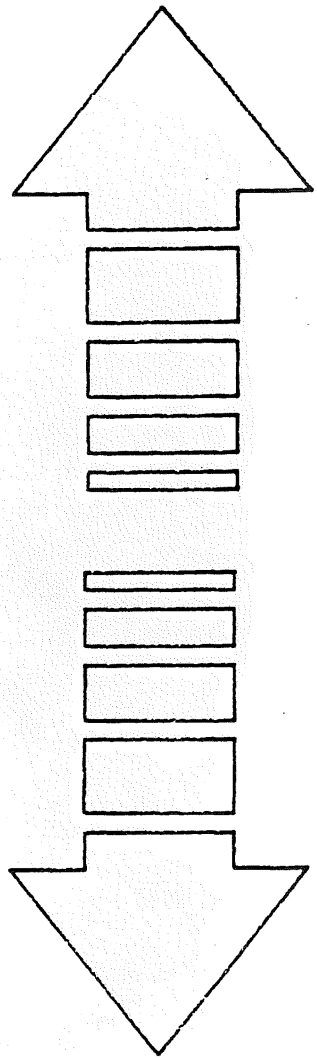


STATE BUDGET STABILITY

The Limits of Forecasting -- Creating a Manageable Budget

Prepared for the Governor and Legislature

Department of Finance - November, 1986

CONTENTS

EXECUTIVE SUMMARY

Anyone who has observed public finance in the state of Minnesota in recent years knows that the state budget has had unpredictable shortfalls and unanticipated surpluses. This pattern has occurred because actual results of state revenues and expenditures have proved very different than the forecasts upon which the budgets were adopted. These unexpected fiscal events have, in turn, caused special legislative and gubernatorial actions to deal with deficits or surpluses.

Minnesota state revenue and expenditure forecasts, while prepared proficiently, have been anything but accurate. Since 1979, the average absolute forecast error has been 9.0% ($900 million) per biennium or errors ranging from a negative $1.5 billion to a positive $670 million. Why are the state forecasts consistently wrong?

The short answer is that the relationships among the national economy, the state economy, the tax system and state expenditues are neither direct nor easily predictable, but rather complex, dynamic and very hard to understand. This report goes beyond the short answer and examines the major factors influencing the forecasts to better understand forecast errors. Here are some of the findings:

National Economic Factors

- State revenues generally vary with the national economy (page 9).
- The U.S. economy has a highly irregular pattern of growth, which is difficult to forecast (page 11).
- The state's average real GNP 2-year forecast error has been slightly less than 3% (page 20).
- Inflation, which is critical to a budget forecast, has fluctuated considerably (page 12).
- The average inflation 2-year forecast error has averaged slightly over 3% (page 21).
- While lower than anticipated inflation tends to draw revenues down, it does not reduce expenditures correspondingly because of the rigidity of the appropriation process (page 41).
- Data Resources, Inc., the state's national economic consultant, has been a consistently better performer in estimating national growth and inflation than most (page 22).

Minnesota's Economy and Tax System

- The swings of the Minnesota economy are similar to national economic swings, but generally more pronounced (page 13).

- Contrary to what one might expect, income tax indexing has not made the short run relationship (1 to 3 years) between income and tax revenue more predictable (page 26).

- An elastic income tax structure makes the relationships between personal income and income tax revenues more unpredictable (page 28).

- A narrow, volatile sales tax base makes predicting sales tax revenues very difficult (page 31).

- Corporate accounting practices, no minimum tax, and a progressive rate schedule make the corporate tax very volatile (page 34).

Other Problems of Forecasting Revenues and Expenditures

- Time lags in tax data, lack of necessary forecasting information, federal and state law changes and institutional complications cause difficult technical forecasting problems (page 36).

- The need to estimate future levels of factors such as unemployment, school enrollment, property market values, welfare caseloads and cost of health care complicates the problem of forecasting expenditures (page 39).

- Changes in federal policy can also unexpectedly increase state expenditures (page 43).

- Future commitments within enacted budgets result in significant problems in balancing budgets for succeeding biennia and contribute to a perception of inaccurate forecasting (page 45).

Determining the precise "weight" or importance of each individual forecasting factor to the total forecast error is analytically infeasible. However, because of the importance of conveying an understanding of the significance of each factor, the Department of Finance collectively made the following judgments:

Factors	%	$
Revenues:		
Volatile National Economic Growth	20	180M
Fluctuating Inflation	20	180M
Minnesota's Relationship to the National Economy	15	135M
Sensitivity of Tax System	15	135M
Technical Forecasting Problems	20	180M
Expenditures:		
Fluctuating Inflation	3	27M
Estimating Other Factors	6	54M
Federal Changes	1	9M
	100%	$900M

The most commonly discussed method for improving the accuracy of state forecasts is to change the revenue system "to make it more stable." This report examines the advantages and disadvantages of some revenue system changes:

- Changing the Mix of Revenues
- Using a Flat Rate Income Tax
- Establishing a Dollar Amount of Taxes
- Changing the Sales Tax Base
- Reducing the Number of Law Changes

We found that no revenue system change alone will substantially reduce forecast error. Some of the changes could reduce some of the forecast error, but would not solve the problem.

What else should be done? Our contention is that forecast error must, more or less, be accepted as a fact of Minnesota life. Solutions are needed for budget stability that are independent of forecast accuracy.

This report reviews two types of options that attempt to prevent forecast errors from causing massive budget instability.

The first option simply formally acknowledges inherent Forecast Risk by responding with a Contingent Plan in anticipation of foreseeable risks. It requires development of, and adoption of, specified responses to unanticipated budget deficits or surpluses. Adopting a contingent plan which recognizes forecast risk provides more than a mechanism for "balancing the budget" as it appears to offer a valuable alternative to repeated unexpected shortfalls and surpluses and resulting abrupt policy changes.

History demonstrates that no single action provides sufficient response to the problems of forecast error -- other complementary options which represent components of a contingent plan are suggested:

- Budget Reserves
- Trigger Tax Changes
- Staged Appropriations
- Inflation Adjustments Made Annually
- Expenditures Linked to Revenues

The second option relates to changes in the budget process which can assist in managing future budgets. A shorter, more synchronized budget cycle could possibly improve budget stability.

- Annual Budget Considerations
- Uniform Budget Cycle

Hopefully, this report on the limits of forecasting accurately and options for attaining budget stability will lead to the adoption of specific proposals in the 1987 Session of the Legislature to eliminate unpredictable shortfalls and unanticipated surpluses in the state budget.

I. INTRODUCTION

"The wisest saying of all was that the only true wisdom lay in not thinking that one knew what one did not know."

- Cicero

Minnesota forecasts of state revenues and expenditures have historically "missed the mark." The result has been unpredictable shortfalls or unanticipated surpluses. These unexpected fiscal events have, in turn, caused special legislative and gubernatorial actions to deal with the budget deficit or surplus. Dealing with deficits is a painful experience because previous commitments to taxpayers and public services must be revised. Even dealing with surpluses may be acrimonious because of lingering feelings that the original tax and spending package was unnecessarily burdensome on taxpayers and parsimonious to public services. The purpose of this report is to review budget instability issues and assess options for dealing with the problem.

A major purpose of forecasts is to facilitate fiscal planning in order to avoid a mismatch of revenues and expenditures. The record clearly indicates that forecasts have not succeeded in meeting this challenge for biennial budgets. However, the record also reveals that forecasts have provided public officials with some advance warning of shifts in the economy and tax system. These warnings have eased the burden of adjustment by providing more time for planning and implementation than would have been available without forecasts. Better forecasts would clearly be even more useful in state fiscal planning.

This report explores in considerable detail the forecasting of the state budget. The forecast is a sophisticated technical discipline as well as a sensitive political issue. Forecasting future revenues thirty months or more into the future is best understood as a careful, organized means to assess risks rather than as a specified mathematical process. This report analyzes the risks of forecast error, the likelihood of future errors, and presents an explanation of -- those factors which influence forecast accuracy but remain beyond our capabilities to predict successfully.

The report pursues the issue of forecasting in detail for two reasons. First, the Department of Finance desired a careful examination which could serve as a guide for its own efforts to improve fiscal planning. Others have criticized state forecasts; if the forecasts could be improved, the department wanted to identify the necessary steps. Second, the detailed discussion of forecasting lays the groundwork for the most important conclusion of the report; without the detail, readers might remain unconvinced of the limitations of forecasting.

This report concludes that forecasting has inherent limitations which make it impossible to solve the problem of budget instability through better forecasting. Other means must be sought, or state government will once again be forced to rewrite the budget in the midst of the 1989 biennium. The report outlines possible policies, principles and practices to improve management of the budget and suggests means to manage unavoidable risks effectively.

This report does not conclude with recommendations. Most of the potential means of addressing budget stability are not widely understood; each has important public policy implications. A debate of the appropriate mix of policies is essential to forming a stable foundation of informed public opinion upon which to base policy. The Department of Finance hopes to encourage and inform this debate by releasing this report on the limitations of forecasting and the potential of other means of fiscal planning.

II. BUDGET UNCERTAINTY CLEARLY EXISTS

During the last half dozen years, it has become popular to speculate on the causes of errors in forecasting and budget instability. Such problems are obvious when action is necessary to deal repeatedly with anticipated deficits. However, the problems of forecasting and budget instability are not new.

Long Term Instability

Historically, there has been a pattern of instability within the state's general fund budget. In general, there were slight imbalances in state revenues and expenditures during the 1970's. However, after 1979, the pattern of imbalances has widened. Unexpected revenue shortfalls which required repeated budget adjustments have highlighted these problems. Figure 1 compares general fund revenues to expenditures by year -- excluding any balance or surplus carried forward. Occurrences of expenditures exceeding revenues for a given year indicate an underlying problem. The graph illustrates how the pattern of revenues exceeding expenditures -- then falling short -- has become more pronounced in recent years. While recent dollar "gaps" have become larger as the size of the budget has grown, they are roughly similar as a percent of the total budget to those experienced during the 70's.

GENERAL FUND IMBALANCE
REVENUES and EXPENDITURES
1970 - 1987

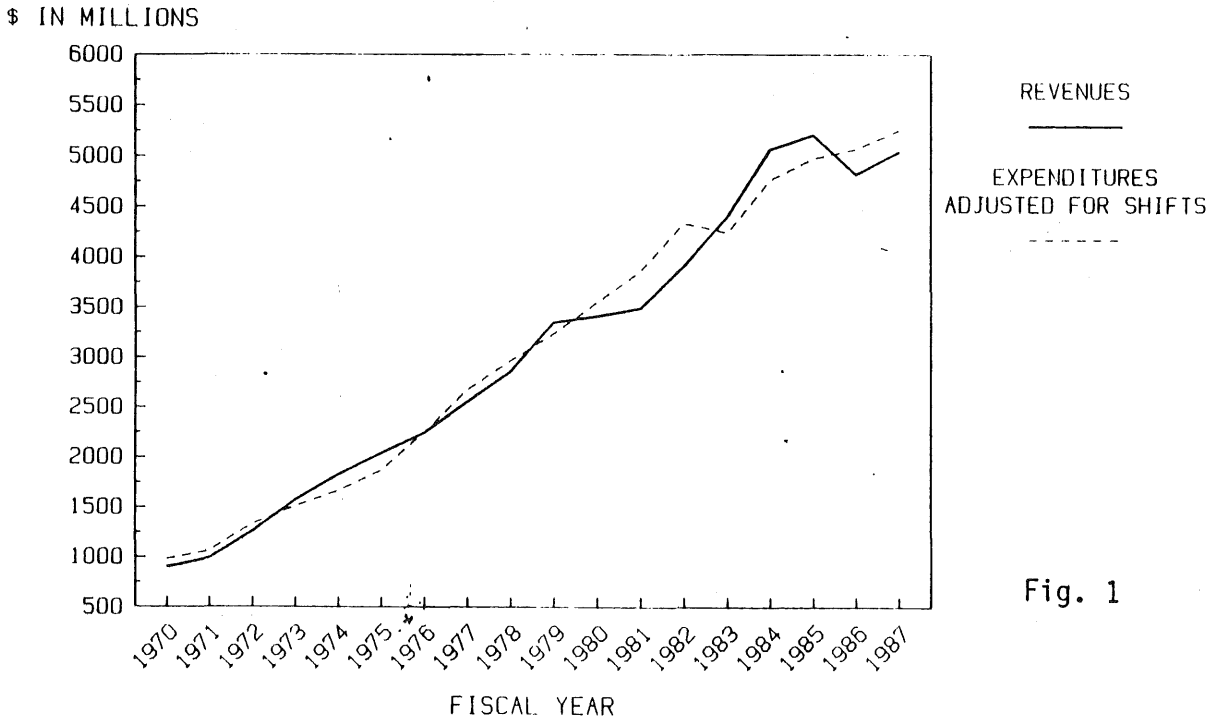
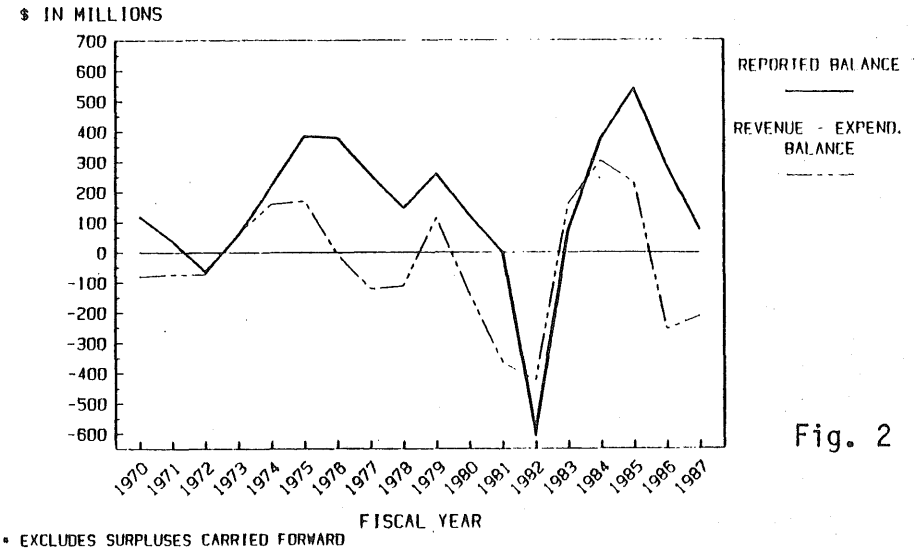


Fig. 1

Figure 2 displays the reported ending general fund balance as well as the difference between revenues and expenditures by year.

Since the state is required to have a balanced budget at the end of each two year period, it is not surprising that a positive reported general fund balance occurred in all but two years during the eighteen year period. However, during the same period, state expenditures often exceeded revenues by year even after budget adjustments. The state has had a positive revenue/expenditure balance in only seven years since 1970.

REPORTED GENERAL FUND BALANCES
COMPARED TO
REVENUES LESS EXPENDITURES *



* EXCLUDES SURPLUSES CARRIED FORWARD

Fig. 2

The pattern since fiscal year 1981 is in many ways similar to the pattern which began to emerge during the 1970's -- action and reaction to positive and negative revenue forecast errors. However, the pattern has been exaggerated by the growth in the overall size of the budget as well as by tax and spending actions taken during the period.

Major Cause of Instability: Inaccurate Forecasts

That forecasts of state revenues are an inadequate basis for developing state budget policies is a simple statement of the obvious. It is equally obvious to note that if forecasts of state revenues and expenditures were one hundred percent accurate -- budget problems would not occur. The pattern of budget shortfalls and surpluses was not planned, but occurred because actual results proved very different from the forecasts on which the budgets were adopted.

The following table displays forecast error, both in dollars and percent, from the forecasts on which the biennial budgets were enacted. Since 1980-81, forecast error has ranged from a negative 16.1% to a positive 7.5%. The average absolute error (ignoring whether positive or negative) for the biennial periods 1980-1987 was 9.0% -- or roughly $900 million based on the current $10+ billion general fund budget.

Table 1

FORECAST VARIANCE
PERCENT ERROR
($ in millions)

	BIENNIUM								
	1980-81		1982-83		1984-85		1986-87		AVERAGE ABSOLUTE
	$ VARIANCE	%	$ VARIANCE	%	$ VARIANCE	%	$ VARIANCE	%	ERROR
NON-DEDICATED REVENUES	(414)	-6.0%	(1,306)	-14.3%	596	6.8%	(652)	-6.9%	8.5%
EXPENDITURES/OTHER	55	0.7%	(169)	-2.2%	73	0.8%	(82)	-0.8%	1.1%
TOTAL	(359)	-4.9%	(1,475)	-16.1%	669	7.5%	(734)	-7.2%	9.0%

Because of repeated budget shortfalls during recent history, questions arise about the causes of forecast error. Should the Department of Finance change its forecasting methods or procedures?

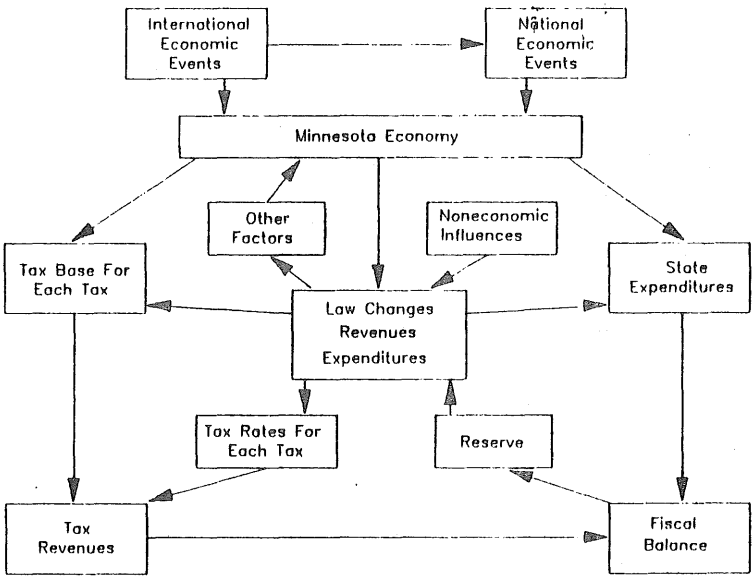
In response to repeated forecast errors, the Research Department of the Minnesota House of Representatives prepared a research paper in January, 1986 which reviewed the technical aspects of the state's revenue forecasting process. One of the conclusions of that report was that no major changes were required in the technical procedures used to forecast state revenues. We agree, of course, with that conclusion. This review of forecasting error also supports a general conclusion conveyed by the House research paper that little can be done to substantially improve forecast accuracy. Why then have the forecasts been inaccurate?

III. THE FORECAST PROCESS

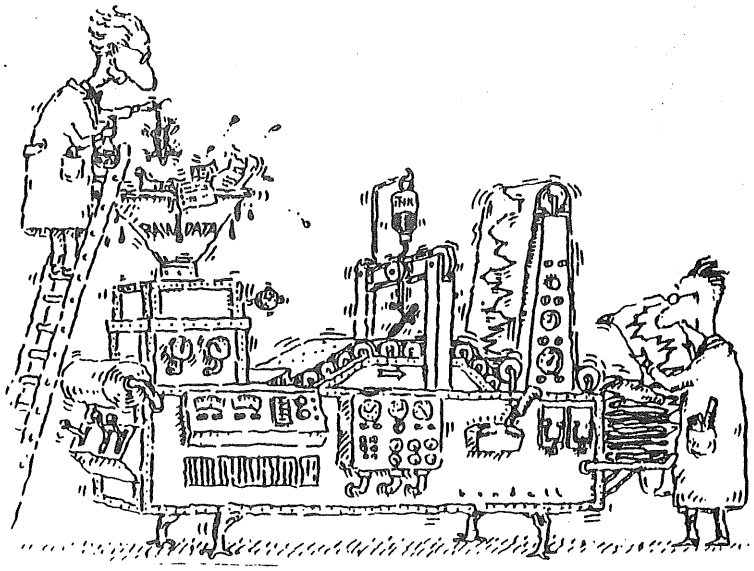
A Forecasting House of Cards

Forecasting state finances relies upon a complex relationship of economic and legislative factors.

Economic and Legislative Influences
on State Fiscal Stability Fig. 3



The following cartoon provides a comic representation of the real life complexities of the process of converting these factors into budget forecasts.



-Reprinted from LOTUS magazine

Forecast Procedures

Current revenue forecasting procedure is based on the premise that the Minnesota economy is strongly influenced by national and international economic events including recessions in the U.S. economy and the world market for agricultural products. Forecasts of national and international economic events are purchased from a nationally known economic consulting firm, Data Resources, Inc., whose performance is evaluated later in this report. These forecasts are reviewed by Minnesota's Council of Economic Advisors. Depending on the circumstances, the Council advises on the risks to the Data Resources forecasts and suggests alternatives which appear to encompass the risks which are foreseeable, resulting in a range of plausible economic forecasts.

Using a statistical model of the Minnesota economy and models of the tax and expenditure systems, the Finance Department calculates revenue and expenditure implications consistent with the economic forecast. Although not perfect, these calculations attempt to take into account the complex set of interactions within the tax and expenditure systems and between these systems and the economy as shown in Figure 3.

When one attempts to account for errors in forecasts of state finances over the last dozen years, it becomes apparent that an exact approach for analyzing and ascribing forecast errors to particular factors is not feasible. The relationship between economic and other factors influencing forecasts is not direct. It is extremely difficult to track a particular forecast change, event, or series of events through a forecast and ascribe a dollar impact to it. At best, one can attempt to examine the relationships among the major factors influencing forecasts to identify underlying causes of forecast errors and to make judgements about their relative importance.

The following sections examine major factors causing forecast inaccuracy: first by reviewing revenue forecasting; then by examining expenditure forecasts; and finally, other problems are noted.

IV. REVENUE FORECAST ERROR

What Has Been the Track Record -- and Why?

Since the 1980-81 biennium, forecasts of non-dedicated general fund revenues have had an average 8.5% absolute error or an error range of a negative $1.3 billion to a positive $600 million.

Table 2

FORECAST VARIANCE
PERCENT ERROR

($ in millions)

	BIENNIUM								
	1980-81		1982-83		1984-85		1986-87		AVERAGE ABSOLUTE
	$ VARIANCE	%	$ VARIANCE	%	$ VARIANCE	%	$ VARIANCE	%	ERROR
Non-Dedicated Revenues									
Individual Income Tax	(184)	-5.9%	(449)	-10.9%	460	11.2%	(275)	-6.4%	8.6%
Corporate Income Tax	(60)	-8.6%	(268)	-33.8%	(99)	-13.6%	(5)	-0.7%	14.2%
Sales Tax	(18)	-1.3%	(437)	-19.0%	173	7.1%	(282)	-9.2%	9.2%
Motor Vehicle Excise Tax	(25)	-12.6%	(67)	-22.8%	25	7.1%	(20)	-4.5%	11.8%
All Other Non-Dedic. Revenues	(127)	-8.3%	(85)	-5.3%	37	3.0%	(71)	-6.8%	5.9%
TOTAL	(414)	-6.0%	(1,306)	-14.3%	596	6.8%	(652)	-6.9%	8.5%

Forecasting for a biennium involves projecting conditions some 28-30 months in advance. The preceding table illustrates the lack of success in forecasting that far into the future. The error rate in forecasting only a single year ahead is better at 6.5% average absolute error.

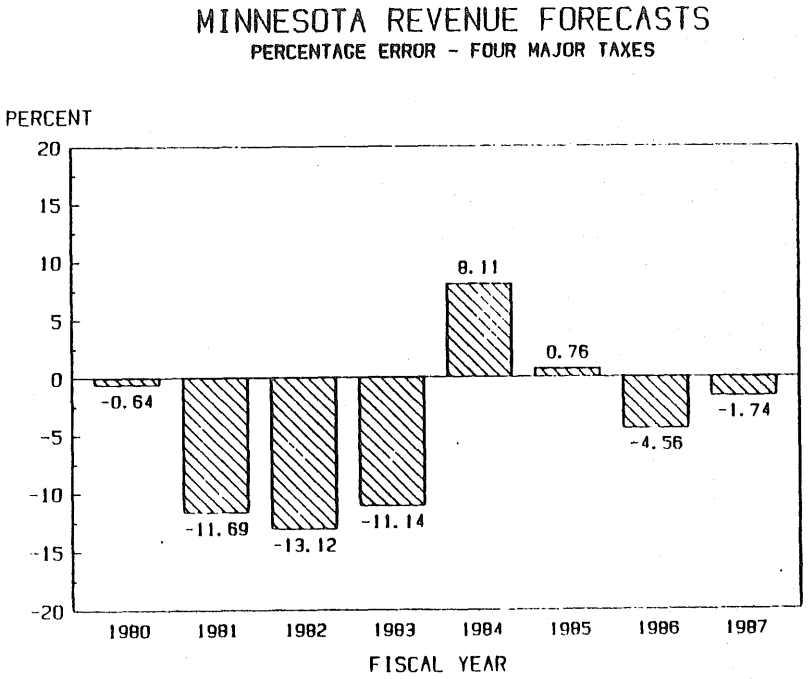


Fig. 4

Figures 5, 6 and 7 compare the growth by year of total general fund non-dedicated revenues (adjusted for major law changes) with primary measures of national economic activity: nominal Gross National Product (GNP), Real GNP, and the GNP deflator (an indicator of inflation). What the graphics highlight is that general fund revenues generally vary with the national economy. While generally paralleling the growth of the national economy over the longer term, state revenues by year have grown at widely varying rates.

FOUR MAJOR TAXES* vs
NOMINAL GNP GROWTH
1975 - 1987

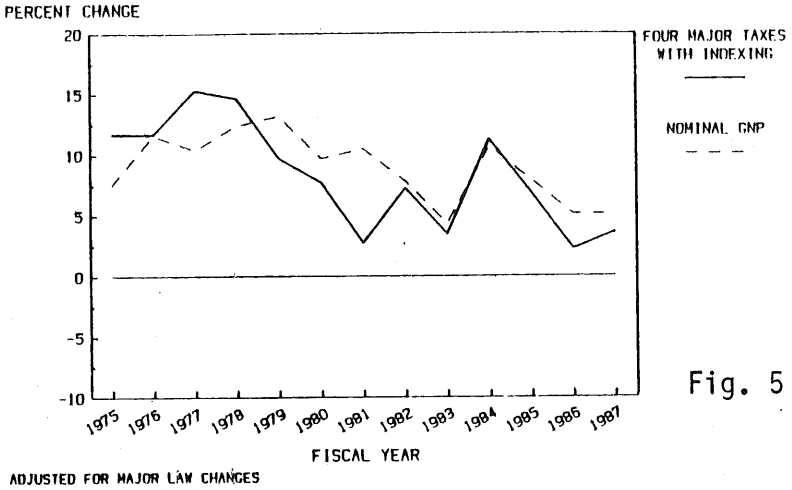


Fig. 5

While it is true that Minnesota's economy closely parallels the national economy, Minnesota's system of raising revenues and spending dollars is different than other states in ways which create unique problems in developing state budget forecasts. The volatile nature of Minnesota's tax system, recent substantive tax law changes, and the composition of the state's tax base, account in part for the year to year variations in Minnesota's revenue compared to national indicators.

FOUR MAJOR TAXES* vs
REAL GNP GROWTH
1975 - 1987

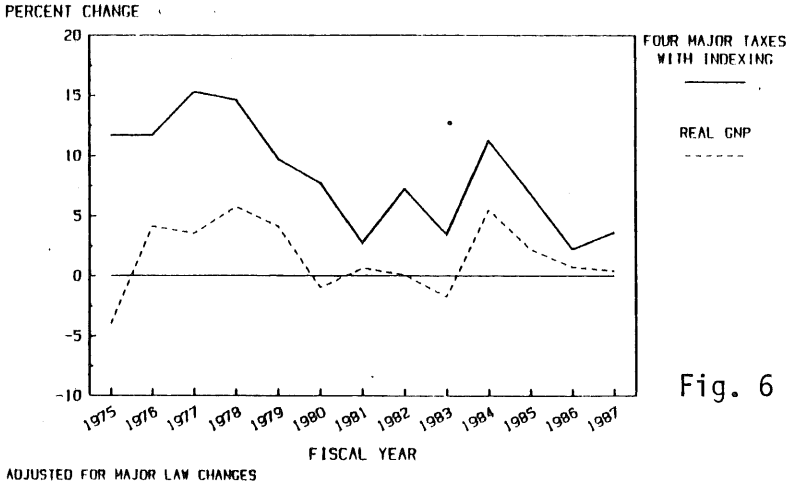
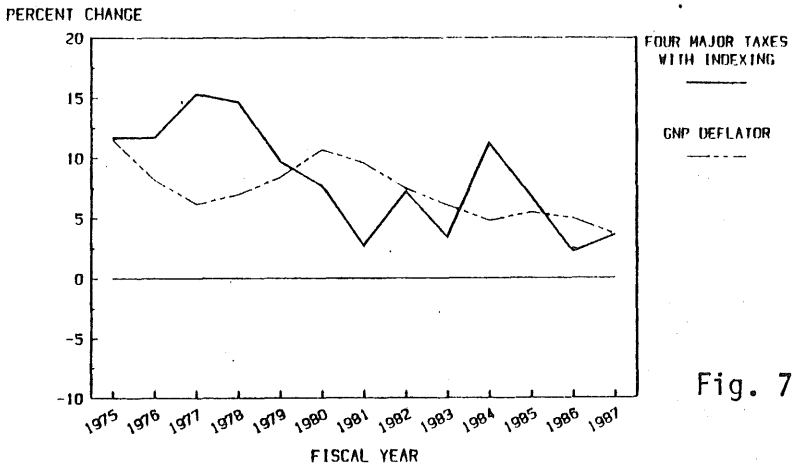


Fig. 6

FOUR MAJOR TAXES* vs
CHANGE IN GNP DEFLATOR (INFLATION)
1975 - 1987



* ADJUSTED FOR MAJOR LAW CHANGES

Fig. 7

Revenue Volatility: Sources of the Problem

There are two factors which cause tax revenue volatility: structural factors, and technical factors. The nature of Minnesota's tax system, the Minnesota economy, and other factors influencing the forecast make it difficult to ascribe precise measures to that volatility -- and make it difficult to draw direct relationships to resulting revenue changes.

Structural Volatility

Structural revenue volatility is caused by cyclical national and state economic activity and the composition of the state's tax base and rates. The national and state economies do not grow steadily and evenly. Rather they grow in an irregular manner, described in more detail later in this report. This tends to generate irregularities in tax revenues and to some extent, in expenditures. But apart from these irregularities which are difficult to forecast, even perfect economic forecasts would not lead to perfect revenue forecasts.

One important reason is that Minnesota's tax base interacts with the economy in a number of ways, and not all of these can be measured precisely. A second important reason is that numerous law changes affect the tax base and rate structure and often the effects of these cannot be anticipated precisely. Examples of these problems are also examined later in this report.

The more volatile the economy and the more sensitive the tax system is to economic swings, the more difficult it is to make accurate revenue projections. A review of the revenue forecasts necessarily begins with a review of national and international economic forecasting.

V. NATIONAL ECONOMIC TRENDS

Minnesota's economy and revenues are strongly affected by national economic events. Key indicators of the national economy include nominal or current dollar GNP, real or constant dollar GNP, and inflation as measured by the GNP deflator. Figure 5 showed how revenue varies with fluctuations in nominal GNP. Minnesota can do little to control national economic growth and inflation, though they are important to what happens.

Figure 8 shows the U.S. economy has a highly irregular pattern of growth, with sharp changes in growth rates from one quarter to the next. Both the irregularities and the sharp quarter to quarter changes are difficult to forecast accurately. During the past several quarters, growth has been unusually stable but at a below-trend level. Fluctuations in nominal GNP are the result of combined changes in the rate of inflation and changes in the physical volume of goods and services being produced. Errors in forecasting current dollar GNP growth can be the result of errors in forecasting inflation, production, or both.

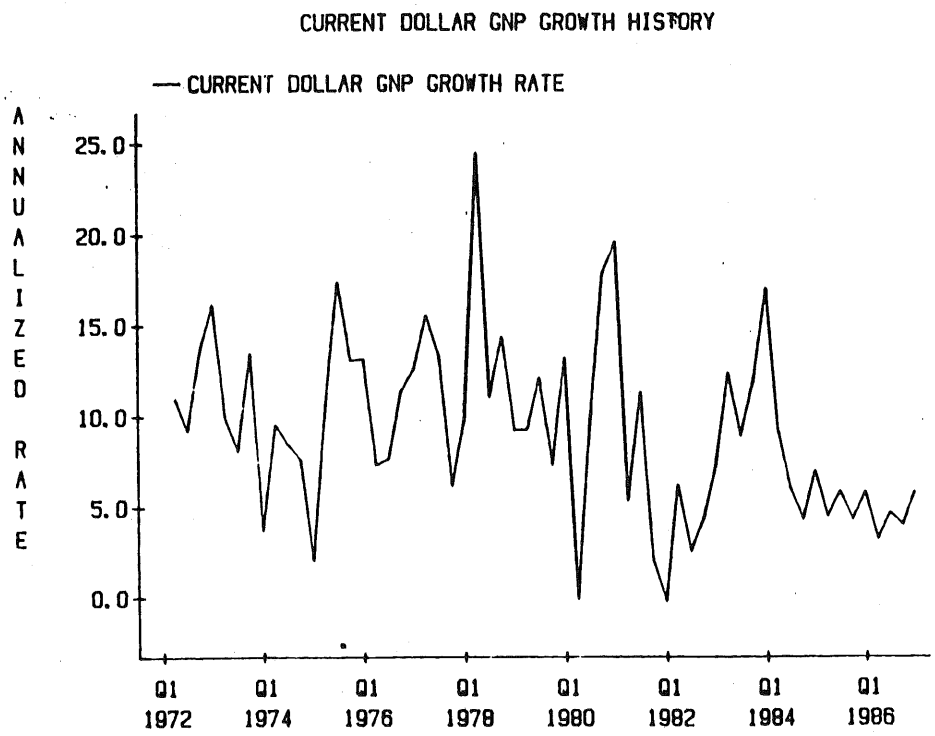


Fig. 8

The GNP deflator is a measure of inflation consisting of a weighted index of the prices of all goods and services produced by the economy. Inflation, has fluctuated considerably from one quarter to the next in an irregular pattern. Since mid-1981, however, increases in prices as measured by the deflator have become smaller and appear to be on a downward trend. Clearly, inflation has "cooled off" considerably compared with the experience of the 1970's.

Fig. 9

Growth in the physical volume of goods and services produced as measured by real GNP has also been very uneven from quarter-to-quarter (Figure 10). While it is fairly unusual to have a quarter of negative inflation, negative growth in real GNP commonly occurs from time to time. Prolonged periods of negative real GNP growth are generally called recessions. Since mid-1984, real GNP has grown on average at a quarterly annualized rate of 1.9 percent, somewhat less than the 2.5 percent trend since 1972 and sharply less than the roughly 3.0 percent considered to be full potential and the long-term trend by many observers.

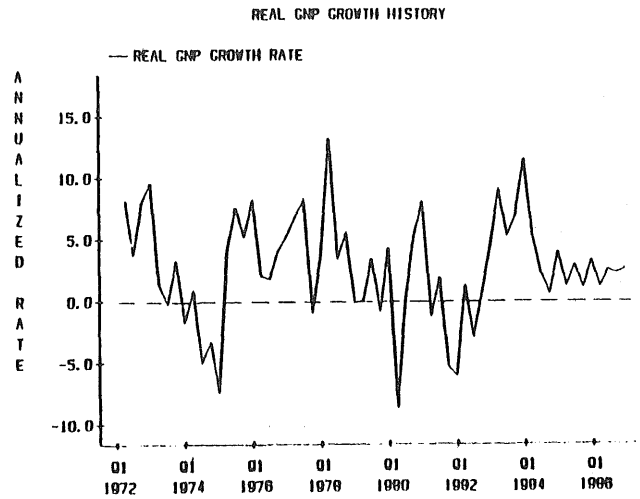


Fig. 10

NATIONAL ECONOMIC IMPACTS ON MINNESOTA

Accurate forecasts of the U.S. economy are critical to forecasting the Minnesota economy because Minnesota economic indicators such as employment and wage and salary disbursements generally track U.S. economic indicators as shown in Figures 11 and 12. The generally close tracking of Minnesota and U.S. economic indicators extends to important individual Minnesota industries such as manufacturing, trade, services, construction, and mining.

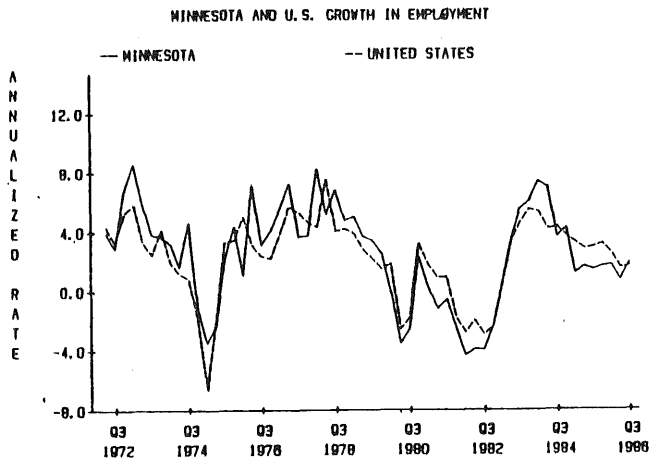


Fig. 11

The similar movements of Minnesota and U.S. economic indicators means that a recession in the U.S. economy is very likely if not almost certain to be transmitted to Minnesota. It also means any error in forecasting the U.S. economy, or any uncertainty in the outlook for the U.S. economy, creates potential error or uncertainty in forecasting the Minnesota economy.

Unfortunately, the Minnesota economy has properties which tend to magnify or leverage changes in the U.S. economy into potentially larger changes in the Minnesota economy. The nature of this problem can be seen by examining Minnesota economic indicators such as employment or wage and salary disbursements as a share of the corresponding U.S. totals.

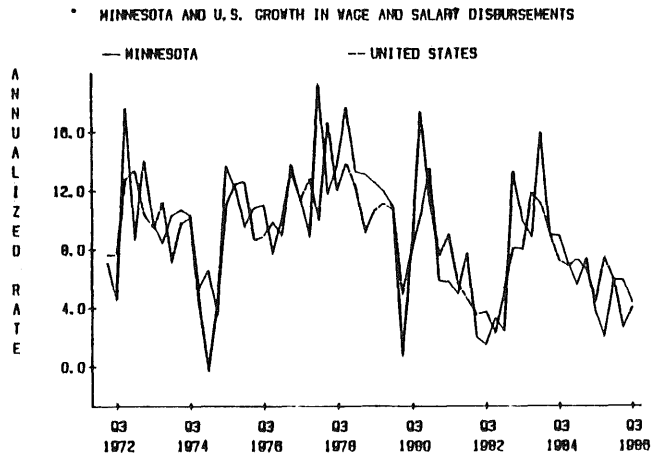


Fig. 12

A graph of Minnesota's share of total U.S. non-farm employment shows that the Minnesota economy is almost always growing faster or slower than the U.S. (Figure 13). A rising share indicates Minnesota is growing faster, a declining share, the reverse. During recessions, such as the experience in the early 1980's, Minnesota employment fell faster than it did nationwide employment, with the result that the recession was more serious in Minnesota than nationwide in its impact on job holders. Generally, Minnesota's share of wage and salary disbursements has the same pattern over time as the employment share.

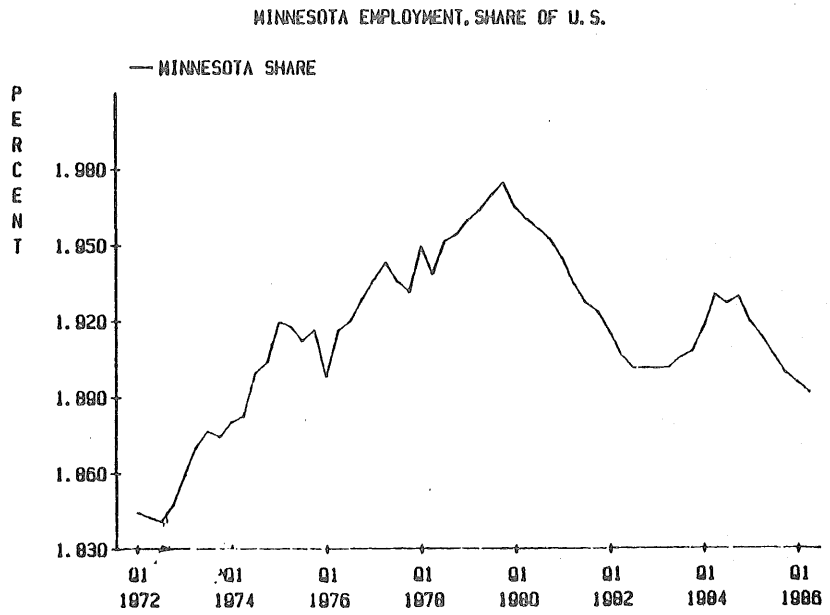


Fig. 13

Not all U.S. recessions affect Minnesota workers more severely than workers in other states. For example, during the 1974-75 recession, the state's share of jobs rose because Minnesota employment fell more slowly than it did nationally. The reasons for this include a strong agricultural sector, as well as strength in trade and services in the non-farm sector.

The tendency for Minnesota indicators such as employment and wage and salary disbursements to almost always rise or fall faster than their U.S. counterparts means the Minnesota economy is generally more volatile than the U.S. economy. Measuring and predicting this extra element of volatility is a significant problem in forecasting the Minnesota economy which introduces extra uncertainty beyond the uncertainty in the U.S. forecast.

Another forecasting problem is suggested by the fact that the Minnesota experiences during the recessions of 1974-75 and the early 1980's did not resemble one another very closely. A strong agricultural sector in the 1970's appears to be partly responsible, an example of the fact that accurate predictions of the fortunes of individual sectors or industries are required for successful forecasts of the Minnesota economy because they can cause significant deviations from national trends. Currently, the computer

industry, mining, trade, services, agriculture, and possibly others, appear to have such potential. Very often, the fortunes of Minnesota firms in these industries depend on the decisions of very small groups of policymakers or businessmen, and even single individuals. These kinds of decisions are often difficult to predict.

While the Minnesota economy shows some tendency to exaggerate national cycles, the pattern is not uniform. In the 25 year period ending in 1985, there were 13 years of annual increases of real GNP in excess of the long-term trend rate of 3.0 percent, but the Minnesota economy grew as fast or faster than the U.S. in only 9 of those years. Similarly, there were 12 years of U.S. growth below 3.0 percent, and the Minnesota economy grew slower than the U.S. in 5 of those years.

The general conclusion suggested is that while the Minnesota economy generally tracks the nation, there have been enough exceptions to the rule to make it clear that although a perfectly accurate forecast of the U.S. economy would be a great help, it does not guarantee a perfectly accurate Minnesota forecast.

VI. ERRORS IN FORECASTING THE NATIONAL ECONOMY

The Department of Finance bases its revenue forecasts on forecasts of the national economy prepared by Data Resources, Inc. and on forecasts developed with the assistance of Minnesota's Council of Economic Advisors. While the notion that economic consultants such as Data Resources, Inc. (DRI) and others "forecast" the national economy is widespread, it is more accurate to describe most of these statements about the future course of the economy as scenarios, not forecasts. A true forecast would be based solely on the history of economic fluctuations. Unfortunately, this information is often unlikely to generate a very good forecast because new, historically unique events are likely to have a significant impact on the economy. Current examples include the value of the dollar and the trade deficit, the recent decline in energy prices and the OPEC oil production agreement, the new federal tax law, and the switch in policy emphasis by the federal reserve from controlling inflation to lowering interest rates in an effort to keep the economy growing.

Forecast scenarios are built by DRI and others by making alternative sets of assumptions about such events. Econometric models are then used to calculate the consequences, which become the forecasts of the U.S. economy that nearly everyone uses. Clearly, these forecasts are only as good as the assumptions of the forecaster. Although DRI's assumptions appear to be at least as good as any, they have never been perfect. In what follows, the DRI forecast record will be reviewed in three ways. First, there will be an analysis of the April, 1985 control forecast. Next, DRI's track record in forecasting over a ten-quarter horizon will be summarized for nine forecasts dating back to January, 1980. Finally, DRI's forecasts will be compared to those of other forecasters.

April 1985 Forecast

Real GNP growth declined below its forecast value immediately after the April, 1985 forecast was issued (Figure 14) and generally remained below the forecast except for the third quarter of 1985 and the first quarter 1986. A revised forecast released in August, 1986 indicates real GNP will remain below its April, 1985 forecast through 1987.

The principal reason the April, 1985 forecast has proved optimistic is the largely unexpected record deficit in the U.S. balance of trade. However, Figure 14 also shows that at the time the forecast was made, forecasters thought the economy had gained strength in fourth quarter, 1984 when, in fact, the revised data shown by the dashed line indicates the weakening evident by late 1985 had already begun late in 1984. This illustrates the fact that preliminary economic data can, and often do, mislead forecasters.

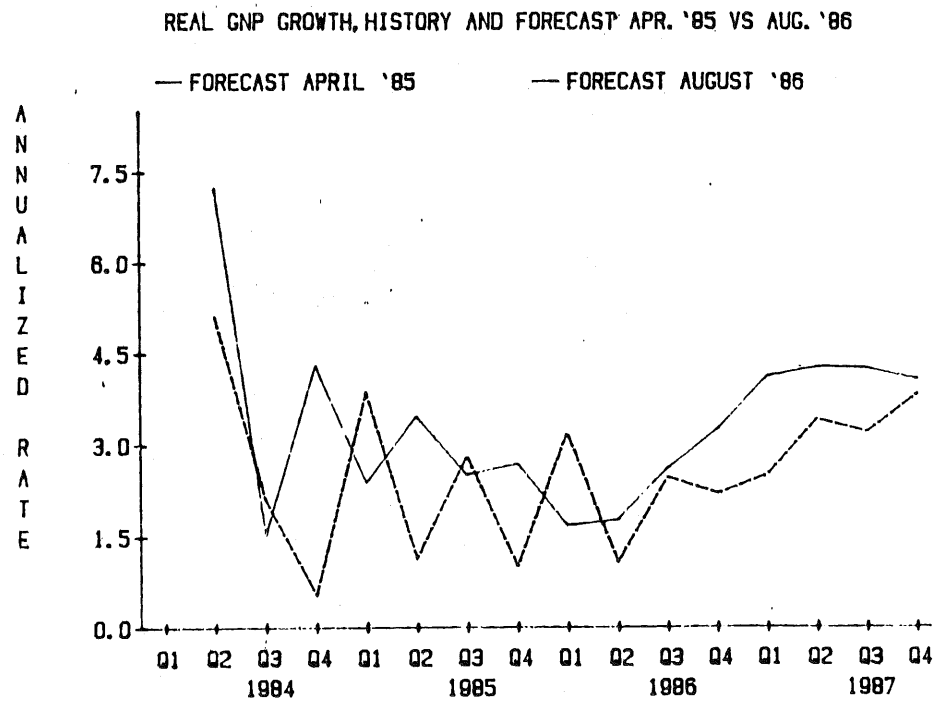


Fig. 14

While the April, 1985 inflation forecast was generally accurate for a few quarters after it was released in early 1986, inflation began to fall very sharply below its forecast. Important reasons for this include the largely unexpected decline in oil prices beginning in early 1986 and rising competition between foreign and U.S. goods as imports rose.

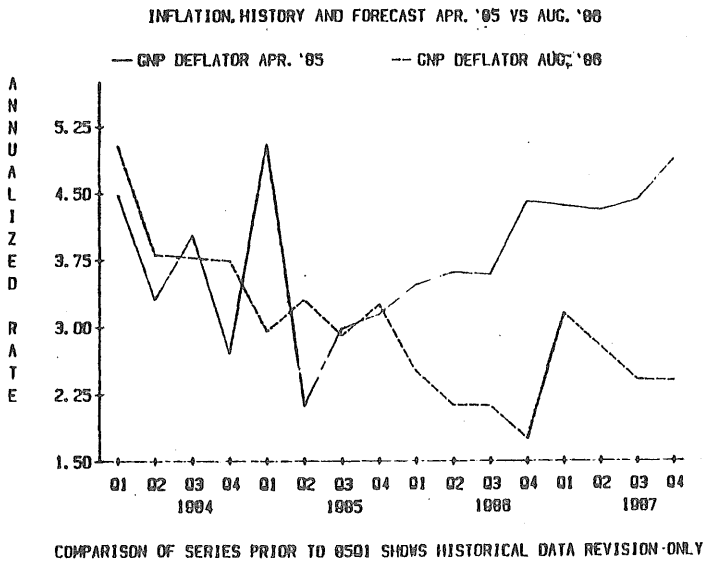


Fig. 15

Although the April, 1985 forecast of inflation and real GNP growth has proved optimistic for identifiable reasons, it is only one forecast. Conclusions drawn from this one experience could prove to be very misleading for at least two reasons. One reason as Figures 7, 8, and 10 displayed, is that the quarter to quarter growth in the economy is highly irregular, with each year generally showing a unique pattern. The so-called business cycle is in fact not really a regular and predictable cycle at all. About the best that can be done is to classify it into recession and recovery, but no two recessions or recoveries are exactly the same.

For this reason, and because of the importance of unique historical events in constructing forecast scenarios, a forecaster's track record is important. A single forecast can be especially good, or especially bad. But since exceptional forecasts only become so with the benefit of hindsight, all the forecast user can be sure of in advance is the forecaster's accummulated average error over a number of years. In economic forecasting, this record should include at least one complete cycle of recession and recovery in order to see how the forecaster performs in as many different kind of situations as possible. By going back to January, 1980 two cycles of recession and recovery can be included plus the period of slow growth currently underway which began in late 1984.

Figure 16 shows the DRI average "control" forecast error measured by forecast growth as a percentage of actual growth for nine real GNP forecasts released in January and April of each year for the period January, 1980 to January, 1984. These forecasts cover the period between January, 1980 and first quarter, 1986. In Figure 16, cummulative growth in forecast real GNP from the base quarter is divided by growth in the actual level of real GNP. If the forecast underestimates real GNP, Figure 16 will show negative error. For the nine forecasts between 1980 and 1984, real GNP growth was on average underestimated up to five quarters out. Beyond six quarters, on average, real GNP growth was overestimated as indicated by the positive forecast error shown in Figure 16.

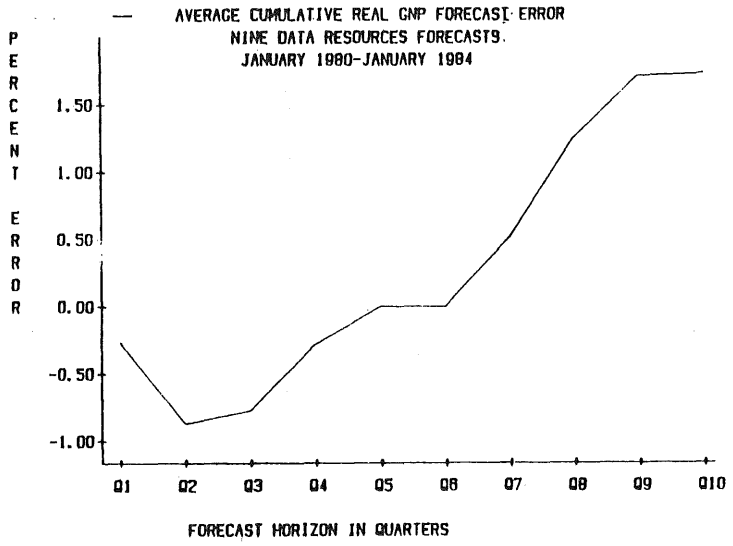


Fig. 16

Average real GNP forecast errors appear to have been fairly small over the 1980-1986 period, with forecast real GNP growth 10 quarters out exceeding actual real GNP 10 quarters out by an average 1.73 percent, as shown in Figure 16. Thus, for example, for the period beginning January, 1980, if actual growth 10 quarters out amounted to 5.0 percent, forecast growth for that period would have been 6.7 percent, on average.

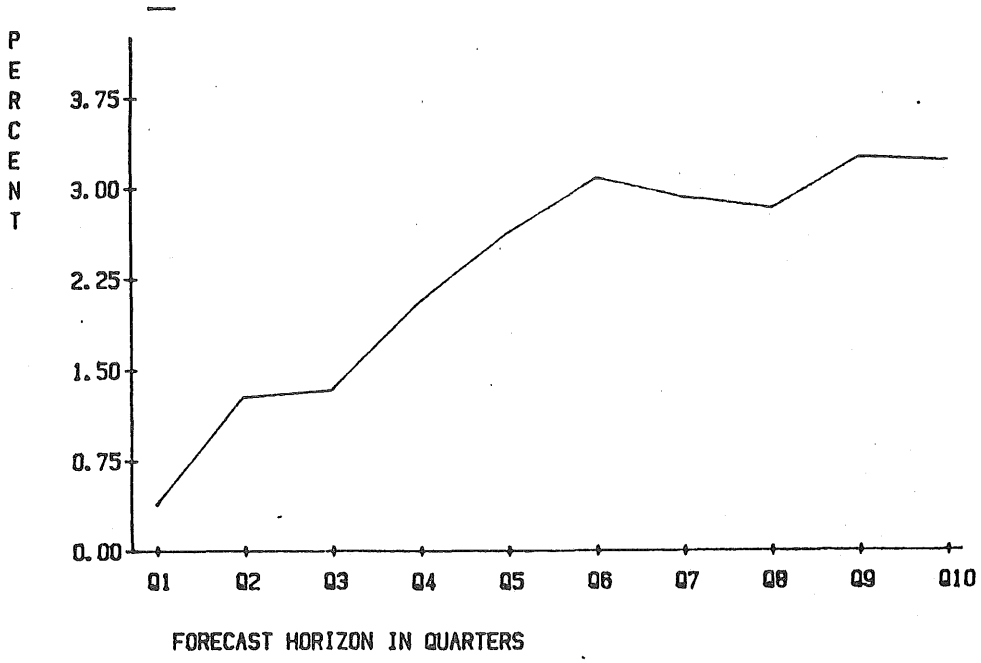
However, individual forecast errors could be larger and some forecasts actually underestimated real GNP growth. For example, maximum individual forecast errors over 10 quarters ranged from a positive 6.2 percent for the forecast released in April, 1981 to a negative 3.3 percent for the forecast released in January, 1983. This means that although DRI has generally tended to overestimate real GNP growth, it is also clear that DRI failed to anticipate the recession which began July, 1980, and DRI failed to fully anticipate the strength of the recovery which began in November, 1982.

Average negative and positive forecast errors, calculated without regard to sign so positive and negative errors do not cancel out as they do in Figure 16 shown in Figure 17. Figure 17 shows, for example, that when real GNP is forecast to be 6 percent higher in eight quarters, the average absolute forecast error is about 3 percent--implying that actual real GNP growth within the range of 3 to 9 percent would be within the average error.

Over the forecast horizon, the error grows steadily from very small for a one quarter forecast to about 3 percent for a six quarter forecast. Forecasts of real GNP for six to ten quarters show roughly the same average absolute error of about 3 percent. The conclusion, not surprisingly, is that error tends to increase as the forecast covers a longer period.

Fig. 17

ERROR SPREAD IN DRI REAL GNP FORECASTS



The DRI inflation forecasts have generally been less accurate than real GNP forecasts. As shown in Figure 18, since January, 1980 DRI has on average overestimated inflation over the entire one to ten quarter forecast horizon.

Inflation forecast errors in recent years have tended to be considerably larger than real GNP forecast errors. For forecasts 10 quarters out, forecast growth in the GNP deflator exceeded actual growth by 5 percent, as shown in Figure 18. Thus, during the period beginning January 1980, if actual growth in the GNP deflator was 5.0 percent, the forecast for that period, on average, was 10 percent. The maximum individual forecast error over 10 quarters was a positive 8.2 percent for the forecast released in January, 1981.

Since nearly all inflation forecast errors were positive, a graph of the average absolute error would have a shape nearly identical to Figure 18 and is omitted for this reason. As was the case for forecasts of real GNP, the forecast errors for inflation become larger as the forecast applies to a more distant period; for example, the error is about 1 percent for a four quarter forecast, 3 percent for an eight quarter forecast, and 10 percent for a ten quarter forecast.

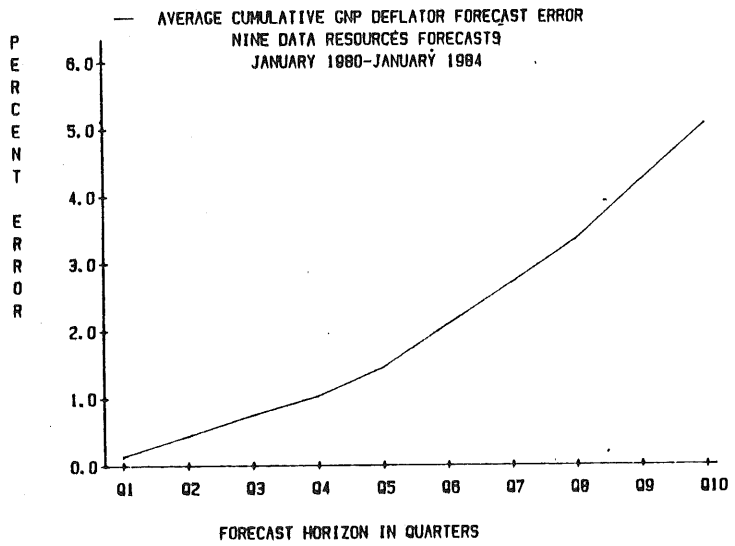


Fig. 18

As shown above, DRI consistently makes errors in forecasting real GNP growth and inflation. Since 1983, the Finance Department has regularly monitored the forecasts of other major firms such as Chase, Wharton, the Blue Chip consensus forecast, and by Merrill-Lynch. A rank comparison of major forecasts summarized in Tables 3 and 4 shows that on average, DRI and Chase received the highest rankings for the most accurate forecasts of real GNP, which in this case were also the lowest forecasts of real GNP growth. In forecasting inflation, however, all the forecasters including Chase, tended to be much more optimistic than DRI which received the highest ranking for consistently forecasting of inflation most accurately.

Table 3

Rank Comparison of Major Real GNP Forecasts
(Highest ranking indicates the most accurate forecast)

	Forecast for Remainder of Year Forecast Originated In	Forecast for Year After Year Forecast Originated In
CHASE	1	1
DRI	1	2
MERRILL LYNCH	3	3
BLUE CHIP	4	3
WHARTON	5	5

Table 4

Rank Comparison of Major Inflation (GNP Deflator) Forecasts
(Highest rank indicates the most accurate forecast)

	Forecast for Remainder of Year Forecast Originated In	Forecast for Year After Year Forecast Originated In
DRI	1	1
WHARTON	2	2
BLUE CHIP	3	3
CHASE	4	3
MERRILL LYNCH	5	5

These tables were constructed by averaging the rankings of several forecasts made on about the same date by each forecaster between April, 1983 and August, 1986. Forecasts of real GNP growth and inflation were analyzed separately, with the best forecast assigned a rank of one and the worst a rank of 5. Forecast lower rates of real GNP growth and lower rates of inflation received higher rankings with one the highest possible rank. Identical forecasts received the same rank.

Both the DRI and Chase real GNP forecasts appear to be comparatively accurate in view of their similar rankings. In forecasting inflation, DRI appears to be considerably more accurate than others, which in recent years inplied forecasting lower rates of inflation. As noted earlier, however, DRI forecasts of inflation have been less accurate than its real GNP forecasts for forecast periods of 9 to 10 quarters.

In summary, national economic forecasts from DRI or anyone else are generally going to be wrong. Although in the period since 1980, the tendency has been to overestimate real GNP and inflation, future errors of similar magnitude could occur on the downside as well as on the upside.

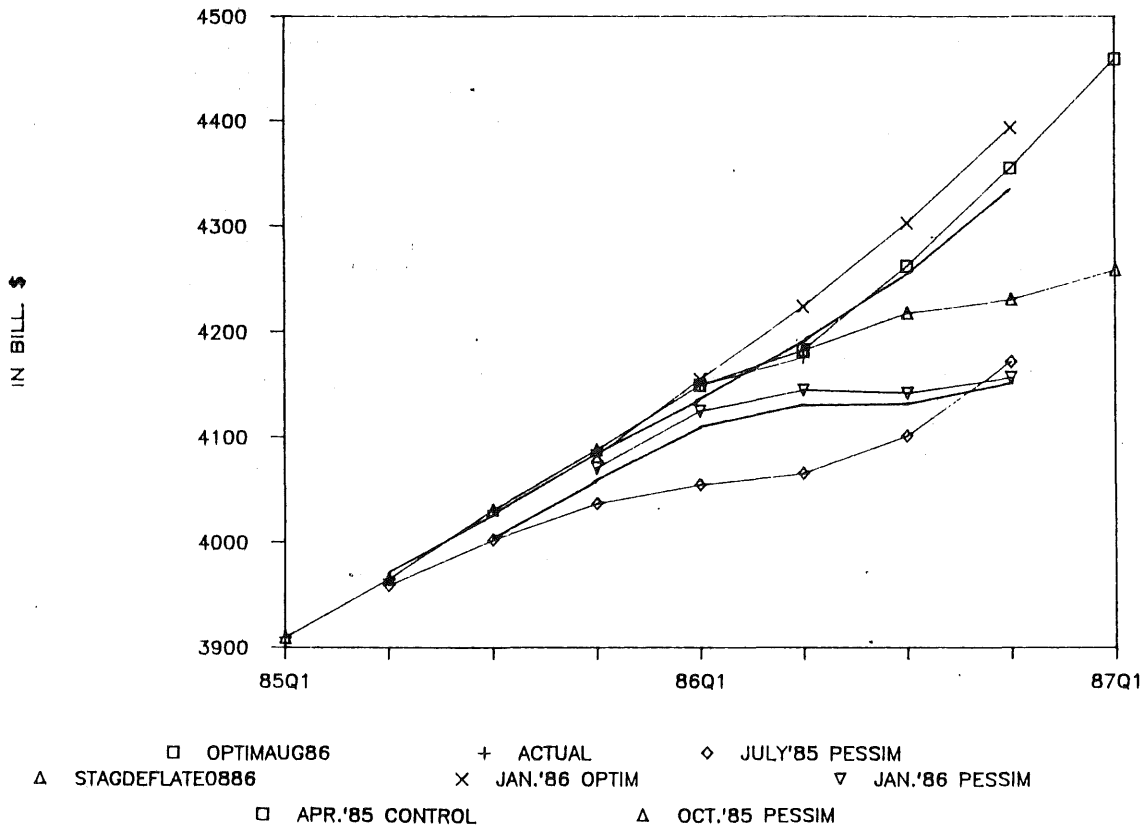
Forecasting Ranges

One way to deal with forecast error in is to plan for economic outcomes generated by sets of forecast scenarios which cover a range of possibilities.

The Department of Finance has followed the practice of analyzing a range of economic situations since July, 1985. Results for nominal GNP and Minnesota non-agricultural employment are shown in Figures 19 and 20.

The forecast ranges usually include the eventual actual outcome; the major exception in the case of Minnesota employment was caused by a major downward revision of historical data which left the April and July forecasts unrealistically high because they were based on preliminary, high estimates of employment. However, there is no guarantee that GNP, employment, or other indicators will generally remain within their forecast range. While the forecast range represents an attempt to account for foreseeable risks in forecasting, unforeseeable events not taken into account may cause forecast indicators to move outside their range.

Fig. 19 G.N.P.



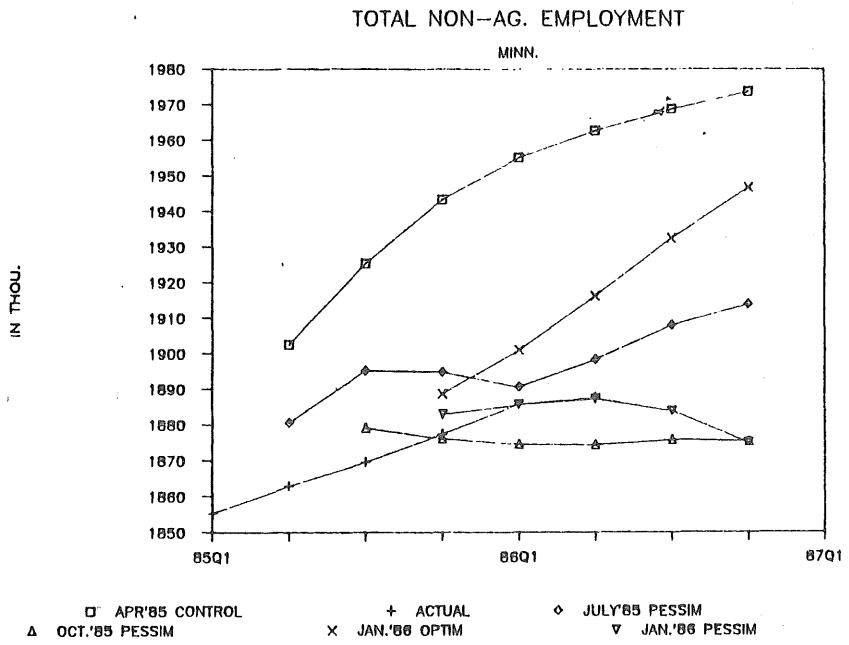


Fig. 20

Figure 21 shows the range of forecast revenues from the four major tax sources for the 1986-87 biennium. Two things should be noted regarding use of the range forecast. First, the latest control forecast has remained within the range originally presented. Second, as forecast revisions have been prepared during the biennium, the range has narrowed - as time remaining decreases, the forecast risk is lessened.

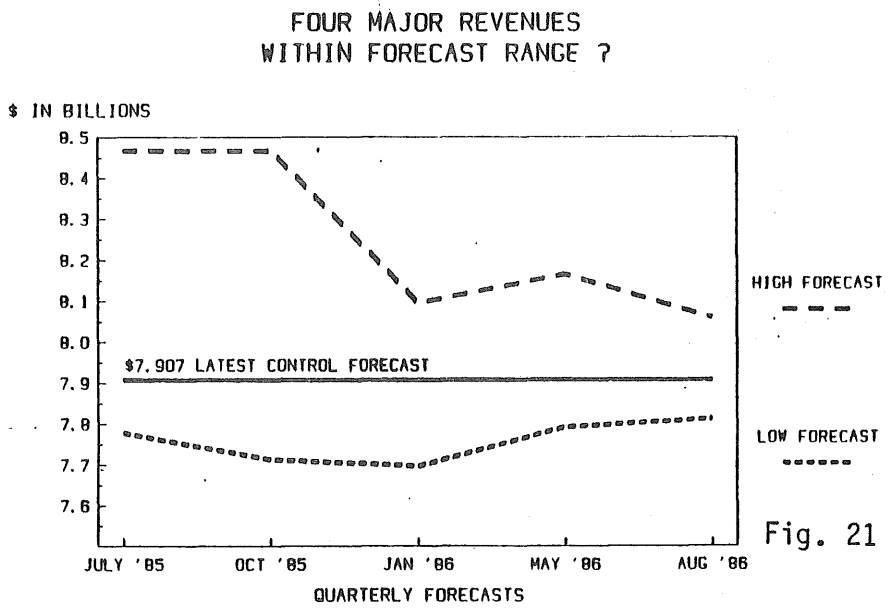


Fig. 21

Figure 10 illustrated earlier, however, that 1985-86 has been an unusually stable period of GNP growth. Success in using the range forecast may appear overly good because of this.

VII. MINNESOTA TAX SYSTEM VOLATILITY

A Volatile Revenue System

The volatility of state revenue forecasts, in part, is a direct reflection of volatility in the underlying structure of the tax system.

Figure 22 shows the relationship between the rate of growth in the state's four major taxes and the rate of growth in Minnesota's non-farm personal income between F.Y. 1975 and F.Y. 1987. To accurately reflect the relationship between tax collections and changes in the state's economy, the growth in tax revenues has been adjusted for those major law changes for which dollar impacts could be estimated during the period.

The graph illustrates the changing dynamics of the state's revenue system relative to growth in personal income. Between F.Y. 1975 and F.Y. 1978, state tax collections increased at a faster rate than did personal income. However, since F.Y. 1979, the state's underlying tax revenue growth (adjusted for indexing and other major law changes) has been lower than the rate of growth in personal income for all years except F.Y. 1984.

FOUR MAJOR TAXES* vs
GROWTH IN MINNESOTA NON-FARM PERSONAL INCOME
1975 - 1987

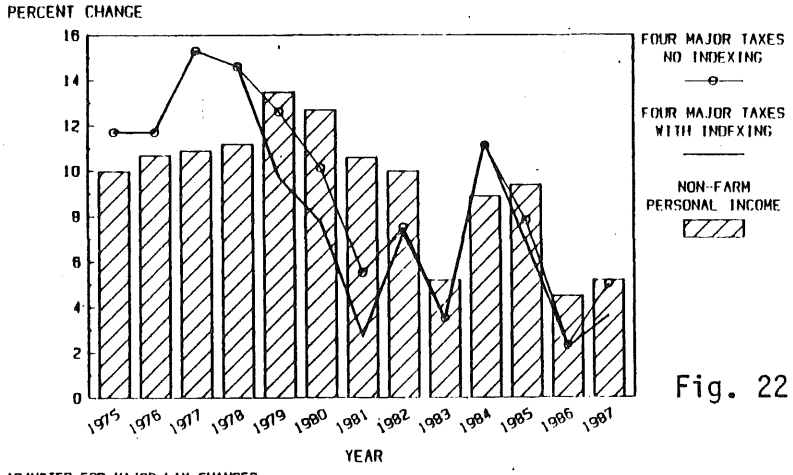


Fig. 22

* ADJUSTED FOR MAJOR LAW CHANGES

Two important observations can be made from this evidence: first, the state's "structural" revenue system relative to non-farm personal income was more revenue beneficial during the mid to late 1970's than during the 1980's. This is especially true since the state indexed its personal income tax but this would also be the case even if indexing had not occurred.

Second, as shown by the jagged line pattern in the graph, the variation in the annual elasticity suggests that the relationship between the state's tax system and its economy is by no means direct and is in fact complex and dynamic. It appears that the task of forecasting revenues during the 1970's

was as risky as it is now, although there may have been a tendency to underestimate rather than overestimate revenues prior to 1980.

Why is the Personal Income Tax Volatile?

The effects of a "lag" in the indexing calculation and a progressive rate structure play a significant part in the volatility and unpredictability of income tax forecasts. An analysis of the personal income tax begins with an examination of the effects of indexing.

Indexing Personal Income Taxes

Figure 23 shows the relationship between the rate of growth in state personal income tax collections and the rate of growth in personal income between F.Y. 1978 and F.Y. 1987. In order to better assess the underlying association between the rates of growth in revenues and personal income, the personal income tax is adjusted for major law changes. Because indexing is an issue of particular concern to many people, the growth in tax revenues is shown with and without indexing.

The graph indicates that, without indexing, state personal income tax revenues would have increased at a rate similar to the growth in personal income. This is especially true during periods of relatively high inflation; during lower inflation the relationship is not as clear.

PERSONAL INCOME TAX REVENUES* vs
GROWTH IN MINNESOTA NON-FARM PERSONAL INCOME
1978 - 1987

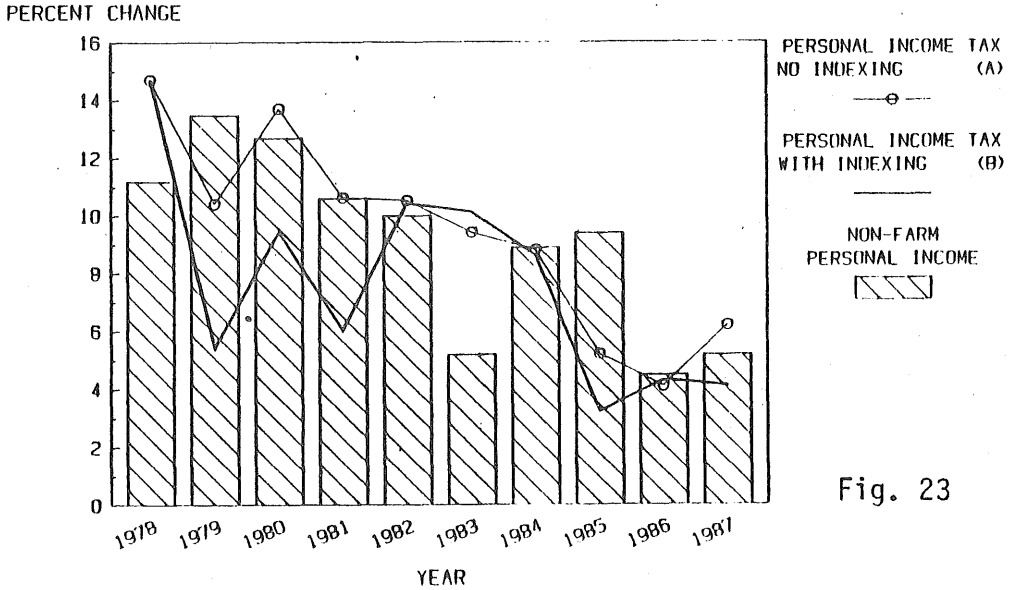


Fig. 23

* ADJUSTED FOR MAJOR LAW CHANGES

Contrary to normal expectations, the evidence suggests that indexing makes the association between growth in income tax revenues and growth in personal income slightly less predictable than without indexing. During times of relatively high inflation, indexing, while slowing the rate of growth in tax revenues relative to personal income, appears to increase the responsiveness of revenues to income changes, that is, to increase the "elasticity" of the tax. In addition, during periods of lower inflation, the impact of indexing becomes less apparent. The primary reason for the increased unpredictability lies within the mechanical nature of particular indexing calculations in terms of what measure is used, what time period the measure represents, and whether the measure is known in advance of a revenue forecast.

Since Minnesota began indexing its personal income tax it has employed three different measures and types of calculations:

- Initial Law--85% of August to August change measured in the Minneapolis/St. Paul Consumer Price Index for Urban Wage Earners (CPI-U) for the year to be indexed.

- 1981 Law--August to August change Minneapolis/St. Paul CPI-U or the forecasted average growth of Minnesota's gross income for the year to be indexed.

- 1985 Law--As an example, the 1986 index is calculated as the percent change of the average U.S. CPI-U computed as an average of October, 1984 to September, 1985 divided by the average of October, 1983 to September, 1984.

Given the multitude of calculations and changes in measures employed, the lack of a strong correlation between growth in indexed tax collections and personal income is not surprising.

A strong argument can be made that the manner in which the state has indexed has stabilized revenues (at least during high inflation) in the long term. Theory strongly suggests that indexing reduces the long term income elasticity of the income tax structure. In the short run, however, indexing has probably decreased the predictability of revenue forecasts of income tax collections.

Income Tax Structure

The volatility of the state's income tax is also a function of its progressive structure. The reason for this is that, in general, as income increases along a progressive structure the marginal effective rate will exceed the average effective tax rate. In other words, if we had a single flat rate system, then the marginal and average rates would be the same. In a simple calculation, we could then expect the change in income to reflect the change in tax revenue. However, when the marginal tax rate exceeds the average tax rate, the change in tax revenues is more sensitive to change in income.

One result of a progressive structure is that errors in forecasting the tax base translate into disproportionally larger errors in forecasting tax revenues. As an example, a progressive rate structure will have an elasticity greater than 1.0, perhaps 1.5. This means a 1% error in forecasting the tax base would result in a 1.5% error in forecast tax revenues. Similarly, a "flat rate" tax structures with an elasticity of 1.0 would translate a 1% error in forecasting the tax base into a 1% error in forecast revenues.

Figure 25 illustrates the nature of income and effective tax rates in Minnesota's progressive tax system. One result is that changes in forecast income tax receipts are exaggerated as incomes (the tax base) rise in good times or fall in poor economic times, which increases the difficulty in forecasting accurately for the two-year budget horizon.

EFFECT OF A PROGRESSIVE INCOME TAX
EXAMPLE: 1984 TAX RATES

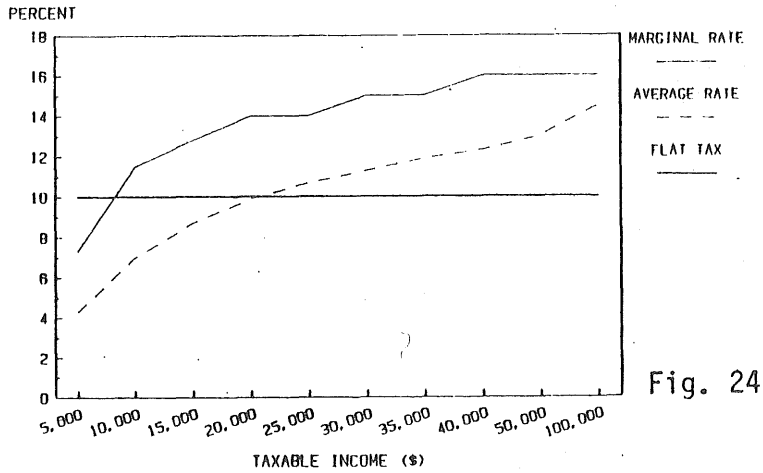


Fig. 24

One might also expect that indexing would interact with the progressive structure to reduce the degree of volatility in income tax revenue collections. However, as noted previously, while indexing reduces elasticity in the long run, the short run relationship is not fixed and tends to be unstable. In fact, under our current system, in forecasts for a 12 month time frame, indexing is not a factor. Since we know the index measure a year in advance (because the index measure lags behind the taxable year income), it is not directly tied to the growth in taxable income. Hence, a change in the

forecast of income, given a known set of brackets, yields the same responsiveness for the year in question as a non-indexed rate schedule.

The Complexity of the Income Tax Base

Growth in non-farm personal income is a proxy measure of the overall growth in the Minnesota economy. However, it is not the base for computing the income tax; taxable income is. In forecasting income tax collections, first a forecast is made of the Minnesota non-farm taxbase (MNNFTB). MNNFTB consists of the following components of personal income: wage and salary disbursements, dividends, interest, rent, and non-farm proprietors income. The forecast of MNNFTB is used to forecast adjusted gross income (AGI), which is, in turn, used to forecast Minnesota taxable income. The relationship between MNNFTB and taxable income is shown in Figure 26. A partial list of the differences between taxable income and MNNFTB is presented below.

- Wages included in personal income but not AGI (e.g., amounts voluntarily contributed by employees to deferred compensation plans).
- Dividend income included in personal income but not AGI (e.g., dividends attributed to existing Keogh plans).
- Interest income included in personal income but not AGI (e.g., interest retained by life insurance companies on whole life policies).
- Rental income included in personal income but not AGI (e.g., imputed rental income).
- Proprietors income included in personal income but not AGI (e.g., excess tax depreciation).
- Income included in AGI but not personal income (e.g., capital gains).
- Adjustments to gross income for the purpose of arriving at AGI (e.g., employee business expenses).
- Minnesota subtractions from AGI (e.g., military pay).
- Federal income taxes subtracted on Minnesota returns.
- Portion of self-employment taxes subtracted on Minnesota returns.
- Itemized and standard deductions.

Figure 25 on the following page displays the role of growth of the non-farm tax base to growth in Minnesota non-farm personal income. The non-farm tax base displays a pattern similar to personal income.

Fig. 25

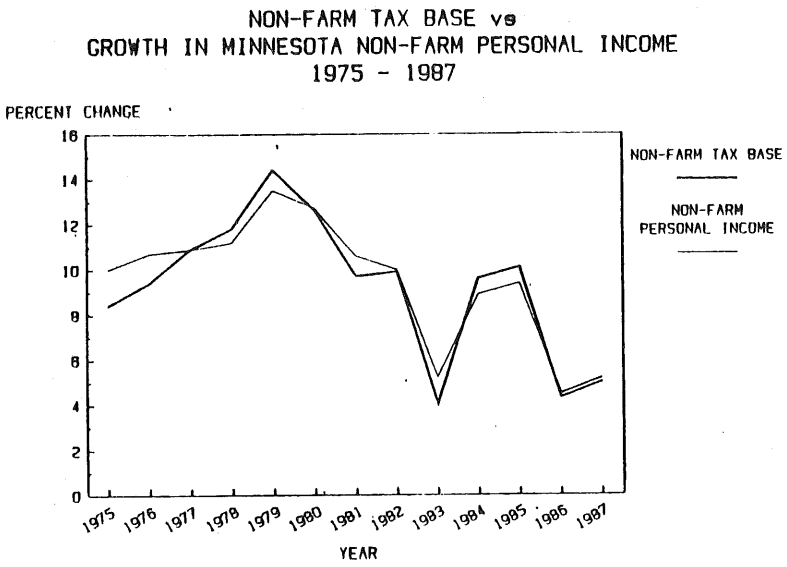


Figure 26 illustrates the difficulty in forecasting taxable income even if personal income could be successfully forecast. While the non-farm tax base parallels the change in personal income -- taxable income does not adhere to the same high correlation.

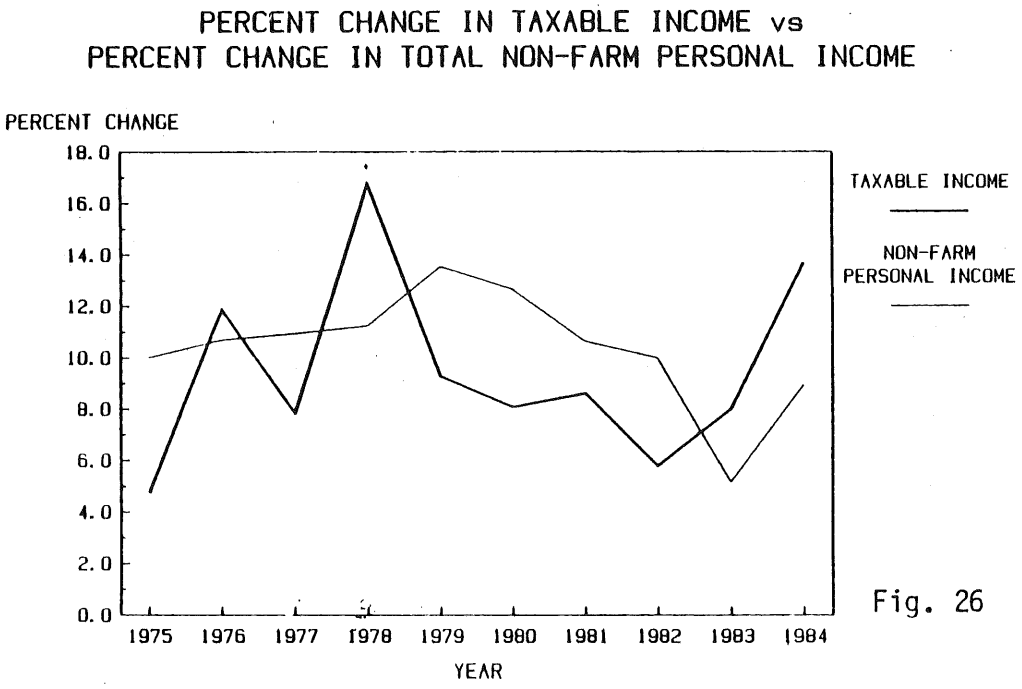


Fig. 26

Why is the Sales Tax Volatile?

The volatility in sales tax revenues is shown by the degree to which the pattern of tax revenues differs from that of the economy as a whole. Figure 27 displays a comparison index of the level of the Minnesota sales tax relative to non-farm personal income. Since 1980, the sales tax pattern has become more volatile relative to non-farm personal income, which adds to forecasting difficulty.

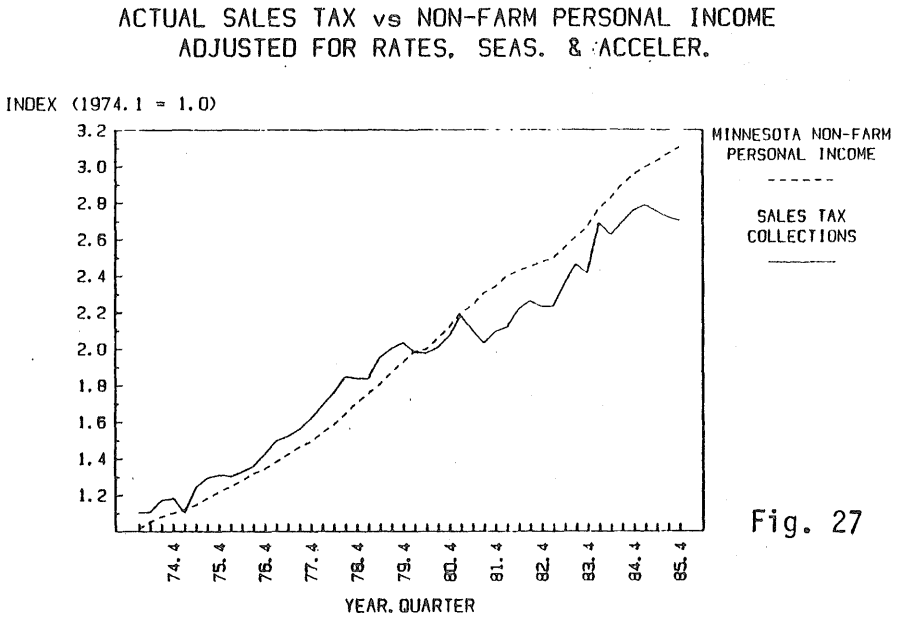


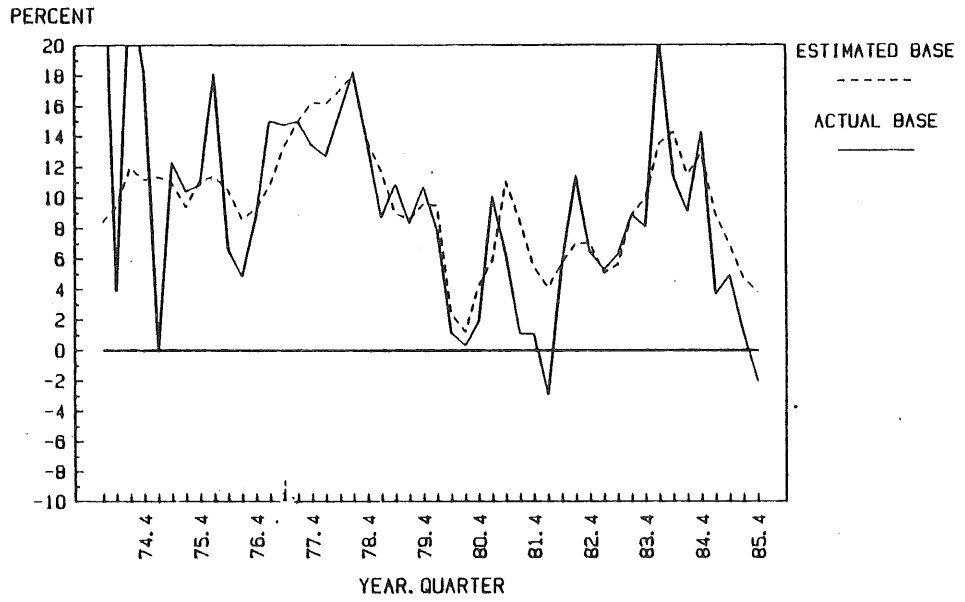
Fig. 27

The Minnesota sales tax is a selective one and its base is, in general, much narrower than non-farm personal income.

A second measure of volatility and difficulty in forecasting is indicated by comparison of the percent change in the sales tax revenue relative to the percent change in the estimated sales tax base (where the tax base is an estimate of the revenues one would expect given the tax law). The tax base is estimated largely by using secondary sources and is computed as if one did not have existing collections data. This is shown in Figure 28. The actual collections (adjusted for rate changes) are much more volatile than the estimate of the base. This graph indicates the inherent limitations in forecasting the sales tax using proxy measures.

Fig. 28

PERCENT CHANGE IN ESTIMATED
SALES TAX BASE vs ACTUAL
PERCENT CHANGE (Q4/Q4)



The conventional wisdom asserts that the sales tax is volatile because of the narrow tax base. That argument has some validity, which is demonstrated below. However, as is shown in a later section of the paper entitled "Revenue Policy Options," it is not clear that the gain in stability from broadening the base is so large that it could be justified on those grounds alone.

The table below provides estimates based on analysis done by DRI of the income elasticity of the various components of personal consumption. Elasticity is a measure of the responsiveness of the category of consumption to a change indisposable income. In general, those items which are subject to tax in Minnesota are more responsive and hence volatile than those items not subject to tax. For example, the category "Other Durables" has an elasticity of 1.5, which means a 1% change in income would lead to a 1.5% change in spending on the category "Other Durables," while on the other hand, a 1% change in the income would lead to only a .5% change in spending on food, as shown by the elasticity of .5.

TABLE 5
ELASTICITY OF REAL CONSUMPTION COMPONENTS
RESPECT TO REAL DISPOSABLE INCOME

Consumption Component	Elasticity	Taxable Status
Consumer Durable spending:		
Motor Vehicles and Parts	1.5	Motor vehicle sales tax
Furniture and Household Equip	2.3	Taxed
Other Durable Goods	1.5	Taxed
Non-Durable Goods:		
Food and Beverages	0.5	Food at home not taxed
Clothing and Shoes	0.7	Not taxed
Gasoline and Oil	0.2	Not taxed
Fuel Oil	---	Not taxed
Other Non-Durable	1.2	Partially taxed
Services:		
Housing Services	0.3	Not taxed
Electricity	0.7	Taxed if not used for heating
Natural Gas	0.7	Not taxed if used for heating
Other Household Operations	0.8	Generally not taxed
Transportation	0.3	Not taxed
Other Services	0.7	By and large not taxed

Source: DRI Review of US Economy, October 1985

In addition to the items identified above, investment in equipment and construction materials is also subject to tax. In general, these two components of GNP are more volatile than is GNP as a whole.

In addition to the fact that the components of Minnesota's sales tax base appear to be more volatile than the economy in general, it also appears that they are more difficult to forecast than overall economic conditions. A comparison of revisions to the forecast of GNP made in April, 1985 to revisions in Minnesota's proxy share of investment in equipment, construction materials and non-auto consumer durables shows that the sales tax proxies have been revised much more.

PERCENT REVISION IN FORECAST
FROM APRIL '85 TO AUGUST '86

	F.Y. 1986	F.Y. 1987
GNP	-0.8	-2.0
Non-Auto Cons. Dur. Proxy	-4.0	-8.2
Capital Equip. Proxy	-5.4	-10.5
Construction Proxy	-10.4	-12.9

Why is the Corporation Income Tax Volatile?

The estimate of national pre-tax profits by the U.S. Department of Commerce is the principal series used to forecast the corporation income tax. Profits earned nationally, rather than just in Minnesota, are important to the corporation income tax because multi-state and multi-national corporations must apportion income to Minnesota for purposes of taxation. In addition, firms that do business elsewhere in the country but not in Minnesota, who are in a domestic (unitary) combination with the taxpayer, must be included on the Minnesota return.

National pre-tax profits have considerable quarter-to-quarter fluctuations, and Minnesota net corporation income tax collections (ACRS adjusted) exhibit similar volatility (Figure 29).

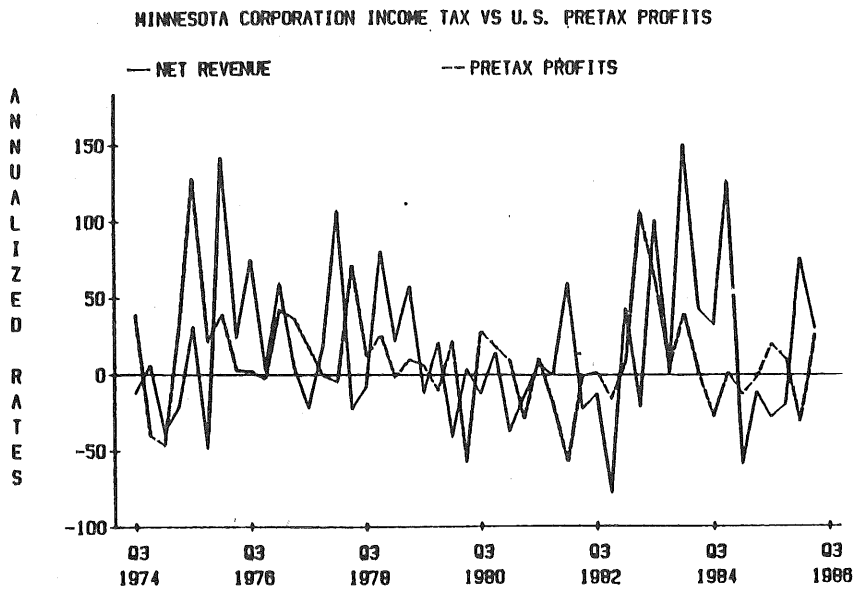


Fig. 29

The fluctuations in corporate tax collections reflect the volatility of the tax base as well as the additional, destabilizing effects of the corporation income tax itself. These are not very well understood, but two examples can be given. The first is the net operating loss carry back provision, which allows a tax payer with a loss on his current-year return to carry it back and receive a refund on tax paid in up to three previous (profitable) tax years. This provision has led to sharp increases in refunds paid in the year following the onset of a recession. Another source of instability is the net income or profits concept itself. Since profits are usually only a fraction of sales on total business expenses, unexpected sales declines and/or increases in expenses can quickly wipe out profits, leaving many taxpayers with zero liability. Approximately one-half the corporation income tax returns filed in any one year show zero liability.

Although any tax based on the current concept of net income, or a related concept, is likely to exhibit considerable volatility no matter what is done, the

current Minnesota law could be modified to improve stability. One possible modification would be elimination of the net operating loss carryback. The current provision for loss carry forwards for five years could be left in place or even be extended to as many as 15 years, as the new federal law does. Second, a minimum tax possibly based on assets, gross revenues less cost of goods sold, or the sum of property, payroll and sales used in the multistate apportionment formula could be imposed on tax filers who would otherwise have zero liability.

VIII. OTHER REVENUE FORECASTING PROBLEMS

What Factors Contribute to Forecast Error? Technical Problems

In addition to the underlying volatility of Minnesota's revenue raising system, the nature of the tax base and tax system also creates severe data and information constraints. The more narrow the tax base the greater the need for accurate, timely information on data items that relate specifically to the base components in order to accurately predict future performance. In many cases, there is insufficient accurate data on recent actual history -- making the forecast of future revenues more difficult.

The "data elements" used in forecasting the major revenue sources are as numerous as the tax code is complex. The following examples are representative of technical problems which are spread through the revenue forecasting models -- making it difficult to discern errors resulting from technical problems from those related to the state economic model or national economic volatility.

Time Lags in Tax Data

There are substantial time lags in key forecast data which make it difficult to interpret the recent past as a basis for predicting the future.

Examples:

- Reliable information on the data from income tax returns, such as Adjusted Gross Income (AGI), is not available until 15 to 18 months after the tax year has ended.

- Reliable information on wage and salary disbursements (a primary component in forecasting withholding) is not available for six to nine months after the quarter has ended.

Lack of Detailed Information

Examples:

- There is virtually no reliable information at the state level of investment by firms within the state. This is an important component of the sales tax and is also an important factor in the computation of depreciation tax law changes affecting the corporate income tax.

- Because we do not code information from federal tax returns we lack information on the components of gross income and the adjustments to gross income on which income tax forecasts are based.

Federal and State Law Changes Compound Problems

There have been numerous state and federal law changes in the last 8 years (excess of 200 law changes for which a presumed revenue impact has been estimated) for which there is insufficient information to determine actual fiscal impacts after the fact. The following are representative examples:

- Frequently there is very little available information upon which to base estimates of the impact of law changes and the result is large errors. For example, the unitary taxation of corporations was estimated to raise $45 million annually. An expensive after-the-fact review revealed that it probably resulted in a slight revenue loss in the first year. In subsequent years, there is inadequate information to make a determination.

- It was initially assumed that personal income tax bracket indexing would result in a biennial revenue loss of $232.6 million. Higher than forecast inflation, a new sample of tax returns and an improved methodology resulted in an estimated actual loss of $300.6 million.

- In most instances it is impossible to determine what the actual impact of a law change was--even after the fact. Many times the impact is hidden in aggregate numbers influenced by so many factors that it is virtually impossible to isolate the impact of a specific law change. The 1986 federal tax law provision disallowing passive losses to be used to offset other income is an example. In order to make a reasonable judgment of the actual impact after the fact, one would need a detailed sample of all the information appearing on schedule E of the federal tax return for the years 1981 through 1985.

Institutional Complications

Factors in the collection and accounting of state tax revenues further complicate forecasting.

Examples:

- There is no completely satisfactory procedure for linking tax revenues from tax return statistics to actual collections as recorded in the state's accounting system. There is usually a gap between these numbers in the tens of millions of dollars. Educated judgments must be made about the causes. This contributes to forecast uncertainty.

- The more complicated a tax form, the more difficult it is to forecast. For example, failure to conform to the federal provisions regarding Individual Retirement Accounts (after the 1981 federal tax bill) resulted in a provision requiring certain taxpayers to add back their IRA on the state return. Many individuals failed to do so, probably

because they were unaware of the requirement. The result is the state unexpectedly lost revenue which will only be made up in part in future years through the audit process.

- There is widespread evidence that there are problems in securing total compliance with state tax laws, particularly the sales tax. The Minnesota sales tax code and regulations are generally acknowledged to be extremely complex. It is not at all certain to what extent these compliance problems affect the forecasts, nor is it precisely predictable what effects changes in emphasis on tax compliance enforcement efforts will have on current and future tax revenues. Forecasting is made more difficult in that as compliance varies over time, the more difficult it is to forecast.

IX. EXPENDITURE FORECAST ERROR

What Has Been the Track Record -- and Why?

Since 1980-81, biennial forecasts of non-dedicated general fund expenditures and other items have had an average 1.1% absolute error, or about $110 million.

Table 6 FORECAST VARIANCE PERCENT ERROR

($ in millions)

	BIENNIUM								
	1980-81		1982-83		1984-85		1986-87		AVERAGE ABSOLUTE
	$ VARIANCE	%	$ VARIANCE	%	$ VARIANCE	%	$ VARIANCE	%	ERROR
Major Expenditure Programs:									
Aid to School Districts	31	1.7%	(64)	-3.0%	(73)	-3.5%	(4)	-0.2%	2.1%
Property Tax Credits & Refunds	191	14.3%	135	9.8%	94	5.5%	3	0.2%	7.4%
Income Maintenance Programs	(43)	-6.2%	(105)	-12.2%	(257)	-35.2%	(37)	-3.3%	14.2%
Local Government Aid	18	3.7%	(40)	-10.1%	(6)	-1.1%	0	0.1%	3.7%
Debt Svc & Short Term Borrowing	(14)	-8.2%	(64)	-23.1%	37	11.8%	22	7.7%	12.7%
All Other Expend/Transfers/Other	(128)	-4.6%	(31)	-1.2%	278	7.5%	(66)	-1.6%	3.7%
TOTAL	55	0.7%	(169)	-2.2%	73	0.8%	(82)	-0.8%	1.1%

As with revenues, forecasting expenditures involves estimating factors some 28-32 months in advance. While the error rate compares favorably to that for forecasting revenues, it may not be a true indication of the volatility of forecasts for individual major appropriation categories. As described in the following sections, compensating errors (over/under estimating) does mask substantial volatility.

The Nature of Appropriations

For analytical purposes, budget appropriations can be classified into four major types:

-- Fixed and Direct Appropriation: an appropriation made for a specific purpose in a specific amount, for a specific period of time. Any unspent balance remaining at the end of the biennium cancels back to the fund from which appropriated. Most state agency programs are funded through fixed and direct appropriations.

-- Open Appropriation: an appropriation for a specific purpose with the amount dependent on the current and future requirements of meeting the

purpose. Under normal conditions, any shortages in funding are automatically provided without legislation. Property tax credits and refunds are open appropriations.

-- Dedicated Appropriation: an appropriation made for a specific purpose based on dedicated receipts. Any money remaining after meeting the current year's obligations carries forward to the next fiscal year to be spent for the same purpose. Because expenditures are linked to specific revenues, they do not affect the bottom line fund balance. Tuition and fees of higher education institutions fall into this category.

-- Appropriations for Entitlement Programs: Appropriations for entitlement programs such as health care (MA and GAMC), income support (AFDC, GA, and MSA), and school aids are direct and fixed based on a forecast. The actual level of spending, however, is contingent upon caseloads and service costs. Unlike open appropriations, any funding for deficiencies must be submitted to the legislature for approval.

The General Fund is distributed by type of appropriation as follows:

	(F.Y. 1986-87)
• Direct and Fixed Appropriations:	32%
• Open Appropriations:	25%
• Entitlement Programs:	35%
• Dedicated Appropriations:	8%
	100%

Observations on Methods of Appropriation

Direct appropriations for agencies are usually statutorily fixed, based on assumptions for inflation, the cost of labor negotiations, equipment costs etc. - projected 30 months in advance when the budget is set at beginning of the biennium. The problem with this rigidity is that when inflation or revenue growth rates have been falling as in recent years, there is no built-in mechanism to adjust the level of spending for this type of appropriation.

Sixty percent of the General Fund expenditure (i.e., open appropriations and appropriations for entitlement programs) are dependent upon the accuracy of forecasts of caseloads, service costs, salary settlements, property market values, local levies, and other factors made at the beginning of each biennium.

In short, in time of economic difficulties when state revenues are falling, a good portion of spending is either fixed or (at worst) driven higher by other determinants.

Inflation and Fixed Appropriations:

Both tax revenues and expenditures are significantly affected by changes in forecast inflation. This sensitivity seriously complicates budget stability because the inevitable errors in forecasting inflation lead to errors in the budget forecast. Although there is no reliable method to single out the impact of inflation alone on the budget, a general observation can be useful for analysis of the budget.

Higher than anticipated inflation may tend to inflate revenues more than it does expenditures because more than 40 percent of expenditures falls into the fixed appropriation type. The remainer is not particularly sensitive to rising inflation. Lower than anticipated inflation tends to reduce revenues but does not significantly affect expenditures because of the rigidity of the appropriation process.

PERCENTAGE CHANGE
GENERAL FUND AND INFLATION (CPI/URBAN)
1970 - 1987

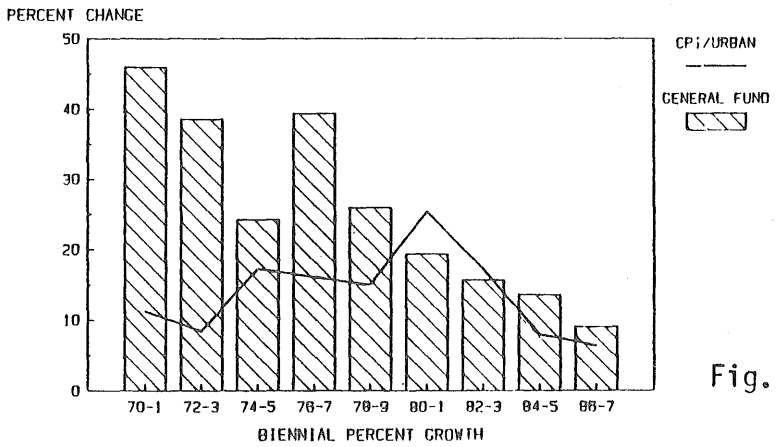


Fig. 30

During the period of accelerated inflation in the 1970's, expenditure growth greatly outpaced inflation as a result of the tendency to spend additional revenues and surpluses generated by the higher rate of inflation (Figure 30). In the period of reduced inflation in the 1980's, the state budget, after "crisis" adjustments in 1981 and 1985 has been growing at a rate closer, or even slower than inflation.

The above observation of course ignores several other economic and policy factors which affect the budget. These relationships are too complex to reduce to simple rules-of-thumb.

Forecast Errors on Expenditures

Sixty percent of the budget falls into the category of open and entitlement appropriations. The planning at the beginning of the biennium for these programs is based on socio-economic factors which are projected 30 months in

advance. While the rates of change in inflation, unemployment, school enrollment, property market values, caseloads in public assistance and health care and other indicators continue to surprise forecasters, these expenditures remain highly volatile.

The following table summarizes forecast errors for the major open appropriations and entitlement programs over recent periods for which data is available:

TABLE 7
MAJOR OPEN AND ENTITLEMENT PROGRAMS
FORECAST COMPARED WITH ACTUAL EXPENDITURES

Average Percentage Error (+/-)

PERIOD	SELECTED PROGRAMS	Average % Error For 1st YEAR	For 2nd YEAR	Biennial Avg. Error ($ Millions)
1980-87	SCHOOL AID	1.0%	5.5%	$43.2
1982-87	INCOME MAINTENANCE PROGRAM	2.8%	0.7%	20.7
	MEDICAL ASSISTANCE	3.2%	5.7%	36.7
	GAMC	13.4%	16.4%	11.1
	AFDC	1.4%	4.4%	3.4
	GENERAL ASSISTANCE	12.9%	35.8%	16.9
	MSA	3.8%	6.7%	1.1
1986-87	PROPERTY TAX REFUNDS	2.2%	0.5%	3.2
	HOMEOWNERS UNDER 65	5.8%	6.1%	4.2
	HOMEOWNERS SENIOR & DISABLED	2.7%	2.4%	1.4
	RENTERS UNDER 65	1.3%	2.5%	0.1
	RENTERS SENIOR & DISABLED	0.8%	4.4%	1.3
1982-87	PROPERTY TAX CREDITS	Known	1.4%	10.5
	HOMESTEAD CREDIT	Known	1.1%	6.6
	AGRICULTURAL CREDIT	Known	5.1%	9.7

Notes: The estimate of the average absolute error (+/-) reflects the forecast error for both first year and second year of the biennium. The forecast begins with end of the legislative session originally enacting the biennial budget (even-numbered year).

- School Aid: Major factors associated with these forecast errors are: pupil counts particularly AFDC pupil units, the allocation of property tax credits between school and non-school units, the fluctuation of EARC mills, and local salary settlements. These factors behave in different ways in different years. The error margins have become narrower in recent years because of policy changes to ease these fluctuations such as EARC mills or AFDC pupil counts.

- Income Maintenance Programs: There are three interrelated factors associated with forecasting caseloads for income maintenance programs: labor market conditions, inflation, and frequent policy changes.

General Assistance (GA) and AFDC-UP (Unemployed Parent) have always been difficult programs to forecast because of their labor market connection. The difficulty is compounded because of frequent legislative changes in these programs. Most forecasting instruments require 30 or 36 monthly observations as a base period for a forecast. In recent years, we have never had a series of 30 monthly observations without major changes. For example, the October 1984 forecast of GA for the 1986-87 biennium understated the caseload by 30%.

A second major problem in forecasting income maintenance programs is inflation. Nursing home rates, inpatient hospital rates, and rates for many other services are indexed to economic indicators. In recent years, falling inflation has produced some surpluses in these programs. Unexpected rising inflation of 1 percent point throughout the biennium would cost the state approximately $10 million in increased income maintenance programs.

- State-Paid Property Tax Credits and Refunds: In property tax credits, from 1981 to 1986, the average percent error per year has been $\pm$ 1.4 percent or $8 million for the first year of the biennium. The error margin is greater for the second year of the biennium due to difficulties in projecting property market values and local levies for a longer horizon.

The forecast for property tax refunds depends on the projections of income growth, local property taxes, and number of claimants. For 1986-87, the average margin of error has been +/- 2.6% for the first year of the biennium, and +/- 3.8% for the second year of the biennium.

Changes in Federal Policy can Increase State Expenditures

The Federal participation rates in Medical Assistance and AFDC change almost annually. They are published about 14 months before the beginning of the federal fiscal year for which they apply. Thus, in doing the forecast for the 1988-89 biennium, we know the rates of federal funding only through September, 1988. This leaves the rate for the last nine months of the biennium unknown. A one-point swing for that period equates to approximately $10 million. In addition, federal budget actions also suggest the possibility that the Congress might make extraordinary cuts in MA and AFDC programs. The forecast for the 1988-89 biennium supposes $1.7 billion in federal funding of MA and AFDC. Even modest percentage cuts in this funding would create substantial

costs for the state: $8 to $9 million each year for each percentage point of reduction.

The preceding table showed the average margin of error between forecast at the beginning of biennium and actual expenditures for each income maintenance program for the period from 1982-83 to 1986-87. The margin of error in the second year is consistently higher than that in the first year. Because the direction of errors commonly has been offsetting, one does not necessarily see a large margin of error for all programs put together: 2.8% the first year, .7% the second.

Other State Spending: Forecasting Cancellations

About $3.2 billion biennially falls into the category of fixed and direct appropriations. This spending includes appropriations for post-secondary education, state institutions, smaller local assistance programs, and funding for the legislature, judiciary, constitutional state offices and state agencies' operating costs.

While a "fixed" specified amount is appropriated for these purposes, historically not every dollar is spent. The result is "cancellations", sometimes also called "reversions" -- where money unspent and unobligated is returned to the general fund during, or at the end of, the biennium. Estimates of these amounts are forecast as part of projecting total spending for the biennium. The following table compares forecast and actual cancellations over recent periods:

Table 8

General Fund Cancellations
($ Millions)

Fiscal Year	Estimate	Actual	Difference
1980	37.7	17.0	(20.7)
1981	26.8	45.9	19.1
1982	36.9	9.1	(27.8)
1983	37.8	29.8	(8.0)
1984	20.0	10.1	(9.9)
1985	40.0	29.9	(10.1)
1986	15.0	10.6	(4.4)

Cancellations are extremely unpredictable--as they are a function of agency actions, legislative restrictions, and general or emergency restraints placed on state spending. Because the total relates to numerous factors within individual agencies and programs, there are historically wide variances in funding cancelled by individual agencies. Future estimates are equally uncertain. One conclusion that can be stated is that cancellations have been overestimated and that past history cannot necessarily be extrapolated for future estimates.

X. OTHER FACTORS CONTRIBUTING TO BUDGET INSTABILITY

There is another set of "hidden" factors which contribute to budget instability. The factors are created by design (or sometimes by accident) but are not readily apparent within a biennium because the full fiscal impact is not realized until a succeeding biennium. Generally, these items represent "future commitments" of resources.

They are discussed here with good reason. While "hidden" in a current "balanced" budget, they may contribute significant problems to budget balancing in succeeding years. As this occurs, the common questions are: "How did we get into this problem? - What's wrong with our forecasts?" When actions are being taken, there is little acceptance to acknowledging these future commitments. These other factors can be categorized under three generic headings:

1. One-Time Reductions:

   One-time reductions adjust the spending level of a given program in a given year without affecting its future expenditure trend. The recent history of one-time reductions has shown that they may provide immediate relief for a current problem, but also put tremendous pressure on future years. In the long run, revenues are not able to keep pace with rising program expenditures due to the use of one-time reductions.

2. Shifts:

   Shifting payment dates of a program from one fiscal year to another has the same effect as do one-time reductions - temporary relief. This instrument was used during the 1982-83 budget crisis, and the $580 million in shifts enacted to balance the 1981-83 budget returned to cause serious problems in restoring stability in the 1984-85 budget.

3. "Timebombs" or "Tails":

   These are other types of revenue and expenditure actions taken during a legislative session which may have partial or no fiscal impact on the current biennium, but have a compounding impact on succeeding budgets.

   By nature, revenues have not radically changed to keep pace with expenditures driven by these types of future commitments. Each biennial budget has contained examples of these factors in varying dollar magnitudes. To the extent that they accentuate existing revenue/expenditure imbalances, the accumulation of all these hidden factors have contributed to budget instability.

   Table 9 provides a listing of recent actions which represent major current law obligations not fully funded within the 1986-87 biennium budget which will result in over $600 million in additional "pressures" in developing a 1988-89 biennial budget.

TABLE 9
Major 1986-87 Current Law Obligations Not Fully Funded
(Time Bombs)

($ In Millions)

1.	Motor Vehicle Excise Transfer	$ 220
2.	Telephone and Telegraph Tax Rate Reductions	58
3.	Sales Tax Exemption for New Construction/Mineral Tax	18
4.	Homestead Credit/Ag Credit Changes	90
5.	School Aids Formula Adjustments	103
6.	TRA/Social Security Shift/School Aids	72
7.	Restoration of Higher Education	21
8.	Medical Assistance Rateable Reduction	19
9.	All Other	16
	TOTAL	$ 617

The factors in the current biennium and their implications for the upcoming Fiscal 1988-89 budget is not a unique example. All recent budgets have contained types of future commitments in varying dollar magnitutdes. When revenues are rapidly increasing, it may be easy to fund these types of increases in a subsequent budget. In periods of slow or moderate revenue growth, however, problems in matching revenues and expenditures are created.

This report suggests that formal recognition of the future impact and a conscious reduction in the creation and use of these types of future commitments is a necessary component of maintaining budget stability.

XI. ALTERNATIVE SOLUTIONS TO BUDGET INSTABILITY

The ACIR recently characterized Minnesota's tax system as the most volatile in the nation; that is, Minnesota's taxes are extremely sensitive to a variety of economic and non-economic variables. The recent history of tax revenue collections and associated budget problems confirms this conclusion.

The inescapable conclusion which must be drawn is that Minnesota's tax and spending system is neither stable nor predictable. The result has been a series of miscues in forecasting and reacting to changes in budget finances. The key policy concern is how to control and manage the volatility in the state's budget.

The first step is to identify alternative measures to make the revenue and expenditure forecasts more accurate. The unfortunate conclusion is that there is little that will substantially reduce forecast errors.

The second step is to acknowledge that forecasts cannot be 100% accurate and that future forecast error may be similar to recent history -- and examine alternative measures that will singly, or in combination, provide mechanisms to effectively manage forecast errors and resulting unstabilizing pressures on the budget.

A. TAX SYSTEM CHANGES

There is nothing which can be done on a state policy level to eliminate the volatility of national economic cycles. At the state level, attention centers on improving the accuracy of state forecasts by substantive changes to the state's revenue system to make it more "stable" and "predictable."

This discussion begins with identification of the principal advantages and disadvantages of the major revenue policy options:

- Change the Mix of Taxes
- Use a Flat Rate Income Tax
- Establish a Dollar Amount of Taxes
- Change the Sales Tax Base
- Reduce the Number of Law Changes

The above list of major options does not exhaust the full range of possibilities. Some other options are noted below but are not specifically discussed because the Department of Finance believes they would have little impact in resolving current problems:

- Relying upon Additional Supplementary National Forecast Data
- Improving Data and Information on Which Forecast is Based
- Increasing Forecasting Staff

1. Change in the Mix of Taxes

One approach to gaining greater stability is changing the mix of taxes. The implicit assumption is that taxes can be ranked from high to low with regard to stability. However, such a ranking is difficult and possibly misleading. Consider the four major revenue sources: Most economists would state that of the four major taxes, the corporate income tax and motor vehicle excise tax are most volatile. Contrary to these expectations, in the current biennium the forecasts of the proxies for the motor vehicle excise tax base have been revised less than those for the sales tax. However, over the last four biennia the results are consistent with expectation; the corporate income tax has been subject to the greatest forecast error, followed by the motor vehicle excise tax, the sales tax, and the individual income tax.

The results over the last four biennia suggest that predictability would be enhanced by changing the mix of taxes to reduce reliance upon the corporate income and motor vehicle excise tax.

The arguments for adjusting the relative proportions of the income and sales taxes are not one-sided, especially if the present base of these taxes changes because of federal and state tax reform. As noted above, the sales tax has been subject to greater forecast error than the individual income tax. Further, the sales tax has been more volatile than the individual income tax since 1979, as measured by comparing the standard deviation of their percent changes (an indication of how much the percent change "bounces around"). However, the past may not be a good guide to the future because current tax reform analysis is considering changes in the sales and income tax bases which would change the relative predictability and stability of these two taxes.

As emphasized throughout this report, the difference between predictability and volatility should be considered in formulating policies, including policy changes with respect to the mix among the four major revenue sources. A shift to the least volatile tax sources does not necessarily imply any better forecast accuracy for state tax sources.

For example, consider the property tax. It is the most predictable of the major taxes. The predictability of the property tax, however, is due in major part to the manner in which it is administered rather than to a lack of volatility in the underlying economic base for the tax. Recent history demonstrates the instability of farm land and residential real estate values. Real estate taxes can be forecast with a high degree of certainty because the tax base is based on past, known property values rather than on current, unknown values. Thus, property values exhibit some volatility but the tax is very predictable.

2. Changes to the Income Tax

The next alternative to be explored is flat rate tax on Adjusted Gross Income (AGI) with either a large standard deduction or a personal credit.

Advantages:

- The tax would be easier to forecast than the current tax because it would eliminate the need to forecast the distribution of income, itemized deductions, additions and subtractions (with the possible exception of interest on U.S. securities), inflation for purposes of indexing, and federal income tax liability.

- It would obviously be a simpler system and hence easier for the taxpayer to understand.

- It would allow for a fairly low tax rate thus reducing the adverse "announcement effect" of a high top marginal income tax rate.

Disadvantages:

- The tax would be less progressive than the current system (it would still be progressive with respect to AGI because of the credits and standard deduction.)

- It would undoubtedly change the burden of the income tax if applied in a "revenue neutral manner," thus making it politically difficult to enact.

- From a revenue growth standpoint over time, it would almost certainly raise less revenue because it would not tax growth in real income per taxpayer (where real income is defined to be income deflated by the rate of indexing) at successively higher rates as the current system does.

3. Establishing Dollar Amounts of Revenue to Be Raised

One possible method for reducing revenue uncertainty is to explicitly set the yield of the tax system for the biennium. This is based on recognition of the fact that, based on a 30-month forecast horizon, there is little reason to believe that a given tax structure will generate revenues to match the desired level of spending. In all likelihood, too much or too little revenue will be realized.

By means of surcharges or "negative surcharges" one could alter the income tax or sales tax yield. At the beginning of the biennium, the legislature could determine the level of spending and taxes based on a forecast. In addition, formally acknowledging a range of economic and forecast risk, they could provide the Commissioner of Finance or Revenue standby authority to raise or to lower tax rates within certain parameters. The legislature could enact other provisions that would allow them to veto the commissioner's action if so desired.

This approach is essentially what local government units in Minnesota do on a regular basis. The only difference is that local unit mill rates are set on a far more certain base and consequently are fairly stable. One concern is that such an approach would transfer uncertainty onto the taxpayer because he will be subject to annual law changes. This is true, but he will be able to easily calculate the impact of the law change because it is a surcharge, so this would uncertainty. Further, with established operating parameters, the uncertainty could probably be no greater than that caused by annual changes in property taxes.

Another opposing concern is that in "bad times" the government should "tighten its belt like everyone else." To set the yield target, rather than the rate, provides government with a method for avoiding belt tightening. It should be recognized that revenue shortfalls are not solely the result of "bad times." Shortfalls can, and have, resulted from the inherent difficulties and inaccuracies of making forecasts. As a consequence, the imposition of a surcharge need not mean that the state is going to take a larger share of resources or income than the legislature originally intended. Rather, it may mean that taxes are going to take the share of resources originally intended--but are unable to under existing law, because existing tax law possibly will not generate as much as originally thought.

The following provides an example based on in the most recent biennium. The forecast of sales tax collections was reduced by 10% from April 1985 to August 1986. For the same period the forecast of non-farm personal income was reduced by only 3.7%. (The difference is accounted for by the fact that the forecast of sales subject to tax was lowered more than non-farm personal income and by normal forecast error.) Therefore, if the legislature permitted a calculated surcharge on the sales tax, it would be taking the share of non-farm personal income as originally intended. If desired, the legislature could specify that the yield with a surcharge could not exceed some designated percent of forecasted personal income or other aggregate measure of the Minnesota economy.

4. Changing the Sales Tax Base

One of the recommendations of the 1984 tax study commission was that the base for the sales tax be broadened. It is often suggested that this would enhance the stability of the tax. In order to test this hypothesis, an analysis was completed which simulates adding estimates of the following categories of sales to the tax base: food purchased for home consumption, clothing and shoes, and personal and auto services. In addition, capital equipment was eliminated from the base.

In making the computations, two definitions of stability were used. The first method is called the "% change" method; the second is called the "elasticity" method. The details of the computations behind the two methods are provided in the appendix.

Before reporting the results the following point needs to be made. An estimate of the base was made which did not include the proposed modifications

to the sales tax base. This base, which is designed to mirror the actual base over time, is substantially more stable than the actual sales tax base -- when, in theory, it should be just as volatile. It can be inferred that, when estimates are made of the impact of adding a component to the actual sales tax base, and the component is estimated in a manner similar to the one used to arrive at the estimated base, a bias is likely to be introduced in favor of stability.

Table 10 summarizes the results of the stability computations. Note that the computations are made for additions to the actual base and the estimated base. Further, the computations are made using the two methods explained above. As a consequence, there are four columns of results. For each component that was added or removed from the base a "positive" or "negative" is attached. A "positive" indicates the item would add to stability and a "negative" indicates it would detract from stability. The magnitude of the changes is indicated in the additional material presented in the appendix. While there are limitations in the methodology, it can be concluded that expanding the sales tax base would probably improve stability, but only slightly. However, the forecasting problems inherent in a major base expansion would in the first few years probably offset the benefits of increased stability.

Table 10

ESTIMATES OF THE IMPACT OF POTENTIAL CHANGES TO THE SALES TAX BASE FOR PURPOSES OF ENHANCING STABILITY*

	ACTUAL COLLECTIONS		ESTIMATED COLLECTIONS	
	74.1-85.4 METHOD #1 (% CHANGE)	74.1-85.4 METHOD #2 (ELASTICITY)	74.1-85.4 METHOD #1 (% CHANGE)	74.1-85.4 METHOD #2 (ELASTICITY)
ADD: SHOES AND CLOTHING	Pos.	Pos.	Pos.	Pos.
ADD: FOOD @HOME	Pos.	Pos.	Pos.	Pos.
ADD: PERSONAL & AUTO SERVICES	Pos.	Pos.	Pos.	Neg.
LESS: CAPITAL EQUIPMENT	Neg.	Neg.	Pos.	Neg.
TOTAL ABOVE 4 CHANGES	Pos.	Pos.	Pos.	Neg.

* See the discussion and table in the appendix for more explanation and greater detail.

5. Reduce the Number of Law Changes

Policymakers must recognize that frequent substantial tax law changes (including federal tax law) make revenue forecasts more uncertain. The more complicated tax law changes are, the more uncertain the forecasts of revenue. Law changes such as income tax surcharges and changes in a flat rate sales tax are much easier to forecast than more complex law changes, such as excluding pension income from tax under certain circumstances.

A conscientious policy to limit tax law changes or to reduce the breadth of such changes would increase forecast accuracy.

B. OPTIONS FOR MANAGING FORECAST ERRORS AND INSTABILITY

It is not clear that substantive changes to Minnesota's tax system would appreciably improve our ability to forecast revenues. Nor is it desirable that state's tax forecasts (or errors in forecasts) should be the principal basis for developing - or departing from - state tax and spending policies.

A 1981 Task Force

In response to charges of fiscal mismanagement and the inability of forecast models to accurately predict the future, a task force on state finances was appointed in 1981 to review the state's financial management. That task force reported that no major changes were required in the technical procedures used to forecast revenues - as did a 1986 House Research study mentioned earlier. The 1981 recommendations, however, did include the following:

- o establish an advisory committee to review forecasts;
- o implement longer forecasting periods - up to five years;
- o establish a reserve fund to guard against unanticipated shortfalls;
- o develop contingency plans for expenditure reductions.

These recommendations, with the exception of a four year, rather than five, forecasting horizon, were put into place within recent years. While they have not contributed directly to improving forecast accuracy, they are the lead to examining additional available alternatives.

This report identifies an approach which may be implemented to reduce the impact of inherent forecast inaccuracy which has caused, and may again cause, massive budget problems.

This report suggests a two-part option for managing budget instability.

Part One: Forecast Risk/Contingent Plan

Formal recognition of Forecast Risk accompanied by development and adoption of Contingent Plan measures which would provide a specified response to unplanned budget deficits or surpluses.

Part Two: Annual Budget-Type Changes

Procedural changes to the biennial budget cycle to improve the state's ability to plan and manage state finances over the length of an unstable forecast horizon.

The issues, advantages and disadvantages of these options are commented on -- in the context of anticipation and effective management of budget uncertainty.

Part One: Forecast Risk/Contingent Plan

In the summer of 1985, the Department of Finance formalized an approach to forecasting which has come to be called a "range forecast." The range forecast consists of three alternative forecasts for revenue and expenditure growth. Implicit in the use of a range forecast is the belief that no one of the scenarios is likely to be right, but rather they together reflect the range of risk or possibilities of the future. The range forecast was one tool for assessing budget risks.

An option for dealing with forecast inaccuracy to maintain budget stability is to develop and adopt not only a budget based on a forecast but also a contingent plan which formally acknowledges budget forecast risk. Such a formal plan would indicate the automatic actions that would take place to assure budget stability when revenues and expenditures vary from the most likely forecast. In many ways, the forecast risk/contingent plan option is a way of thinking about the problem of creating a fixed budget to hit a moving forecast.

The following table illustrates the forecast risk/contingent plan option. A measure of forecast risk of plus 9 percent to a negative 9 percent is assumed. The mid-point presumes a balanced budget and a forecast that remains firmly on target.

TABLE 11
SUSTAIN BUDGET STABILITY

If Forecasts Will Be Wrong, What Then?

Example: Forecast Risk/Contingent Plan

Forecast Risk	Contingent Plan	
+ 9%	Automatic Actions	
	9% to Budget Reserve	
-0-	Adopted Budget	
	No Action Required	
- 9%	Automatic Actions	
	Cut Expenditures	+4.5%
	Trigger Tax	+4.5%

This report has documented that any single forecast will be wrong, and wrong by up to 9% either up or down. So simply adopting a balanced budget is inadequate. As the example shows, a total financial plan needs to be adopted that addresses the contingent actions that should occur automatically when a shortfall or surplus occurs. In the example, expenditures would automatically be cut 4.5% and revenues raised 4.5% through a trigger tax. If there is a surplus of funds, a budget reserve would be established, permitting future consideration of reduction in taxes or restoration of spending cuts.

Questions about the forecast risk/contingent plan option like "what does the Legislature do in the off-year?" or "how much discretion should the Governor have in implementing the contingent actions?" still need to be considered. But, the forecast risk/contingent plan option seems to better define the problem of inaccurate forecasts and, as a result, offers hope that a workable solution can be found to create budget stability. Many of the other options within this section can be viewed as complementary proposals for use within a contingent plan.

1. Budget Reserve

The use of a Budget Reserve should be a key component of a contingent plan. If revenues drop from the original forecast, a Budget Reserve can be used to replace the shortage. Likewise, if revenues are greater than expected, the excess can be used to build the Budget Reserve. It is an excellent tool for dealing with expected small scale increases or decreases in revenues.

The Budget Reserve has been clearly intended to provide a degree of protection (flexibility) against unforeseen revenue shortfalls. Since 1983 it has been recognized as an essential fiscal management tool. However, issues remain concerning the appropriate size of the fund. To address these issues, it is first necessary to determine its purpose.

In general, the Budget Reserve is intended to provide a revenue "cushion" that protects the budget from unforeseen revenue shortfalls.

The optimum size of the state's Budget Reserve depends on the desire for fiscal stability -- to limit the risk in having to adjust taxes or spending in order to avoid deficits. If the state desires to budget with a high degree of risk and potentially have frequent massive changes to its fiscal policies, it may choose to have no reserve at all.

The size of the Budget Reserve is a subjective decision based on an assessment of the degree of volatility in the revenue system and the state's ability to accurately forecast revenues. However, policy makers could be greatly aided in making this decision if presented with an indication of the chances of revenue shortfalls occurring and by how much. Put simply, policy makers may wish to minimize the risk of shortfalls occurring, but not necessarily eliminating them at all costs.

There are basically four empirical guides to be considered in determining the size of a budget reserve:

- historical forecast error;
- other risks;
- other measures which can be implemented to manage budget volatility;
- an evaluation of the anticipated variations in state cash flow.

The Budget Reserve option does have some drawbacks. First, it is very difficult to provide for a Budget Reserve when expenditures are being cut or revenues increased to balance the budget. It's easiest to build the reserve when its least needed, i.e. when revenues are exceeding the mid-range forecast. Second, to be the only defense against forecast inaccuracy, the Budget Reserve would have to be at least 9%(the average error) of the budget or close to $1 billion.

One aspect of the Budget Reserve should not be overlooked; it helps cushion the state's cash flow peaks and valleys. To the extent the state needs to avoid short term borrowing and cannot readily make other cash flow adjustments, the minimum amount of a Budget Reserve should cover the anticipated maximum projected cash flow deficiencies.

2. Trigger Tax and Spending Decisions

Contingency changes in tax policies are often referred to as "trigger taxes" -- tax changes which automatically take effect if a specified economic or budget events occur.

In a sense, the consideration of trigger taxes is similar to the preceding discussion on establishing the dollar amount of tax revenue to be raised. Such tax changes may take the form of automatic rate changes or surcharges on the personal income or sales taxes. The concept is not new; in 1983 Minnesota enacted a trigger provision which effectively suspended the indexation of personal income taxes if the Budget Reserve was insufficient to offset revenue shortfalls.

While the suspension of indexing was subsequently repealed and replaced by other legislative and executive actions to rebalance the budget, it represents an excellent opportunity to review the use of trigger tax measures as part of a contingent plan for maintaining budget stability.

Similarly, Minnesota has also considered a type of "trigger" spending reduction option. In 1983, a "shared risk" option was presented by the Department of Finance as part of the proposal for initially creating the Budget Reserve. While this provision was not adopted, it in part, provided for automatic reduction of appropriations to state agencies, as well as local units of government, according to a prearranged schedule in the event that other specified actions were insufficient to eliminate a forecast revenue shortfall.

Other options include "triggering" certain other tax or spending decisions such as phased-in tax reductions or programmed expenditure increases. In

either case, a measure of fiscal stability or "affordability" could be used to determine the implementation of major budget actions.

The conclusions of this report regarding inherent forecast inaccuracy support a positive reconsideration of trigger actions on tax and spending policies. While difficulty does exist in determining appropriate "triggers" for implementation, such actions would provide an automatic response under a contingent plan which may include other options.

3. Linking (Dedicating) Expenditures with Revenues

Dedicating revenues usually means restrictions on the use of specified revenues. The common rationale for such a policy is based on linking expenditures and benefits to particular users of a governmental service and the taxes collected from them.

Although this is the prevailing rationale underlying Minnesota's current dedicated funding policies, it has not always been the case. Between 1957 and 1968, dedicated revenues comprised nearly 80% of total state revenues. During those years, for example, almost all the individual and corporate income tax revenues were earmarked to finance school aids. Assignment of all or part of an established revenue source became a way to assure funding without annual legislative evaluation and appropriation. Since 1969, however, the proportion of dedicated state revenues has declined significantly. Under the state's current funding policies only a few taxes are dedicated for specified purposes and in most cases (but not all) the justification is based on a benefit-linkage rationale.

The largest single dedicated tax is the motor fuels tax (approx. $300 million) which is earmarked for road and highway expenditures. Another example of dedicating tax receipts is the motor vehicle excise tax, 50% of which ($240 million) is earmarked in F.Y. 1988-89 for highway purposes. Other significant general fund dedicated tax revenue includes 2% of specified net insurance premiums for police and fire aids to local governments, and 5% of taxes on cigarette and tobacco products for selected natural resource and environmental purposes.

Given the state's current economic and fiscal environment, another rationale for utilizing dedicated tax revenues is emerging. Budget stability can be enhanced by dedicating specified taxes or a given percent of revenues for particular purposes. In effect, linking revenues and expenditures in this manner shifts (or shares) the volatility (risk) of a given tax "directly" to the level of spending.

Under current budget policies, if state revenues fall short of expectations and expenditure liability is fixed or increases, then a budget problem materializes. This has required unallotments or legislative action that reduces spending or increases taxes. Tying the spending level of specified programs to a fixed portion of individual revenue sources would reduce the likelihood of frequent fiscal adjustments.

It should be noted, however, that not all types of expenditures or programs could be tied directly to revenues. For example, it would be inappropriate to link spending for income maintenance programs directly to revenues because these programs are intended to provide greater levels of assistance during economically depressed periods. However, it may be appropriate to dedicate revenues for such programs as local government aids or general property tax relief because local governments have the capacity and flexibility to adjust to potential fluctuations in aid amounts.

There are, however, some possible problems in "linking" expenditures and revenues:

- It may remove certain revenues and expenditures from regular and periodic control.
- Except when particular expenditures and revenues are "naturally" linked, dedication allows expenditures to be too large or small in relation to actual needs.
- Excessive segmentation in the number or dollar amounts of dedicated tax revenue sources, may create rigidities into both the revenue system and spending process.
- Transferring downside revenue volatility to spending may limit flexibility during periods of high revenue growth. This may be a problem if revenue windfalls are needed to fund other spending priorities.

4. Inflation Adjustment at the Beginning of each Year:

The recent history of declining inflation illustrates the difficulty in capturing the benefits of reduced inflation from state expenditures. Inflation built into the budget in salaries, supply and expenses, as well as grants and formula driven items, is forecast when the budget is developed and enacted. Occurring in generally "fixed" appropriations, that money is available and spent -- the benefits of a lower forecast of inflation are missed.

An adjustment for inflation at the beginning of each year may solve the problem caused by setting spending based on the 30-month horizon forecast required at the beginning of the biennium.

Instead of appropriating inflation funding to individual agencies for both years of the biennium, the projected funding allocated for an inflation adjustment - a capped amount - could be appropriated into a separate account to be allocated to provide inflation adjustments at the beginning of each year of the biennium. Or, inflation adjustments for the second year of the biennium could be deferred until the following legislative session.

In the recent situation where inflation has been declining, that decline has also effected a reduction in revenues. An annual inflation adjustment would compensate for reductions in anticipated revenues resulting from lower inflation by reducing or eliminating inflation increases in spending. In a rising inflation environment, the annual inflation adjustment could be capped within original appropriated amounts.

5. Stage Appropriations:

Given the forecast horizon of more than thirty months and the fixed nature of Minnesota appropriation mechanisms, there is a potential for serious instability in any biennial budget not secured by a budget reserve. A shift from the existing 100% appropriation rule (i.e., the right to spend all appropriated funding in a given year) to a 95/5 authorization is a possible modification of Minnesota's appropriation process.

The 95/5 approach operates simply: the 100% funding is appropriated to a given program based on need, but its "approved" spending level will be limited to a 95% level until sufficient tax revenues are confirmed at the beginning of the second year of the biennium. If a revenue shortfall occurs, the 5% (or less) of the appropriation will be held back -- possibly to be funded through a supplemental bill at the beginning of the following biennium to restore the base for programs. If the shortfall exceeds 5% additional unallotment or other mechanisms could be implemented to further reduce spending levels.

The following are advantages and disadvantages of the this approach:

Advantages:

- Provides flexibility to the appropriation process so as to limit massive adhoc reductions. Spending can be more readily adjusted to actual rather than anticipated revenues.
- Maintains spending in line with revenue trends.
- With the 95/5 authorization approach, there may be reductions in the requirements for a substantial budget reserve.
- The possibility of legislative budget reductions in the off-budget year is reduced unless the revenue shortfall is particularly large.

Disadvantages:

- State agencies and local governments may develop an anticipatory spending behavior by inflating their budgets to deal with a possible 5 percent holdback.
- The revenue forecast process may be manipulated in order to control spending.

- The 95/5 authorization does not improve cash flow as effectively as does a substantial budget reserve.

- Any deferred amounts could become permanent "shifts".

Part Two: Changes to the Budget Process

Are there changes which can be made in the budget process which can provide better management of the volatility associated with forecasts and the budget? The examination of the problems of forecast error supports a conclusion that annual budgeting could reduce budget instability and perhaps contribute to more stable policy decisions.

In Minnesota, the distinction between biennial and annual budgeting is not that clear. Approximately 40 percent of the budget is effectively decided during the off-budget year of the biennium (even-numbered year) for the first year of the following biennium. They are: Foundation Aid, Property Tax Credits, and Local Government Aid. Only 60 percent of the budget is decided in the regular budget session (odd-numbered year). Most direct appropriations are not allowed to be carried over the following year of the biennium. In recent years, legislative sessions in off-budget years and in special sessions have been unusually active in budget decisions, aiming at reconciling expenditures with annually revised tax revenues to avoid budget deficits.

Some commonly cited benefits of biennial budgeting include:

- A lengthened planning horizon produces greater stability.
- Decreased frequency for which budgets must be prepared, presented and passed.
- Extended time for budget review and deliberation.
- Less abrupt changes in fiscal policy.

Few could cite the advantages for Minnesota's budget process in recent years. Clearly, the advantage of the stability that a two-year budget seems to confer appears to be a substantial disadvantage when the recent history of special sessions, budget reductions, and abrupt changes required in fiscal policies is considered. Effectively, annual budget reconciliations triggered by forecast changes have become a part of Minnesota legislative life.

As a result, there is substantial reason to consider options of annual budgeting. It is not necessarily an either-or proposition which would sacrifice benefits of biennial budgeting. Discussions may center about a hybrid approach which would retain a longer planning horizon but act on a yearly basis on selective portions of the budget.

Prior to 1981, the informal mechanisms of the biennial budget process worked well. One might argue that ad hoc mechanisms also responded well to recent budget problems. However, recent history suggests that as the size and volatility of the budget has increased, there is need for greater control and review that a contingent plan and changes to the budget and appropriation process would provide.

Several primary objectives can be outlined in considering changes to the budget process:

- Improving the accuracy of revenue and expenditure forecasting by reducing the forecast horizon;
- Providing annual review to result in less volatile incremental changes in budget and tax policy;
- Providing annual review to allow current assessment of the impact of tax and budget changes and permit timely intervention in the event of errors in estimating the impact of law changes.

The remaining section of this report suggests some approaches and options which may be used to address these issues.

An Annual-Biennial Approach

The following option suggests a middle-of-the-road approach for annual budgeting, aiming at taking advantage of the benefits of annual budgeting while trying to avoid some of its inherent flaws.

Four major points of a possible option are:

a. The budget allocation could be broken down into two processes: the biennial appropriation process and an annual spending authorization process. An appropriation could be provided for two years and can be modified each year. A spending authorization could be decided each year.

b. The state budget could be divided in two categories:

   -State services and operations, which include only basic expenditures for agency operations and services.

   -Local Assistance and Payments for individuals, which include grants to higher education institutions, school districts, localities, and entitlement programs.

c. Expenditures for basic state services and operations could be appropriated on the biennial basis and, under normal circumstances, not be subject to annual review, except for an annual inflation adjustment. In other words, spending authorization could equal appropriations adjusted for inflation and salary increases. Expenditures for state operations account for only less than 10 percent of the total state's general fund, but usually require considerable time in a legislative session. Most is a repetition of the previous year's work. There is no reason why that cannot be continued on a two-year cycle.

d. Two-year appropriations for education, local assistance, and entitlement programs could be made for planning purposes. Spending for these programs could be authorized on an annual basis. Spending authorization would depend on several factors: annually updated tax revenues, projected inflation, caseload review, and any required policy changes.

There would be no need to extend the legislative session in even-numbered years to accommodate this approach. Budgeting of basic state operations on a two-year cycle would permit executive and legislative decision makers and staff time to concentrate efforts on allocation of major program funding decisions.

Another Piece: Uniform Budget Cycle Improvements

To improve financial relationships between state and local governments, a uniform fiscal year for both state and all other units of government could be considered, or at least establishing a synchronizing mechanism to relate legislative appropriations and state aid to local governments along a coordinated schedule in a timely fashion.

Currently, state funding for school aids, local government aid, and property tax credits is effectively committed during the off-year session for the first year of the succeeding biennium. This occurs without benefit of a revenue forecast or formal analysis of the projected financial situation and likely requirements of the remaining portions of the budget to be established by the following legislative session. It is extremely difficult to reduce committed spending should deterioration of anticipated revenues occur.

This improvement would at least remove some difficulties of localities in budget planning particularly for expenditures which depend greatly on state aid, such as school aids and property tax credit programs which may be affected by instability of finances at the state level. However, there are complexities and costs in bringing the state and local units into similar fiscal schedules which require additional analysis.

Summary: In Conclusion

As this report has indicated, forecasts for state revenues and expenditures have been no less accurate than national or private sector forecasts. Two year estimates prepared for the budget, locked into tax and spending decisions, allow a longer time for errors to compound and accumulate. The larger forecast errors for both revenues and expenditures for the second year of a biennium is indicative of the problems caused by a 30-month forecast horizon.

Each of the options discussed in this report could be expanded to develop further variations. The Department of Finance hopes that analysis of the problems and introduction of possible solutions will lead to discussion and development of specific legislation in the 1987 session to improve budget stability.

APPENDIX

APPENDIX: Changes to the Sales Tax Base for the Purpose of Enhancing Stability

One of the questions that arises regularly in the discussion of revenue volatility is: "Would broadening the base of the sales tax make it more stable?" In order to test that hypothesis, we have attempted to simulate the effect of adding the following items to the base: food at home, shoes and clothing, and personal and auto services. In addition, we have simulated the removal of capital equipment from the base.

Analysis:

For purposes of this analysis, stability was defined in two ways:

- The first measurement is "the standard deviation of the annual percent changes in the tax", where annual percent change is measured as a quarterly value of one year divided by the corresponding quarterly value of the prior year. Under this measure, perfect stability would exist if the tax grew at a constant percent change without any deviations from that percent change. In the case of perfect stability, the standard deviation would be zero. If perfect stability existed under this measure, one would be able to forecast future values of the tax perfectly by simply knowing its past rate of growth.

- The second measure is the "standard deviation of the ratio of the annual percent change in the tax to the annual percent change in non-farm personal income" (this ratio is commonly refered to as an elasticity measure). The measurement of percent changes is the same as in the first method. Perfect stability would exist under this measure if the ratio of the two percent changes remained constant. A constant ratio would imply a standard deviation of zero. If perfect stability existed under this measure, one would be able to make perfect forecasts of the tax if the growth rate of personal income could be determined in advance.

The following two points should be made about the computations. In each instance the component was added to the base to determine the combined stability of the base and the item as opposed to computing the stability of the item itself and then comparing it to the stability of the base. It is the combined effect that is important. It is conceivable that one could have two highly unstable components, which when added together, could be quite stable because of offsetting changes. Secondly, two bases were used for the computation. The first base was the actual collections adjusted for rate changes, time and seasonality. The second was an estimate of collections based largely on outside sources that purports to mirror the sales tax base and and takes into account the effect of major law changes so as to be theoretically consistent with the actual base.

Table 11 gives the stability results. It gives the two measures of stability described above for both the estimated base and the actual base. The "+" and

"-" signs indicate whether a particular change adds to stability or detracts from it given the definition of stability and the base.

The most important finding is that the estimated base is substantially more stable than the actual base. If one were to simply look at the sales tax law and attempt to estimate the tax base over time, one would conclude that the sales tax was far more stable than it in fact is. The inference is that when one estimates the effect that changes in the law may have on the stability of the actual base, one is likely to over-estimate their stabilizing effect. The estimates are likely to be more stable than the reality that they are a proxy for. The explanation for this is that our ability to accurately estimate law changes, using a combination of state and national data, is quite limited and subject to error.

Adding Estimated Modifications to the Actual Base:

When one compares the estimates of the proposed additions plus the actual base to the actual base one finds that in general, they add to stability as one would predict. However, the increase to stability is not by any means overwhelming. In the case of capital equipment, deleting it would make the tax less stable. However, this illustrates the effect that was described above--namely that the law changes are more stable than the actual collections for which they are a proxy. As a consequence when you add an individual set of items to the actual base, the stabilizing effect may be overstated and by the same token, if you subtract a "relatively stable estimate" from the base it may be destabilizing. It is also worth noting that the effect of the combination of all changes (using both stability measures and the actual base) is to make the tax base more stable than any single change (somewhat analogous to portfolio diversification.)

Adding Estimated Modifications to the Estimated Base:

When one makes modifications to the estimated sales tax base using the first stability measure (percent change), one finds that stability by that measure is increased in all instances. Further, one finds that stability is the greatest under the first measure of stability when all changes are combined. However, when one uses the second measure (elasticity method) of stability, the results are not uniform. Under the second measure, the addition of personal services and deletion of equipment does not add to stability. Its not readily apparent why this divergence from the first method occurs. (It should further be noted that the equipment estimate is the least reliable estimate, in that there is virtually no state information on capital equipment spending.)

Conclusion:

One may conclude from this that a broadening of the base would probably improve stability slightly. On the other hand, any slight improvement in

stability may be offset in the first couple of years by the imprecision of the law change estimate itself. Further, a more stable base does not guarantee that the determining underlying external variables such as personal income and consumer durable spending are going to be forecast more accurately than they are at present.

Table 11

ESTIMATES OF THE IMPACT OF POTENTIAL CHANGES TO THE
SALES TAX BASE FOR PURPOSES OF ENHANCING STABILITY

	74.1-85.4 METHOD #1 (% CHANGE)	74.1-85.4 METHOD #2 (ELASTICITY)		74.1-85.4 METHOD #1 (% CHANGE)	74.1-85.4 METHOD #2 (ELASTICITY)
ACTUAL COLLECTIONS :			ESTIMATED COLLECTIONS :		
MEAN	9.3	0.93	MEAN	9.6	0.97
STANDARD DEVIATION	6.8	0.67	STANDARD DEVIATION	3.8	0.32
ACTUAL COLLECTIONS + SHOES AND CLOTHING :			ESTIMATED COLLECTIONS + SHOES AND CLOTHING :		
MEAN	9.2	0.92	MEAN	9.5	0.95
STANDARD DEVIATION*	6.2 +	0.61 +	STANDARD DEVIATION*	3.6 +	0.3 +
ACTUAL COLLECTIONS + FOOD @HOME :			ESTIMATED COLLECTIONS + FOOD @HOME :		
MEAN	9.1	0.91	MEAN	9.4	0.94
STANDARD DEVIATION*	5.8 +	0.57 +	STANDARD DEVIATION*	3.3 +	0.26 +
ACT. COLLECTIONS +PERSONAL & AUTO SERVICES :			EST. COLLECTIONS +PERSONAL & AUTO SERVICES :		
MEAN	9.3	0.93	MEAN	9.1	0.96
STANDARD DEVIATION*	6.6 +	0.65 +	STANDARD DEVIATION*	3.6 +	0.5 -
ACTUAL COLLECTIONS -CAPITAL EQUIPMENT			ESTIMATED COLLECTIONS -CAPITAL EQUIPMENT		
MEAN	9	0.92	MEAN	9.3	0.97
STANDARD DEVIATION*	7.5 -	0.81 -	STANDARD DEVIATION*	3.7 +	0.43 -
ACTUAL COLLECTIONS + ABOVE 4 CHANGES			EST COLLECTIONS +ABOVE 4 CHANGES		
MEAN	8.8	0.9	MEAN	9	0.93
STANDARD DEVIATION*	5.5 +	0.6 +	STANDARD DEVIATION*	2.8 +	0.33 -

* Compare these values to the standard deviation for actual collections to assess stability. A lower value indicates greater stability and is highlighted by a "+" sign; the reverse is highlighted by a "-" sign.