A Primer on Revenue Planning for the Budget Advisor

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Why Revenue Planning is important

- Governments need to have a good handle on their likely revenues in order to prudently plan their spending and to prepare a responsible fiscal framework.
- Own source revenues are an important part of the resource envelope guiding expenditure planning even for countries dependent on ODA.
- A good revenue forecast makes for a harder budget constraint.

Budgeting Based on Solid Revenue Forecast

- The steps are:
  - Forecast revenues;
  - Project spending on existing programs;
  - Determine discretionary changes in spending and taxes based on a comparison of expenditures to revenues and a consideration of the deficit and financing implications of the preliminary fiscal plan.
- Final product
  - A annual budget presenting planned spending, projected revenues, and financing intentions that is approved by the legislature.
- Monitor revenue outcomes against predicted.

Approach to Revenue Forecasting

- The basic approach to revenue forecasting is very simple
  - Revenue equals rate times base or
  - $R=\Sigma\ r_i*b_i$
- Income taxes are more complicated.
- Personal income tax
  - Form
  - Different classes of income – salary, interest, dividends, self-employment, resource, manufacturing
  - Exemptions and deductions for personal income tax
  - Progressive rate structure
- Corporate income tax
  - Different income types – manufacturing, resource, financial services
  - Capital cost allowance and investment credits

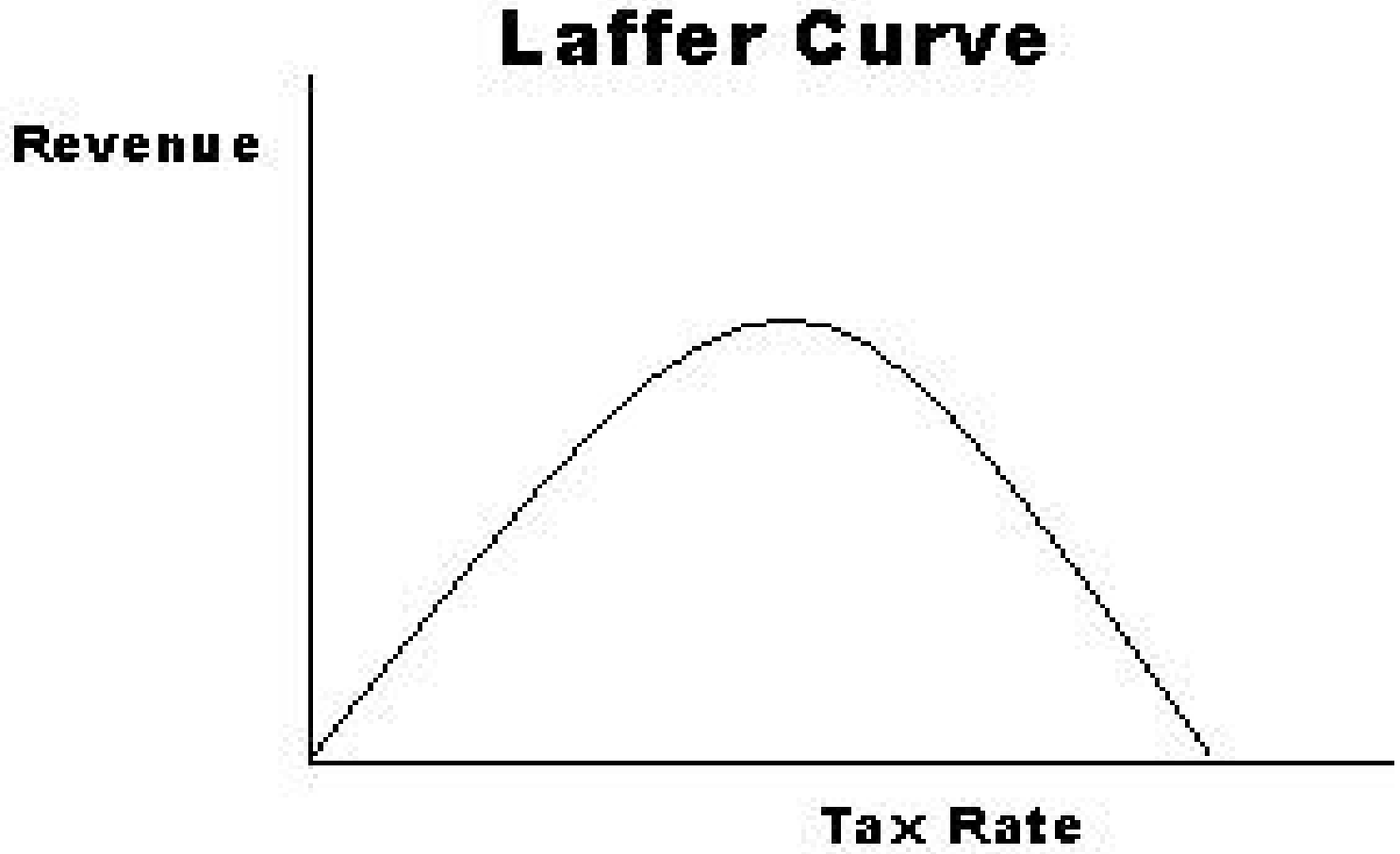
Fiscal Forecasts Must Be Built on Economic Assumptions

- The fiscal forecast must be prepared in conjunction with the economic forecast.
  - Government expenditures and revenues are an important part of the economy, serving as both a component of aggregate demand and a determinant within the usual Keynesian framework.
  - Revenues are dependent on economic activity, which in various forms comprise the tax bases.

Economic Forecast

- Economic Forecasts can be done judgementally or using econometric models.
- Several different departments and agencies are usually involved:
  - In US it is the “Troika” comprised of the CEA, Treasury, OMB.
  - In developing countries, it oftentimes is a committee made up of representatives from the Ministry of Finance (Budget Department, or Economic Affairs or Policy Department), the Ministry of Economics or Planning, the National Statistical Office or Agency, and the Central Bank.
- Econometric forecasts are preferable because they allow forecasts to be modified quickly as the situation changes and permit consideration of scenarios

Problem of Two-Way Causality Between Revenues and the Economy



Institutional Knowledge of the Tax System

- What is the country's Tax Structure?
  - Exports –oil or other commodities
  - Imports
  - VAT
- How does it differ from that in other countries?
- Are there any specific challenges to forecasting the particular country's tax revenues?
- What data bases are available?
- Are there any good tax models currently in use in the country that can be adapted?

Revenue Forecasting Techniques

- There are a whole range of forecasting tools that can be utilized.
- From the simplest to the most advanced, they are:
  - Targets are sometimes established where collections closely depend on efforts and can be used as forecasts
  - Extrapolation, various forms of smoothing and filtering (and).
  - Elasticities
  - Time series analysis
  - Estimated structural equations
  - Micro-simulation models based on personal and corporate tax files.
- They can all be used to build a revenue forecasting model and to produce forecasts.

Overview of Revenue Forecasting

- Revenue forecasting is best done with econometric tools.
- Their advantages are that they:
  - provide comprehensive documentation of the methodologies utilized for revenue forecasting;
  - allow a mixed frequency database required for forecasting and monitoring revenues;
  - contain all the statistical techniques necessary to estimate rate-times-base equations required for revenue forecasting;
  - provide a modeling capability to build and maintain revenue forecasting models;
  - permit discretionary changes in tax policies to be explicitly incorporated;
  - facilitate analysis of changes in the forecast and evaluation of forecasting errors;
  - help auditors to audit revenue forecasts and outcomes after the fact.

The Importance of a Medium-Term Horizon

- Even though budgets are annual and emphasize the budget year, it is important that they be prepared from a medium-term perspective.
- It is very difficult to modify spending with only a one-year horizon.
- It is essential to have an appreciation of likely revenues to plan medium-term spending.
- For these reasons, the IMF and World Bank encourage countries to prepare Medium-Term Expenditure Frameworks (MTEFs) incorporating revenues and based on a Medium-Term Fiscal Framework (MTFF).

Revenue Forecasting Tools

- Spreadsheets like Excel.
- Database programs like Microsoft Access, Oracle.
- Statistical software packages like SPSS or SAS.
- Econometric Software Packages for time series like EViews, Stata, RATS and TSP.

EViews as a Revenue Forecasting Tool

- Introduction to EViews
  - Concept
  - Loading data
  - Viewing Data
  - Analyzing Data
- EViews also provides
  - all the required econometric and statistical tools, and
  - modeling capability.

The Concept of EViews

- The distinctive feature of EViews is that it was one of the first econometric programs to take advantage of the Windows operating system.
  - It is still the most user friendly.
- Data can be viewed and analyzed in many different ways using the mouse and drop down menus.
  - This encourages users to become really familiar with data and not to just mechanically apply statistical techniques.
- Also has a command interface which enables repetitive tasks to be completed using a sophisticated set of commands
  - This makes it suitable for preparing regular revenue forecasts where the same calculations are repeated with only exogenous variables or parameters changing.

Seasonal adjustment

- Revenue data often exhibits pronounced seasonality.
- Revenue forecasters have to deal with the problem of incorporating monthly and quarterly data with strong seasonality into annual revenue forecasts.
- And with disaggregating annual forecasts into monthly and quarterly to monitor revenue collections.
- There are different ways of dealing with seasonal data when forecasting:
  - Use year-to-date shares.
  - Incorporate seasonal dummy variables in the revenue equations.
  - Seasonally adjust the data using a statistical program (X11 or X12) and then spread forecast using factors,

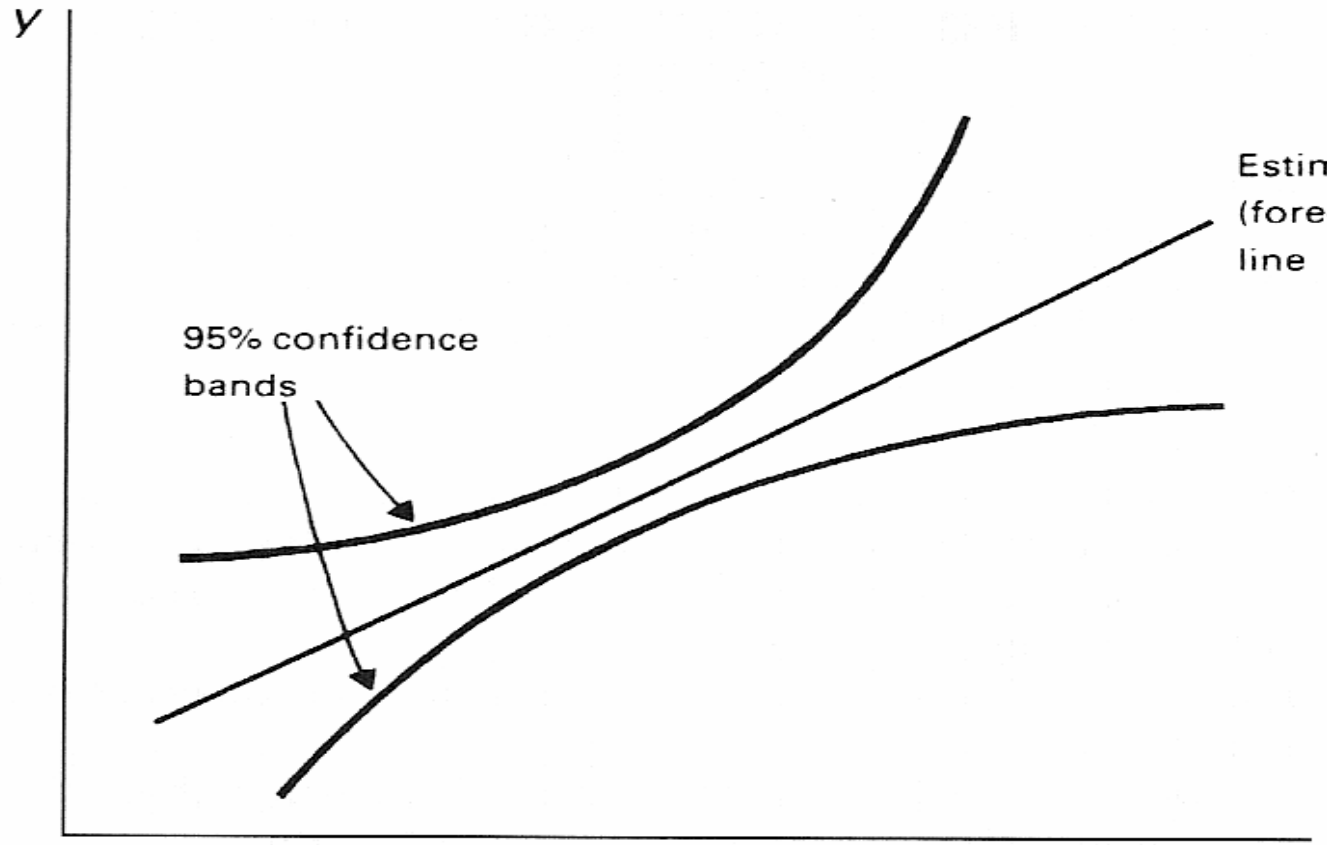
The Approach to Revenue Forecasting

- **Create a data base of fiscal and economic data.**
- **Staff must develop the skill to use econometric software to develop revenue forecasting equations.**
- **They also require the detailed institutional knowledge of tax system to specify appropriate equations for the different revenue sources.**
- **Estimate equations linking the revenue forecast by revenue to a proxy tax calculated as rate times base using the appropriate rates and tax bases from the economic forecast.**

More on The Approach

- **Put the revenue equations together into a model and use them to prepare the base line medium-term fiscal forecast and the most relevant alternative scenarios.**
- **Make budget spending and tax decisions based on analysis of resulting deficits and the sustainability of the implied debt.**
- **Use the model to monitor the revenue forecast over time as new data becomes available and to update the forecast if necessary.**
- **Also can use the model to audit the forecast and decompose sources of errors.**

Revenue Forecasting Errors Grow with the Forecast Horizon



Source: Peter Kennedy, *A Guide to Econometrics* (2003).

Figure 19.1 Confidence intervals for forecasting

Analysis of Forecast Errors

- Sources
  - **Errors in specification**
  - **Errors in forecasting independent variables**
  - **Errors in coefficients from sampling**
  - **Random errors (disturbance term)**
- Measuring errors
  - **Mean absolute error**
  - **Root mean square error**
  - **Mean absolute percentage error**
  - **Correlation of forecast and actual values**
- Decomposing errors
  - **Thiel's Inequality coefficient**

Requirements for Success

- Ministry must have capacity to absorb a new more sophisticated econometric approach.
- Need buy-in by Ministry and commitment of staff time and resources to learn new skills.
- Need to acquire econometric software like EViews.
- Need laptops available for training seminars for hands-on practice.
- Need actual revenue and economic data base to use in examples and for students to experiment with.
- Need to give participants were hand-on experience in modeling individual revenue sources.
- Need adequate follow-up helped to ensure that new tools were actually utilized.

Last words

- A revenue forecast is the necessary first step in preparing a budget.
- Revenue planning should be done on a medium-term basis to give the required time horizon to effectively manages expenditures.
- An econometric approach to revenue forecasting is to be preferred because it permits:
  - clear links with the economic forecast;
  - discretionary changes in rates and bases;
  - quick adjustments and the use of scenarios;
  - Identification of sources of forecast errors.
- An econometric package like EViews provides the most effective and easily utilisable revenue forecasting tool.