## Methodology Used to Estimate Short Run Income Elasticities of Tax Revenue

Short run elasticity of a tax system is a measure of the system's volatility. A measure approximately equal to 1 indicates a system that tracks with the economy. A measure greater than 1 indicates a volatile system; tax revenues grow faster than the economy in good economic times and decline faster than the economy in bad economic times. An elasticity less than 1 indicates that the tax system is not as volatile as the economy. A negative short run elasticity indicates that the tax system is counter-cyclical. The following table shows short run elasticities for Washington's tax system.

The elasticities are calculated for two time periods, 1970-2001 and 1983-2001. The early 1980s, with high inflation, economic decline and high sales tax collections from Washington Public Power Supply System construction, may be an anomalous period. To the extent that these years are anomalous, their inclusion may bias the short run elasticity estimates upwards. However, the early 1980s are also the only serious recession years in the time period. Including only growth years would tend to bias the volatility estimates downwards. Therefore estimates for two time periods are included to frame a range of possible estimates.

**Short Term Elasticities for Major Washington Taxes**

| | **1970-2001** | | **1983-2001** | |
|---|---|---|---|---|
| **Tax Base** | **SR Elasticity** | **Rank** | **SR Elasticity** | **Rank** |
| Non-food Sales and Use | 1.543 | 1 | 1.275 | 1 |
| B & O | 1.365 | 2 | 0.897 | 2 |
| Property | 0.414 | 3 | -0.146 | 3 |
| Public Utilities | -0.094 | 4 | -2.453 | 4 |
| **All Taxes** | **1.300** | **n.a.** | **0.885** | **n.a.** |

In both sets of estimates, the sales tax short term elasticities are the most volatile and significantly higher than 1. B&O is the next most volatile. Property tax and public utility taxes provide some stabilization.

### Methodology

We used a standard double log regression model to estimate the short run income elasticities of the sales and use tax, business and occupation, property and public utility tax bases. The model is specified as follows (Holcombe and Sobel, 1993):

(1) $\text{Ln}\ (B_t) = \text{"} + \$\ln(Y_t) + >_t$

Where $B_t$ = the level of the tax base in time period t
$Y_t$ = the level of personal income in period t
$t_1$ = 1970…….2000

Three transformations of the data in equation (1) were done before running the linear regression equations associated with each tax base. First, the nominal data in B (the tax base) and Y (personal income) were transformed to real variables using the personal income deflator of consumer expenditures (PDIC). The logs of the real variables were then taken. Since we are using time series data, we removed the upward trend inherent in time series data by taking first differences of the real variables. The transformed model becomes the following:

(2) $\Delta \ln(B_t) = \alpha + \beta \Delta \ln(Y_t) + \varepsilon_t$

The $\beta$ coefficients from equation (2) yield the elasticities for each of the tax bases under consideration.

The data we used are a constant base series running from 1970 to 2000.

**Reference:**

Holcombe, Randall and Russell Sobel. 1993. Growth and Variability in State Tax Revenue: An Anatomy of State Fiscal Crises, Greenwood Press, Westport, CT.