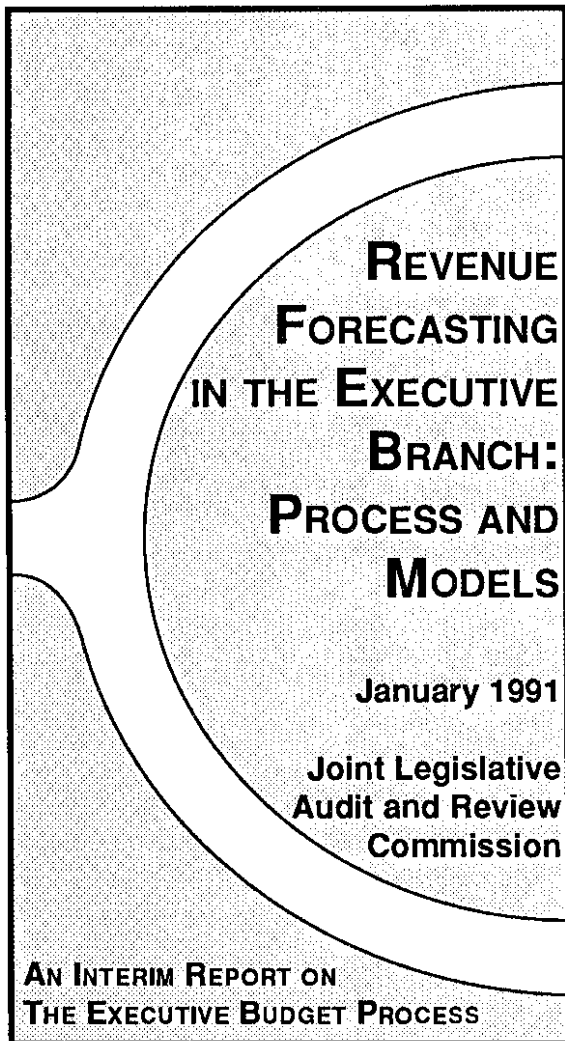
The Secretary of Finance and the Department of Taxation expressed general agreement with the findings and recommendations of the study. On behalf of the JLARC staff, I wish to express our appreciation for their cooperation.



Philip A. Leone
Director

January 31, 1991

JLARC Report Summary



Virginia experienced an unusually large revenue shortfall for FY90, with additional and substantial shortfalls expected for FY91 and FY92. The shortfalls have raised questions concerning executive revenue forecasting — Virginia's forecast accuracy, the forecasting process itself, the forecast models used and their administration, and the effects of tax policy changes and judgmental inputs. This interim report, the first in a series on the executive budget process, addresses these questions.

Forecasting is not an exact science — there will always be uncertainty associated with forecasting. Differences between revenue forecasts and actual collections are to be expected. Historically, Virginia's forecast accuracy has been similar to that of other states, the federal government, and national economic forecasting firms. However, revenue forecasts for FY91 and FY92 have been reduced to an unusually large degree: the current shortfall now approaches \$1.7 billion for the biennium.

The magnitude of the recent forecast reductions does not appear to be the result of an unsound forecasting process. While improvements could be made to increase accountability for the forecast, the process fully or partially meets the majority of criteria for an optimal forecasting process. Nor were adjustments to the forecast necessitated by problems with the statistical forecasting models. These models, and their administration, appear to be generally sound.

The majority of the shortfall in the General Fund appears to be due to an economic downturn. JLARC staff confirmed this with a technical replication of the statistical models used in the forecasting process. The remainder of the shortfall in the General Fund could be the result of tax policy changes and judgmental inputs, as well as normally-occurring forecast error. The lack of conclusive research on the fiscal impact of tax policy changes and the lack of documentation of judgmental inputs to the forecast make it difficult to independently substantiate the impact of these factors. Forecast error, on the other hand, is an inevitable part of forecasting.

If forecast error is inevitable, how can the legislature better anticipate changing revenue conditions that affect budget-

ary decisions? One step the General Assembly could consider is an increased role in the forecasting process. Relative to other state legislatures, the Virginia General Assembly plays a minimal role in the forecast process. Increased participation, however, would mean a commitment of more legislative time and money. The feasibility of such a commitment will need to be evaluated against the degree to which the desired outcomes — a more accurate revenue forecast and increased accountability — can be achieved.

In addition, the General Assembly may wish to protect the State's budget in case of unusually large forecast error by establishing a Revenue Stabilization Fund or "rainy day" fund. A proposal for such a fund is described in the JLARC special report, *Proposal for a Revenue Stabilization Fund in Virginia*.

Historically, Virginia's Forecast Accuracy Is Similar to That of Other States

The General Assembly has been told that Virginia's forecast accuracy over the past 16 years is two percent; in other words, forecasts differ from actual revenue collections by an average of two percent. However, the two percent figure is based typically on forecasts made only five months from the end of the fiscal year, a standard for forecast accuracy used by the executive branch for many years.

However, the forecasts the legislature actually uses for appropriations are one-and-a-half to two-and-a-half years from the end of a fiscal year. The accuracy of these longer-term forecasts in predicting collections averages from three to four percent. On average over the past 16 years, Virginia's forecast accuracy of three to four percent is similar to that of other states, national economic forecasting firms, and the federal government.

Recommendation. *The one-and-a-half to two-and-a-half year forecasts are those used by the General Assembly to make its budgetary decisions. Consequently, the Department of Taxation should monitor and report differences between forecasts and actual collections for all forecasts which the General Assembly may use in making appropriations.*

Forecasts for FY90, 91, and 92 Were Unusually Far Off

The FY90 forecast used by the 1989 General Assembly was 10.3 percent higher than actual collections, much higher than the three to four percent average over the last 16 years. The forecasts used by the General Assembly in its 1990 session to budget for the 1990-92 biennium are now expected to be even further off. For FY91, the difference between the original forecast and the most recent revision is 13.3 percent, while for FY92 there is a 16.8 percent difference. For the 1990-92 biennium, the shortfall has been estimated at \$1.7 billion.

Forecast Models and Their Administration Are Basically Sound

The unusually large downturns in the FY91 and FY92 revenue forecasts do not appear to be attributable to either unsound models or inadequate administration of the models. The model assumptions appear to be clearly understood by Department of Taxation staff, and the economic variables (personal income, gross national product, and unemployment rates) used in the models appear to be sufficient. In addition, the mathematics underlying the models appear sound. While accounting for regional conditions seems problematic, it is unclear whether the added complexity of formally modeling regions of the State separately would improve the accuracy of the revenue forecast models.

Most of the Downward Revisions to the Revenue Forecast Can Be Attributed to Declining Economic Indicators

Sixty percent of the forecast reduction in the major tax sources of the General Fund for FY91 and FY92 (approximately \$926 million) can be attributed to declines in economic indicators. In general, as economic indicators used in the models have declined, the model forecasts have declined. JLARC staff used the Department of Taxation's models of major tax sources and the corresponding economic data used in each model to reach this conclusion.

Some of the Shortfall Cannot Be Independently Substantiated

Over 40 percent of the decline in the major tax sources of the General Fund cannot be attributed to changes in economic indicators driving down the model results. This amount (approximately \$622 million) may be due to the effects of tax policy changes and judgmental inputs. JLARC staff were unable to substantiate independently the estimated impacts of tax policy changes because sufficient data are not yet available to verify the estimates. Also, while the forecast models are well documented, judgmental adjustments used to amend forecasts are not.

Recommendation. *The Department of Taxation should take steps to enhance its research and monitoring capability to predict better the impact of tax policy changes. Specifically, the Department should:*

- *Conduct more research to verify the estimated fiscal impacts of specific federal and State tax reforms.*
- *Collect itemized statistics of income.*
- *Develop additional sampling strategies for analyzing income tax returns.*

- *Separate out the components of non-withholding payments on monthly revenue reports.*

The Department should also document changes to its forecasts based on judgment.

Recommendation. *The Department of Taxation should ensure that sufficient documentation of each revenue forecast exists so that the Department of Taxation staff, or any other group reviewing the forecasts, can replicate each forecast. In the event judgmental adjustments are made to a forecast, they should be identified. A record should be made of the size of the adjustments and of the forecast errors with and without the adjustments.*

Legislative Involvement in the Forecast Could Be Increased

Greater legislative involvement in the forecasting process could theoretically improve forecast accuracy and would improve accountability for the forecast. There are a number of ways to increase legislative input, depending on the level of involvement desired by the General Assembly. No one option for increased legislative involvement is clearly preferable to others. Any option increasing legislative participation would cost Virginia's citizen legislature time and money, however. Therefore, the various options for increasing legislative involvement in the revenue forecasting process should be studied further. In the meantime, JLARC staff can continue to monitor the forecast process and models until the General Assembly determines what, if any, expanded role it wants in the forecasting process.

The General Assembly may also wish to formalize a collection-monitoring process and designate a legislative staff agency to execute it. Currently, the General Assembly relies primarily on the executive branch to analyze and interpret

revenue collection data. Formalizing such a collection-monitoring function in the legislative branch could provide the General Assembly an alternative early warning system to identify potential shortfall years. For instance, an analysis of individual income tax collections by JLARC staff indicates that FY90 experienced slow collections beginning in the first quarter, and continuing throughout the year. Through its first five months, FY91 is following a similar pattern, indicating the downward revisions in the forecast made thus far are justified.

Recommendation. *The JLARC Subcommittee on the Executive Budget Process may wish to consider options for increasing the level of legislative involvement in the revenue forecasting process and report to the full Commission by December 1991. Moreover, the General Assembly may also wish to formalize the collection-monitoring function in the legislative branch in order to allow an independent analysis of collection trends.*

Improvements in the Forecasting Process Could Increase Accountability

In addition to increased legislative involvement, other improvements in the forecasting process would enhance accountability. First, the executive branch should submit revenue-related reports on a regular basis, as required by the General Assembly. These reports have not always been submitted as required. In addition, the General Assembly may wish to clearly specify that an interim forecast, when used by a Governor to reduce appropriations or withhold allotments, should follow the same process as specified in the Code of Virginia for December 15 forecast estimates.

Recommendation. *The Secretary of Finance should monitor the submission of the "Monthly Report to the Governor" and the "Monthly Revenue Report" to ensure*

full compliance with Section 4-8.01(f) of the 1990 Appropriation Act.

Recommendation. *The General Assembly may wish to specify in Part 4 of the Appropriation Act or by revision of statute that any interim forecast upon which the Governor reduces appropriations or withholds allotments, and which is not submitted during a legislative session, should follow the forecast process as set out in Section 2.1-393 of the Code of Virginia.*

I. Introduction

Item 13 of the 1990 Appropriation Act directs the Joint Legislative Audit and Review Commission (JLARC) to "review the Commonwealth's executive system of financial planning, execution, and evaluation." The item further specifies that the scope and duration of the review should be determined by the Commission, and that a progress report should be made to the 1991 General Assembly and to each succeeding session until the project is completed. Because of the mandate's emphasis on Commission direction, staff met with the Commission or its budget subcommittee six times during 1990.

During this same period, the General Assembly was receiving periodic updates from the executive branch on the magnitude of the expected revenue shortfall for FY90 and the 1990-92 biennium. Despite previous reductions in the General Fund revenue forecast for FY90 totalling \$248 million, it appeared that FY90 revenues would still fall substantially below the official revenue forecast. Ultimately, General Fund revenues for FY90 fell short of the April 1990 official forecast by \$151 million. An interim revenue forecast produced in August 1990 reduced the General Fund revenue forecast for the 1990-92 biennium by \$1.2 billion. (A subsequent interim forecast in December 1990 estimated a \$1.7 billion shortfall for the biennium.)

At the September 1990 JLARC meeting, staff presented a study proposal encompassing the full breadth of the executive budget process, including revenue forecasting, budget development, budget execution, and evaluation. The study report and Commission briefing were proposed for completion in fall 1991. In view of the revenue shortfall predicted by the August 1990 interim forecast, however, the Commission designated certain issues related to revenue forecasting for priority review. Priority issues included the soundness of the executive branch revenue forecasting process, the accuracy of executive revenue forecasts, the technical soundness of forecast models, and the effects of major federal and State tax reforms on individual income tax collections.

Staff were directed to report on these issues prior to the 1991 General Assembly session. A JLARC subcommittee was established to guide the staff in their work. Meetings with the subcommittee were held in October, November, and December of 1990. Key issues discussed at those meetings are presented in this report. Other issues designated for long-term review by the staff will be studied as part of the continuing assessment of the executive budget process and addressed in subsequent JLARC reports.

VIRGINIA'S REVENUE FORECASTING PROCESS

Virginia's revenue forecasting process is an integral part of the State's fiscal planning. The process was formally codified in 1984, with responsibility for the

forecast given to the Governor. The Governor meets this statutory responsibility primarily through the Secretary of Finance and the Department of Taxation, although other State agencies support and contribute to the process. In addition, the process has evolved to include outside reviews by three separate advisory groups. These groups are: the Governor's Advisory Board of Economists (GABE), the Governor's Advisory Council on Revenue Estimates (GACRE), and the Governor's Economic Advisory Council (GEAC). These actors bring different perspectives to bear on the Department of Taxation's revenue forecast.

State Officials and Agencies Involved in the Revenue Forecasting Process

Section 2.1-387 of the *Code of Virginia* specifies that the "Governor shall be the chief planning and budget officer of the Commonwealth." In addition, Section 2.1-393 of the *Code* gives the Governor responsibility for annually preparing and submitting a prospective six-year estimate of anticipated General Fund and major Nongeneral Fund revenues to the General Assembly by December 15. The Secretary of Finance, the Department of Taxation, and other agencies develop or review estimates and forecasts to help the Governor fulfill this responsibility.

Secretary of Finance. The Governor's Secretary of Finance oversees the revenue forecasting process because the primary agencies involved in the process are in the finance secretariat. It is the Secretary of Finance who often presents the forecast details to the advisory groups and to the legislature. The Secretary also distributes information related to the forecast and collections.

Department of Taxation. The primary responsibility for preparing the Governor's revenue estimates lies with the Department of Taxation. The research division of the Department currently has five full-time staff positions devoted to forecasting responsibilities. The research division subscribes to the WEFA Group, a national economic forecasting firm, for national economic models and forecasts and a Virginia economic model. The WEFA Group provides almost all data inputs to the department's models on a quarterly basis. The research division then uses this information to develop projections of the State economy (separate from that provided by the WEFA Group) and to produce the revenue forecast for all but a few components of the General Fund. In addition, the research division coordinates the forecasting efforts among other State agencies to produce a single executive forecast.

Other State Agencies. In addition to the Department of Taxation, several other State agencies within the finance secretariat have responsibility for forecasting. The Department of Treasury projects interest earnings for the General Fund. The Department of Planning and Budget (DPB) develops the projections for the majority of Nongeneral Funds. In addition, DPB provides forecasts of miscellaneous transfers into the General Fund. While it does not have specific forecasting responsibilities, the Department of Accounts supplies a monthly revenue report comparing current collections to the prior year and to the forecast.

Agencies outside the finance secretariat also have forecasting responsibilities. For example, the Department of Alcoholic Beverage Control (ABC) is responsible for projecting ABC State Tax revenue and ABC profits, and the Department of Motor Vehicles forecasts Commonwealth Transportation Fund revenues. Future studies may address the roles played by other State agencies in the forecast process. For the most part, this report focuses on the roles of the Department of Taxation and the Secretary of Finance.

Advisory Groups Participating in the Revenue Forecasting Process

Section 2.1-393 of the *Code of Virginia* states that the Governor's December 15 estimates of anticipated General and Nongeneral Fund revenues shall be reviewed by two advisory boards:

- The Governor's Advisory Board of Economists, and
- The Governor's Advisory Council on Revenue Estimates.

This *Code* section also allows the Governor to establish any "such other advisory bodies as the Governor may desire." The Governor's Economic Advisory Council was created under this provision.

The Governor's Advisory Board of Economists. The statutory responsibility of the GABE is to review the Governor's revenue estimates with respect to economic assumptions and technical econometric methodology. In 1989, the GABE was composed of ten economists from both private industry and the State's universities. In 1990, members on the GABE increased to 12 economists. Typically, the GABE meets annually to discuss alternative national and State economic scenarios and recommends the adoption of the most probable scenario for both the nation and the State. Members of the GABE also critique the revenue forecasting methodologies and suggest changes to existing techniques. Depending upon the issues that may arise over the forecasting period, the GABE may reconvene at a later point to review the revenue forecast or to provide an analysis of specific topics.

The Governor's Advisory Council on Revenue Estimates. The statutory responsibility of the GACRE is to review the Governor's revenue forecasts with respect to economic assumptions and the general economic climate of the Commonwealth. In 1989, the GACRE was comprised of six members of the General Assembly and 22 private sector business leaders appointed by the Governor. The Lieutenant Governor and Attorney General are also typically invited to sit on the GACRE. The GACRE meets in November to review the outlook for the national and Virginia economies and evaluate the validity of the revenue forecast. As part of their review, GACRE members discuss the outlook for their respective businesses, industries, or areas of the State.

The Governor's Economic Advisory Council. The GEAC, first created during the Robb administration, has typically focused on the review of the economic and reve-

nue projections and recommends adoption of (or changes to) the forecast. The GEAC, which tends to meet more often than the GABE or the GACRE, was comprised of 12 business executives in 1989. In 1990, the number of GEAC members was increased to 15. The GEAC directly advises the Governor on fiscal information, which the Governor later releases to the General Assembly. Because the *Code* does not explicitly define the GEAC and its role, the Governor has the flexibility to define the role of the council in the State's fiscal planning process.

Producing the Forecast

A typical forecasting season begins in October when the GABE meets to review alternative national and Virginia economic forecasts, as presented by the WEFA Group and Department of Taxation research division staff. The GABE recommends the adoption of the most probable scenario for both the nation and the State.

To produce a starting point for the revenue forecast, research division staff enter a variety of economic data into a series of computerized statistical models (often referred to as "forecast models"). Generally, these models use regression analysis to predict future revenue collections based on the historical relationship between revenue collections and economic indicators. Department of Taxation staff may exercise their own judgment in adjusting the figures produced by the statistical models. The figures are also adjusted for the estimated fiscal impact of tax policy changes, such as those enacted by the Virginia Tax Reform Act of 1987.

The GACRE meets with the Governor to review the revenue forecast (typically in November). GACRE members share their views on the latest economic and revenue projections from the perspective of their various industries or areas of the State. Again, the administration may choose to revise the forecast based on this meeting.

Research division staff use new economic information to produce an updated revenue forecast for a meeting of the GEAC (typically held in early December). GEAC members provide the Governor with their judgments about the revenue numbers. Further revisions to the forecast may be made as a result of this meeting. The Governor releases the revenue forecast to the legislative money committees (Senate Finance, House Appropriations, and House Finance) in mid-December. With minor changes, this is the forecast introduced with the Governor's budget at the convening of the General Assembly in January.

In mid-February, the research division updates the economic and revenue projections with the latest data available. This forecast has typically been reviewed by the GEAC and released to the General Assembly. Final revisions to the forecast are made at the end of the legislative session. These revisions include the estimated fiscal impact of tax policy changes passed during the session.

Once the forecast is produced and in place, collections must be monitored to make sure the revenue target is met. The primary source of collections information is

a monthly revenue report produced by the Department of Accounts which compares current collections to the prior year and the forecast. Research division staff prepare a summary report on collections, which the Secretary of Finance may choose to disseminate to General Assembly members.

While the forecast "season" typically focuses on the upcoming biennium, forecasts actually begin at least six years prior to the year being forecast. As shown in Table 1, more than 30 forecasts were made to estimate General Fund revenues for FY90. These estimates began in late 1982 and continued until a few months before the close of FY90. The last forecast made is typically the "official forecast" figure used for historical and analytical purposes by the executive branch.

Revisions to the forecasts are made for a variety of reasons. Newer data may become available. Tax policy changes, such as a tax increase or decrease, can also dramatically affect assumptions. Economic conditions may change. Forecasts are revised periodically to reflect such changes to inputs and assumptions.

RESEARCH ACTIVITIES

JLARC staff used a variety of approaches to study the issues addressed in this report. To address the accuracy of executive revenue forecasts, staff analyzed Appropriation Acts and Department of Planning and Budget and Department of Taxation records of forecasted and actual revenues. Similar data were collected from 49 states through a JLARC telephone survey. In addition, data on the experiences of other states and the federal government were collected from a variety of governmental and professional publications.

To study the technical soundness of the forecast models, JLARC staff reviewed documentation of the models and their outputs. The timeliness and accuracy of economic input data provided by the WEFA Group were evaluated. The statistical models were analyzed and tested through simulations using the same input data and calculations used by the Department of Taxation in the development of forecasts. The effects of major federal and State tax reforms on individual income tax collections were assessed through an audit of research conducted by the Department of Taxation. Interviews were held with Department of Taxation staff to determine the processes and methods for fiscal impact assessment. Historical research documents were also reviewed as part of this process. To determine the tax policy research capability of the Department, interviews were held and technical documentation of data resources was reviewed.

To assess judgmental adjustments to the forecast, Department of Taxation staff were interviewed and various documents were reviewed. Judgments about collections patterns were also assessed. Revenue collections data, obtained primarily from monthly revenue reports provided by the Department of Accounts, were analyzed to identify trends. Interviews were held with Department of Taxation research division

Table 1

Revenue Forecasts for FY90

<u>Date</u>	<u>Product Where Forecast Appears</u>	<u>Source of Product</u>	<u>Recipient</u>	<u>Amount Forecast (\$ millions)</u>
December 1982	Six-year Forecast	Governor	Money Committees*	\$5,891.1
December 1983	Six-year Update	Governor	Money Committees	5,815.2
December 1984	Six-year Update	Governor	Money Committees	5,585.9
December 1985	Six-year Update	Governor	Money Committees	5,475.5
December 1986	Six-year Update	Governor	Money Committees	5,522.9
November 1987	November Revenue Book	Taxation/ GABE	GACRE	5,575.8
December 1987**	Table of Revenue Estimates	Taxation	GABE	5,645.2
December 1987	Table of Revenue Estimates	Taxation/ GACRE/ GABE	GEAC	5,672.2
December 1987	Presentation	Governor/ GEAC	Money Committees	5,672.2
January 1988	Budget Bill	Governor	General Assembly	5,689.2
February 1988	Table of Revenue Estimates	Taxation	GEAC	5,718.5
February 1988	Letter or Presentation	Secretary/ GEAC	Money Committees	5,718.5
April 1988	Appropriation Act	General Assembly	Public	5,736.7
November 1988	November Revenue Book	Taxation/ GABE	GACRE	5,978.2
December 1988	Table of Revenue Estimates	Taxation/ GACRE	GEAC	6,008.8
December 1988	Presentation	Governor/ GEAC	Money Committees	6,008.8
January 1989	Budget Bill	Governor	General Assembly	6,008.9
January 1989	Table of Revenue Estimates	Taxation	GEAC	6,016.5
February 1989	Letter or Presentation	Secretary/ GEAC	Money Committees	6,021.6

Table 1 (Continued)

Revenue Forecasts for FY90

<u>Date</u>	<u>Product Where Forecast Appears</u>	<u>Source of Product</u>	<u>Recipient</u>	<u>Amount Forecast (\$ millions)</u>
March 1989	Appropriation Act	General Assembly	Public	\$ 6,059.5
May 1989	Special Session Chapter 10	General Assembly	Public	5,990.2
May 1989	Table of Revenue Estimates	Taxation	Money Committees	5,890.0
November 1989	November Revenue Book	Taxation/ GABE	GACRE	5,728.1
December 1989**	Table of Revenue Estimates	Taxation	GABE	5,728.1
December 1989	Table of Revenue Estimates	Taxation/ GACRE/ GABE	GEAC	5,710.8
December 1989	Presentation	Governor/ GEAC	Money Committees	5,710.8
January 1990**	Special Budget Bill	Governor	General Assembly	5,710.8
February 1990**	Table of Revenue Estimates	Taxation	Some GABE Mem- bers/Legislative Staff	5,598.3
February 1990	Table of Revenue Estimates	Taxation/Some GABE Members/ Legislative Staff	GEAC	5,644.0
February 1990	Letter or Presentation	Secretary	Money Committees	5,644.0
April 1990**	Special Appropriation Act	General Assembly	Public	5,644.3

June 30, 1990	Actual Collections	\$5,494.9 Million
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* "Money Committees" refers to the House Appropriations, House Finance, and Senate Finance committees.

** Not normally part of the revenue forecasting process for FY90.

Source: JLARC analysis of Appropriation Acts; Department of Taxation documents and interviews; and *Code of Virginia* provisions.

staff to discuss collections patterns in recent years. Memoranda prepared by research division staff for the Secretary of Finance were also reviewed.

A number of approaches were used to evaluate Virginia's revenue forecasting process. JLARC staff examined the *Constitution of Virginia*, *Code of Virginia*, and the 1990 Appropriation Act to determine legislative intent concerning the revenue forecasting process. A search of professional forecasting literature was conducted to determine elements of an optimal forecasting process. An examination was conducted of all available minutes, documents, and meeting schedules of advisory groups involved in the revenue forecasting process from 1986 to 1990. In addition, two of the advisory groups involved in the process were observed in October and November of 1990. The JLARC telephone survey of other states, and documents provided by the National Conference of State Legislatures (NCSL) and the National Association of State Budget Officers (NASBO), provided information on the revenue forecasting process in other states. Throughout its research, JLARC staff interviewed current and past participants in the process.

REPORT ORGANIZATION

This chapter has provided a description of the evolution of the study mandate, an overview of the revenue forecasting process, and a description of the research activities used in the study. Chapter II provides an assessment of Virginia's revenue forecasting process, focusing on compliance with legislative intent, the extent to which Virginia meets criteria for an optimal forecasting process, and the possible need for improvements to the forecasting process including options for increasing legislative involvement. Chapter III reviews the results of the assessment of Virginia's revenue forecasts, including the historical accuracy of the models, the technical soundness of the models, the effects of tax policy changes, and revenue collection patterns. The study mandate, details on the forecast models, and the Department of Taxation's response to this report are included as appendixes.

II. Assessing Virginia's Revenue Forecasting Process

For FY90, there was an unusually large difference between the revenue forecasts legislators used for budgeting decisions and actual collections. The gap between the forecast and collections in FY90, as well as significant shortfalls projected for the 1990-92 biennium, raised questions concerning the forecasting process. Because of the magnitude of the shortfall and the importance of the revenue forecasting process to State fiscal planning and budgeting, the Joint Legislative Audit and Review Commission (JLARC) was asked to review the State's revenue forecasting process. This became a priority component of JLARC's study of the executive budget process. The objectives of the JLARC review of the forecasting process have been twofold:

- first, to determine whether the statutorily defined revenue forecasting process was followed for the FY90 forecast; and
- second, to determine whether Virginia's revenue forecasting process meets criteria for an optimal forecasting process.

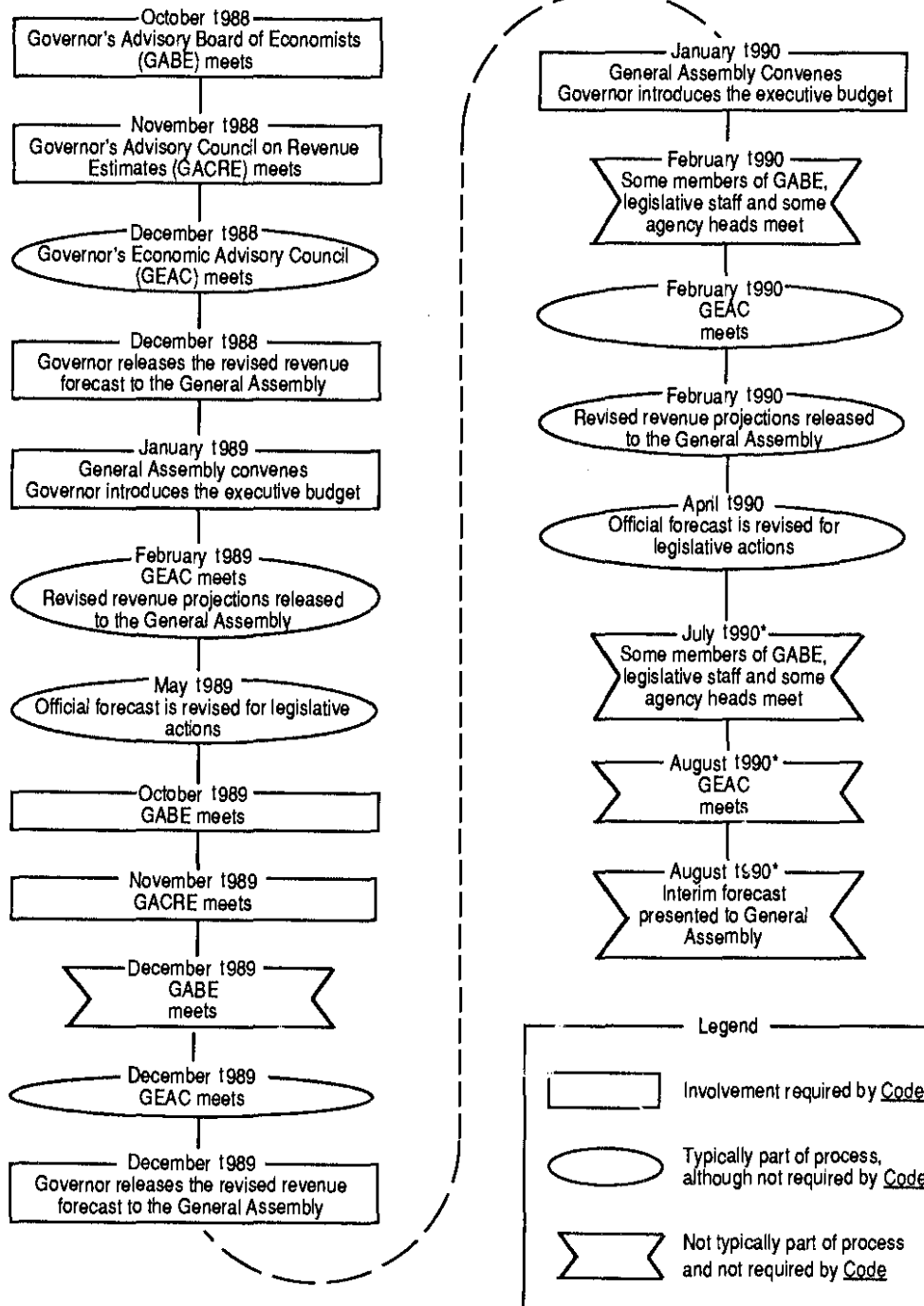
The process for the FY90 forecast did meet statutory requirements. However, the General Assembly may wish to specify whether interim forecasts, which have been unusual events in the past, should follow the existing statutory requirements for the Governor's December 15 forecast.

The process also meets or partially satisfies the majority of criteria JLARC staff identified for an optimal revenue forecasting process. However, the process could be improved by more fully conforming with several criteria. First, income data could be collected on a more timely basis. Second, the executive branch could more consistently share revenue-related information with the legislature. Third, documentation of judgmental inputs and calculations could be improved. Finally, legislative involvement could be increased. Several options for strengthening the General Assembly's participation in revenue forecasting are presented for the Commission's consideration. All of these improvements would increase executive branch accountability for the forecast, provide for a better informed legislature, and could, theoretically, improve forecast accuracy.

THE FY90 FORECAST PROCESS

The revenue forecasting process, as set out in the *Code of Virginia*, is a complex one. The requirements for the process were followed for the FY90 revenue forecast (Exhibit 1). In calendar years 1988 and 1989, the Governor's Advisory Board of Economists (GABE), the Governor's Advisory Council on Revenue Estimates (GACRE), and the Governor's Economic Advisory Council (GEAC) all met at least once prior to

Stages in the FY 1990 Revenue Forecasting Process



Source: JLARC analysis of Department of Taxation documents and interviews; and
Code of Virginia provisions.

the Governor's December 15 forecast for these years. As has become traditional, the GEAC also met to approve revised revenue projections in February 1989.

In February 1990 the process fundamentally departed from what has typically been the case. Normally, the GEAC meets to approve the revised forecast. However, in February 1990 three members of the GABE met, along with legislative staff and certain agency heads present, prior to a GEAC meeting to review the revised revenue estimates.

The interim forecast presented to the General Assembly budget and finance committees in August 1990, which affected FY91 and FY92, mirrors the process of February 1990. The process followed to develop this forecast differed from the process set out in the *Code of Virginia* since the full GABE and GACRE did not meet. However, this variance was not out of compliance with any statutory requirement. Section 2.1-393 of the *Code of Virginia* does not address interim forecasts, only the December 15 forecast.

Language in Part 4 of the Appropriation Act does speak to interim forecasts, but is unclear regarding whether an interim forecast estimate (based upon which the Governor reduces expenditures or withholds allotments) should follow the process used for the December 15 forecast. Section 4-1.04 of the 1990 Appropriation Act states that the Governor is given the power, authority, and responsibility to re-estimate the total General Fund revenues to be available during the current or next biennium. The Act goes on to state that the Governor shall take no action to reduce the General Fund expenditures or withhold allotments of appropriations on account of reduced revenues, "until such a time as a formal re-estimate of General Fund revenues for the current biennium has been reported to the chairmen of the Senate Finance, House Finance, and House Appropriations Committees."

The uncertainty lies in the intended meaning of "a formal re-estimate." If the General Assembly wanted the GABE and GACRE involved in interim forecasts, it could so specify in statute. The benefit of such a provision would be that it would ensure external review of any forecast revisions that could be the basis for spending cuts or other reactive measures.

Recommendation (1). The General Assembly may wish to specify in Part 4 of the Appropriation Act or by revision of statute that any interim forecast based upon which the Governor reduces appropriations or withholds allotments, and which is not submitted during a legislative session, should follow the forecast process as set out in Section 2.1-393 of the *Code of Virginia*.

EVALUATION OF VIRGINIA'S REVENUE FORECASTING PROCESS

Virginia's revenue forecasting process meets or partially satisfies the majority of the criteria JLARC staff identified for an optimal forecasting process. JLARC staff identified 14 criteria that an optimal revenue forecasting process would meet (Exhibit 2). The first ten criteria are from a paper entitled "Good Practices in Revenue Estimating" by the National Association of State Budget Officers (NASBO) and the Federation of Tax Administrators (FTA). These criteria were developed in response to a request from the National Governor's Association. The last four criteria, while not cited by NASBO, were often identified in professional forecasting literature. JLARC staff evaluated Virginia's revenue forecasting process using these criteria as well.

While Virginia's process met the majority of these 14 criteria, the forecasting process could be improved in several areas. Legislative involvement in the forecast could be increased. There are a number of options that could achieve this objective, depending on the level of involvement the legislature wishes to have in the forecast. The forecast process could also be improved with more timely collection of Virginia income data. Also, the executive branch should share revenue-related information with the legislature on a regular and timely basis. Finally, the Department of Taxation should identify and fully document judgmental inputs and calculations to the forecast. While improvements to the process may not guarantee increased forecast accuracy, especially during economic turns, they would increase accountability and knowledge of the forecast.

Virginia's Conformity With Forecasting Criteria

Virginia's process fully meets seven of the 14 criteria which JLARC staff identified. First, Virginia's process meets the criterion (number 1 on Exhibit 2) that governors should understand and participate directly in the development of a state economic forecast that has broad acceptance. Governors Baliles and Wilder attended all meetings of the GACRE during the period 1986 to 1990. In addition, the Governor himself chaired the majority of the GABE meetings. That the Governor should understand the degree of uncertainty associated with a revenue forecast is another criterion (number 4 on Exhibit 2) where Virginia's process follows optimal forecasting practices.

Virginia's process also meets a third criterion (number 2 on Exhibit 2) that the estimating process should utilize the expertise of academic and business economists in developing the state economic forecast. The GABE includes both private industry and State university economists in the development of the State economic forecast. Also, Virginia has a single executive revenue forecast, thereby meeting a fourth criterion for an optimal forecast (number #5 on Exhibit 2).

A fifth criterion (number 8 on Exhibit 2) points out the difficulty of drawing conclusions based on short-term revenue collections. Based on interviews with De-

Exhibit 2

Criteria for an Optimal Revenue Forecasting Process

The National Association of State Budget Officers (NASBO) in conjunction with the Federation of Tax Administrators (FTA) identified the following criteria for a good revenue forecasting process:

Virginia's
Process

- | | |
|---|-------------------------------------|
| 1. Governors should understand and participate directly in the development of a state economic forecast that has broad acceptance. | <input checked="" type="checkbox"/> |
| 2. The estimating process should utilize the expertise of academic and business economists in developing the state economic forecast. | <input checked="" type="checkbox"/> |
| 3. As part of the revenue estimating process, and to the extent possible, the legislative branch should be included in the development of the economic forecast. | <input type="checkbox"/> |
| 4. When presented with a revenue estimate, the Governor should understand the degree of uncertainty associated with it. | <input checked="" type="checkbox"/> |
| 5. An organizational structure should be established that aids the development of a single executive revenue estimate. | <input checked="" type="checkbox"/> |
| 6. Insure that the agency responsible for the revenue estimates has the data and personnel required to generate a good estimate. | <input type="checkbox"/> |
| 7. Require a monthly report on revenue collections and an annual report on the variance between revenue collections and revenue estimates. | <input type="checkbox"/> |
| 8. Monthly collections are a snapshot. Understand the difficulty of drawing conclusions based on short-term revenue collections. | <input checked="" type="checkbox"/> |
| 9. The revenue estimate is based on a certain set of economic assumptions. Maintain the flexibility to respond to dramatic economic changes by revising the revenue estimate. | <input checked="" type="checkbox"/> |
| 10. That the need to share revenue-related information with the public throughout the fiscal year be considered and that states be consistent in the practice they choose. | <input type="checkbox"/> |

These additional criteria for a good revenue forecasting process were often identified in professional forecasting literature:

- | | |
|---|-------------------------------------|
| 11. The successful use of experts requires that their projections be free of bias. This means that the expert panel should have a clearly defined role, be representative of important sectors of a state's economy, and that panel members feel free to speak frankly. | <input checked="" type="checkbox"/> |
| 12. The production of two independent revenue forecasts as opposed to one could improve forecast accuracy. | <input type="checkbox"/> |
| 13. In addition, a formal process developed to combine two independently produced revenue forecasts could further improve forecast accuracy. | <input type="checkbox"/> |
| 14. In the event that judgmental adjustments are made to the forecast, they should be identified. A record should be made of the size of the adjustment and of the forecast errors with and without the adjustments. This audit trail is one of the most important steps in substantiating the integrity of the forecast. | <input type="checkbox"/> |

Key:



- Meets criterion



- Does not meet criterion



- Question concerning whether fully meets criterion

Source: JLARC analysis of "Good Practices in Revenue Estimating"; *The Handbook of Forecasting*; and other professional forecasting literature.

partment of Taxation staff, Virginia's forecasters appear to understand this difficulty and thereby meet this criterion. Virginia's process also meets a sixth criterion (number 9 on Exhibit 2) of maintaining the flexibility to respond to dramatic economic changes by revising the revenue estimate. There appears to be sufficient flexibility in Virginia's process to respond based on changes in the economy. As explained in Chapter III, Virginia's forecast models are highly sensitive to changes in the economy's performance.

Finally, the successful use of experts requires that their projections be free of bias (number #11 on Exhibit 2). The role of the advisory groups in Virginia is clearly defined. They are representative of important sectors of the State's economy. Panel members, from JLARC staff observation, do appear to feel free to speak frankly. All of these contribute to protecting the forecast from bias.

Questions Concerning Virginia's Conformity With Forecasting Criteria

Virginia's process does not meet, or only partially conforms with, seven of the 14 criteria examined. These can be grouped into four general areas: data and personnel required to generate good estimates, consistent sharing of revenue-related information with the public (or its representatives), documentation of all judgmental adjustments made to the forecast, and finally, the level of involvement of the legislature in the revenue forecasting process.

Data and Personnel Required to Generate Good Estimates (Number #6 on Exhibit 2). There are two main data limitations that hinder the Virginia revenue forecasting process. The first is that Virginia does not collect its own income statistics. Federal statistics of income for the State's fiscal year ending in June are typically received much later in the calendar year. Therefore the data are not fully analyzed until after the forecast revision during the legislative session.

The second data limitation concerns the Department of Taxation's inability to disaggregate nonwithholding payments in a timely fashion. This inability may distort current year collections and makes it difficult to monitor yearly and seasonal trends in estimated payments. These data problems, including corrective options and recommendations, are fully discussed in Chapter III.

Also, according to Department of Taxation staff, personnel limitations within the research division are affecting the Department's ability to document the judgmental adjustments and calculations in the forecasting process. The Department of Taxation believes the planned addition of two staff people to the research division will help address this problem.

The Consistent Sharing of Revenue-Related Information (Numbers 7 and 10 on Exhibit 2). Section 4-8.01(f) of the 1990 Appropriation Act states that the Governor shall make available monthly to the chairmen of the House Appropriations, House Finance, and Senate Finance committees a report concerning the following:

- general indicators of economic condition;
- an analysis of year-to-date revenue collections, actual versus projected;
- an analysis of year-to-date expenditures, actual versus projected;
- employment levels for each branch of State government; and
- other key performance indicators and service levels as may be reasonably available.

The "Monthly Report To The Governor," produced by the Office of the Comptroller, complies with Section 4-8.01(f), except for an analysis of revenue collections. The "Monthly Revenue Report," also produced by the Comptroller, is not necessarily prepared in compliance with Section 4-8.01(f), but does fulfill the reporting requirement for analysis of revenue collections. While these reports comply with the reporting requirement, they are not always submitted as required. JLARC staff determined that the "Monthly Report To The Governor" was not officially prepared and filed for six months during FY90 (December 1989 through May 1990), and the "Monthly Revenue Report" was not officially filed for September 1989. JLARC staff are reviewing executive branch compliance with other budget-related reports and will report to the Commission on this issue throughout the budget study.

Recommendation (2). The Secretary of Finance should monitor the submission of the "Monthly Report to the Governor" and the "Monthly Revenue Report" and ensure full compliance with Section 4-8.01(f) of the 1990 Appropriation Act.

Documentation of Judgmental Inputs and Calculations (Number 14 on Exhibit 2). Department of Taxation staff indicated that little documentation of judgmental inputs and calculations was made at the time of the forecasts. Consequently, Department of Taxation staff were, at times, unable to fully explain to JLARC staff exactly what calculations were made in generating past revenue forecasts and the rationale for these forecasts.

This lack of documentation of judgmental inputs makes it impossible to fully audit and substantiate changes to the State's revenue forecasts influenced by judgment (of Department of Taxation staff or the Governor's advisory groups). It also makes errors in calculations or assumptions difficult or impossible to detect and correct. Therefore, the executive and legislative branches cannot know how much of the shortfall is attributable to normal forecast error and how much is attributable to judgment.

Adequate documentation is important as a general principle in forecasting, but is especially important when relied on for State revenue estimates. Additional discussions of this issue and its effects on the forecasts are contained in Chapter III.

Legislative Involvement in the Forecast (Numbers 3, 12, and 13 on Exhibit 2).

Relative to other states, there is currently little formal legislative participation in the development of Virginia's forecast. Formal participation is limited to the membership of certain legislators on the GACRE. For the FY91 forecast, legislators were invited to participate in some additional forecast activities, such as the GABE meeting in October 1990. Also, legislative staff have been routinely invited to GABE meetings for several years. Options for increasing legislative involvement in revenue forecasting are discussed in greater detail in the following section.

Regardless of which broad option is chosen, however, legislative involvement in the revenue forecasting process could be increased by simply formalizing a revenue collection monitoring function in the legislative branch. (Methods for monitoring collections are discussed in detail in Chapter III.) This would provide an alternative early warning system if collections are falling below the forecast. It would also allow for an independent analysis of collection trends. Existing legislative staff, such as JLARC staff or staff of the House and Senate Finance committees, could provide this service. A monthly analysis could be distributed to the chairmen of House Appropriations, House Finance, and Senate Finance committees.

Recommendation (3). The General Assembly may wish to formalize the collection monitoring function by establishing an independent monthly analysis of collection trends to be produced by legislative staff. This function could be performed by JLARC staff until the General Assembly determines which, if any, permanent forecasting role it wants.

OPTIONS FOR INCREASING LEGISLATIVE INVOLVEMENT IN REVENUE FORECASTING

Besides monitoring collections, additional legislative involvement could take many forms. Based on a 1987 study by the National Conference of State Legislatures (NCSL), there are four basic roles state legislatures can assume. These roles are (1) a limited legislative role, (2) a technical assessment role, (3) a joint legislative and executive (consensus) role, and (4) an independent legislative role. Implementation of these options in Virginia could range from hiring one economist (to monitor the existing executive forecast models and process) to creating a new legislative staff unit (to produce an independent forecast). The cost of these options could vary from \$90,000 to \$350,000 annually.

Moving from the limited to the independent legislative role clearly enhances the legislature's participation in the process. However, there are considerations that need to be addressed before deciding what role the General Assembly should take. For example, as the legislature becomes more involved in the process, costs and legislator time associated with the increased involvement rise dramatically. Depending on the role selected, the time commitment required of legislators could further tax the concept of Virginia's part-time citizen legislature.

Limited Legislative Involvement

NCSL identified Minnesota, Oklahoma, and Texas as states whose legislatures have a limited role in the revenue forecasting process. This role most closely approximates the current role of the Virginia General Assembly in the revenue forecasting process, and appears to predominate in states where there is a strong executive branch revenue forecasting process already in place. In this role, the most active legislatures review and comment on the executive revenue forecast. The least active legislatures simply receive the forecast.

This limited role does have its advantages. First, it is inexpensive. Little specialized staffing or computer resources are required. Second, it keeps the revenue forecasting process as simple as possible since there is little public debate about the appropriateness of the revenue forecast. According to NCSL, this role seems more appropriate in states where the executive branch forecast group has a solid reputation for objectivity and professionalism.

There is a disadvantage to such a legislative role, of course. It substantively excludes the legislature from the revenue forecasting process. As noted earlier, NASBO recommends the active involvement of the legislature in the development of the forecast. Members of the JLARC Subcommittee on the Executive Budget Process have expressed an interest in exploring alternatives to the General Assembly's current role in the revenue forecasting process, indicating that the limited role may not be the most desirable option for Virginia.

Technical Assessment

One method for enhancing the legislature's participation in revenue forecasting is to develop a stronger technical assessment capability in monitoring the executive forecast. Such a capability could provide the General Assembly with a more thorough understanding of the data, models, and assumptions associated with the revenue forecast. This type of legislative role seems to be well suited for legislatures in states where the official revenue forecast is primarily the product of the executive branch.

Conducting an Assessment of the Forecasting Process. In order to conduct a technical assessment of the revenue forecasting process, the General Assembly would need to acquire full-time quantitative expertise and computer resources. An individual, preferably with an advanced degree in economics (with a quantitative emphasis), could be hired on a full-time basis. This individual would represent the General Assembly in monitoring and assessing the revenue forecasting process. The economist's full-time job would be to assess the administration and technical soundness of the revenue forecasting models, the economic indicators, and subjective judgments used in the models. In addition, this staff person would attend all revenue forecast advisory board and council meetings to monitor and question the forecasting process and the revenue forecast itself.

Finally, an assessment of the official revenue forecasting process would require replicating the official forecast. Such a process would be similar to the one undertaken by JLARC staff for this study. The forecasting models would be the same ones used by the executive branch in developing the revenue forecast.

The findings of the assessment of the revenue forecasting process could be reported in a number of ways. For example, formal reports and briefings could be presented to the Senate Finance, House Finance, and House Appropriations committees, or others designated by the General Assembly.

Advantages and Disadvantages. The technical assessment role has several advantages. First, it requires only one full-time staff position. Second, it greatly increases legislative input to the revenue forecasting process with minimal disruption. Third, because there is only one staff position involved in the assessment, selecting a location for the function would not be difficult. Finally, legislative input is almost immediate. Once the staff person is hired, it should take relatively little time for him or her to fully assume the oversight role of the revenue forecast. The primary disadvantage of the technical assessment role is that it stops short of producing a legislative revenue forecast.

Estimated Cost. The annual costs associated with a technical assessment role would be approximately \$90,000. About \$70,000 is for salary and benefits for the staff (equivalent to a Grade 17 position) conducting the assessment of the official revenue forecast. Other possible expenses include office space, subscriptions to economic data sources and professional publications, travel and registration fees for professional economic forecasting conferences, and computer costs.

Joint Legislative and Executive Role

NCSL refers to the joint legislative and executive role as a “consensus” role because both the legislative and executive branch have input to the final revenue forecast. NCSL notes that this role is being considered by states that are experiencing problems with their current revenue forecasting process. In essence, a single revenue forecast is derived or negotiated by representatives of both the executive and legislative bodies.

Conducting a Joint Legislative and Executive Forecast. NCSL identified, among others, Florida, Wyoming, and Delaware as states whose legislatures are involved in developing a joint revenue forecast with the executive branch. The role taken by the legislature in this scenario can vary greatly. In Florida, the process consists of a number of consensus forecasting conferences held in the Fall that are made up of professional legislative and executive branch staff with revenue and economic forecasting backgrounds. No elected officials are involved. Forecasts developed by both the legislative and executive branches are presented and debated. The forecast finally agreed upon is the official forecast used in the governor’s budget bill

and is the only forecast used by either branch of government. A conference is also held in the spring to provide final estimates for the legislature's appropriation.

Other states take different approaches. For example, in Delaware a council made up of legislators, business people, and executive branch officials prepares the state's forecast. This forecast is then approved by the legislature and the governor. In Kansas, the forecast is developed by representatives of the governor and legislative fiscal staff with input from economists from the state's university system.

Such a forecasting process would operate best with clear statutory authority. Specific statutory authority would provide clear responsibilities for all participants in the forecasting process. If such a process were adopted in Virginia, staff involved in the forecasting process would probably report to the Senate Finance, House Appropriation, and House Finance committees.

Advantages and Disadvantages. NCSL noted a number of advantages to this type of process. First, the joint legislative and executive forecast provides a great deal of legislative input because all forecasting conference members have equal input. Second, because this process is a consensus, some resources such as computer hardware and software could be shared, reducing the need for some expensive duplication of effort. Finally, the joint legislative and executive forecast is said to depoliticize the revenue forecasting process in some states because both the legislative and executive branches are aware of all assumptions in the forecasts.

Of course, there are potential disadvantages to this process. Such a role may not be feasible in states where the executive branch produces the primary forecast and is unwilling to share those responsibilities. Staff from the legislative forecasting unit in Florida noted that their process worked well because the legislative branch's power is co-equal with, or even greater than, the executive's. Second, it could take a great deal of time simply to hire staff for this unit. Finally, such a process would be more costly in terms of staffing. Florida reports allocating about two full-time equivalent positions to staff their revenue forecasting function.

Estimated Cost of the Joint Legislative and Executive Role. The costs associated with this role are greater than those associated with the technical assessment role. Based on Florida's experience, a preliminary estimate of the total annual cost could approach \$200,000. This includes \$119,000 for salary and benefits for two full-time equivalent positions (equivalent to Grade 14 and 17 positions), office space, travel to professional conferences, subscriptions to forecasting periodicals and consulting organizations for economic data, and computer costs.

Independent Legislative Role

In this role, a separate legislative revenue forecast is produced as an alternative to the executive branch's forecast. According to NCSL, legislative units that produce revenue forecasts are generally acknowledged to have parity with their

executive branch counterparts. Unlike the joint legislative and executive revenue forecast role, however, there appears to be no formalized process to select which forecast will be the official one on which final budget and appropriation bills are developed. NCSL describes legislatures assuming this role as “strong legislative systems.”

Conducting an Independent Legislative Forecast. NCSL identified New York, Michigan, and Illinois as states whose legislatures conduct independent legislative forecasts. The process for conducting an independent legislative revenue forecast is almost identical to the process used by the executive branch’s forecasting unit. This process would likely involve a great deal of legislative staff and legislators’ time. Staff would be required to prepare independent revenue forecasts that would be used as alternatives to the executive branch’s forecasts. This would entail developing and administering revenue forecasting models and using judgmental inputs to produce a revenue forecast. Staff would also need to develop expertise in national and State forecasting which would be valuable in monitoring the State’s revenue projections.

Decisions addressing the conduct of tax policy research would need to be made. For example, the Department of Taxation has research staff and special research software available to analyze the impact of tax law changes on the revenue forecast. The General Assembly would need to decide whether to use the analysis completed by the Department, or to conduct such research using its own staff and resources. It is important to note that including tax policy research as part of the legislative forecasting role would increase costs.

There would also need to be decisions on what type of review process the legislative forecast should have. Currently, the executive revenue forecast is reviewed by the Governor’s Advisory Board of Economists, the Governor’s Advisory Council on Revenue Estimates, and the Governor’s Economic Advisory Council. Such exposure can lend important credibility to the revenue forecasting process and provide input that could result in appropriate adjustments.

Decisions concerning the manner in which the revenue forecast was selected also need to be made. In addition, a formal timetable for selecting a final revenue forecast figure would be needed to prevent reducing the amount of time available to the legislative appropriation process. Staff assigned this role could report to the Senate Finance, House Appropriations, and House Finance committees.

Advantages and Disadvantages. According to NCSL, the primary advantage to the independent legislative forecast is that it provides the legislature with a professional revenue forecast that can be used as an alternative to the executive branch revenue projections. Disadvantages, however, are numerous. First, it can seriously politicize the revenue forecasting process. Second, it can delay the legislative appropriations process while there is debate over which forecast figure is to be used.

Third, developing an independent legislative revenue forecasting capability can take a great deal of money and time. From the time the forecasting unit is

authorized until it produces its first revenue projection could take two years. Legislatures in states like Michigan, Illinois, and New York reported allocating an average of seven full-time equivalent positions to revenue forecasting duties. The legislatures in these states are virtually full-time legislatures with no limit on session length or duration.

Finally, while conceptually an independent forecast process should increase accuracy, JLARC data would suggest otherwise. JLARC staff found that the 33 states with independent legislative forecasts had an average FY90 forecast error of 4.4 percent, while the 16 states (excluding Virginia) without independent legislative forecasts had an average FY90 forecast error of 4.3 percent. As a result, the substantial commitment of time by Virginia's citizen legislature might not yield significant results. However, these figures represent forecast results from only one point in time. An analysis of an individual state's forecast accuracy over a period of years would need to be completed to fully determine whether revenue forecasting accuracy improved when the legislature implemented its own forecast.

Estimated Cost of Independent Legislative Role. Clearly, this option would be the most costly. JLARC staff used the costs associated with the State's revenue forecasting unit located at the Department of Taxation as an indicator of potential cost. Based on five approved positions in the forecasting unit at the Department of Taxation (one Grade 16, two Grade 14, and two Grade 12 positions), total personnel and support costs would be approximately \$250,000 annually. Additional costs such as computer charges, subscriptions to data from an economic forecasting firm, and costs associated with advisory group meetings could increase the annual cost to at least \$300,000.

If the pro-rated costs for the time the Department of Taxation's Research Director (a Grade 17 position) devotes to revenue forecasting were included, annual costs could reach \$350,000. In addition, personnel costs would increase if positions were added to carry out tax policy analysis currently conducted at the Department of Taxation. Neither cost estimate includes expenses associated with office space, overhead (utilities and maintenance), and administrative staff support.

Conclusion

The General Assembly has at least four options available for increasing its participation in the State's revenue forecasting process. While each option should enable the General Assembly to have greater participation, each option will also increase the commitment of both legislative time and money. The feasibility of such a commitment will need to be evaluated against the degree to which the desired outcome — a more accurate revenue forecast — is achieved. In addition, other decisions related to increased involvement in the revenue forecast process will need to be made. For example, where the legislative staff assigned to the revenue forecast will be located must be decided. Formal reporting procedures and guidelines also will need to be developed.

Finally, consideration will need to be given to how the legislative role in the revenue forecasting process would interact with the executive's role. Increased legislative involvement would probably be of little benefit with no formal mechanism to provide input to the final revenue forecast. These and other issues can be studied further during JLARC's review of the executive budget process.

Recommendation (4). The Joint Legislative Audit and Review Commission Subcommittee on the Executive Budget Process may wish to consider options for increasing the level of legislative involvement in the revenue forecasting process and report recommendations to the full Commission by December 1991. The Joint Legislative Audit and Review Commission may wish for staff to continue to monitor the revenue forecasting models and process until the General Assembly determines which, if any, permanent forecasting role it wishes to assume.

III. Assessment of Virginia's Forecasts

Three fundamental components are included in the revenue forecasts used by the Commonwealth: (1) the statistical models and their results; (2) supplementary calculations that estimate the impacts of tax policy changes; and (3) judgmental inputs, including those based on examining the most recent monthly revenue collections. Assessing these components is one way to evaluate Virginia's revenue forecasts. Another method of assessing the forecasts is to examine outcomes at a broad level, in terms of the differences between past revenue forecasts and actual collections.

JLARC staff used both of these approaches to assess Virginia's revenue forecasts. The primary conclusions from this assessment are:

- Virginia's forecasting experience, on average across the past 16 years, appears to be similar to that of other states, national economic forecasting firms, and the federal government. Normally occurring forecast error appears to range from three to four percent.
- The unusually large downturns in the FY91 and FY92 revenue forecasts do not appear to be attributable to unsound models or inadequate administration of the models.
- The majority (60 percent) of the downturn in the FY91 and FY92 forecasts for the major tax sources can be attributed to changes in economic indicators, on which model forecasts are based.
- JLARC staff found revisions attributed to tax policy changes and subjective judgment difficult to substantiate independently.
- More timely data can be collected to substantiate fiscal impact estimates for tax policy changes in the future.
- Little documentation of judgmental inputs and resulting calculations is made for forecasts.
- Monitoring and analysis of monthly collections data can be improved to provide early warning of revenue shortfalls. Collection patterns seem to indicate that the most recent forecast, in December of 1990, will require above-average collection patterns for the remainder of FY91.

DIFFERENCES BETWEEN REVENUE FORECASTS AND ACTUAL COLLECTIONS

Differences between revenue forecasts and actual collections normally occur and should be expected. For several administrations, the General Assembly has received reports that Virginia's revenue forecasts are accurate within two percent, which is more accurate than those of most other states. These reports have been true. However, these reports have been based on the reported accuracy of forecasts only five months away from the end of the fiscal year, the standard used by the executive branch for years. For budgeting purposes, the General Assembly actually uses revenue forecasts made one-and-a-half to two-and-a-half years before the end of a given fiscal year. It is important, therefore, that the General Assembly also be aware of the normally-occurring differences between the forecasts actually used for its appropriation decisions.

When the accuracy of these longer term forecasts is examined, Virginia's forecasts are correct (on average) within three to four percent, which is in the same range as those of other states, the federal government, and national economic forecasting firms.

Differences Between Forecasts and Collections Are Normal Occurrences in Virginia

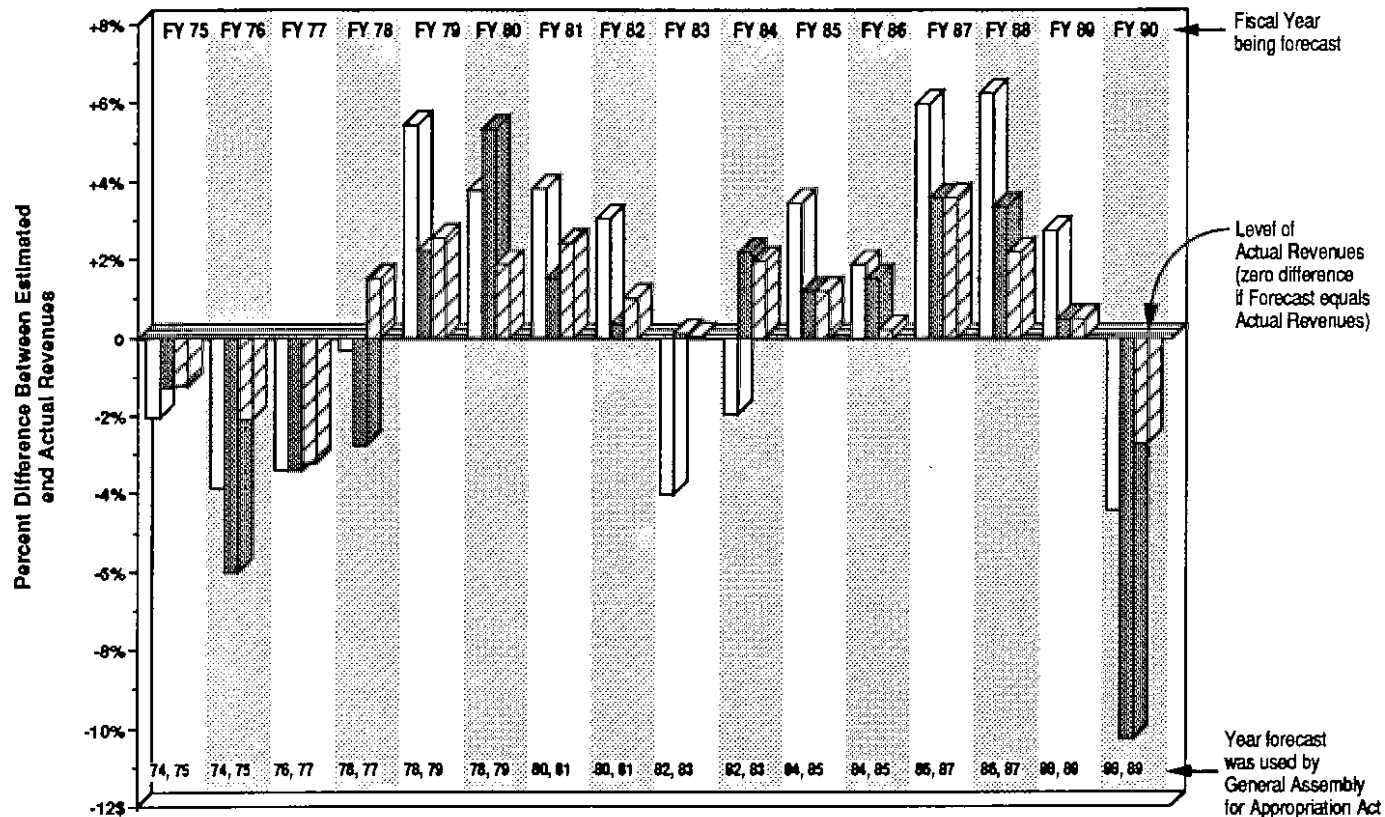
For any given fiscal year in Virginia, there is more than one separate forecast of General Fund revenues. For the most part, there is always some difference between a forecast and collections. In general, as shown in Figure 1, forecasts for a given fiscal year are made at different times. The further out a forecast is from the end of the fiscal year being predicted, the less accurate the forecast tends to be. As shown by the white bars in Figure 1, forecasts used in the first General Assembly session for biennial appropriations differed on average from actual collections by approximately 3.5 percent. Forecasts used in the second General Assembly session for biennial appropriations differed on average from collections by approximately 2.9 percent (represented by the gray bars). And the final official forecasts, produced approximately five months before the end of each fiscal year, differed on average from collections by approximately 1.8 percent (represented by the striped bars). This smaller difference is the standard the executive branch has used for years in assessing forecast accuracy.

A more relevant measure for the General Assembly would be based on estimates used during the session. Over the period examined, these differences have ranged from 0.1 to 10.3 percent. Collections have been lower than forecasts in seven out of the 16 years.

Larger differences between forecasts and actual collections appear to come when there are turns in the economy, such as the recessions of the mid-1970s and early 1980s. The largest difference shown in Figure 1 occurred in a forecast for FY90. This

Figure 1

Percent Differences Between General Fund Forecasts Used by General Assembly and Actual Collections



FIRST-YEAR GENERAL FUND REVENUE ESTIMATES
(3.5 percent average difference) This estimate used by General Assembly in the first Appropriations Act

SECOND-YEAR GENERAL FUND REVENUE ESTIMATES
(2.9 percent average difference) This estimate used by General Assembly in the second-year Appropriations Act

DIFFERENCE REPORTED AS FINAL OFFICIAL FORECAST
(1.8 percent average difference) Used by the executive branch as its standard measure of forecast accuracy.

Source: 1980 through 1990 Appropriation Acts. Forecast points do not reflect subsequent tax policy, economic, or other changes. Does not include transfers or ABC profits.

unusually large difference has been attributed by Department of Taxation staff to changes in tax policy (such as pension reform and tax reform) and to a downturn in the economy.

Virginia Forecast Differences Are Comparable to the Federal Government and Other States

The differences between Virginia's forecasts and collections are comparable to those of federal government revenue forecasts. Over the last 16 years, the average difference between the federal government's forecasted revenues (made approximately a year-and-a-half before the end of the fiscal year forecasted) and actual collections was 3.2 percent. The differences ranged from 0.1 to 13.2 percent. In eight out of these 16 years, federal collections were lower than the forecasts.

Virginia's forecasting experience appears to be comparable to those of other states as well. In 1985, the Public Policy Institute of New York collected data on 29 states' forecasts from 1978 to 1984 (for a report entitled *An Analysis of State Revenue Forecasting Systems*). The median difference between forecasts and actual collections was reported to be 3.0 percent. In 1990, JLARC staff conducted a survey of the other 49 states' forecasts for FY90. The average difference between the forecasts and actual collections was 4.4 percent. (The differences ranged from 0.1 to 22.4 percent. These percentages are comparable to the 10.3 percent forecast difference for Virginia in 1990.) Of the 49 states surveyed, 26 had collections for FY90 that were lower than the revenues forecasted.

Forecasts By Economic Forecasting Firms Also Have Error

Forecasts of economic indicators (such as personal income, the gross national product (GNP), the Consumer Price Index, and the U. S. unemployment rate) are prepared by commercial firms. Differences between their forecasts and actual results also normally occur and should be expected. Economic forecasts are currently purchased by the Virginia Department of Taxation from the WEFA Group. Previously, they were purchased from Chase Econometrics before its merger with the WEFA Group. Forecasts from these firms for FY82 through FY90 show average differences of two to three percent for one-year-out forecasts, and average differences of three to five percent for two-year-out forecasts. These differences do not appear to be unusually large compared to those of other economic forecasting firms. In fact, a 1988 study of national economic forecasting firms (including the WEFA Group and Chase Econometrics) by Stephen McNees concluded that "no one forecaster dominates all others in terms of accuracy." Therefore, differences in these ranges appear to occur normally among national economic forecasts as well.

Unusually Large Differences Occur For FY90

Forecasts used by the General Assembly in the 1989 and 1990 sessions showed unusually large differences from actual collections (or later revisions). In particular, the FY90 forecast used in the 1989 session had a 10.3 percent difference from actual collections. Differences for FY91 and FY92 will probably be larger. The FY91 and FY92 forecasts which were used in the 1990 session were reduced by 13.3 percent and 16.8 percent, respectively, in the most recent forecast revisions made in December of 1990.

As shown in Figure 2, the forecasts for FY90 through FY92 have fluctuated considerably. Especially noteworthy for these forecasts is the decline that occurred throughout calendar year 1989. This drop has been attributed by Department of Taxation staff to both economic decline and tax policy changes. The tax credit which resulted from the Virginia Tax Reform Plan of 1989 is a factor in the decline for the FY90 forecast. But optimism appeared to remain for the FY91 and FY92 forecasts, even as the FY90 forecast was being adjusted downward. The precipitous drop in the FY91 and FY92 forecasts during calendar year 1990, however, has led to questions concerning what goes into these forecasts, and whether the components are sound.

The components of the Virginia forecast can be classified as one of three types: (1) statistical models and their results; (2) estimated impacts of tax policy changes; and (3) judgmental inputs, including adjustments to the forecasts based on monitoring recent monthly tax collections. Each component is examined more closely in the following sections.

STATISTICAL MODELS AND THEIR RESULTS

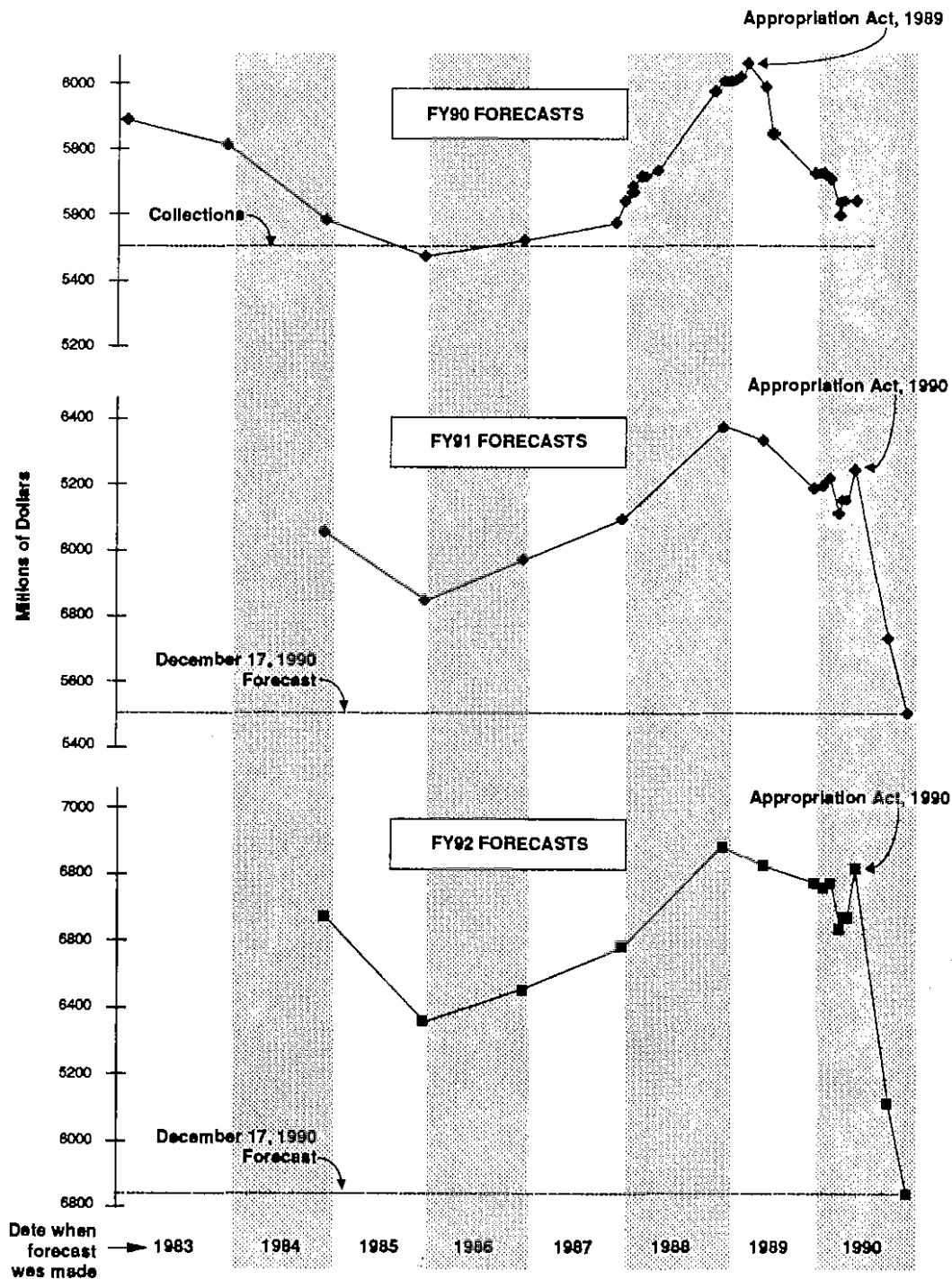
In assessing the statistical models used in the revenue forecasts, two questions were addressed:

- Are the revenue forecast models technically sound and administered adequately?
- How could the model results be affected by changing economic indicators?

The JLARC staff analysis indicates that the revenue forecast models of the major tax sources appear to be technically sound, and to be administered adequately. Therefore, the unusually large downturns in the FY91 and FY92 revenue forecasts do not appear to be attributable to unsound models or inadequate administration of the models.

Furthermore, most of the downturn in the forecasts can be attributed to economic indicators on which the model forecasts are based. However, over 40 percent

Figure 2
General Fund Forecasts for
Fiscal Years 1990, 1991, and 1992 Over Time



Note: Forecast points do not reflect subsequent tax policy, economic, or other changes.

Source: JLARC analysis of Appropriation Acts; and Department of Taxation documents and interviews.

of the reduction, which is attributable to judgmental inputs and other factors, cannot be substantiated independently by JLARC staff.

Technical Soundness of Models and Their Administration

This assessment focuses on the revenue forecast models for the five major tax sources of the General Fund: individual income tax, sales tax, corporate income tax, insurance premiums, and public service gross receipts tax. The reason for focusing on these sources in particular is that in the 1990-1992 biennium, they account for 91 percent of the General Fund, as well as 91 percent of the estimated revenue shortfall. Department of Taxation staff administer the revenue forecast models for these tax sources.

Regression models are used in forecasting General Fund revenues. Regression is a standard statistical technique which can be used to analyze the relationship between a dependent variable and one or more independent variables. Regression produces an equation (often referred to as a "regression model") which best summarizes how much impact the independent variables may have in increasing or decreasing the dependent variable. The equation contains a "constant," which represents the value of the dependent variable when all the independent variables are equal to zero. The equation also contains "coefficients" for each independent variable. The coefficients indicate the weight that each independent variable has in causing the dependent variable to increase or decrease.

For each tax source, a separate regression model is created and run to generate a preliminary forecast. These preliminary forecasts are often adjusted to reflect tax policy changes or judgmental inputs before they are finalized. Eventually, finalized forecasts are summed across tax sources to produce a total General Fund forecast. Appendix B summarizes the variables that are used in the major tax source models and shows the fully-specified models that were used in generating the December 17, 1990 revenue forecasts.

JLARC staff developed six criteria for evaluating the revenue forecast models and their administration. These criteria are shown in Exhibit 3 and applied to Virginia's models in the following sections.

The Model Assumptions Appear to be Clearly Understood. One primary assumption of all statistical modeling of future revenues is that the relationships between predictor variables and corresponding revenues that can be observed from the past, such as the relationship between Virginia tax-based income and individual income tax collections, will remain the same in the future. Another key assumption is that projections for predictor variables are relatively accurate. If either of these assumptions is not valid, the forecast may be grossly inaccurate. Economic turning points, such as the beginnings of recessions, are periods when these assumptions are most prone to being invalid.

Criteria For Evaluating Revenue Forecast Models And Their Administration

- Clear understanding by participants of model assumptions and periodic reexamination of these assumptions.
- Predictor variables used in models' equations are sufficient, accurately measured, and best information available at the time.
- Equations are mathematically sound and tested to ensure mathematical precision.
- Different regional conditions are taken into account sufficiently.
- Forecast errors are analyzed on an on-going basis.
- Forecast models are reviewed and documented well.
 - Regression models are well documented.
 - Judgmental adjustments are well documented.

Source: JLARC analysis.

Department of Taxation staff provide ample information regarding the first assumption. Department staff document many of the assumptions about relationships between variables in notebooks prepared every October and November for the Governor's Advisory Board of Economists (GABE) and the Governor's Advisory Council on Revenue Estimates (GACRE), respectively. Information regarding key economic assumptions and key predictor variables is presented in the notebooks, which allows participants to judge their utility. Department of Taxation staff have consistently stated their own assumptions regarding key economic relationships, as well as possible alternatives and the WEFA Group's judgment. The notebooks include a discussion of the WEFA Group's alternative scenarios, and of the events which would likely cause divergence from the WEFA Group's standard forecast. DOT staff also discuss in the notebooks their assumptions regarding collections. As JLARC staff observed in the GABE and GACRE meetings of October and November 1990, the advisory group members are asked to provide judgmental input concerning the likelihood of the alternatives presented in the notebooks.

The second key assumption concerning the accuracy of predictor variables appears to be handled appropriately by Department of Taxation staff. Predictor variables are updated as necessary, and adjusted when Department staff (or members of the GABE or the GACRE) have reason to doubt their accuracy.

The Predictor Variables Used in the Models Are Sufficient. Economic indicators which are used to predict revenue collections should be sufficient, accurately measured, and the best information available. A national economic forecasting firm, the WEFA Group, provides almost all of these inputs with quarterly updates. Department of Taxation staff alter these inputs to reflect revisions and judgment, if different from the WEFA Group's.

However, predictor variables for personal income, GNP, and employment were overstated for fiscal years 1990, 1991, and 1992. In fact, FY90 ended before some indicators began to register the weakness in the economy that slowed State revenues. Further, data revisions made by the federal government, on which the WEFA Group bases its economic forecasts, were apparently a serious problem in 1989 and 1990, and contributed to this overstatement. Yet data revisions in general are a routine part of this process and further highlight the uncertainty that is fundamental to forecasting one-and-a-half and two-and-a-half years prior to the end of the fiscal year. The federal government produces projections and estimates of national economic and demographic activity with two, often contradictory, goals — timeliness and accuracy. To be timely, data have to be based on limited actual experience and substantial projection. However, to be accurate, later revisions are routinely made, and these revisions may continue for two and three years.

For example, recent revisions to FY89 personal income and GNP have only recently surfaced, reducing some earlier estimates. Growth in U. S. personal income from first quarter 1989 to first quarter 1990 was revised downward, from 7.4 percent to 6.1 percent. This change reduces estimated growth by 20 percent. For a similar period, two-thirds of estimated GNP growth was reduced by revisions. Despite these difficulties, the input data provided by the WEFA Group appear to be as timely and accurate as those of any other national economic forecasting firm.

Further, Virginia's regression models generally include a limited number of predictor variables and are therefore parsimonious. Parsimony is a desirable property of statistical models, because simpler models are less cumbersome, easier to update and maintain free of errors, and easier to understand. The high coefficients of determination (R^2) indicate that most of the variation in tax collections is explained by one to four variables. Therefore, the number of inputs in the models appears sufficient as well.

The Mathematics Underlying the Models Appears Sound. Basic mathematical precision of the models involves primarily the actual computations and the functional form of the models. To check the computations, JLARC staff ran separate regressions to independently develop equations for the three largest General Fund revenue sources. Using the same mathematical functions as DOT staff for the interim forecast, JLARC staff developed individual income tax coefficients similar to those reported by DOT. While corporate and sales tax coefficients were somewhat different from DOT's coefficients, they were of the same sign and magnitude, indicating substantial agreement.

Regarding functional forms, DOT seems to have achieved a degree of sophistication in its equations which appears to be appropriate. Most models use some time series equations but some, such as corporate income tax, use autoregressive features to model the impact of previous quarters on the current quarter. Several equations use logarithmic transformations to adjust for non-linear change and dummy variables to adjust for seasonal fluctuations. The sales tax equation uses regression of first differences, in which change over time of the variables is more directly analyzed. The corporate income tax model uses a weighting scheme known as the "polynomial distributed lag" to weight the current and previous three quarters. Documentation of the models from GACRE notebooks over the years indicates the models have evolved slowly to their present form.

To ensure mathematical soundness, all General Fund statistical models should be recomputed and diagnosed at least annually. Annual re-examination of the equations and results should provide evidence of any changing relationships.

Accounting for Regional Conditions Appears to Be Problematic. Department of Taxation staff also consider regional data in their economic and revenue forecasts. However, lack of timeliness is a major drawback to using federally-collected substate data. For example, substate data from the federal Bureau of Economic Analysis is one year behind State-level data. State-level personal income data for a given period are published four months following the end of the period, while local-level personal income data are published one year and four months following the end of the period. Local region-level data may provide an early warning of economic downturns, although it is not always clear what local data are sufficiently valid and timely. Department of Taxation staff are currently exploring alternative data sources. However, it is uncertain whether the added complexity of formally modeling regions of the State separately would improve the accuracy of the revenue forecast models. In addition, qualitative input on regional conditions is achieved when members of the GABE and GACRE review model results.

The Analysis of Forecast Errors Could Be Improved. Residual errors of the models (based on historical data) are routinely reported in the notebooks prepared each November for the GACRE, as well as various diagnostic statistics, including the Durbin-Watson test for autocorrelation, a common problem in time series data analysis. This form of forecast error analysis is a routine procedure for Department of Taxation staff.

However, differences between all revenue forecasts across time and corresponding collections do not appear to be routinely reported or examined. Only differences resulting from the last official forecast for a given fiscal year appear to be reported, even though the General Assembly may have used up to two previous forecasts for that fiscal year at earlier points in time. Further, for a given forecast, forecast error produced by a given model does not appear to be routinely assessed separately from error introduced by judgmental inputs.

Recommendation (5). Department of Taxation staff should monitor and report differences between forecasts and actual collections for all forecasts which the General Assembly may use.

Forecast Review and Documentation Could Be Improved. Virginia's forecast models themselves are well documented in the November notebooks prepared for the GACRE. Thus, the models are accessible for outside review, although explicit review of the models themselves does not appear to occur routinely.

Further, many judgmental adjustments of model results do not appear to be routinely documented for outside review. The issue of documenting judgmental inputs to forecasts was briefly discussed in Chapter II and is discussed further in following sections.

Changing Economic Conditions Could Affect Model Results

There are two ways that changing economic conditions could affect Virginia's forecast model results. One way is by changing the predictor variables in the revenue forecast models. As already mentioned, the WEFA Group provides economic forecasts that are used in the forecast models as predictor variables. When these economic forecast variables decrease to reflect changing economic conditions, the revenue forecast model results generally decrease as well.

Another way is through changes in the data on which the revenue forecast models themselves are based. The regression equations which constitute the revenue forecast models are based on data across time, generally ranging from the mid-1970s to the most recently-ended calendar year quarter. Several times each year the regression models are updated, when data from new calendar year quarters are added to the database. Further, the regression models are calculated using historical economic data provided by the federal government. The federal government periodically revises estimates for these economic variables. Substantial revisions in historical economic data that better reflect actual economic conditions of the recent past could cause substantial changes in the models themselves.

Changes in Predictor Variables. JLARC staff examined how much the revenue model forecasts could be affected by changing economic variables. First, JLARC staff obtained the data used by Department of Taxation staff for the official forecast (of early 1990), the interim forecast (of August 17, 1990), and the December 17, 1990 forecast. These data were based in large part on the WEFA Group's forecasts for economic variables from October 1989, July 1990, and November 1990, for the three respective forecasts. The WEFA Group's forecasts had decreased substantially from October 1989 to July 1990, and from July 1990 to November 1990. These decreases reflected downward revision by the federal government of economic data used as bases for the forecasts, and the WEFA Group's greater expectation of an economic downturn as 1990 progressed.

Second, JLARC staff obtained the regression models for the major tax sources that were used by Department of Taxation staff for the three forecasts. Major revisions by the federal government of historical economic data on which the models are based caused substantial change from the official forecast models to the interim forecast models, and to the December 17 forecast models as well.

JLARC staff used the alternative sets of data (from the different sets of forecasts) in the corresponding models to estimate the effects of changing economic variables on what the models would forecast. The forecast models were found to be very sensitive to changes in economic predictor variables. For example, if the predictor variables were to decrease by one percent:

- forecasted net individual income tax collections would decrease by 1.2 percent;
- forecasted sales tax collections would decrease by 2.0 percent;
- forecasted corporate income tax collections would decrease by 1.1 percent;
- forecasted insurance premiums collections would decrease by 1.1 percent; and
- forecasted public service tax collections would decrease by 0.4 percent.

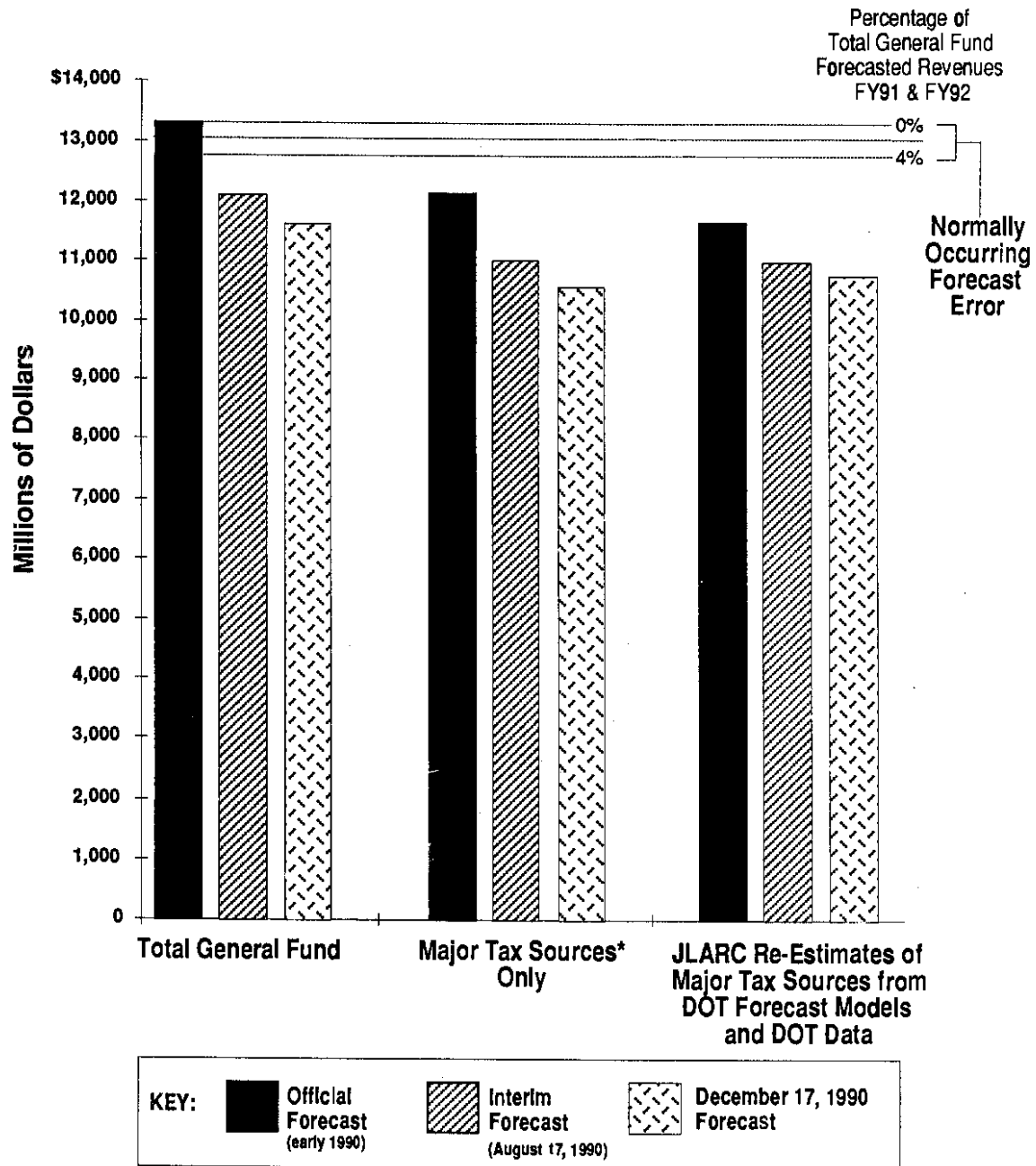
JLARC staff compared official forecasts, interim forecasts, the December 17, 1990 forecasts, and projections generated from the Department of Taxation's forecast models and data. As shown in Figure 3, the official forecast for total General Fund revenues in FY91 and FY92 was approximately \$13.3 billion. This figure dropped to approximately \$12.1 billion in the interim forecast, and to \$11.6 billion in the December 17 forecast. The reduction in total General Fund revenues from the official forecast to the interim forecast was approximately \$1.2 billion, and the reduction from the interim forecast to the December 17 forecast was approximately \$0.5 billion, resulting in a net reduction from the official forecast to the December 17 forecast of approximately \$1.7 billion.

Focusing on the five major tax sources, which account for over 91 percent of the total General Fund revenues, the official forecast was approximately \$12.1 billion. This figure dropped to approximately \$11.0 billion in the interim forecast, and to \$10.6 billion in the December 17 forecast. The total reduction in projected major tax source revenues from the official forecast to the interim forecast was approximately \$1.1 billion, and the reduction from the interim forecast to the December 17 forecast was approximately \$0.4 billion, resulting in a net reduction from the official forecast to the December 17 forecast of approximately \$1.5 billion.

JLARC staff used the same models and data used by Department of Taxation staff to forecast major tax source collections. These models are not the only source of

Figure 3

Comparison of Official Forecast, Interim Forecast, and December Forecast Fiscal Years 1991 and 1991



* Major Tax Sources include individual income tax, sales tax, corporate income tax, insurance premiums, and public service gross receipts tax.

Source: JLARC analysis of Department of Taxation data.

inputs used by Department of Taxation staff to derive the final forecasts, but they generally serve as a starting point for deriving the forecasts. Using the models and data from the official forecast, JLARC staff estimate that the models alone predicted \$11,652 million being collected through the major tax sources. Then, when the models and data from the interim forecast were used, the models predicted that \$10,991 million would be collected. Finally, when the models and data from the December 17 forecast were used, the models predicted that \$10,725 million would be collected. The total reduction in projected major tax source revenues from the official forecast models to the interim forecast models was approximately \$661 million, and the reduction from the interim forecast to the December 17 forecast was approximately \$265 million, resulting in a net reduction from the official forecast to the December 17 forecast of approximately \$926 million.

As discussed previously, forecast error normally occurs and is to be expected, often averaging in the three to four percent range. The scale at the upper right of Figure 3 shows how large three to four percent of the forecast is, compared to the downward shifts from the official forecast to subsequent forecasts.

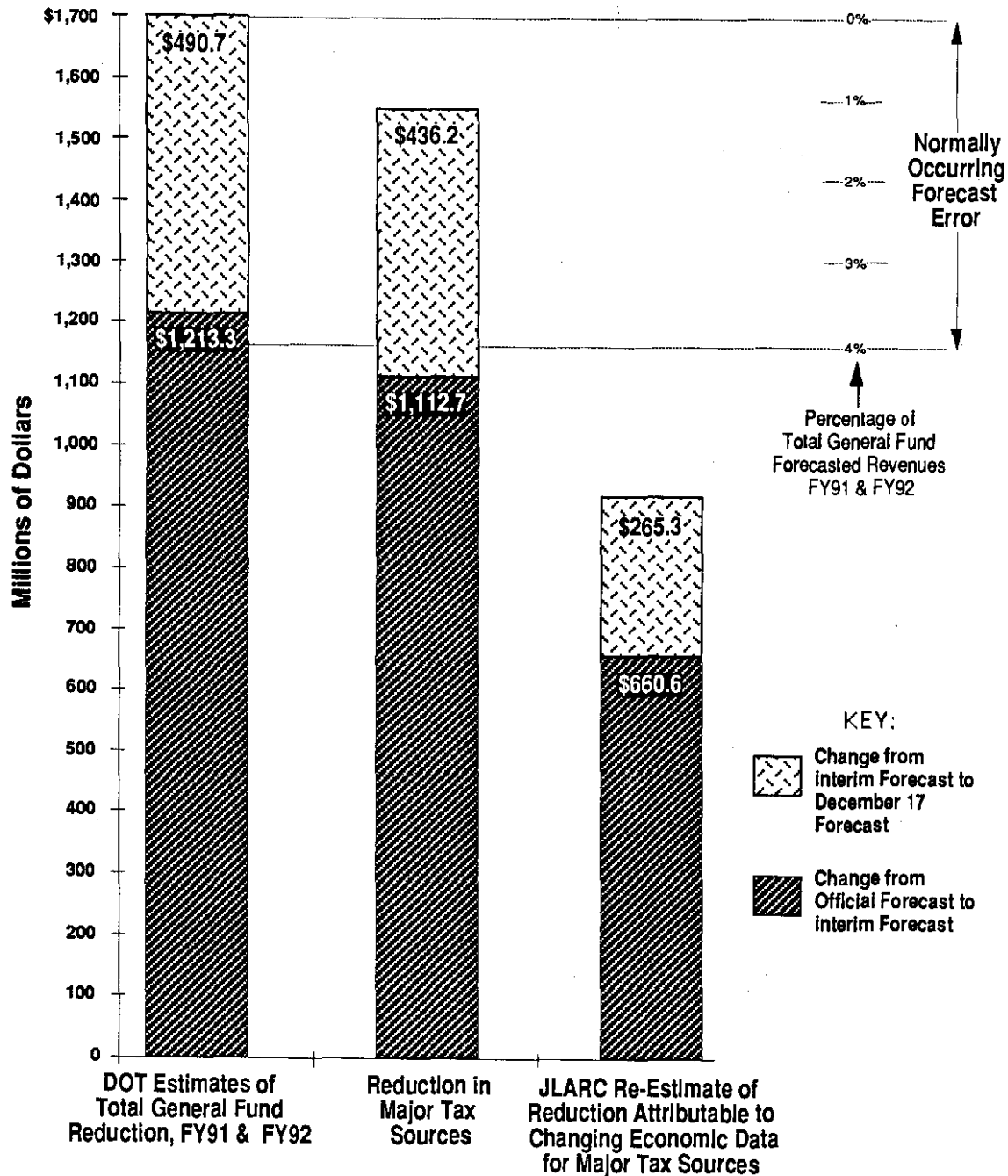
Figure 4 provides a closer examination of the differences between the three sets of forecasts. When focusing on the reduction in major tax source revenues, the majority of that reduction is attributable to the model results dropping by \$926 million, due to declining economic indicators on which the models are based. And, keeping in mind that forecast error is often three to four percent on average, the scale in the upper right of Figure 4 shows that the remaining difference between the reduction in major tax sources and the JLARC estimate from the models is close to the range of normally occurring forecast error. However, there still is a major portion of the reduction in the forecasts which cannot be attributed to changes in the models due to changing economic data.

Department of Taxation staff have attributed reductions from the official forecast to the interim forecast to other factors as well as changing economic conditions (Figure 5). These other factors include potential underestimates of the tax reform credit, accelerated refund processing, potential shortfall in capital gains, and other technical error. These factors account for approximately 20 percent of the reduction from the official forecast to the interim forecast. These factors will be examined further in the following section on the estimated impacts of tax policy changes.

Department of Taxation staff have also attributed a larger amount of the reduction from the official to the interim forecast to changing economic conditions. DOT's estimate of \$954.7 million is not necessarily inconsistent with the JLARC staff estimated reduction of \$660.6 million. The JLARC staff estimate is based solely on the models, and only on models of the major tax sources. In contrast, the \$954.7 million attributed by DOT staff to economics is based not only on major tax sources, but other revenue sources as well. These additional revenue sources — such as interest and rents, and wills, suits, deeds, and contract fees — may account for as much as \$100 million of the difference between the \$954.7 million and the JLARC staff's \$660.6 million estimate. Further, the \$954.7 million is based not only on the model results

Figure 4

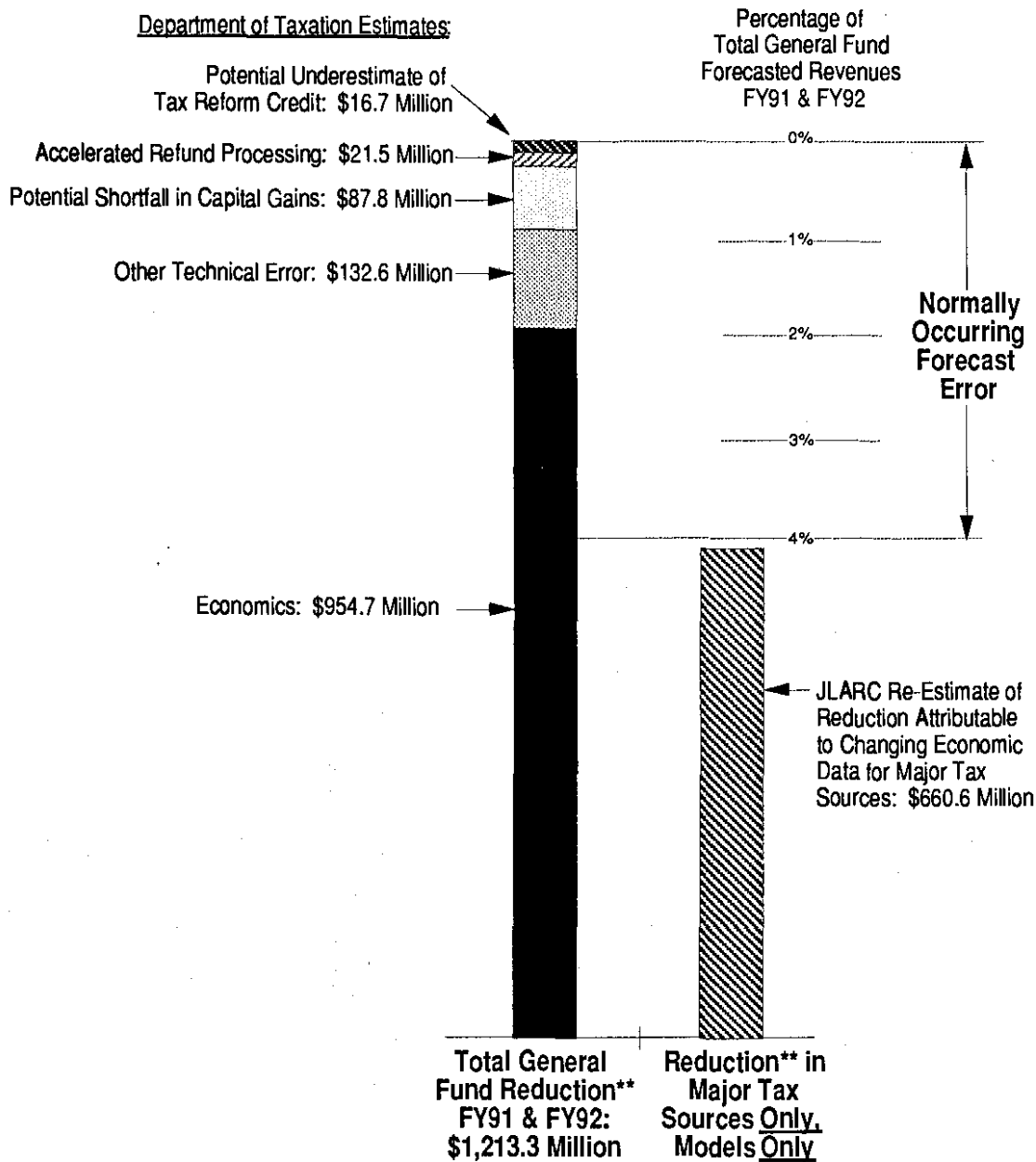
The Majority of the Downturn in Forecasts for Major Tax Sources Appears to Be Attributable to Changing Economic Variables



Source: JLARC analysis of Department of Taxation data.

Figure 5

Department of Taxation Staff Attribute Downward Revisions in Interim Forecast* to Other Factors as Well



* Interim forecast of August 17, 1990.

** Reduction from official forecast to interim forecast.

Source: JLARC analysis of Department of Taxation data.

changing, but on judgmental inputs changing as well. This difference leaves approximately \$200 million of the reduction attributable to changing judgmental inputs, which are difficult to independently substantiate.

Once again, the scale at the upper right of Figure 5 shows that the difference between the total reduction (represented by the bar on the left) and the amount JLARC staff can independently attribute to changing economic data (represented by the bar on the right) is roughly four percent of the total forecast, which is in the range of normally-occurring forecast error.

In conclusion, after examining the evidence presented in Figures 3, 4 and 5, the majority of the downturn in the forecasts can be attributed to changes in economic indicators on which the model forecasts are based. However, changing results of the statistical models cannot account for over 40 percent of the downward revisions in the forecasts. Changing judgmental inputs and the estimated impacts of tax policy changes appear to have led to major reductions in the forecasts as well, which are discussed in the following sections.

ESTIMATED IMPACTS OF TAX POLICY CHANGES

Tax policy changes are an additional factor in the revenue forecast, along with the statistical models and judgmental input. The fiscal impact of tax policy changes is estimated by Department of Taxation staff, and the revenue forecast is adjusted accordingly. Some tax policy changes affect revenues substantially over a number of years, so that inaccurate estimates of fiscal impact could result in greater forecast error. It is therefore important to verify the accuracy of projected fiscal impact estimates against actual tax return data. Again, JLARC staff found it difficult to replicate the Department's estimates of major tax policy changes.

Virginia has experienced a number of tax reforms since 1986 which have affected or will affect General Fund revenues for FY88 through FY92. This study focused on the four major policy changes since 1986, all of which affect individual income tax revenues. The fiscal impact estimates for these changes should be reevaluated in light of the current revenue shortfall. The tax policy research capability of the Department of Taxation should be improved as well.

Major Tax Reforms Since 1986

In 1986, the U. S. Congress passed the most sweeping package of tax reforms since World War II: the Federal Tax Reform Act of 1986 (FTRA86). The federal reforms pertaining to individuals resulted in the restriction or repeal of many itemized deductions. The effect of this was a general increase in federal taxable income. So that this increase would not result in an overall federal tax increase, federal tax rates were lowered.

As a result of FTRA86, Virginia was faced with deciding what to do with the anticipated revenue windfall resulting from a general increase in taxable income levels. The Governor and the General Assembly decided to return the windfall to individual taxpayers. The Virginia Tax Reform Act of 1987 (VATRA87) was designed to offset the federal windfall through a series of major changes in the tax structure. The VATRA87 also contained a provision calling for the return of any unanticipated revenue windfall from federal tax reform to individual taxpayers through further tax reform. This provision was the basis for the individual income tax credit allowed in taxable 1989 under the Virginia Tax Reform Plan of 1989 (VATRP89).

An additional policy change, relating to the taxation of pension income, was enacted in a 1989 special legislative session. In the case of *Michigan vs. Davis*, the U.S. Supreme Court ruled against preferential treatment of State and local pensioners over federal pensioners for tax purposes. In response, the Virginia General Assembly implemented a system of equal treatment of pension income for all public or private retirees. This tax policy change was expected to result in a net loss of tax revenue for the Commonwealth.

Fiscal Impact Estimates

Department of Taxation staff are responsible for estimating the fiscal impact of tax policy changes. Federal windfall estimates for FY88 through FY92 were initially derived in 1986, and revised in late 1988, with the help of the Policy Economics Group, Inc. Costs of VATRA87 were originally estimated by Department of Taxation staff in 1987, and revised in 1990. (A re-estimate of the fiscal impact on FY91 and FY92 has not been made, however.) The costs of VATRA89 and the pension income subtraction were estimated by Department of Taxation staff as well.

These four tax policy changes were expected to have substantial effects on Virginia's individual income tax revenues (Table 2). In 1988 it was estimated that FTRA86 would result in a total gross revenue windfall of \$694.4 million over the 1990-92 biennium. VATRA87 is expected to return \$493.5 million of this anticipated windfall to individual taxpayers, leaving a net windfall of \$200.1 million for the Commonwealth.

In the current shortfall situation, the fiscal impact estimates for major tax policies deserve close scrutiny. For the 1990-92 biennium, the Department's estimates indicate that the Commonwealth is collecting more from FTRA86 than it is returning through VATRA87, even as the revenue shortfall has continued to grow. However, the federal windfall estimates were calculated in 1988 based on certain assumptions about economic growth. Given the unexpected economic decline, the existing windfall estimates warrant reexamination. In particular, re-estimates should be made of the effect of tax reform on FY91 and FY92 individual income tax revenues.

Other unexplained factors also point to the need for a reevaluation of fiscal impact estimates. FY90 saw a major overestimate of nonwithholding payments and a

Table 2

**Department of Taxation Estimates of Fiscal Impact
Major Tax Policy Changes
Fiscal Years 1988-1992
(Millions of Dollars)**

<u>Legislation</u>	<u>FY88</u>	<u>FY89</u>	<u>FY90</u>	<u>FY91</u>	<u>FY92</u>	Total FY91 FY92
FTRA86	\$188.4	\$256.4	\$309.0	\$330.7	\$363.7	\$694.4
VATRA87	(141.2)	(238.4)	(253.0)	(240.8)	(253.5)	(494.3)
Net Windfall Before VATRP89	\$ 47.2	\$18.0	\$ 56.0	89.9	\$110.2	\$200.1
VATRP89			(100.1)*			0.0
Pension Subtraction			(83.0)	(56.6)	(62.3)	(118.9)

*The tax credit was actually funded from estimated, additional gross windfall in FY88 (\$41.7 million) and FY89 (\$58.4 million). These amounts were transferred into the General Fund for distribution in FY90.

Source: JLARC analysis of Department of Taxation records.

major underestimate of refunds which have yet to be fully explained (Table 3). Non-withholding payments, which comprise about 22 percent of gross payments, were responsible for more than 50 percent of the shortfall in individual income taxes. Refunds increased at nearly double the forecasted rate to cause about 33 percent of the shortfall.

The shortfall in nonwithholding payments raises questions about the fiscal impact estimate for the pension income subtraction, because many retirees pay their taxes on a quarterly basis. The unexpected increase in refunds raises questions about the fiscal impact estimate for the tax credit. Considering that the income tax credit was based in part on income level, and the pension income subtraction reduces taxable income for some individuals, the possibility of unanticipated interactive effects between the credit and the pension income subtraction should also be examined.

An additional unusual occurrence in FY90 was that individual income tax collections actually declined over the previous year for the first time in recent history,

Table 3

**Unexplained Shortfall in Nonwithholding Payments
And Increase in Refunds in Fiscal Year 1990**

<u>Component of Individual Income Tax:</u>	<u>Forecasted Growth (%)</u>	<u>Actual Growth (%)</u>	<u>Difference (Millions \$)</u>	<u>Percent of Shortfall</u>	<u>Percent of Gross Collections</u>
Withholding Payments	5.0	4.2	(23.4)	15.0	78
Nonwithholding Payments	6.5	(3.5)	(81.8)	52.4	22
Refunds	13.2	24.4	(50.9)	32.6	—

Source: JLARC analysis of Department of Taxation records.

although tax-based personal income grew by more than seven percent (Figure 6). This occurrence would be partly explained if the windfall from FTRA86 was overestimated and if the costs of VATRA87, VATRP89, and the pension income subtraction were underestimated. These issues bear further scrutiny. In addition, the possibility that there may be fundamental changes developing in the relationship between personal income and income tax collections should also be explored.

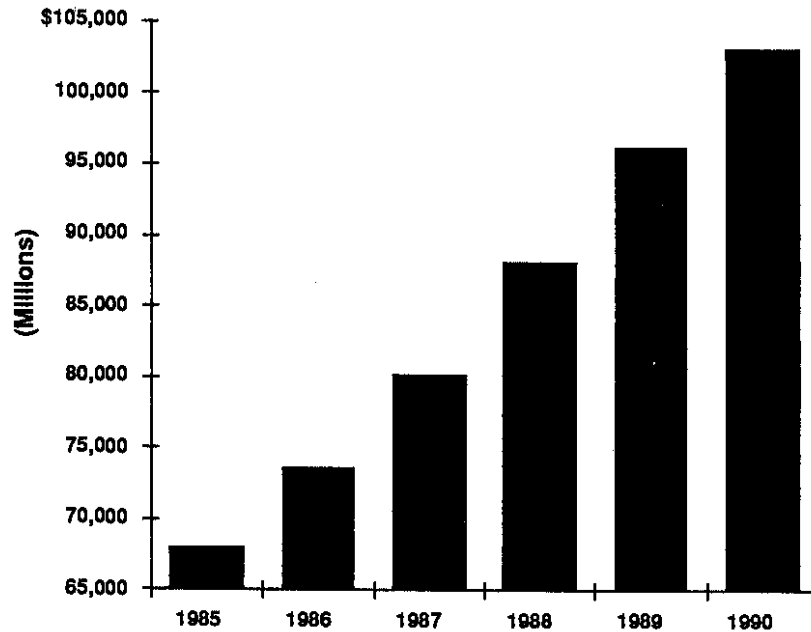
JLARC staff found it difficult to independently substantiate the Department of Taxation's fiscal impact estimates of major tax policy changes. Although Department of Taxation staff have reevaluated components of tax reform in recent years, there has not been a comprehensive verification of the fiscal impact estimates using actual tax return data. Federal tax return data for FY90 (taxable 1989) have only recently become available and have not yet been fully analyzed by Department of Taxation staff.

In preparing the interim forecast for August 1990, Department of Taxation staff conducted preliminary research showing that inaccurate fiscal impact estimates for capital gains tax changes and the tax credit may be contributing to the shortfall for FY90 through FY92, as shown in Figure 5 in the previous section. These estimates were based in part on assumptions about economic growth and taxpayer behavior. These assumptions may need to be changed in light of recently changing economic conditions. Therefore, these estimates should be reexamined as well.

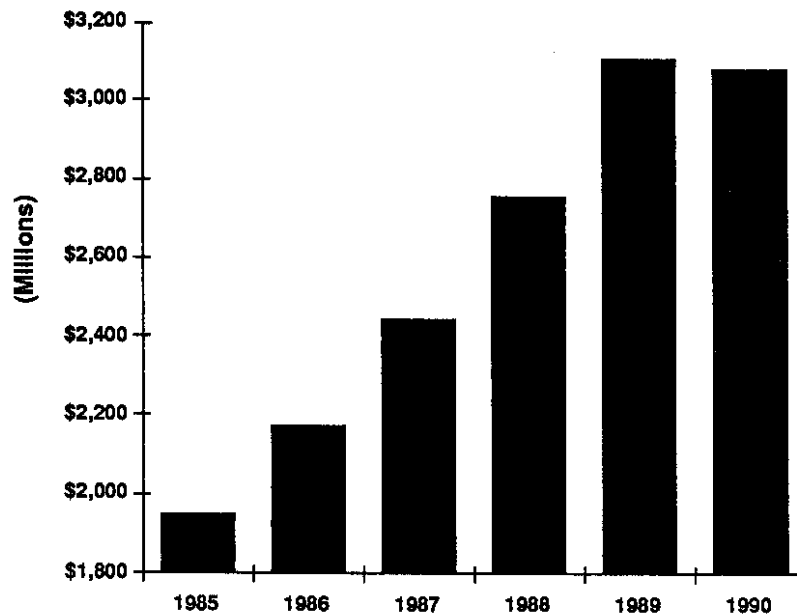
Capital Gains. Department of Taxation staff estimated that a potential shortfall in capital gains taxes contributed \$36.7 million to the FY90 shortfall, and

Figure 6

Virginia Tax-Based Economic Income Fiscal Years 1985 through 1990



Virginia Net Individual Income Tax Collections Fiscal Years 1985 through 1990



Source: Virginia Department of Taxation Data, October 1990.

\$87.8 million to the 1990-92 biennium shortfall. This analysis was limited because itemized statistics of income for taxable 1989, including capital gains realizations, were not available from the federal Internal Revenue Service (IRS) at the time of the analysis. As a result, assumptions had to be made about growth in capital gains realizations in taxable 1989 over taxable 1988.

It was assumed by the Department that zero growth in capital gains realizations occurred due to a slowing economy and a "lock-in effect" in anticipation of the Bush administration's planned capital gains tax cut. While this assumption is not unreasonable, it has not been tested with actual data. Further research using 1989 tax return data will be required to validate this estimate.

Tax Credit. DOT staff estimated that a potential underestimate of the cost of the tax reform credit for taxable 1989 contributed \$7 million to the FY90 shortfall. This estimate was based on an analysis of approximately 60 percent of taxable 1989 returns, which were processed between January and July 1990. This analysis assumes that the remaining 40 percent of returns followed a similar distribution to the first 60 percent. It also assumes the average tax credit taken on returns processed in June approximates the average credit taken by all eligible filers. A more comprehensive assessment should be conducted when the Virginia tax return database is completed by the end of calendar 1990.

DOT staff also attributed \$16.7 million of the 1990-92 biennium shortfall to the tax credit. This was done by carrying the impact of the potential shortfall in FY90 forward into the next biennium. However, there is no tax reform credit in effect for FY91 and FY92 (the original legislation establishing such a credit was repealed). This \$16.7 million would be more appropriately allocated to the unexplained portion of the technical forecast error for the 1990-92 biennium, increasing that total to \$149.3 million.

Accelerated Refund Processing. Department of Taxation staff estimated that \$9 million of the FY90 shortfall and \$21.5 million of the 1990-92 biennium shortfall can be attributed to accelerated refund processing. This estimate was based on qualitative data used to estimate an acceleration in refund processing for taxable 1989 versus taxable 1988. It was assumed that this acceleration would occur for taxable 1990 and 1991 as well. The estimate remains hypothetical in the absence of actual data on processing rates. Further research would be required to validate the estimate.

Pension Income Subtractions. At the time the estimates for capital gains, the tax credit, and accelerated refund processing were released, the Department of Taxation had not reevaluated the fiscal impact of the pension income subtraction. This tax policy change was expected to cost the Commonwealth \$83 million in tax revenues in FY90, \$56 million in FY91, and \$62 million in FY92. Considering the major shortfall in nonwithholding payments mentioned earlier, the pension income subtraction should be studied as a potential source of technical forecast error.

Fiscal Impact of Tax Policy Changes Needs to be Reexamined. The individual income tax forecast can only be as accurate as its component parts: statistical forecast models, tax policy impact estimates, and expert judgments. The tax policy changes addressed in this section have had a major impact on Virginia's forecasts of individual income tax revenue. Therefore, it is important to monitor the accuracy of the fiscal impact estimates that are related to major policy changes, especially considering the recent economic downturn. Although the Department of Taxation has spent considerable energy developing fiscal impact estimates for tax policy changes, the Department does not routinely validate all of the estimates for previous years using actual tax return data. Also, the Department has not re-estimated the projected fiscal impacts for FY91 and FY92 in light of deteriorating economic conditions.

Given the legislative concerns about the validity of the existing estimates, the Department of Taxation should conduct research to verify the fiscal impact estimates for FY88 through FY90 using actual tax return data as it becomes available. DOT should also reevaluate the projected fiscal impact estimates for FY91 and FY92, and adjust the revenue forecasts for these years as necessary.

Recommendation (6). The Department of Taxation should study and prepare a report for the Senate Finance, House Appropriations, and House Finance committees and JLARC on the impact of specific federal and State tax reforms using actual tax return data where possible. Specific items to be addressed should include:

- The fiscal impact of the Federal Tax Reform Act of 1986 and the Virginia Tax Reform Act of 1987 on General Fund revenues for FY88 through FY92.
- The impact of the Virginia Tax Reform Plan of 1989 (tax credit) on General Fund revenues for FY90.
- The impact of the pension income subtraction in FY90 through FY92.
- Any interactive effects of pension taxation reform and the Virginia Tax Reform Plan of 1989 on FY90 revenues.
- Reasons for the overall decline in individual income tax revenues in FY90 over FY89, and reasons for the unexpected underestimate of individual income tax refunds and overestimate of nonwithholding payments in FY90.
- Necessary revisions in the amount of the projected revenue shortfall in FY90 through FY92 which are attributable to changes in economic conditions and technical forecast error.

- **Necessary revisions to the General Fund revenue forecast for FY91 and FY92 as a result of the above analyses.**

Tax Policy Research Capability

Virginia's individual income tax forms begin with federal adjusted gross income, leaving out itemized statistics of income such as wages and salaries, capital gains, and pension income. Itemized statistics of income are important for analyzing the impact of certain tax policies, such as those affecting capital gains and pension income. Virginia collects itemized statistics of income via federal tax return tapes provided by the IRS. However, IRS statistics of income for Virginia do not typically arrive in time for comprehensive analysis before the next legislative session after the end of a fiscal year.

The Department of Taxation could improve the timeliness of its research by collecting certain itemized statistics of income directly with Virginia tax returns, rather than relying entirely on the IRS to provide this information. A more timely analysis of collections patterns for the most recent fiscal year could provide the next General Assembly with useful information as it evaluates the revenue forecast and decides tax policy issues for the upcoming budget period. To collect the information, taxpayers could either submit a copy of their federal tax form with the Virginia return, or Virginia forms could be altered to include selected statistics of income from the federal form. Collecting statistics of income, however, would increase data processing costs and require more work by the taxpayer.

The Department could also improve its research capability by enhancing its sampling methods to target particular income sources affected by tax policy changes. The Department's current capability allows for stratified sampling based on income level and filing status. The preferred capability would also include stratified samples for such groups as capital gains and pension income recipients. This enhanced capability would facilitate more reliable estimates of tax policy impacts for these income sources.

Recommendation (7). The Department of Taxation should implement procedures for collecting itemized statistics of income with Virginia tax returns in order to allow more timely analysis of income tax data. This should be done either by requiring taxpayers to submit a copy of the federal tax return form or by altering the Virginia tax return form.

Recommendation (8). The Department of Taxation should develop additional sampling strategies for analyzing income tax returns to allow more detailed analysis of such income sources as pension income and capital gains.

JUDGMENTAL INPUTS AND MONITORING COLLECTIONS

JLARC staff found it difficult to substantiate independently the judgmental inputs that may account for major portions of the revisions to the FY91 and FY92 forecasts. A key reason for this difficulty is the insufficient documentation of these inputs and the resulting calculations. This documentation problem is also discussed in Chapter II.

However, a major source of judgmental input comes from monthly tax collections reports. It is important to monitor General Fund collections during a fiscal year in order to assess whether or not the revenue target (which may be determined by prior forecasts) will be met. Qualitative judgments must be made to interpret collections patterns in light of historical patterns and assumptions about the future. Nonetheless, collections can often provide an early warning as to whether a shortfall is likely to occur, which may have an important bearing on how revenue forecasts are revised.

JLARC staff conducted a systematic analysis of collections patterns for the individual income tax from FY80 through the first five months of FY91. The individual income tax comprises more than half of General Fund revenues, and has been a driving force behind the current revenue shortfall situation. Comparing FY90 to previous surplus years, early warnings of the impending shortfall were present from the first quarter onward. The same may be said of FY91 through its first five months, indicating that past downward revisions in the FY91 forecast were justified, and that above-average collection patterns will be needed to meet the forecast.

The primary source of collections data are monthly revenue reports produced by the Department of Accounts based on collections which flow through the tax department. The Department of Taxation could improve the collections reporting system by developing a method for separating out the different components of non-withholding payments for analysis.

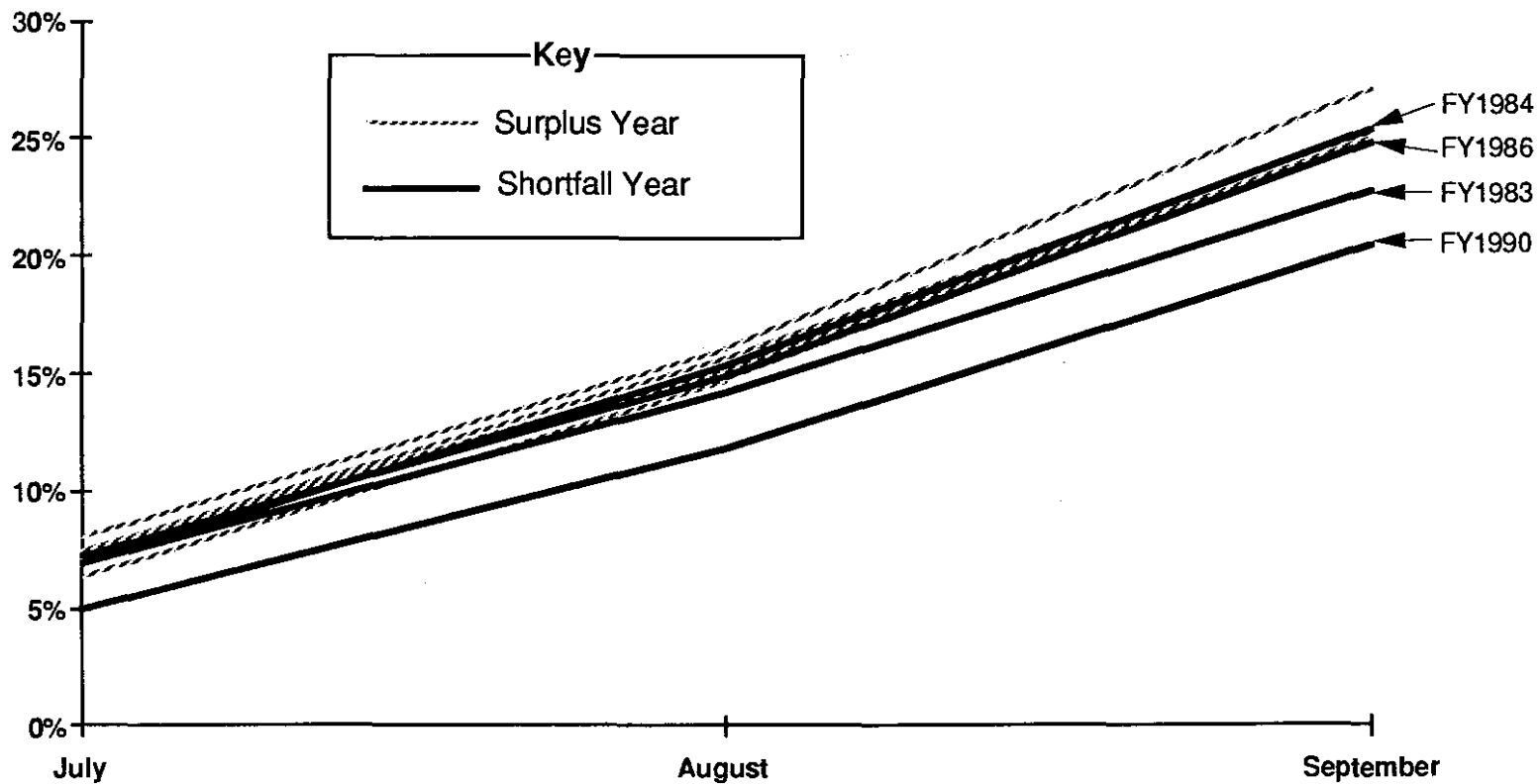
Collections Patterns in FY90 and FY91

One way to examine individual income tax collections in a given year is to analyze the cumulative progress toward the target in the current year versus previous shortfall and surplus years. This type of systematic analysis indicates that different patterns exist between surplus and shortfall years. Using the forecast in place at the beginning of the fiscal year as the target, collection patterns in shortfall years between 1981 to 1990 (1983, 1984, 1986, and 1990) were noticeably different from surplus years (Figure 7). The beginning-of-year forecast is used in the analysis because this figure is used by the legislature in making budget allocation decisions.

The analysis shows that FY90 collections were off-pace in comparison with surplus years beginning in the first quarter. July collections were expected to be sluggish because in June 1989 deposits were accelerated and refunds were decelerated

Figure 7

Cumulative Net Individual Tax Collections as a Percentage of the Forecast in Place at Start* of Fiscal Years 1981 to 1990



*Forecasts are those in place at the beginning of the fiscal year as reported in Department of Accounts "Summary Report on General Fund Revenue Collections."

Source: JLARC analysis of Department of Accounts data, fiscal years 1981 to 1990.

in order to meet the FY89 revenue forecast. However, August and September collections also declined from the previous year. By the end of the first quarter of FY90, 21 percent of the target had been collected. In contrast, the average in surplus years was 25 percent.

The gap between FY90 and surplus years widened in the second quarter, and the third quarter of 1990 remained sluggish. At the end of April 1990, 72 percent of the beginning-of-year target had been collected, as opposed to an average of 81 percent for surplus years. This left 28 percent of the target to be collected in May and June. The greatest percentage of the beginning-of-year target that had ever been collected in these months during surplus years was 24 percent, and the average was 19 percent. Ultimately, FY90 collections met neither the beginning-of-year target nor the revised February 1990 target.

This same type of analysis indicates that FY91 is following the pattern of a shortfall year for the individual income tax (Figure 8). As of November, 34 percent of the beginning-of-year forecast for net individual income tax had been collected. In surplus years, an average of 42 percent of revenues had been collected by November. Sixty-six percent of the beginning-of-year forecast must be collected in the remaining seven months of FY91. The average percentage collected in the last seven months of previous surplus years is 61 percent. (Collections for surplus years averaged more than 100 percent.)

Conducting the same analysis using the December 17 forecast as the target, FY91 is following a similar but somewhat less pessimistic pattern. This pattern indicates that the downward adjustments made to the August and December forecast revisions were justified. Thirty-eight percent of the December 17 forecast had been collected by November, compared to a 41 percent average for previous years except FY90. Sixty-two percent of the December 17 forecast must be collected in the remainder of FY91 in order to meet the forecast. The average percentage collected in the last seven months of previous years except FY90 is 59 percent. It would seem unlikely that above-average collection patterns would be realized in the current recession-like environment.

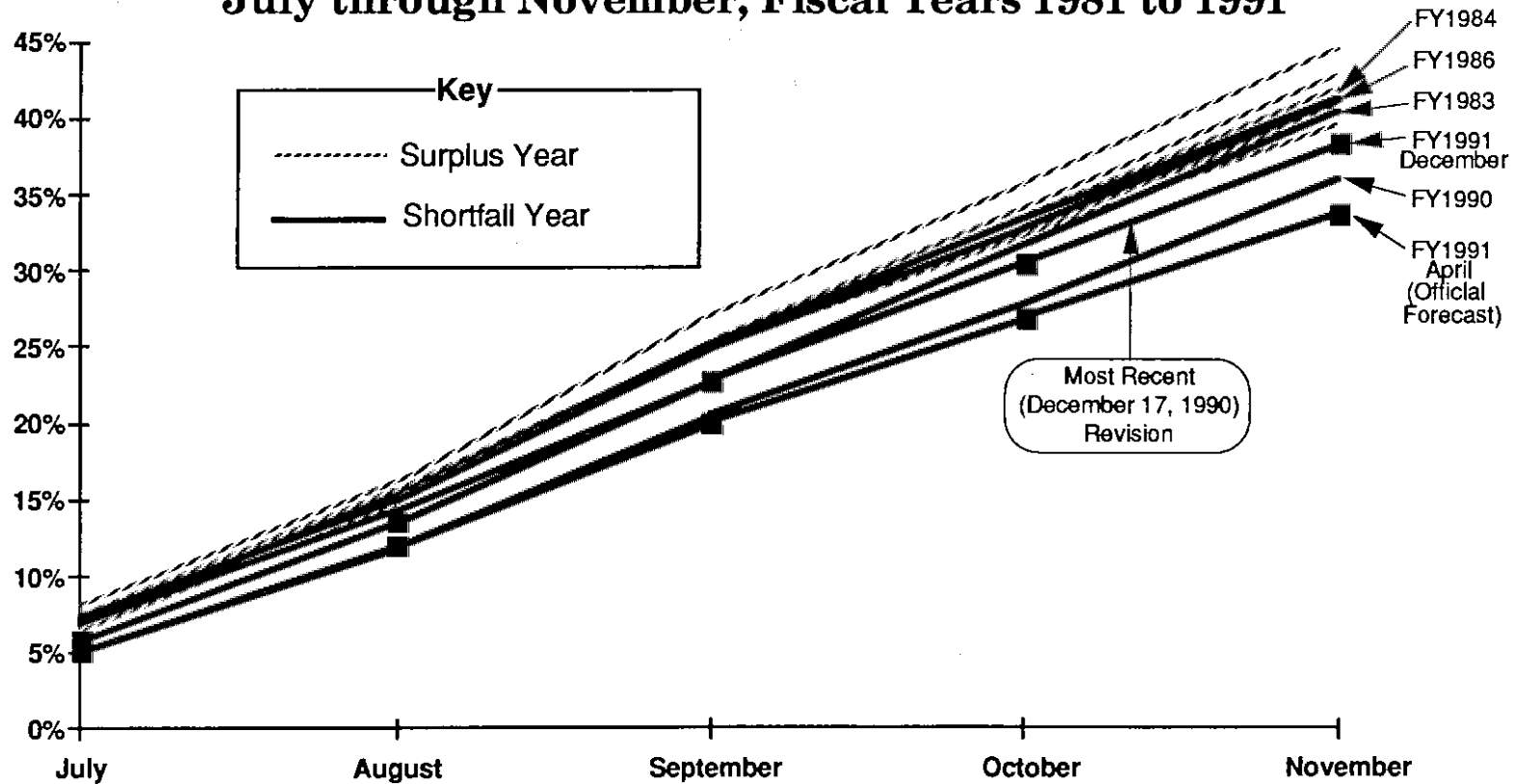
JLARC staff are continuing to examine collections patterns for sales tax and corporate income tax. A recommendation suggesting a greater legislative role in monitoring collections is presented in Chapter II.

Disaggregation of Nonwithholding Payments

An additional technical improvement should be the disaggregation of nonwithholding payments in monthly collections reports. Currently, nonwithholding payments include a variety of sources including estimated payments, taxes due, audit revenues, and unusual additions such as amnesty revenues. These sources represent different taxpayer groups. For instance, pensioners and small businesses commonly make estimated tax payments, while audit revenues are paid by a variety of people with tax liabilities from previous years.

Figure 8

Cumulative Net Individual Tax Collections as a Percentage of the Forecast Used in the Appropriations Acts* July through November, Fiscal Years 1981 to 1991



*Forecasts are those in place at the beginning of the fiscal year as reported in Department of Accounts "Summary Report on General Fund Revenue Collections."

Source: JLARC analysis of Department of Accounts data, fiscal years 1981 to 1991.

The aggregation of these different sources limits in-depth analysis of collections. For example, it is difficult to discern quarterly growth patterns in estimated payments on a year-to-year or seasonal basis. Also, audit revenues and special collections such as amnesty can distort collections patterns and the associated evaluation of the strength of collections. Disaggregating collections data could allow an earlier, more accurate evaluation of collections with regard to meeting the target.

Staff of the Department of Taxation report that there are operational problems which prevent the disaggregation of collections. When payments are received, they are not always accounted for correctly. For instance, sometimes estimated payments are initially recorded as taxes due, and vice versa. These errors are not corrected until months after the payments are received. The research and operations divisions at DOT are currently working on a system to resolve the problem, but the system is not operational yet.

Recommendation (9). The Department of Taxation should develop a method for separating out estimated payments, taxes due, and audit revenues in order to analyze these subcomponents of nonwithholding tax payments on a monthly basis.

Summary

The majority of the downturn in the FY91 and FY92 forecasts can be attributed to changes in economic indicators, on which model forecasts are based. However, JLARC staff could not independently substantiate Department of Taxation research that attributes most of the remainder of the revenue shortfall to tax policy changes or judgmental inputs. Federal data on Virginia income have only recently become available and research on tax policy effects is largely dependent on these data. Further, there is little documentation of judgmental inputs.

Recommendation (10). The Department of Taxation should ensure that sufficient documentation of each revenue forecast exists so that the Department of Taxation staff, or any other group reviewing the forecasts, can replicate each and every forecast. In the event judgmental adjustments are made to a forecast, they should be identified. A record should be made of the size of the adjustment and of the forecast errors with and without the adjustments.

Conclusion

While improvements to the current forecasting process may lead to greater accountability and improved accuracy, forecasting by its nature is uncertain. To provide a buffer against the inherent uncertainty associated with forecasting, the JLARC Subcommittee on the Executive Budget Process recommended the adoption of a State "rainy day" fund. This proposal — the Revenue Stabilization Fund — is discussed in a companion report in this JLARC series on the executive budget process.

Appendixes

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Appendix A

JLARC Study Mandate

Item 13, 1990 Appropriation Act:

B. The Joint Legislative Audit and Review Commission shall review the Commonwealth's executive system of financial planning, execution and evaluation. The scope and duration of the review shall be determined by the Commission. The Commission shall report on its progress to the 1991 General Assembly Session and to each succeeding session until its work is completed. In carrying out this review, all agencies shall cooperate as requested and make available all records, information and resources necessary for the completion of the work of the Commission and its staff.

Appendix B

Details On Forecast Models

This appendix summarizes the variables that are used in models for the major tax sources of the General Fund and shows the fully-specified models that were used in generating the December 17, 1990 revenue forecasts. Included are models for forecasting the individual income, retail sales, corporate income, insurance premium, and public service gross receipt revenues.

NET INDIVIDUAL INCOME TAX FORECAST

Model Variables

Variable Predicted: Virginia net individual income tax collections

Predictor Variables:

- Virginia tax-based income
(Virginia personal income
adjusted to reflect only
taxable types of income)
- Controls for calendar year
quarter

Data Source for Forecasts:

WEFA
(DOT makes adjustments)

Known by definition of data

Net Individual Income Tax Model

$\log(IINXQ)$

$$\begin{aligned} = & 1.33397*QD1*\log(YRTAXVA) + 1.22565*QD2*\log(YRTAXVA) \\ & + 1.13148*QD3*\log(YRTAXVA) + 1.11570*QD4*\log(YRTAXVA) \\ & - 8.76257*QD1 - 7.38291*QD2 - 6.38385*QD3 - 6.17135*QD4 \end{aligned}$$

Where:

- IINXQ = Virginia net individual income tax collections
- YRTAXVA = Virginia tax-based income (Virginia personal income adjusted to reflect only taxable types of income)
- QD1 = A dummy variable (first calendar quarter = 1, all others = 0)
- QD2 = A dummy variable (second calendar quarter = 1, all others = 0)
- QD3 = A dummy variable (third calendar quarter = 1, all others = 0)
- QD4 = A dummy variable (fourth calendar quarter = 1, all others = 0)

Quarterly data for 61 periods from 1975, third quarter to 1990, third quarter

RETAIL SALES TAX FORECAST

Model Variables

Model I: Taxable sales

Variable Predicted: Virginia taxable sales

Predictor Variables:	Data Source for Forecasts:
----------------------	----------------------------

- | | |
|--|------------------------|
| • Treasury Bill rate -- 3 month | WEFA |
| • Virginia disposable personal income | WEFA (Adjusted by DOT) |
| • Virginia manufacturing employment | WEFA (Adjusted by DOT) |
| • Control for price inflation:
U. S. implicit price deflator
for total consumption
expenditures | WEFA |

Model II: Sales tax

Variable Predicted: Virginia state sales tax collections

Predictor Variables:	Data Source for Forecasts:
----------------------	----------------------------

- | | |
|---|-----------------------------|
| • Virginia taxable sales | Model I forecasts |
| • Controls for calendar year
quarter | Known by definition of data |

Taxable Sales Model

$pchya(CTSUXQ/(PDISUXQ/100))$

$$\begin{aligned} = & - 0.77655 * diffya(RTBILL3M - pchya(PDISUXQ)) \\ & + 0.96125 * pchya(YRDPIVA/(PDISUXQ/100)) \\ & + 0.98523 * pchya(XMFEMVA) - 0.71230 \end{aligned}$$

Where:

$pchya$ = Year-over-year percent change function

$diffya$ = Year-over-year difference function

$PDISUXQ$ = U. S. implicit price deflator for goods on which
Virginia's sales tax is levied

$CTSUXQ$ = Virginia taxable sales

$RTBILL3M$ = Treasury Bill rate - 3 month

$YRDPIVA$ = Virginia disposable personal income

$XMFEMVA$ = Virginia manufacturing employment

Quarterly data for 66 periods from 1974, first quarter to 1990,
second quarter

Sales Tax Model

SUXQ

$$\begin{aligned} = & 1.12124*QD1*.0291*CTSUXQ + 0.96132*QD2*.0291*CTSUXQ \\ & + 0.99797*QD3*.0291*CTSUXQ + 0.91463*QD4*.0291*CTSUXQ \\ & - 0.36975 \end{aligned}$$

Where

SUXQ = Virginia state sales tax collections

CTSUXQ = Virginia taxable sales

QD1 = A dummy variable (first calendar quarter = 1, all others = 0)

QD2 = A dummy variable (second calendar quarter = 1, all others = 0)

QD3 = A dummy variable (third calendar quarter = 1, all others = 0)

QD4 = A dummy variable (fourth calendar quarter = 1, all others = 0)

Quarterly data for 66 periods from 1975, first quarter to 1990, second quarter

CORPORATE INCOME TAX FORECAST

Model Variables

Variable Predicted: Virginia corporate income tax collections

Predictor Variables:

Data Source for Forecasts:

- U. S. corporate profits before tax (current and preceding three calendar quarters) WEFA (Adjusted by DOT)
- 90-day commercial paper rate WEFA (Adjusted by DOT)
- Controls for calendar year quarter Known by definition of data

Corporate Income Tax Model

$\log(\text{CIXQ})$

$$\begin{aligned} = & 0.21290 \cdot \log(\text{ZB}) + 0.31935 \cdot \log(\text{ZB})[-1] + 0.31935 \cdot \log(\text{ZB})[-2] \\ & + 0.21290 \cdot \log(\text{ZB})[-3] - 0.27445 \cdot \log(\text{RPRIME}) - 0.51347 \cdot \text{QD1} \\ & + 0.73614 \cdot \text{QD2} - 1.29823 \end{aligned}$$

$$\text{AR}_x = + 0.69861 \cdot \text{AR}_{x-1}$$

Where

- CIXQ = Virginia corporate income tax collections
- ZB = U. S. corporate profits before tax (second degree polynomial distributed lag over the current and preceding three calendar quarters)
- RPRIME = The 90 day commercial paper rate
- QD1 = A dummy variable (first calendar quarter = 1, all others = 0)
- QD2 = A dummy variable (second calendar quarter = 1, all others = 0)
- AR_x = Autoregressive coefficient, order x

Quarterly data for 72 periods from 1972, fourth quarter to 1990, third quarter

INSURANCE PREMIUM FORECAST

Model Variables

Model I: Property/casualty insurance premiums

Variable Predicted: Property-casualty insurance premiums in Virginia

Predictor Variables:

Data Source for Forecasts:

- Virginia personal income WEFA
- Interest rate on AAA-rated corporate bonds WEFA

Model II: Life insurance premiums

Variable Predicted: Life insurance premiums in Virginia

Predictor Variables:

Data Source for Forecasts:

- Virginia real personal income WEFA
- Interest rate on AAA-rated corporate bonds WEFA
- Price inflation (implicit deflator, personal consumption expenditures) WEFA

Property/Casualty Insurance Premiums Model

PROP

$$= 48.6421*YRPICVA - 86368.3*RCORPS_AAA + 429757$$

AR₋

$$= +0.65504*AR_1$$

Where:

PROP = Property-casualty insurance premiums in Virginia

YRPICVA = Virginia personal income

RCORPS_AAA = Interest rate on AAA-rated corporate bonds

AR_x = Autoregressive coefficient, order x

Annual data for 29 periods from 1961 to 1989

Life Insurance Premiums Model

LIFE

$$= 16.7229*CYRPICVA - 40405.7*RCORPS_AAA + 6858.51*PDICE \\ - 248299$$

AR₋

$$= + 0.08088*AR_1$$

Where

LIFE = Life insurance premiums in Virginia

CYRPICVA = Virginia real personal income

RCORPS_AAA = Interest rate on AAA-rated corporate bonds

PDICE = Implicit deflator, personal consumption expenditures

AR_x = Autoregressive coefficient, order x

Annual data for 29 periods from 1961 to 1989

PUBLIC SERVICE GROSS RECEIPTS FORECAST

Model Variables

Model I: Electric company gross receipts

Variable Predicted: Virginia electric company gross receipts

Predictor Variables:	Data Source for Forecasts:
----------------------	----------------------------

- | | |
|---|------|
| • Virginia personal income | WEFA |
| • U. S. household consumption expenditures on electricity (in 1982 dollars) | WEFA |
| • U. S. producer price index for fuel and power | WEFA |

Model II: Water company gross receipts

Variable Predicted: Virginia water company gross receipts

Predictor Variables:	Data Source for Forecasts:
----------------------	----------------------------

- | | |
|--|-----------------------------|
| • Price inflation (U. S. implicit price deflator for consumption expenditures on household operations) | WEFA |
| • Controls for specific years | Known by definition of data |

Model III: Gas company gross receipts

Variable Predicted: Virginia gas company gross receipts

Predictor Variables:	Data Source for Forecasts:
----------------------	----------------------------

- | | |
|--|-----------------------------|
| • Price inflation (U. S. implicit price deflator for consumption expenditures on household operations) | WEFA |
| • Virginia personal income | WEFA |
| • Control for 1985 (year in which a regulation allowed end-of-pipeline sales) | Known by definition of data |

Model Variables (continued)

Model IV: Electric, gas and water company gross receipts tax

Variable Predicted: Virginia electric, gas, and water company gross receipts tax collections

Predictor Variables:

Data Source for Forecasts:

- | | |
|---|---------------------------------|
| • Virginia electric, gas, and water company gross receipts | Models I, II, and III forecasts |
| • Applicable Virginia tax rates | Code of Virginia |
| • Controls for calendar year quarter | Known by definition of data |
| • Control reflecting increased percentage required for estimated payments (first quarter of 1973 through 1985) | Known by definition of data |
| • Control reflecting the balance due payment made when the percentages required for estimated payments increased (made in first quarter 1985) | Known by definition of data |

Electric Company Gross Receipts Model

$\log(\text{GRE})$

$$= 0.35981 * \log(\text{PPIFAP}) + 1.03291 * \log(\text{CESHHOELE82}) \\ + 0.44908 * \log(\text{YRPICVA}) - 2.59589$$

$$\text{AR}_- = + 0.66814 * \text{AR}_1$$

Where

- | | |
|-------------|---|
| GRE | = Virginia electric company gross receipts |
| YRPICVA | = Virginia personal income |
| CESHHOELE82 | = U. S. household consumption expenditures on electricity in 1982 dollars |
| PPIFAP | = U. S. producer price index for fuel and power |
| AR_x | = Autoregressive coefficient, order x |

Annual data for 29 periods from 1961 to 1989

Water Company Gross Receipts Model

GRW

$$\begin{aligned} &= 0.05673*PDICESHHO + 0.00019*YRPICVA - 2.52799*DUMWAT68 \\ &\quad - 1.26515*DUMWAT79 + 2.00230 \end{aligned}$$

AR_

$$= + 0.45096*AR_1$$

Where

- GRW = Virginia water company gross receipts
- YRPICVA = Virginia personal income
- PDICESHHO = U. S. implicit price deflator for consumption on household operations
- DUMWAT68 = Dummy variable (1968 and on = 1, all others = 0)
- DUMWAT79 = Dummy variable (1979 = 1, all others = 0)
- AR_x = Autoregressive coefficient, order x

Annual data for 29 periods from 1961 to 1989

Gas Company Gross Receipts Model

GRG

$$\begin{aligned} &= 4.98789*PDICESHHOGAS + 0.00043*YRPICVA \\ &\quad - 90.1055*DUMGAS85 - 42.2415 \end{aligned}$$

AR_

$$= + 0.48305*AR_1$$

Where

- GRG = Virginia gas company gross receipts
- YRPICVA = Virginia personal income
- PDICESHHOGAS = U. S. implicit price deflator for household consumption of natural gas
- DUMGAS85 = A dummy variable reflecting a regulation allowing end-of-pipeline sales (1985 = 1, all others = 0)
- AR_x = Autoregressive coefficient, order x

Annual data for 29 periods from 1961 to 1989

Public Service Gross Receipts Tax Model

FT61

$$\begin{aligned} = & 0.21256*QD3*GRSIX*RT6 + 0.21211*QD4*GRSIX*RT6 \\ & + 0.09439*QD1*GRSIX[-1]*RT6 + 0.43486*QD2*GRSIX*RT6 \\ & + 3.25273*DUM7385 + 9.5006*DUM851 \end{aligned}$$

Where

FT61	=	Virginia electric, water, and gas company gross receipts tax collections
RT6	=	The applicable Virginia tax rate
GRSIX	=	Virginia taxable gross receipts
QD1	=	A dummy variable (first calendar quarter = 1, all others = 0)
QD2	=	A dummy variable (second calendar quarter = 1, all others = 0)
QD3	=	A dummy variable (third calendar quarter = 1, all others = 0)
QD4	=	A dummy variable (fourth calendar quarter = 1, all others = 0)
DUM7385	=	A dummy variable reflecting the increased percentage required for estimated payments (first quarter of 1973 through 1985 = 1, all others = 0)
DUM851	=	A dummy variable reflecting the balance due payment made when the percentages required for estimated payments increased (first quarter 1985 = 1, all others = 0)

Quarterly data for 71 periods from 1972, third quarter to 1990, first quarter

Appendix C

Agency Responses

As part of an extensive data validation process, the major State agencies involved in a JLARC assessment effort are given an opportunity to comment on an exposure draft of the report. Appropriate technical corrections resulting from the written comments have been made in this version of the report. Page references in the agency responses relate to an earlier exposure draft and may not correspond to page numbers in this version of the report.

This appendix contains the response from the Department of Taxation.



JAN 25 1991

COMMONWEALTH of VIRGINIA

Department of Taxation
Richmond, Virginia 23282

January 25, 1991

Mr. Philip A. Leone, Director
Joint Legislative Audit and Review Commission
General Assembly Building, Suite 1100
Capitol Square
Richmond, Virginia 23219

Dear Mr. Leone:

Enclosed are my brief comments on the exposure draft of your interim report on Virginia's revenue forecasting process. I believe your assessment is generally fair but had some omissions, and I would like to take this opportunity to provide information to supplement that contained in your report.

The first area I would like to discuss is the criteria you cited for an optimal revenue forecasting process. The first ten criteria were identified in a report produced by the two national organizations most interested in tax revenue forecasting, the Federation of Tax Administrators and National Association of State Budget Officers. Their study was funded by a Ford Foundation grant. Your report fails to note that, while no state meets all the criteria, it was Virginia's process that was selected as the model for developing the ten criteria you cited. The remaining four criteria noted in the report were not identified by the two associations as necessary in a sound forecasting process, and their source was not well documented. Regardless, we believe that any change to Virginia's process should be made only after a careful analysis of needs and not solely because there was a revenue shortfall.

In several places the report cites the failure to develop documentation for external review. While models provide one input to the process, the final forecast blends information from many sources. Extensive forecast documentation is contained in working papers, data files, spreadsheets, data bases, and computer models, both personal computer and mainframe. Information from dozens of sources is evaluated by the Research staff in finalizing a forecast. The sheer variety of information and sources makes it difficult to concisely document for external review the evolution of

Mr. Philip A. Leone
January 25, 1991
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a forecast. Another impediment, as I am sure you are aware, is the restrictions the Internal Revenue Service places on the disclosure of federal tax data. For example, these restrictions prohibit the release of raw data which are based on confidential taxpayer information; this further impedes the external assessment of the forecast.

Of the substantial documentation offered to the JLARC staff, most of that which was accepted appears to have fostered a good understanding of the basics of the forecasting process as well as its complexity. However, some of the documentation JLARC received appears not to have been reviewed in time for this interim report. This is particularly apparent in the discussion of the FY90 shortfall and subsequent forecast revisions and of the interaction of the income tax credit and pension subtraction. The incomplete review is understandable given the short time over which the study was conducted. In addition, JLARC staff did not request all of the data files and computer programs which would have been necessary to replicate the Department's forecasts of various tax policy changes.

I think you would agree that the report's conclusion regarding Virginia's forecasting track record is a positive reflection of the process. In assessing Virginia's forecast accuracy, and as noted in Figure 1 on page 42 of the report, forecast variances were calculated without regard to the effects of tax policy changes implemented subsequent to the development of the forecast. I would again like to stress that using a pre-policy change forecast to measure post-policy change accuracy is an invalid and misleading comparison. For example, in several instances the report cites a -10.3% variance associated with the fiscal year 1990 forecast. The forecast referred to is one which was available prior to the 1989 Special Session of the General Assembly. The reduction in fiscal year 1990 revenue resulting from the enactment of changes in pension taxation during the Special Session was not reflected in that forecast. Adjusting for this enacted tax law change, the forecast accuracy improved from -10.3% to -7.2%. That is, the error range in the report is overstated by three percentage points due solely to a General Assembly action.

Also, from a technical perspective, the formula used in the report to calculate the forecast variances differs slightly from that generally accepted by forecasters to gauge forecast accuracy. The report shows errors calculated on the actual receipts rather than on the forecast. Computing the error on the forecast, the method recommended many years ago by the Board of Economists, would yield a forecast variance of -6.7% rather than -7.2%.

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January 25, 1991
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As you know, the Research staff monitors monthly collections and prepares a report for the Secretary of Finance. As a part of this process, collection trends are analyzed in a manner similar to that discussed in your report. Two points regarding this type of analysis should be stressed. First, changes in tax law tend to disrupt the "normal" revenue flow within a year. Two significant changes affected fiscal year 1990 revenue - a legislative change in the withholding table and the Special Session change in the taxation of pension income. Because of these tax law changes, it was expected that revenues would be sluggish during the first half of the year with a reversal late in the year. We now know that the economy was deteriorating to such an extent that any policy-induced upturn in collections was mitigated.

Second, tax reform measures passed in the latter half of the 1980s have significantly altered collections patterns from those experienced during the early part of the decade. For example, the proportion of net individual income taxes collected through November averaged 41.2% from 1980 through 1989. For the pre-tax reform years the average was 42.3%, while in 1987 through 1989 the first five months' collections averaged only 38.5% of the fiscal year total. The report notes that 38% of the December 17, 1990, net individual income tax forecast was collected through November compared to an average of 41%. We believe the proper comparison should be to the post-tax reform average of 38.5%.

In regard to staffing, the report cites the "planned addition of two staff people to the research division." We have indicated several times that these two positions have been vacant. Your report may lead the reader to conclude that these are two additional positions; they are not. The Research Division has five positions dedicated to forecasting, excluding the Director's which cannot be totally devoted to forecasting. One of the five positions was recently reallocated to forecasting from tax analysis. Currently, only two of these five positions are filled. The forecasting effort has been understaffed throughout calendar year 1990.

One finding of the JLARC report centers on the failure of the Research Division to evaluate the revenue impacts of tax policy changes using actual tax return data. In fact, the most up-to-date reevaluations of these tax policy changes were provided to JLARC staff. In August 1990, Research Division staff completed a reevaluation of the fiscal impact of the federal Tax Reform Act of 1986, the Virginia Tax Reform Act of 1987, and the Virginia Tax Reform Plan of 1989, using actual return data for 1987 and 1988, and six months of tax credit data for 1989. This report was provided in

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its entirety to JLARC staff, and numbers from that report are included in the table on page 65. The major point of JLARC's discussion appears to be that the reevaluation does not incorporate 1989 tax return data which were unavailable at the time. In fact, JLARC staff were informed that the items addressed in Recommendation (6) had been impacted, or were in the process of being impacted, using the best data available. As new data become available, we will continue to validate our estimates, as we always do.

I would like to note that, in many cases, tax return data are insufficient to definitively determine a fiscal impact of enacted legislation because the data do not reveal the taxpayer's behavior in the absence of the tax law change. For example, the adjustment to income for individual retirement account (IRA) contributions was repealed for many taxpayers beginning with taxable year 1987. 1987 tax returns do not indicate the IRA contributions taxpayers would have made if contributions were still deductible. Therefore subsequent validation of tax policy estimates will continue to require the judgment of the Research staff.

In regard to Recommendation (7), one of the goals of the General Assembly in conforming to the federal income tax structure in 1972 was simplicity of administration and simplicity for the taxpayer. The Department has always tried to comply with this goal by eliminating unnecessary paperwork and keeping the tax forms as simple as possible. This has obvious administrative benefits but, as your report points out, has entailed some unquantifiable costs such as the loss of timely data. We will continue to seek ways to obtain timely and accurate tax return information while minimizing the burden on the taxpayer.

I agree with the report's conclusion that Virginia's forecasting process is sound. Given the many uncertainties associated with predicting the future, Virginia's track record has been above average, as your report notes. I am sure that record will continue to be a good one.


W. H. Forst
Tax Commissioner

WHF:cj

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