METHODOLOGY FOR MONTHLY ESTIMATES OF STATE TAX REVENUE
2023-2024

State tax revenues as defined in this report come from taxes imposed upon the citizenry, private and corporate, through laws enacted by the Tennessee General Assembly. They are collected and apportioned monthly by the Department of Revenue to various funds as directed by statute for the operation and financing of state government.

To arrive at monthly distributions for fiscal year tax estimates, used to support the state's annual budget as adopted by the Tennessee General Assembly, the Department of Finance and Administration utilizes the services of the University of Tennessee's Boyd Center for Business and Economic Research (Boyd CBER) and the Research Section of the Department of Revenue.

Boyd CBER uses three separate and distinct methods to allocate the annual revenue estimates across the 12 months of the fiscal year (usually defined as August through July to approximate the collection of revenues on an accrual basis). These methods are discussed below. The Department of Revenue uses a single methodology, much like Boyd CBER's Seasonal Factors Model, but which utilizes a much shorter time frame (four years of tax collection data compared to Boyd CBER's twenty year method.)

The Department of Finance and Administration has chosen the four-year approach used by the Revenue department to allocate monthly estimates for all taxes with the exception of franchise and excise taxes. It is thought by F&A that the four-year method for these particular taxes captures the most recent changes in tax laws which influence the timing and amounts of tax collections and thereby produces a more accurate result as to what is likely to be collected for any given month.

Recognizing that franchise and excise tax collections account for nearly twenty two percent of all state tax revenue, and that no single model can consistently predict with any significant degree of accuracy monthly collections for these taxes, the Department has chosen to average the three models produced by Boyd CBER. This method of blending the estimates produced by the three separate models has the effect of smoothing the monthly highs and the lows of any single model and is a more reasonable approach for establishing monthly estimates for these particular taxes.

The end result establishes the benchmark from which actual monthly revenue collections are compared to the official budgeted estimates and serves as an important budgetary tool in assisting the Governor and the Commissioner of Finance in keeping the state's budget in a balanced posture throughout the fiscal year.

UNIVERSITY OF TENNESSEE'S BOYD CBER MODEL METHODOLOGY

Seasonal Factors Methodology

The tax estimates distributed by seasonal factors were prepared by finding the seasonal patterns, or the seasonal adjustment factors, for the prior fiscal year actual tax revenues by month. The seasonal adjustment factor for each month is calculated using at least 20 years of historical monthly tax revenue data and the U.S. Census Bureau X12 adjustment model contained in the econometric software EViews 11. (Because EViews cannot seasonally adjust a time series with negative numbers, those months with negative revenues were replaced with $0.00000001, still allowing the seasonal effects to be picked up in the adjustments.) The estimate for each month was found by dividing the official estimate for the fiscal year 2024 by 12 and multiplying by the corresponding month's seasonal adjustment factor from 2023. For example, to find the August 2023 estimate for sales tax revenue, the official fiscal year 2024 annual estimate for sales tax was divided by 12 and multiplied by the seasonal factor from August 2022.

Constant Growth Methodology

The monthly constant growth estimates were prepared by utilizing the fiscal year 2023 constant growth variable calculations necessary to reach the official 2024 estimates for each tax. Fiscal year 2024 monthly revenues for each tax were multiplied by the corresponding required average annual growth rates that were applied to 2023. For example, to calculate the August 2023 sales tax estimate, the August 2022 actual revenue was multiplied by the required average annual growth rate for sales tax from fiscal year 2023 to fiscal year 2024.

Statistical Model

The statistical model is used only for sales and franchise and excise taxes and is based on combined time series and economic models. Specifically for the sales tax, an economic model based on Tennessee and U.S. economic data is implemented on the seasonally differenced monthly revenue data, and the residual is diagnosed as an ARIMA (6,0,0) process. Then an integrated model which incorporates the economic and time series models is used to perform the one-step-ahead estimate and is re-estimated to perform the next one-step-ahead estimate, and so forth. For franchise and excise taxes, a time series model is developed on the seasonally differenced monthly revenue data. The ARIMA model chosen for this revenue estimate is based on a diagnosis test of the data characteristics and the criterion that the model produces the least out-of-sample forecast error among all candidate models.