STATE REVENUE ADEQUACY AND OPTIMAL STATE PORTFOLIOS OF SALES TAX COMPONENTS

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INTRODUCTION

PROVIDING APPROPRIATE LEVELS OF REVENUE for state government functions is one of the core principles of an optimal state tax system (Brunori, 2001). As part of both ongoing budget planning and tax reform efforts, state policy makers and analysts often consider tax base and tax rate tradeoffs. During such deliberations, the planning and analytical horizon often focuses predominantly, if not entirely, on revenue adequacy in the immediate budgeting cycles. However, legislative decisions that broaden the tax base and lower tax rates not only affect proximate tax receipts, but also alter the long-term expected growth and volatility of revenue streams.

The present paper combines four dimensions for evaluating the revenue adequacy of alternative tax proposals. The first two constitute the traditional tax base and tax rate tradeoff. The third asks whether revenue will grow sufficiently to allow state government officials to maintain the delivery of goods and services consistent with their perceived public mandate. The final characteristic questions the robustness of the revenue system so that the natural volatility associated with the business cycle does not unduly interrupt appropriate governmental functioning. In summary, evaluation of revenue adequacy requires simultaneous consideration of the tax rate, tax base, expected growth, and risk of alternative tax proposals.

Previous public finance research establishes that unique combinations of tax codes and economic characteristics cause tax receipts for each state to react differently to the business cycle (Dye and McGuire, 1991). This paper attempts to further this understanding and focuses on the interaction of tax rates, tax base breadth, expected growth, and volatility. It begins by first reviewing and adapting financial market portfolio concepts so that they apply to the state budgeting problem. This background provides a framework for assessing alternative tax systems using state data. From these results, the implications for tax policy and reform are summarized.

SALES TAXES AS A REVENUE PORTFOLIO

Because public finance shares much in common with its corporate counterpart, the well-developed applications of tested financial market models can also aid public sector decision makers. Groves and Kahn (1952) lay the foundation for modeling tax portfolios by researching the tradeoff between stability and growth. Building on the finance literature (Markowitz, 1959) that considers the risk and return of equity portfolios, White (1983) adapts this methodology to tax problems and derives an efficiency frontier for the State of Georgia. Berg, Marlin, and Heydarpour (2000) make similar calculations for the City of New York. Misiolek and Perdue (1987) recalculate the efficiency frontier and emphasize the importance of considering real rather than nominal revenues. Suyderhoud (1994) researches diversification, balance, and fiscal performance of state revenue sources.

Since revenue adequacy isn't the only objective in good tax policy, others consider the mix of taxes included in a portfolio when taking into account other objectives. Gentry and Ladd (1994), for example, also consider competitiveness and equity. Harden and Hoyt (2003) investigate the effect of the tax mix on employment losses.

The foundation for considering sales taxes as a portfolio of personal consumption expenditure components is established by Dye and McGuire (1991). They calculate growth, standard deviations, and expenditure share for a variety of personal consumption expenditures (PCE) components. The present investigation updates their calculations and presents the results in a traditional risk-return efficiency frontier context. Data based from Utah historical tax receipts illustrate each concept.

Tax Rates and the Tax Base

Many tax policy investigations focus on the interaction between the rate and the base as joint determinants of tax revenue. This gives the well known relationship

$$(1) \quad R = r \cdot B \,,$$

where R is the total tax revenue, r is the tax rate, and B is the tax base. As mentioned, those charged with planning and executing state budgets concern themselves with the expected growth rates and their accompanying uncertainty that is often measured as a variance. Using the expectations operator, this gives

$$(2) \quad E[R] = r \cdot E[B] \,.$$

Similarly the variance of the rate of change in tax revenues is

$$(3) \quad Var[R] = r^2 \cdot Var[B] \,.$$

This means that the tax rate alters the expected value and variance of the tax base by a proportion due to the tax rate. Because sales tax rates are usually less than 10 percent, however, it can safely be concluded that the variation in sales tax revenues is mostly due to changes in the tax base rather than the tax rate.

Sales Taxes as a Portfolio

Analogous to equity portfolios that are composed of an assortment of companies, sales taxes generate revenue from a variety of retail products. Just as industry groups react differently to the phases of the business cycle, likewise different classes of retail products exhibit unique covariation with the aggregate economy.

Formal representation of sales tax revenues as a portfolio of different types of products and services begins by defining B as the total of the individual components where $B = \Sigma_i B_i$ and B_i is the tax base for the ith category of products. If b_i is the continuously compounded growth rate or $b_i = \Delta \ln(B_i)$ and x_i is the proportion of the revenue coming from the ith category, then the continuously compounded rate of growth for the sales tax portfolio is:

$$(4) \quad b = \sum_t x_i b_i \,.$$

This means that the total growth rate is the weighted average of the growth rates for each individual tax. The expected growth rate for sales tax receipts b is simply the weighted sum of the expected growth rates

$$(5) \quad b = \sum_i x_i E[b_i] \,.$$

Since risk is often measured by the variance of the growth rate, this gives the equation

$$(6) \quad Var[b] = \sum_i x_i^2 \sigma_i^2 + \sum_i \sum_{\substack{j \\ i \neq j}} x_i x_j \rho_{ij} \sigma_i \sigma_j \,,$$

where σ_i is the standard deviation of the ith category and ρ_{ij} is the correlation between the ith and jth categories.

APPLICATION USING UTAH SALES TAX RECEIPTS

Utah is unique among states in that its income taxes are constitutionally earmarked for public and higher education. Like most states, property taxes are generally considered local taxes. This means that sales taxes generate the preponderance of General Fund revenues used to finance state government functions such as transportation, corrections, health and human services, and general government. Consequently, the adequacy of fiscal resources generated from sales taxes is an important issue to the state.

Sales tax policy caused an interesting political contrast in Utah between 2004 and 2007. In 2004, Governor Olene Walker and her tax advisors proposed tax reform to broaden the sales tax base and lower the sales tax rate. She recommended expanding the base to include all final consumption, including personal consumption services. Because Governor Walker and her advisors were concerned about the inefficiency and lack of transparency caused by imposing sales taxes on business purchases, she proposed excluding those purchases from taxation. Simultaneously, in a gubernatorial campaign which didn't include Governor Walker as a candidate, future Governor Jon Huntsman suggested removing the sales tax on food. In the 2006 and 2007 legislative sessions, the Legislature and Governor Huntsman reduced the sales tax rate on food and did not enact the Walker proposal to tax services.

More recently, the Utah Tax Review Commission (TRC), a group of citizens and lawmakers who

advise the Governor and Legislature on tax policy issues, began to develop an initial framework to change Utah's retail sales tax into a broad-based household consumption tax. A working group of the TRC first adopted a set of guiding principles and then outlined a household consumption tax where all goods and services (including health care services) consumed by households would be subject to the sales and use tax. They tentatively exempted all business purchases of goods and services from tax levies.

Narrowing the tax base by excluding food might be especially important when considering revenue flows over the entire span of the business cycle. The boom times that generated the fiscal surpluses that enabled the partial removal of the sales tax on food during the 2006 and 2007 legislative sessions might possibly create a fiscal challenge during a recession. The question about the effects of reducing the sales tax on food on long-term revenue growth and risk gives rise to an important question about how the different components of retail sales that are included in the tax base affect tax receipts during different phases of the business cycle.

UTAH'S CURRENT SALES TAX BASE

Mikesell (2003) notes the variety among the statutorily defined state sales tax bases. As states determine the breadth of their sales tax base, crucial decisions center on the inclusion of food, services, and business inputs. Another issue questions whether products already subject to excise taxes should also be included in the sales tax base. To illustrate and compare the relative breadth of state sales tax bases, Mikesell suggests a ratio of the "implicit sales tax base to personal income" to show the diversity among the 45 states that impose a sales tax.

Utah imposes its sales tax on more services than do most other states. According to the 2004 state survey of sales taxation of services conducted by

Table 1
Historical Expected Growth and Risk for Utah's Sales Tax Portfolio

Category	Share of Base	Growth Rate Mean	Risk Std Dev
Retail - General Merchandise	11.3%	9%	5%
Retail - Motor Vehicles	11.0%	7%	7%
Wholesale - Durable Goods	9.3%	6%	11%
Retail - Food Stores	8.2%	6%	6%
Retail - Miscellaneous	6.9%	7%	6%
Retail - Eating & Drinking	6.3%	8%	3%
Retail - Building & Garden	5.9%	7%	10%
Manufacturing	5.5%	5%	11%
Electric & Gas	4.7%	7%	11%
Retail - Furniture	4.4%	8%	8%
Communications	3.7%	9%	10%
Services - Auto & Repair	3.4%	7%	6%
Services - Business	3.2%	11%	14%
Retail - Apparel & Accessories	2.6%	7%	5%
Services - Amusement & Recreation	2.1%	10%	8%
Wholesale - Non-Durable	1.9%	8%	11%
Services - Hotels & Lodging	1.8%	7%	7%
Private Motor Vehicle Sales	1.6%	7%	18%
Construction	1.5%	7%	17%
Finance, Insurance & Real Estate	1.0%	12%	17%
Mining	0.9%	8%	30%
Services - Education	0.7%	9%	14%
Services - Personal	0.6%	6%	4%
Transportation	0.5%	8%	24%
Services - Health	0.3%	10%	16%
Public Administration	0.3%	7%	21%
Occasional Retail Sales	0.2%	9%	24%
Agriculture, Forestry, Fishing	0.2%	12%	23%

the Federation of Tax Administrators, Utah and Arizona tied for 21st place in imposing the sales tax on 58 of the 177 distinct service types identified in the survey. Utah imposes its sales tax on several categories of services including telephone and telegraph, mobile telecommunications, admission or user fees, repairs or renovations of tangible personal property, cleaning or washing tangible personal property, tourist accommodations use for less than 30 consecutive days, and laundry or dry cleaning services. Using Mikesell's implicit sales tax based to personal income ratio, he concludes that Utah's ratio of .575 makes it the seventh highest among those states.

The proposed framework of tax base breadth, tax rate, expected growth, and risk generates insights into the characteristics of current tax policy. The statistics in Table 1 summarize Utah State Tax Commission historical data from fiscal years 1980 through 2006. This table reports mean growth rates and standard deviations for different Standard Industrial Classification (SIC) categories. SIC cat-

egories are ordered by their relative importance in the current sales tax system. The share of tax base column uses 2006 data, whereas the mean growth and standard deviation columns are calculated for the entire period. As shown in Table 1, retail sales constitute almost 50 percent of the sales tax base. Other major components of the sales tax base are various business categories and taxable sales by wholesalers.

Figure 1 fosters analysis of the information presented in Table 1. The bubble chart plots the growth and risk characteristics of different personal consumption and business expenditures that are taxed in Utah. The size of each bubble is proportional to the percentage of the tax base derived from that category. The bubbles in Figure 1 depict the top 10 most important contributors to the base. One conclusion immediately apparent from this graph is that the top 10 categories, which account for nearly three-fourths of the sales tax base, have comparatively low risk as measured by their standard deviations. Many of these major contributors

Figure 1: **Major Components of Utah Sales and Use Tax Base Expected Growth and Risk**
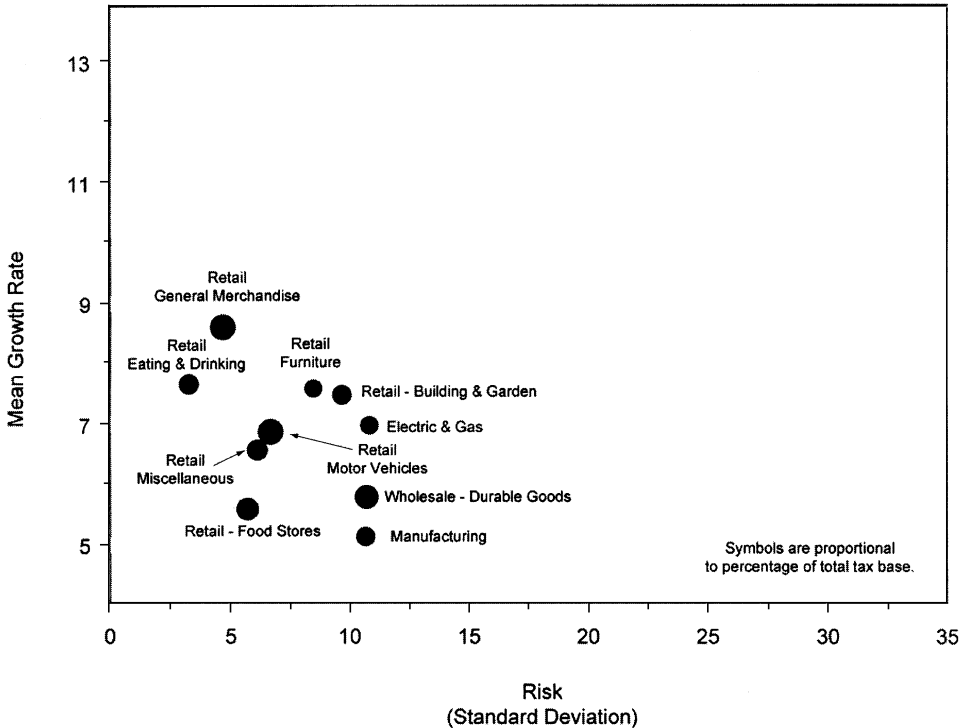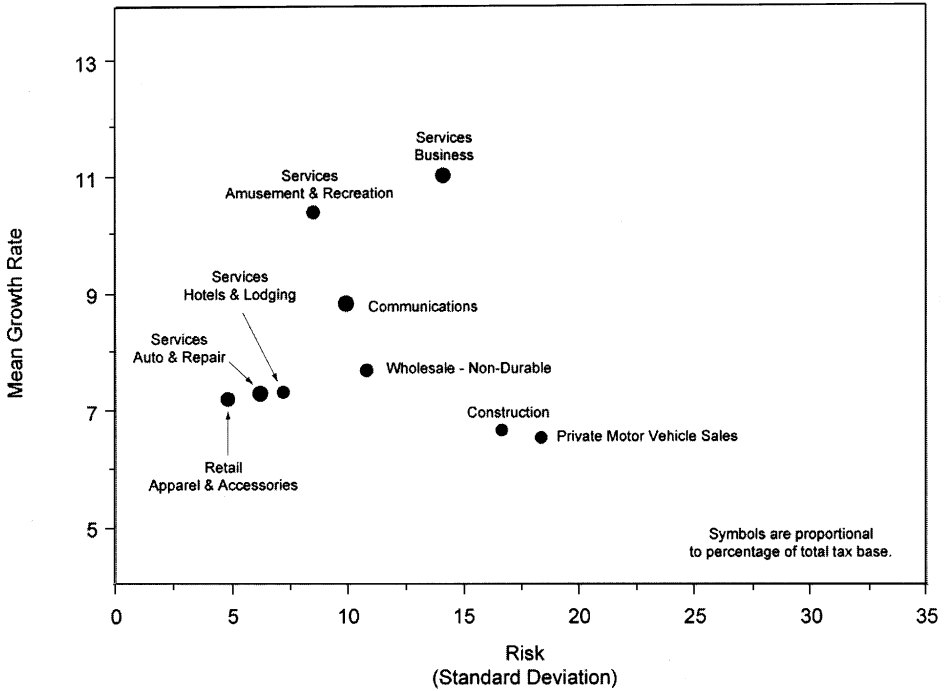
Figure 2: **Medium Components of Utah Sales and Use Tax Base Expected Growth and Risk**

also exhibit slower growth rates. The graph also identifies the Retail-General Merchandise category as a source of steady revenue simultaneously with a high growth rate. Contrast this with Retail-Food Stores which also has little risk but grows at a much lower rate. Retail Furniture has a high growth rate and relative low level of risk. Manufacturing offers slower growth but significantly more risk.

The second group, the moderately important personal consumption expenditures classifications identified in Figure 2 that together account for a little more than 20 percent of the tax base, tends to exhibit higher expected growth but with correspondingly higher variability. Business Services, Amusement and Recreation Services, and Communications all grow rapidly with moderate risk. Construction and Private Motor Vehicle Sales grow more slowly and erratically. In general, many of the categories in this group add to the potential growth rate with only moderate additions to risk.

The third category of expenditures identified in Figure 3, which makes up approximately 5 percent
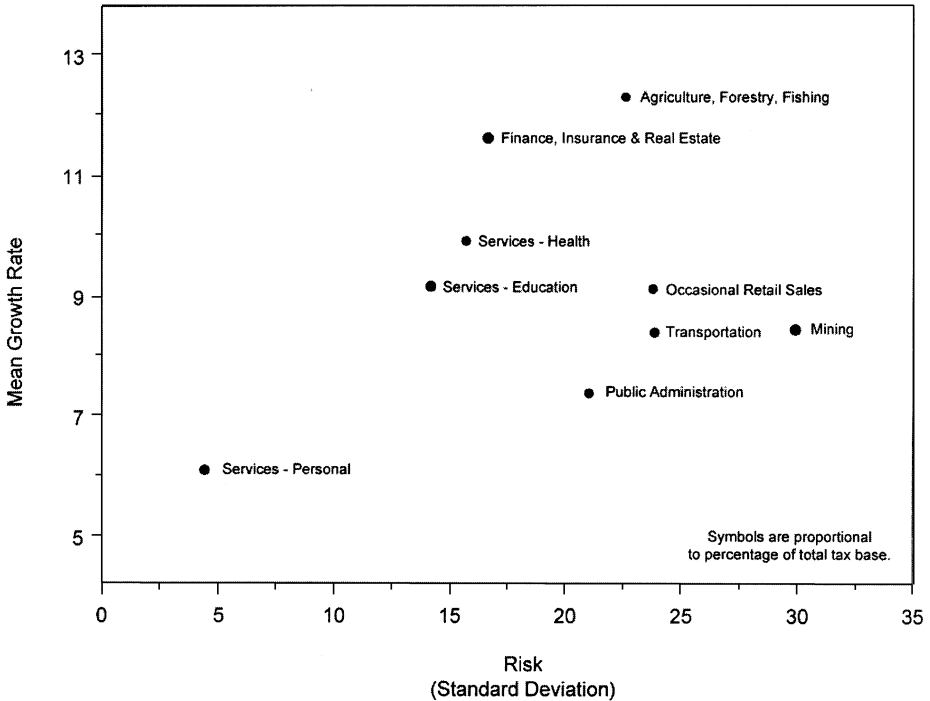
of the tax base, generally have higher growth rates but also have accompanying higher levels of risk. Because they add insignificantly to the base, however, none of these minor categories currently have a very important impact on the overall portfolio of personal consumption expenditures.

SUMMARY AND CONCLUSIONS

A clear focus on revenue adequacy and a longer planning horizon will foster legislative and executive analysis that considers how base and rate adjustments affect the current budgeting cycle as well as those in the future. Augmenting the analysis framework to four dimensions by including consideration for future growth and risk can lessen the uncertainty of business cycle impacts on state finances.

Because of the prominence and importance of sales taxes among state revenues sources, the sales tax base, tax rate, potential growth, and risk all comprise critical inputs into government planning. The mean-variance efficiency frontier graph from

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Figure 3: **Small Components of Utah Sales and Use Tax Base Expected Growth and Risk**

traditional finance applications can be augmented in a bubble chart to depict all four of these dimensions simultaneously. This allows decision makers to find broad bases of consumption expenditures which allow correspondingly desirable low rates. They can also discover that broad bases often also have correspondingly lower levels of risk.

The current levels of increasing state fiscal stress may further attempts to bolster the declining sales tax base by increasing the number of taxable services included in the sales tax base. In an economic downturn, simple increases in sales tax rates may not generate adequate revenue. When government officials and their analysts encounter such an eventuality, they may well want to consider the additional effects that broadening the base and lowering rates can have on future expected growth rates and risk. If such research occurs soon, it could significantly influence and promote fiscal adjustments that would insure adequate financing of demanded government services.

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