A. Personal Income Tax Model Methodology, January 2011

Introduction

The Office of Economic Analysis produces forecasts of personal income tax collections as part of the quarterly general fund outlook. These forecasts extend two biennia into the future. The current forecast can be found at: http://oregon.gov/DAS/OEA/listserv.shtml.

Broadly, the forecasting strategy first determines the relationships between underlying economic conditions and the various sources of personal income tax revenue. Given these relationships, the consensus outlook for economic indicators such as employment, wages and investment income can be translated into an outlook for tax revenues.

The forecast process begins after the Oregon Economic Model has been updated and reviewed by the Governor's Council of Economic Advisors. These economic assumptions are then used to drive the revenue forecast. The methodology for the economic model can be found at: http://www.oregon.gov/DAS/OEA/economic.shtml#Most_Recent_Forecast.

The first step in the revenue forecasting process generates the outlook for taxable income from various sources as reported on tax returns (e.g. wages & salaries, retirement income, capital gains, dividends, interest and business-related income). For most years, this forecast is produced using a system of reduced-form econometric equations. For the most recent tax year, the forecast combines these model estimates with preliminary information from tax returns that have been processed to date.

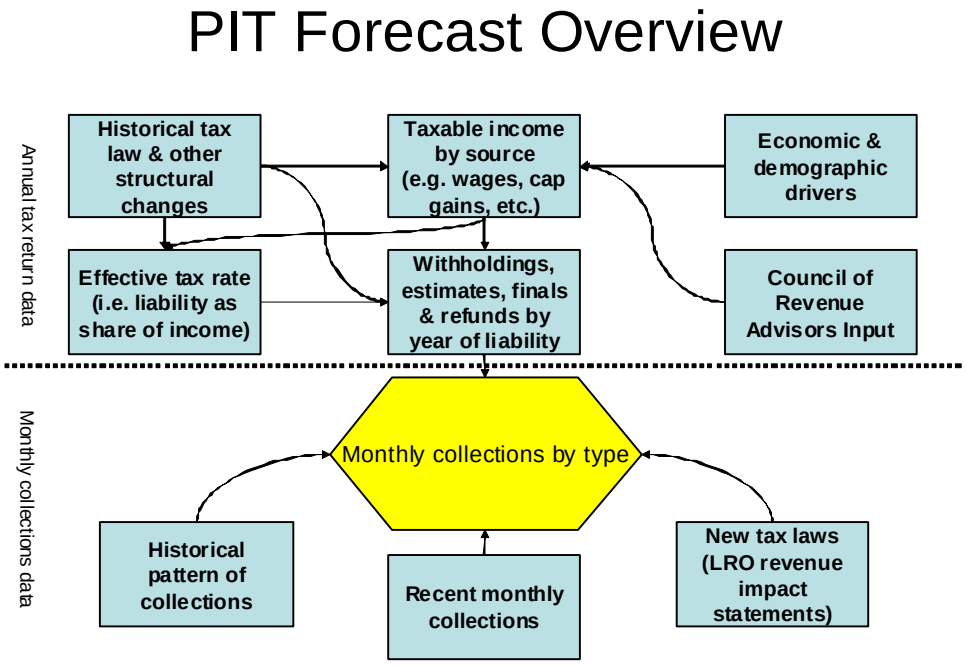
The income equations link taxable income sources with associated economic indicators in an intuitive way, while attempting to isolate the effects of structural shifts over time including changes to tax law. For example, taxable wages are tied to labor income, retirement income is determined in part by demographic mix, and capital gains are tied to the performance of equity and housing markets.

Once the outlook for taxable income by source has been developed, it is translated into tax liability using effective tax rates (i.e. taxes as a share of income). Effective tax rates are a function of the composition of income and statutory tax law. This estimated liability is then allocated across payment types (Withholdings, Estimates, Final Payments and Refunds) according to the mix of income. Withholdings and refunds are determined largely by the size of labor market earnings, while estimated and final personal income tax payments are highly sensitive to nonwage income sources such as investment income.

With a forecast for taxable income and tax liability in hand, the second stage of the forecasting process adjusts for the timing of when tax revenues are collected by the Department of Revenue, and thus can be tapped by policymakers to meet their spending needs. Much of the tax liability incurred in a given year will not be paid immediately, but will trickle into Department of Revenue collections over several years. The liability forecast is allocated across months in accordance with the historical pattern for each payment type. Withholdings and estimates tend to come in quickly, while the bulk of final payments and refunds are paid or received in later years. Once generated, the monthly forecast for collections is then merged with the most recent historical collections estimates.

The final stage of the forecasting process makes adjustments to the model output based on expected structural changes and forecaster judgment. In particular, estimates of the revenue impact of new legislation are incorporated into the outlook. Ground-level observations from the Governor's Council of Revenue Advisors are also considered.

The following methodological summary outlines the forecasting process in greater detail. Equation specifications are included as an appendix.



Income & Liability

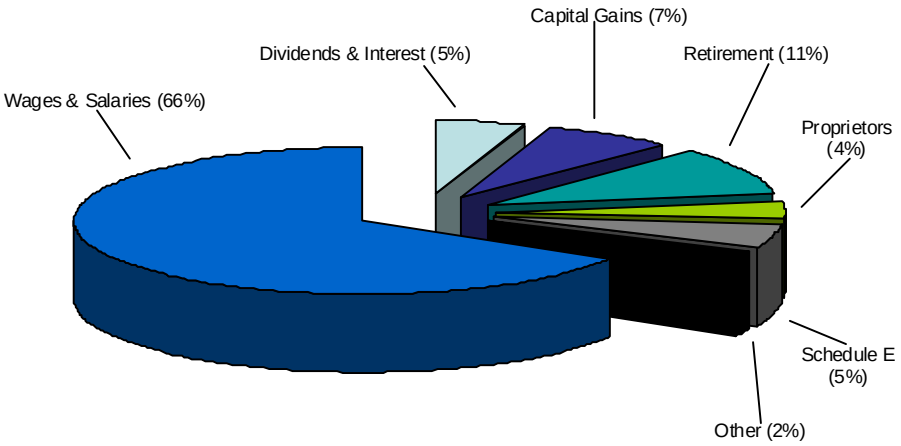
Historical Data

The personal income tax model begins by looking at the various types of income that Oregon's households have earned over time. The primary data is culled from Oregon resident tax returns dating back to the 1980 tax year. For the purpose of this analysis, gross taxable income is delineated across eight sources: wages and salaries, dividends, interest, capital gains, retirement (IRAs, pensions and taxable Social Security), proprietors, Schedule E[1], and all other sources[2]. A detailed description of taxable income by source is produced annually by the Oregon Department of Revenue.[3]

[1] Schedule E income includes rents, royalties, and S-Corp income.
[2] Other income includes alimony, unemployment, farm, and tax refund income. Early in the sample, much was also comprised of unassigned income due to a lack of detailed data from federal returns.
[3] "Oregon Personal Income Tax Statistics, Characteristics of Filers, 2010 Edition, Tax Year 2008", Oregon Department of Revenue (http://www.oregon.gov/DOR/STATS/docs/101_406_10/101-406.pdf).

Figure 1: Taxable Income by Type

Shares of Oregon taxable income, 1998-2008 average



Source: Oregon Department of Revenue

Income reported on tax returns is the natural starting point for the revenue model. Not only does reported income ultimately determine how much tax households owe, but it is also closely tied to contemporaneous economic activity. Concepts in the economic model can be reasonably linked to taxable income categories, providing a framework to shed light on the outlook for tax liability in future years.

The primary drawback of income and liability data taken from tax returns is a lack of timeliness. Many households take advantage of extensions and do not file returns until October of the following year. Given the delayed nature of filing, and the time necessary to audit and summarize return data, information on income and liability becomes available approximately one year following the end of the tax year for which it was claimed. Economic indicators and data on taxes collected by the state are updated much more frequently, with a typical delay of only a month or two.

Wages & Salaries

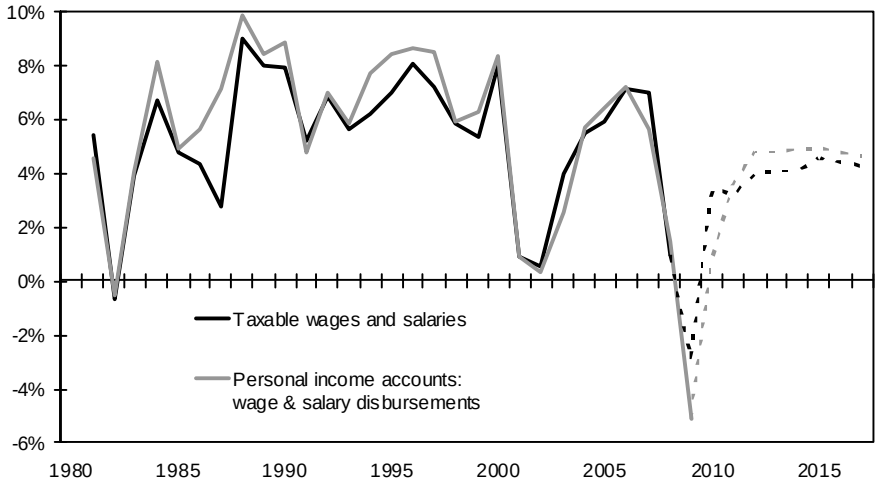
Wages and salaries are by far the largest component of taxable income, accounting for two-thirds of the total in an average year. Luckily, not only are wages and salaries large and important, they are also relatively well-behaved and easy to track. In particular, the taxable wages and salaries reported by filers closely mirror the earnings and employment measures contained in the economic model.

The forecast equation for taxable wages and salaries is a simple one, with most of the fluctuations in reported wages being explained by changes to the survey-based personal income measure that is contained in the economic accounts. In addition to personal income data, controls for changes to historical tax law and data definitions are also used as explanatory variables in the wage model. In particular, controls for the federal tax law

changes enacted as part of the Tax Reform Act of 1986 are included, as is a factor for the availability of detailed federal return data, as well as a control for recent series breaks in the often-revised state personal income estimates.

Figure 2: Wage Measures Closely Related

Oregon, % change year ago, calendar years



Looking ahead to the task of revenue forecasting, not only do wages as reported on tax returns track up-to-date measures of personal income very well, they also closely track contemporaneous withholdings in the tax collections data. As such, most of the errors in forecasts for withholdings of personal income taxes result from the difficulties associated with predicting turning points in underlying economic conditions, and not from problems with the translation of economic conditions into revenue estimates.

Retirement Income

Retirement income makes up the second largest component of taxable income, accounting for 11% of the total in an average year. There are three primary forms of taxable retirement income: IRAs, pensions and taxable social security benefits. Since the market factors that drive the three types of retirement income are somewhat different in nature, each source is modeled individually.

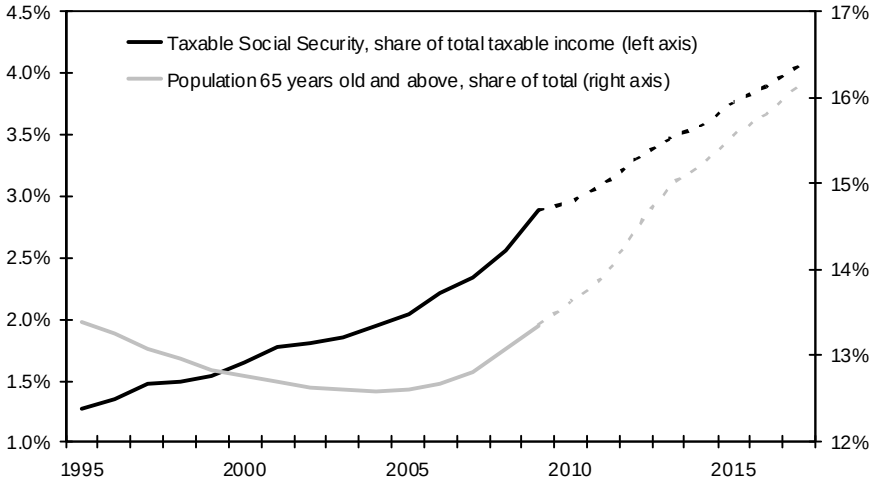
Social security

Starting in 1994, federal reforms made up to 85% of social security benefits taxable. Taxable social security benefits now account for 22% of total taxable retirement income. Aside from some small policy changes to the Social Security retirement age and benefit levels over time, the growth in overall benefits has been steady, and is determined by the population and past labor force earnings of Oregon's older residents. As a result, taxable social security is the most tractable of retirement income sources.

The model for taxable social security income is based on the resident population 65 years old or above, wage and salary earnings over the past decade, and controls for federal policy reforms. Over time, as the population cohort of retirement age grows in size, taxable social security will expand faster than most other forms of taxable income.

Figure 3: Social Security's Rising Share

Oregon, calendar years



Individual Retirement Accounts

Saving through IRAs has increased sharply since program eligibility requirements were loosened in the early 1980's. Taxable distributions of IRAs have increased ten fold since 1990.

Similar to taxable social security benefits, IRA payouts will account for an increasing share of taxable income as Oregon's population of older individuals grows. However, unlike social security benefits, IRA distributions will also be determined by the size of historical contributions into the accounts, as well as the performance of the savings instruments where funds are stored.

To reflect these differences, measures for the stock of IRAs and the value of equity markets are included along with Oregon's retirement-aged population in the model for taxable IRA distributions. The Wilshire 5000 stock index is used as a proxy for the returns on IRA investments. The stock of uncashed IRAs is measured by the present discounted value of net contributions into the plans.[4]

[4] IRA contributions and withdrawals are taken from IRS publication #1304, table 1.4, various years.

Pensions

Pensions represent 61% of taxable retirement income, more than IRAs and Social Security benefits combined. Some pensions are similar in nature to IRAs, while others have an outlook more like that of Social Security payments.

In a traditional defined benefit pension plan, workers get a pre-determined fraction of their working pay upon retirement. The size of future benefits is largely set, much like payments under the Social Security program. Like social security, this portion of pension income can be expected to grow over time along with labor market earnings and the population that is of retirement age.

Due to their considerable and uncertain costs, defined benefit plans have lost popularity over time. Defined benefit plans accounted for two-thirds of employer-sponsored pensions in 1980, but have shrunk to less than one-third today.[5]

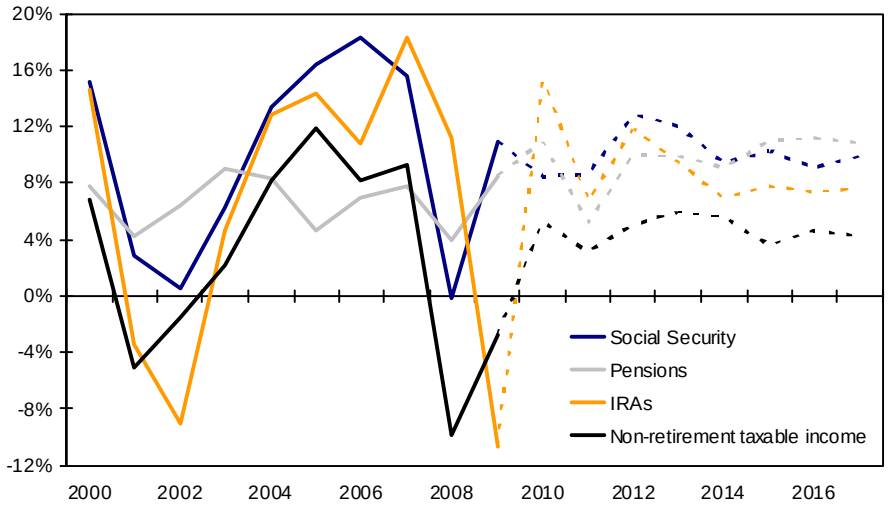
Defined benefit plans are being replaced by defined contribution plans, like 401Ks, where employers contribute directly to their employee's retirement accounts. Defined contribution plans give firms more certainty about their future pension costs. Unfortunately, the outlook for taxable retirement income becomes more uncertain under defined contribution plans. Under these plans, future pension income is tied to the performance of stock markets and other investment instruments. Also, retirees can strategically choose when to cash in their accounts, making the timing of taxable income and tax liability hard to predict.
Many employer-sponsored pensions will be recorded as taxable IRA distributions in future years. Around half of all IRAs originated as employer-sponsored plans.

In the model, taxable pension income is driven by proxies for the number of pension participants and for benefit levels. As a proxy for the number of filers claiming pension income, the population over 65 years of age is multiplied by the pension participation rate among workers over the past decade. Two measures of the potential size of benefit levels are used: wage earnings over the past decade and stock prices. The stock price measure (Wilshire 5000 index) is scaled by the share of defined contribution plans among pension participants over the past decade.

[5] Historical contributions to, disbursements of, and participation in, employer sponsored pensions are taken from the U.S. Department of Labor, form 5500 filings.

Figure 4: Gains in Retirement Income

Oregon taxable income, % change, calendar years



In light of the aging workforce, all sources of taxable retirement income are expected to grow at an above-average rate over the next decade. The outlook for IRA distributions remains the most uncertain, with the value of IRAs, and the disbursement decisions of retirees, highly sensitive to business cycle conditions.

Capital Gains

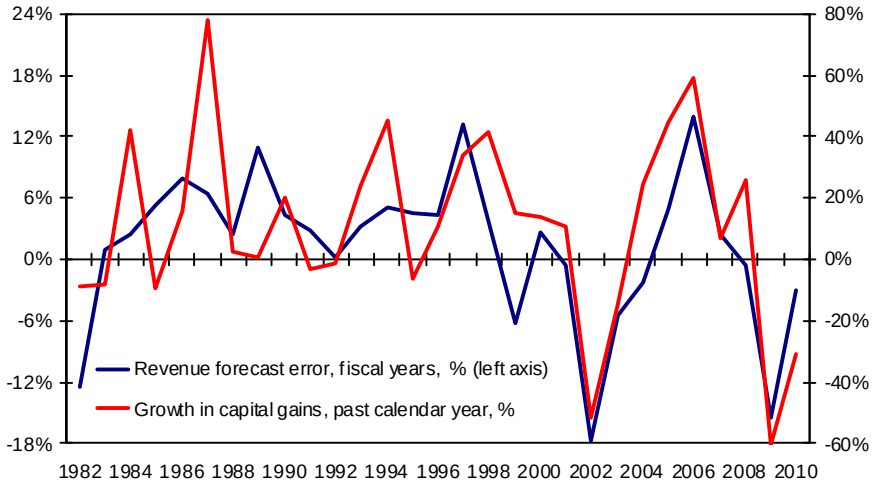
Realizations of capital gains account for 7% of taxable personal income in an average year. While this pales in comparison with the size of taxable wages, the outlook for capital gains is much more uncertain. Together with other nonwage sources of income, capital gains account for most of the error in the overall revenue forecast. Not only does the outlook for capital gains depend on unpredictable future asset prices, it also depends on the sometimes fickle behavior of investors who decide when to cash their gains in.

Unlike taxes withheld out of wages, capital gains are not usually realized for tax purposes at the same time they are earned in the market. Investors often hold assets for many years, and decide to cash them in based on a wide range of factors including market conditions, life cycle considerations and tax law changes.

Not only is the timing of capital gains income difficult to predict, swings in capital gains have an outsized impact on tax revenues since effective tax rates on capital gains are relatively high. Also, some capital losses can be carried forward into future tax years, further complicating the timing of tax liability.

Figure 5: Volatile Income Sources Generate Revenue Forecast Errors

Error based on the June structural general fund revenue forecast

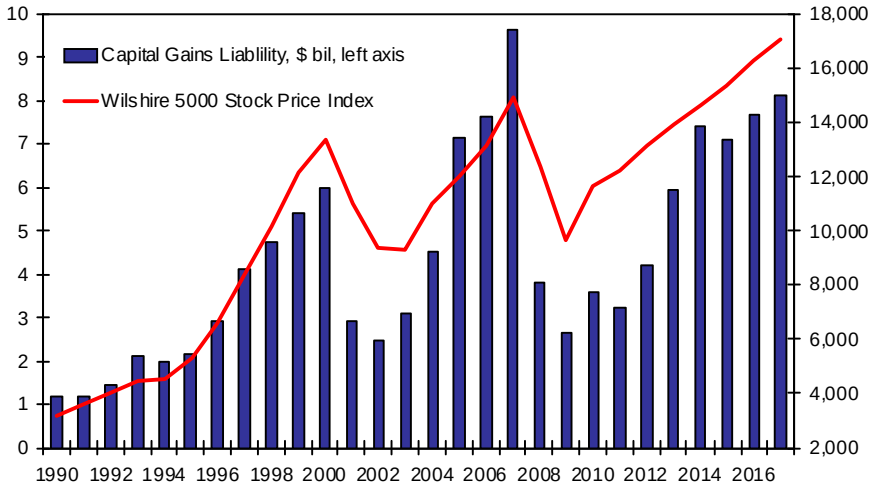


The model for capital gains is driven by measures of asset appreciation for equities and housing. For stocks, the Wilshire 5000 index with a five-year average holding period is assumed. Housing gains are represented by the product of per capita home sales and average sales prices. Over history, stock markets have explained more of the fluctuations in capital gains than have housing markets, in keeping with the fact that many housing transactions are not taxable.

Along with the performance of investments, controls for the behavior of investors are also included in the capital gains model. Realizations of capital gains in Oregon are dominated by a small fraction of filers, with the wealthiest handful of households accounting for most of the income and tax liability. As a result, large one-time events such as insider trades can move the needle by themselves, and are therefore controlled for in the historical sample in an attempt to isolate the structural changes in revenue.

A control for changes to federal tax law is also included in the capital gains model. Taxpayers will change the timing of their realizations of capital gains in anticipation of changing tax rates. In 1986, realizations of taxable capital gains in Oregon rose by 78% as filers hurried to claim gains before federal tax rates increased and coverage of capital gains expanded in 1987. As a result, a control for the federal top rate on capital gains is included in the model.

Figure 6:Capital Gains & Stock Prices



Schedule E & Proprietor's Income

Schedule E income and proprietors' income capture rents, royalties, profits and other income earned from business activities that are subject to personal income taxes.

Most taxable income from sole proprietorships is generated by service firms. Among non-employer businesses in Oregon, construction, trade, and financial, professional and business service industries together account for more than three quarters of revenues. The closely related quarterly measure of proprietors' income contained in the economic model is used to drive the outlook for taxable proprietorships on Oregon returns.

Schedule E income includes many types of rents and royalties, but is dominated by dividends paid by S corporations. S corporations are similar in nature to sole proprietorships. However, S corporations generate more revenue from the production and transport of goods than do sole proprietorships, which are almost entirely service firms. Together with many small service firms, S corporations also include wholesale trade firms and small manufacturers such as breweries and wineries. Given the large share of income generated by S corporations, corporate profits are used to drive the outlook for overall Schedule E income.

Interest, Dividends & Other Income

Dividends and interest earnings are tied to the performance of financial markets, and are therefore not easy to predict. Even so, the outlook for income from interest and dividends is more straightforward than that of capital gains, business earnings and other nonwage forms of income. Dividends and interest earnings are realized for tax purposes at roughly the same time that they are earned. Other nonwage forms of income are subject to larger

swings as investors and business owners have more freedom in choosing when to claim income/pay taxes.

The model for taxable dividends is based on the outlook for corporate profits and the measure of dividends, interest and rent in the economic model. The model for interest income is based on contemporaneous and lagged U.S. Treasury Bill rates, and overall personal income from the economic model.

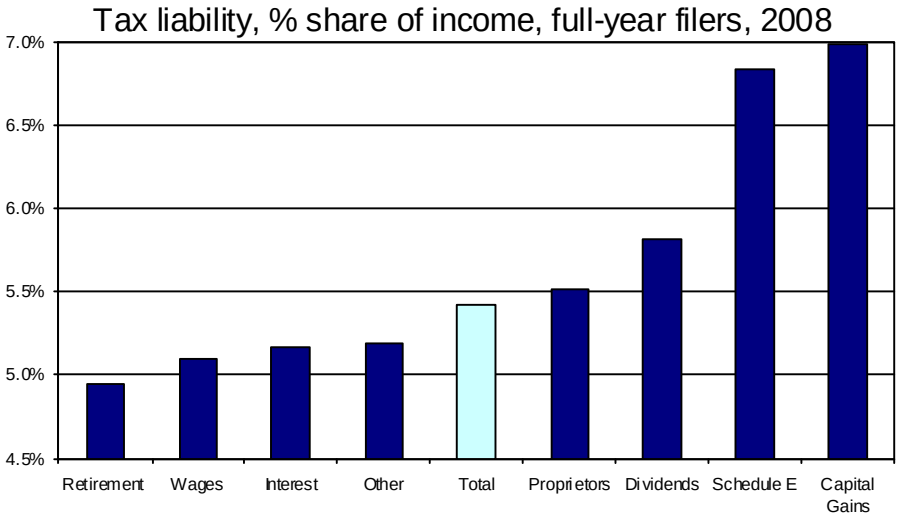
The final category of miscellaneous income includes farm income, alimony payments, tax refunds, unemployment insurance benefits, and the like. Although some of the individual components in the miscellaneous category are not closely tied to business cycle conditions, most will expand along with population growth and household income gains over the long term. As such, the outlook for miscellaneous income growth is tied to growth in economic output as measured by Gross State Product. Also, due to improvements in reporting, much of the income in the miscellaneous category was reassigned to wages and other income categories in 2003 by the Department of Revenue. The model also includes a control for this series break.

Tax Liability

Once forecasts for taxable income by source have been generated, the next step in the analysis is to translate the outlook for income into an outlook for tax liability. In addition to income levels, taxes owed depend on statutory tax law as well as the distribution of income across filers. The tax rate on each dollar earned by a household will depend on the overall level of income of that household as well as the deductions, exemptions, credits, etc. that it claims.

Once Measure 66 has been fully phased in, Oregon will have four personal income tax brackets, starting at 5% for joint filers earning less than $6,100, and ending at 9.9% for filers earning more than $250,000. After deductions, credits and other adjustments have been included, the average full-year filer faces liability amounting to 5.4% of their taxable income (2008). Aggregating across filers, retirement income and wages are subject to the lowest personal tax rates, while capital gains and Schedule E income are subject to the highest.

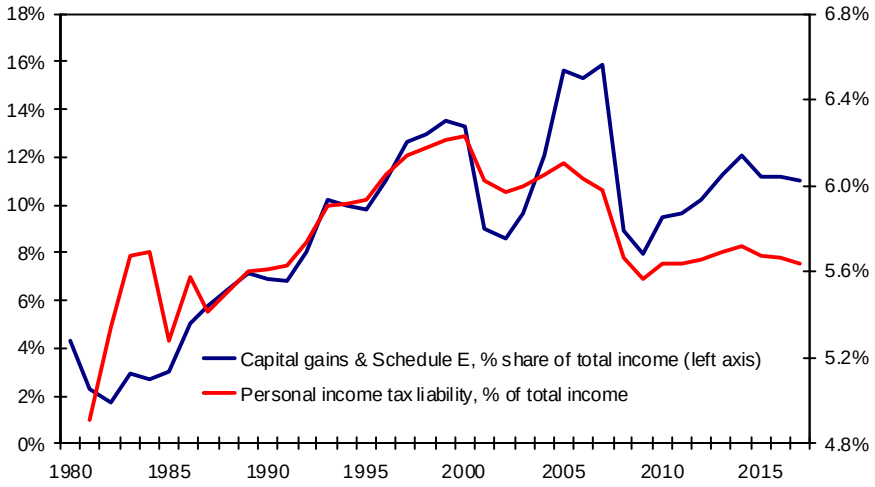
Figure 7: Effective Tax Rates By Income Source



Even when no tax law changes have been enacted, average (effective) tax rates change as filers move up and down tax brackets, and change the nature of the income they earn and deductions/credits that they claim. Changes in effective tax rates are determined in part by business cycle conditions, with taxes amounting to a larger share of income during good times than bad. As a result, swings in tax revenues are more pronounced than changes in underlying income levels across the business cycle.

Figure 8: Effective Tax Rates Over Time

All filers, Measure 66 excluded



The forecast model for tax liability estimates effective tax rates as a function of economic output, the composition of income by source and tax law changes. In the model, effective tax rates rise with output growth and with the share of income derived from capital gains and business-related activities. Federal taxes paid can be subtracted from Oregon taxable income (up to a cap), and as a result, act to reduce Oregon tax liability. Oregon tax reforms have also had a significant impact on revenues over time, particularly in the 1980's. Following this script, Measure 66 reforms will increase effective tax rates noticeably in the years ahead.

Collections

Historical Data

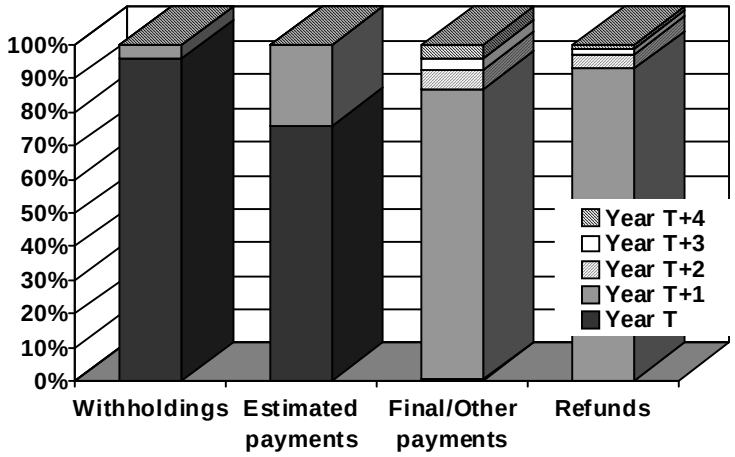
Although income as reported on tax returns is closely related to underlying economic conditions, and forms the basis from which tax liability is calculated, policymakers need information on collections in order to craft their budgets. State spending during a given biennium is supported by the tax payments that are received by the Department of Revenue over that period, not by the liability reported on tax returns.

Personal income tax collections are assumed to be of three types: withholdings out of wages and salaries, quarterly estimated tax payments, and all other payments, which include final payments remitted when tax returns are filed. Year-end refunds work in the opposite direction of collections, serving to reduce revenues. The background collections data consists of monthly Department of Revenue personal income tax refunds and payments by type.

Most of withholdings and estimated payments are collected during the same year as the tax liability was incurred. The majority of refunds and final tax payments are collected/paid in the following year. Due to delayed filing, some refunds and final payments are collected/paid several years after tax liability is incurred. For the translation of liability to collections, the model considers payments received up to four years after the related tax liability was incurred.

Figure 9: Timing of Collections

Collections related to liability in year T, share of total, 1994-2007



Collections vs Liabilities

There are two potential alternative strategies for mapping the outlook for taxable income and tax liability into a collections forecast. Either the collections data can be adjusted to fit the timing of income/liabilities, or the income/liability data can be adjusted to fit the timing of collections.

For one alternative, collections of various types (withholding, estimates, finals and refunds) can be aggregated according to the year for which the tax liability was incurred. Then, the relationships between these tax-year adjusted collections and underlying taxable income are established, and a forecast for the adjusted collections series is produced. Collections related to liability from a given tax year can then be spread across future years according to the historical pattern of payments. The current forecasting process follows this methodology.

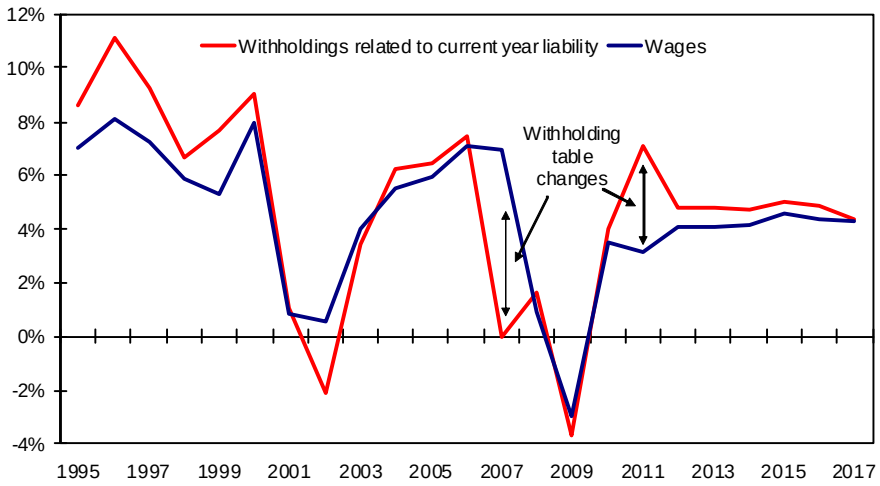
Another alternative is to forecast collections that are received in a given year directly, without first determining the amount of collections that are related to the liability from any given tax year. Collections received by the Department of Revenue reflect a mix of income earned in both the current and past tax years. As such, an alternative model specification could relate collections to a weighted average of taxable income/liability for all past years from which the tax bill was generated. For example, in light of the historical timing of collections, withholdings can be modeled as a function of an adjusted income series that consists 96% of wage earnings from the current year, and 4% of wages from the prior year. An alternative forecast using this methodology will be produced and analyzed beginning in 2011.

Withholdings

Withholdings are the most straightforward form of collections to model since they closely reflect contemporaneous wage growth. In addition to wages, withholdings are assumed to be a function of taxable social security and defined benefit pension payments as well. In addition to these income sources, the model for withholdings also includes current tax rates and a control for historical changes to the withholdings schedules.

Figure 10: Withholdings Mirror Wages

% change year ago



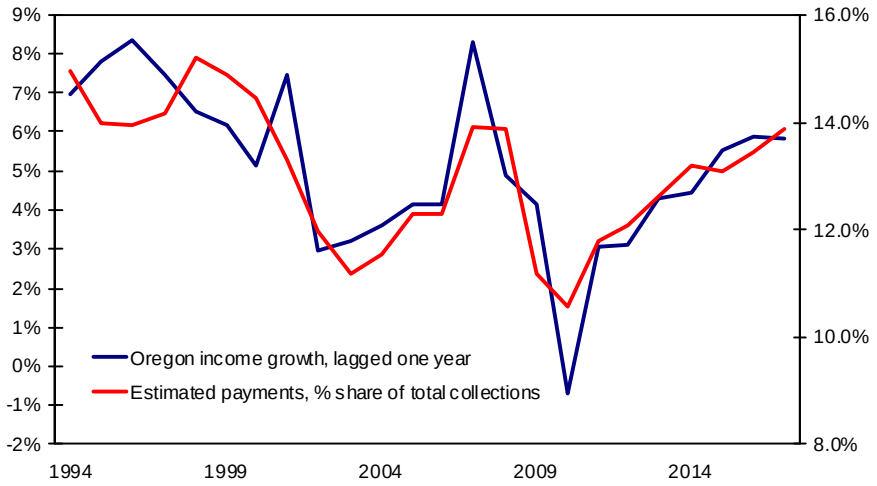
Estimated payments

Quarterly estimated payments are similar to withholdings in that most relate to liability incurred in the year in which payments are collected. However, estimated payments reflect taxable income from a broader set of sources than do withholdings. In addition to wages and fixed retirement income, estimated quarterly payments also reflect nonwage forms of income such as the return on investments. Ties to nonwage forms of income lead to volatile estimated payments.

Estimated tax payments are subject to large swings, and typically show a delayed response to changes in income and tax liability. Although payments go toward the current year's tax liability, taxpayers tend to be backward-looking when making estimated payments. Tax law dictates minimum requirements for withholdings and estimated payments to avoid penalties, generally equal to the prior year's tax (i.e. a safe harbor provision) or 90 percent of the current year's tax. Given these rules, many taxpayers remit payments reflecting their tax liability from the prior year, rather than current liability. Only after taxes are reconciled through the filing of year-end returns do estimated payments fully reflect true liability.

Figure 11: Estimates Are Backward-Looking

% change year ago



Since estimated payments reflect tax liability beyond what is covered by withholdings, it is not surprising that growth in nonwage forms of income is the best predictor for estimated payments. Along with nonwage income, wages and fixed retirement income are included in the model for estimated payments, but do not have a significant impact on collections.

Final and other payments

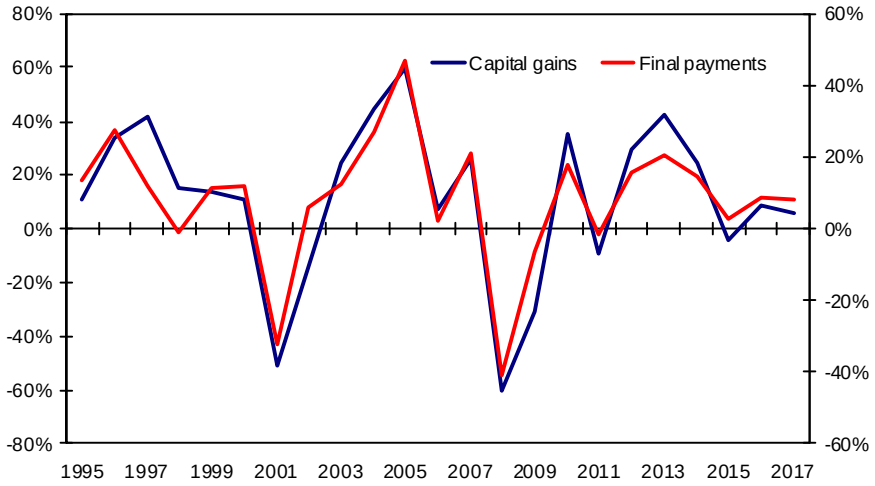
The bulk (87%) of payments associated with year-end tax filings, enforcement activities, and the like are collected during the year after the tax liability is incurred. Another 3% to 5% of collections trickle in over each of the next three years.

The model for final payments is very similar to that of estimated payments. In particular, collections are modeled as a function of both wage and nonwage forms of income, with the nonwage income sources explaining much of the underlying volatility. Controls are also included for changes to the Oregon withholding tables.

Final payments are extremely volatile, rising or dropping by as much as 50% in any given year. Once again, these large swings can almost entirely be traced to capital gains and other nonwage sources of income, for which collections are determined as much by the behavior of taxpayers as by underlying growth.

Figure 12: Final Payments Are Volatile

% change year ago



Attempts have also been made to incorporate Department of Revenue enforcement efforts into the model for final payments. Collections clearly increase when additional resources are funneled into enforcement efforts, amnesty programs, and the like. However, this relationship has proven difficult to isolate in the historical data, due perhaps to the small size of enforcement-related collections (2.5% of final payments), or due to the fact that more aggressive enforcement in the present day can make enforcement more difficult in later years after much of the low-hanging fruit has been picked.

Refunds

Like final payments, refunds are typically determined when tax returns are filed. However, unlike final payments, refunds are more closely tied to taxable wages than to nonwage sources of income. Also, refunds are spread across a wider range of households, with final payments being much more concentrated among high-income households.

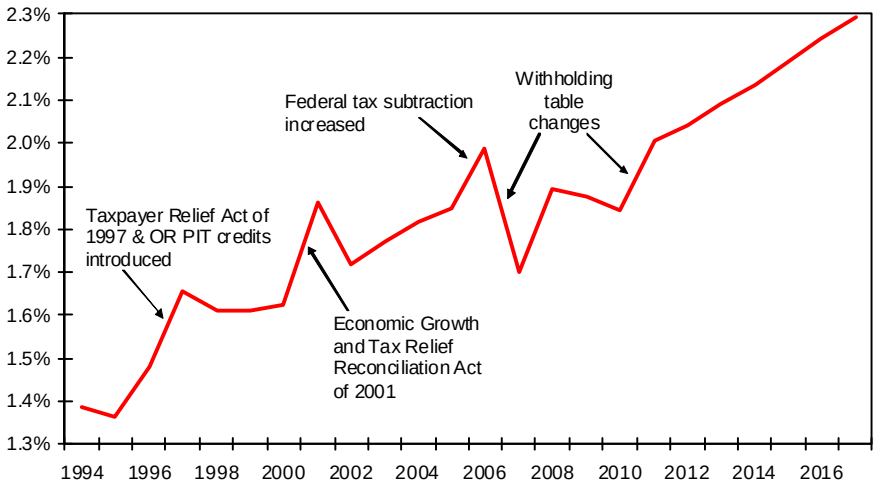
Refunds are highly sensitive to both the state and federal policy environment. Taxpayers do not always adjust their withholdings or estimated payments immediately in response to changes to tax law. Instead, tax law changes are often reconciled when year-end returns are filed, leading to pronounced increases/declines in refunds and final payments.

In the model, refunds are assumed to track wages. Adjustments for tax law changes and revisions to the withholding schedules are also included in the model.

Over the past two decades, refunds have been growing as a share of wages. This result is somewhat counterintuitive given that one could reasonably expect taxpayers to become savvier over time, particularly in light of widespread technological improvements in payroll management and tax filing. From an economic sense, taxpayers should prefer to hold on to their own funds during the year, rather than overpaying the revenue department and receiving refund checks. The model assumes that the historical trend toward larger refunds continues into future tax years. As such, the methodology will be revisited frequently until we have a better understanding of the factors behind the larger refunds.

Figure 13: Refunds Have Grown Over Time

Refunds by tax year, % share of wages



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Forecast Adjustments

Recent collections & matching returns data

Matching returns data

Once again, the primary shortcoming of the taxable income and liability data is its lack of timeliness. Typically, by the time data from tax returns is reasonably complete, another biennium has already begun. That said, preliminary data, while incomplete, can often help shed light on the near-term outlook, and should not be ignored.

The first significant portion of liability and income data is received as households file their tax returns early in the following year. While most filers will have completed returns by the April deadline, the many households who make use of extensions account for a disproportionate share of overall tax liability and swings in collections. In general, simple

tax returns are filed in a timelier manner than complex ones that must deal with several sources of income and adjustments. As such, add-factors and other forecast adjustments for early tax return data are only included when early returns are significantly different from what the model is predicting, since the aggregate numbers can change drastically as extended returns come in.

By October of the following year, most extended tax returns have been filed, and the revenue picture becomes clearer. For full-year filers, over 95% of returns will have been matched with those of the prior year. At this point, enough of the year is in the books to treat extrapolated liability and income estimates as historical inputs to inform the model rather than adjusting the model output on the back end.

Collections data

Unlike data from tax returns, collections data is very timely, being complied by the DOR into weekly totals within a few days after it is processed. Since collections data ultimately determines the resources available to policymakers, and is rarely revised, an effort is made to incorporate every available month of collections data into the outlook.

Although historical collections data is set in stone, the question of how recent history should inform the forecast remains. If recent collections were weaker than expected given underlying economic fundamentals, does this imply future growth will be stronger than expected as collections play catch up, or can the weakness be expected to persist?

Due to seasonal factors such as the number of business days in a given week, and variable processing times for tax return data, inflows of tax collections can be lumpy, bouncing around from week to week. As such, forecast accuracy can suffer if the outlook for collections is tied too closely to recent performance.

The current methodology uses a sliding scale to determine how much weight to put on the performance of recent collections relative to model expectations. The more historical collections data that is available relating to a given tax year, the more we believe that those collections are a good reflection of underlying liability. When little historical information is available, the forecast more closely mirrors the model outlook.

For a simple example, consider withholdings, for which the vast majority of collections occur within the same tax year as liability is incurred. Nine months into the year, some 70% of withholdings will have been collected in an average year. Growth for the remainder of the year is assumed to be a weighted average consisting of the underlying trend growth rate from the model (70% weight), and an augmented growth rate set so that collections catch up to the original model forecast by the end of the year (30% weight).

Governor’s Revenue Advisors

Once again, the largest errors in the personal income tax revenue forecast typically do not result from taxes on the largest income sources (i.e. wages). Instead, the largest revenue

forecast errors tend to be associated with income sources for which behavioral factors play a large role in the timing of tax liability and payments.

Tax liability on wages and salaries is incurred at roughly the same time that income is earned. For other income sources, such as capital gains and business-related income, taxpayers have some flexibility over when they report income for tax purposes. Among the many factors that taxpayers consider are tax law changes, the outlook for future asset price appreciation and profits, lifecycle considerations and gains/losses among other taxable income sources.

To get a better handle on taxpayer behavior, feedback is solicited from the Governor's Council of Revenue Advisors. The panel provides insider perspective on the current challenges and incentives faced by their clients as they navigate the tax code. Insider feedback can be particularly useful in Oregon, where a small percentage of high-income taxpayers account for a disproportionate share of the overall movement in revenue streams.

Tax Law Changes

The revenue model equations look at the historical relationship between taxes and underlying economic conditions. These relationships can change when the rules of the game change. An increase in income tax rates, for example, will lead to a larger share of withholding out of wage earnings.

OEA produces what is known as a current law forecast. The revenue outlook assumes that Oregon tax law remains as it was at the time of forecast in future years. The only changes to tax rules that are considered in future years are those that have been enacted into law in the past, such as the phasing out of an earlier tax rate increase or tax credit. OEA does not predict future actions by the State Legislature, no matter how likely these actions may be.

The outlook for future federal tax rules does not adhere to such a current law assumption. OEA depends on private vendors and the Governor's Council of Economic Advisors for its assumptions about economic conditions at the U.S. level. Assumptions about the most likely future path of federal fiscal and monetary policies are implicit in this macroeconomic outlook. When potential federal policies have a direct impact on Oregon tax liability, an effort is made to match the policy assumptions underlying the macroeconomic outlook.

Due to a lack of evidence in the historical record, the impact of future tax law changes typically cannot be estimated within the model. Instead, the impact of tax law changes must be estimated separately, and used to adjust the revenue forecast on the back end. For this purpose, estimates from the most recent revenue impact statement produced by the Legislative Revenue Office are used.

Tax law and other revenue changes can be thought of as belonging to one of three groups:

1) Changes that have been fully implemented, and are reflected in collections data.

For significant law changes contained in the historical record, controls can be included in the model equations to adjust for legislation.

2) Changes made during the current legislative session.

Changes made during the legislative session need to be treated separately in order to calculate any potential “kicker” refund owed to personal income tax payers. Personal income tax surpluses are determined by how actual collections compare with the forecast made at the close of session, when the outcome of all pending legislation is known. In this way, changes to tax law do not affect the size of kicker refunds.

3) Changes made during earlier sessions that have yet to be fully implemented or realized in collections data.

In order to fully reflect a current law assumption, existing tax law changes that have yet to be fully reflected in the historical record need to be accounted for. For tractability, only large law changes amounting to more than 1% of structural revenues are considered. Currently, Measure 66, the Business Energy Facilities Credit (BETC) and sunset provisions for other tax credits exceed this cutoff. In these cases, the revenue impacts as estimated by the Legislative Revenue Office are applied, with an attempt being made to net out the extent that partial revenue impacts are already appearing in the historical data.

Appendix: PIT Equation Specifications and Variable Listing

Wages

Dependent Variable: LOG(GI_WAGES)
Method: Least Squares
Date: 11/10/10 Time: 07:53
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments
Convergence achieved after 222 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	141	122	1.16	1.00
LOG(OYWSD_F)	0.85	0.03	30.30	0.00
WAGE_ADJUSTMENT	0.00	0.00	5.05	0.00
DMY_FED87	-0.02	0.01	-4.77	0.00
DMY_FED_DATA	0.02	0.01	2.55	0.02

R-squared	1.00	Mean dependent var	24.15
Adjusted R-squared	1.00	S.D. dependent var	0.46
S.E. of regression	0.00	Akaike info criterion	-7.80
Sum squared resid	0.00	Schwarz criterion	-7.51
Log likelihood	115.17	Hannan-Quinn criter.	1.59
F-statistic	0.00		

Realized Capital Gains

Dependent Variable: LOG(GI_CAPGAINS/GSP)
Method: Least Squares
Date: 11/12/10 Time: 07:39
Sample (adjusted): 1985 2009
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.41	0.69	7.81	0.00
LOG(WL5000/WL5000(-5))	0.90	0.14	6.35	0.00
DMY_NIKE	0.29	0.16	1.83	0.08
LOG(TOPRATE_FED/TOPRATE_FED(-1))	-0.29	0.38	-0.79	0.44
LOG(HOUSEPRICE*HOMESALES/OPOP)	0.56	0.09	6.58	0.00

R-squared	0.81	Mean dependent var	10.28
Adjusted R-squared	0.77	S.D. dependent var	0.40
S.E. of regression	0.19	Akaike info criterion	-0.27
Sum squared resid	0.75	Schwarz criterion	-0.03
Log likelihood	8.39	Hannan-Quinn criter.	1.15
F-statistic	0.00		

Dividends

Dependent Variable: LOG(GI_DIVIDENDS)
Method: Least Squares
Date: 08/05/10 Time: 15:21
Sample (adjusted): 1982 2008
Included observations: 27 after adjustments
Convergence achieved after 21 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.57	1.00	11.60	0.00
LOG(OYDIR_F)	0.76	0.18	4.09	0.00
LOG(ZB)	0.29	0.13	2.15	0.04
AR(1)	0.77	0.18	4.17	0.00
AR(2)	-0.43	0.22	-1.96	0.06

R-squared	0.98	Mean dependent var	20.65
Adjusted R-squared	0.98	S.D. dependent var	0.51
S.E. of regression	0.08	Akaike info criterion	-2.14
Sum squared resid	0.13	Schwarz criterion	-1.90
Log likelihood	33.95	Hannan-Quinn criter.	2.24
F-statistic	0.00		

Interest

Dependent Variable: LOG(GI_INTEREST)
Method: Least Squares
Date: 11/09/10 Time: 11:23
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments
Convergence achieved after 9 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.10	1.02	15.83	0.00
LOG(OYP_F)	0.43	0.09	4.94	0.00
RMTB3M	0.05	0.01	5.87	0.00
RMTB3M(-1)	0.05	0.01	5.99	0.00
AR(1)	0.70	0.11	6.68	0.00

R-squared	0.89	Mean dependent var	21.41
Adjusted R-squared	0.87	S.D. dependent var	0.15
S.E. of regression	0.06	Akaike info criterion	-2.80
Sum squared resid	0.07	Schwarz criterion	-2.56
Log likelihood	44.19	Hannan-Quinn criter.	1.51
F-statistic	0.00		

Retirement: Pensions

Dependent Variable: LOG(GI_PENSIONS)
Method: Least Squares
Date: 11/09/10 Time: 11:43
Sample (adjusted): 1990 2009
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.34	4.97	-2.48	0.02
LOG(POP_OR_65*@MOVAV(PENS_PARTICIP,10))	1.69	0.35	4.83	0.00
LOG((1-PENS_DBSHARE)*WL5000)	0.08	0.03	2.97	0.01
LOG(OYWSD_F(-10))	0.54	0.08	6.69	0.00

R-squared	1.00	Mean dependent var	22.01
Adjusted R-squared	1.00	S.D. dependent var	0.44
S.E. of regression	0.03	Akaike info criterion	-4.19
Sum squared resid	0.01	Schwarz criterion	-4.00
Log likelihood	45.95	Hannan-Quinn criter.	1.12
F-statistic	0.00		

Retirement: Social Security

Dependent Variable: LOG(GI_SOCIALS)
Method: Least Squares
Date: 11/09/10 Time: 11:51
Sample (adjusted): 1990 2009
Included observations: 20 after adjustments
Convergence achieved after 12 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14.14	9.72	-1.46	0.17
LOG(POP_OR_65)	1.49	0.87	1.71	0.11
LOG(@MOVAV(OYWSD_F,10))	1.43	0.18	7.87	0.00
DMY_TAXABLESS	0.33	0.06	5.49	0.00
AR(1)	0.57	0.21	2.71	0.02

R-squared	1.00	Mean dependent var	20.58
Adjusted R-squared	0.99	S.D. dependent var	0.74
S.E. of regression	0.05	Akaike info criterion	-2.84
Sum squared resid	0.04	Schwarz criterion	-2.59
Log likelihood	33.41	Hannan-Quinn criter.	1.46
F-statistic	0.00		

Retirement: IRA Distributions

Dependent Variable: LOG(GI_IRAS)
Method: Least Squares
Date: 11/08/10 Time: 13:37
Sample (adjusted): 1989 2009
Included observations: 21 after adjustments
Convergence achieved after 25 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-15.14	13.54	-1.12	0.28
LOG(POP_OR_65)	1.35	1.27	1.06	0.31
LOG(WL5000)	0.58	0.13	4.63	0.00
LOG(IRA_CONTRIBUTIONS)	4.96	1.56	3.17	0.01
AR(1)	0.47	0.21	2.23	0.04

R-squared	1.00	Mean dependent var	20.43
Adjusted R-squared	0.99	S.D. dependent var	0.81
S.E. of regression	0.06	Akaike info criterion	-2.67
Sum squared resid	0.05	Schwarz criterion	-2.42
Log likelihood	32.99	Hannan-Quinn criter.	1.84
F-statistic	0.00		

Proprietors Income

Dependent Variable: LOG(GI_PROPRIETORS)
Method: Least Squares
Date: 11/09/10 Time: 13:59
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments
Convergence achieved after 9 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	17.13	2.32	7.40	0.00
LOG(OYPRN_F)	0.51	0.25	2.01	0.06
AR(1)	1.26	0.17	7.44	0.00
AR(2)	-0.36	0.16	-2.30	0.03

R-squared	0.99	Mean dependent var	21.34
Adjusted R-squared	0.98	S.D. dependent var	0.51
S.E. of regression	0.07	Akaike info criterion	-2.48
Sum squared resid	0.10	Schwarz criterion	-2.29
Log likelihood	38.73	Hannan-Quinn criter.	2.41
F-statistic	0.00		

Schedule E

Dependent Variable: LOG(GI_SCHED_E)
Method: Least Squares
Date: 11/10/10 Time: 08:24
Sample (adjusted): 1986 2009
Included observations: 24 after adjustments
Convergence achieved after 8 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.27	0.65	25.22	0.00
LOG(ZB)	0.82	0.09	8.86	0.00
AR(1)	0.70	0.03	25.47	0.00

R-squared	0.99	Mean dependent var	21.46
Adjusted R-squared	0.99	S.D. dependent var	0.82
S.E. of regression	0.07	Akaike info criterion	-2.48
Sum squared resid	0.09	Schwarz criterion	-2.33
Log likelihood	32.78	Hannan-Quinn criter.	1.73
F-statistic	0.00		

Miscellaneous Income

Dependent Variable: LOG(GI_OTHER)
Method: Least Squares
Date: 11/10/10 Time: 08:44
Sample (adjusted): 1981 2009
Included observations: 25 after adjustments
Convergence achieved after 7 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.79	6.00	-1.80	0.09
DMY_FED_DATA	-2.38	0.57	-4.19	0.00
LOG(GSP)	2.81	0.54	5.25	0.00
AR(1)	0.36	0.20	1.82	0.08

R-squared	0.78	Mean dependent var	20.47
Adjusted R-squared	0.75	S.D. dependent var	1.18
S.E. of regression	0.59	Akaike info criterion	1.93
Sum squared resid	7.33	Schwarz criterion	2.13
Log likelihood	-20.14	Hannan-Quinn criter.	0.78
F-statistic	0.00		

Estimates

Dependent Variable: LOG(COL_ESTIMATES)
Method: Least Squares
Date: 11/16/10 Time: 16:32
Sample (adjusted): 1995 2010
Included observations: 16 after adjustments
Convergence achieved after 1 iteration

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.72	0.11	175.14	0.00
GI_TOTAL_F-GI_WAGES_F-PENS_DBSHARE*GI_PENSIONS_F-.5*(1-PENS_DBSHARE)*GI_PENSIONS_F-.5*GI_IRAS_F	0.00	0.00	6.80	0.00
AR(1)	0.00	0.30	0.01	0.99

R-squared	0.78	Mean dependent var	20.47
Adjusted R-squared	0.75	S.D. dependent var	0.20
S.E. of regression	0.10	Akaike info criterion	-1.62
Sum squared resid	0.13	Schwarz criterion	-1.48
Log likelihood	15.99	Hannan-Quinn criter.	1.59
F-statistic	0.00		

Finals

Dependent Variable: LOG(COL_FINALS)
Method: Least Squares
Date: 11/16/10 Time: 16:20
Sample (adjusted): 1995 2009
Included observations: 15 after adjustments
Convergence achieved after 27 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.43	11.14	-0.40	0.70
LOG(GI_CAPGAINS_F+.5*GI_IRAS_F+.5*(1-PENS_DBSHARE)*GI_PENSIONS_F)	0.76	0.11	7.08	0.00
LOG(GI_TOTAL_F-GI_CAPGAINS_F-.5*GI_IRAS_F-.5*(1-PENS_DBSHARE)*GI_PENSIONS_F)	0.30	0.49	0.62	0.55
DMY_TABLECHANGE	0.01	0.05	0.23	0.82
AR(1)	0.65	0.23	2.79	0.02

R-squared	0.96	Mean dependent var	20.34
Adjusted R-squared	0.94	S.D. dependent var	0.33
S.E. of regression	0.08	Akaike info criterion	-1.96
Sum squared resid	0.06	Schwarz criterion	-1.72
Log likelihood	19.69	Hannan-Quinn criter.	1.61
F-statistic	0.00		

Refunds

Dependent Variable: LOG(-COL_REFUNDS)
Method: Least Squares
Date: 11/15/10 Time: 15:55
Sample (adjusted): 1995 2009
Included observations: 15 after adjustments
Convergence achieved after 7 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.88	1.52	-11.75	0.00
LOG(GI_WAGES_F)	1.56	0.06	25.13	0.00
DMY_TABLECHANGE	-0.05	0.02	-3.23	0.01
AR(1)	-0.27	0.30	-0.90	0.39

R-squared	0.98	Mean dependent var	20.46
Adjusted R-squared	0.98	S.D. dependent var	0.29
S.E. of regression	0.04	Akaike info criterion	-3.14
Sum squared resid	0.02	Schwarz criterion	-2.95
Log likelihood	27.56	Hannan-Quinn criter.	2.02
F-statistic	0.00		

Withholdings

Dependent Variable: LOG(COL_WITH)
Method: Least Squares
Date: 11/15/10 Time: 15:37
Sample (adjusted): 1995 2009
Included observations: 15 after adjustments
Convergence achieved after 26 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.37	1.69	-1.99	0.07
LOG(GI_WAGES_F+GI_SOCIALS_F+PENS_DBSHARE*GI_PENSIONS_F)	1.02	0.07	14.91	0.00
EFF_TAX_RATE_F	4.08	2.60	1.57	0.15
DMY_TABLECHANGE	-0.03	0.01	-4.57	0.00
AR(1)	0.66	0.17	3.82	0.00

R-squared	1.00	Mean dependent var	22.02
Adjusted R-squared	1.00	S.D. dependent var	0.20
S.E. of regression	0.01	Akaike info criterion	-5.82
Sum squared resid	0.00	Schwarz criterion	-5.59
Log likelihood	48.68	Hannan-Quinn criter.	1.62
F-statistic	0.00		

Total Effective Tax Rate

Dependent Variable: EFF_TAX_RATE
Method: Least Squares
Date: 12/21/10 Time: 09:06
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments
Convergence achieved after 13 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.09	0.01	-8.22	0.00
LOG(GSP)	0.00	0.00	3.70	0.00
LOG(GI_CAPGAINS_F+GI_SCHED_E_F)/LOG(GI_TOTAL_F)	0.13	0.02	7.52	0.00
DMY_FEDTAX	-0.01	0.00	-6.18	0.00
DMY_TAX_RATE8284	0.00	0.00	7.89	0.00
DMY_TAX_RATE87	0.00	0.00	-3.56	0.00
AR(1)	0.28	0.13	2.10	0.05

R-squared	0.96	Mean dependent var	0.06
Adjusted R-squared	0.96	S.D. dependent var	0.00
S.E. of regression	0.00	Akaike info criterion	-11.51
Sum squared resid	0.00	Schwarz criterion	-11.18
Log likelihood	173.86	Hannan-Quinn criter.	-11.40
F-statistic	101.03	Durbin-Watson stat	2.02
Prob(F-statistic)	0.00		

Variable Listing

COL_ESTIMATES	Estimated PIT payments associated with current year liability
COL_FINALS	Final and unclassified PIT payments associated with current year liability
COL_REFUNDS	PIT refunds associated with current year liability (excluding kicker refunds)
COL_WITH	PIT withholdings associated with current year liability
DMY_FED_DATA	Reclassification of income data control
DMY_FED87	Tax Reform Act of 1987 & Oregon bracket change control
DMY_NIKE	Ideosyncratic stock sale control
DMY_TABLECHANGE	Control for change in OR withholding tables
DMY_TAX_RATE8284	Control for change in OR tax brackets, 1982-1984
DMY_TAX_RATE87	Control for change in OR tax brackets, 1987
DMY_TAXABLESS	Control for federal law making social security taxable
EFF_TAX_RATE_F	Effective tax rate
GI_CAPGAINS	Capital gains: Annual tax return data
GI_DIVIDENDS	Dividends: Annual tax return data
GI_INTEREST	Interest Earnings: Annual tax return data
GI_OTHER	Misc. Income: Annual tax return data
GI_SCHED_E	Schedule E Income: Annual tax return data
GI_SOCIALS	Taxable Social Security Income: Annual tax return data
GI_WAGES	Wages and Salaries: Annual tax return data
GSP	Gross State Product
HOMESALES	Existing home sales
HOUSEPRICE	Average existing house prices
IRA_CONTRIBUTIONS	Present discounted value of contributions to IRA plans
OPOP	Oregon civilian population
OYDIR_F	Oregon personal income: Dividends, interest and rents
OYP_F	Oregon personal income: total
OYPRN_F	Oregon personal income: Proprietors income
OYWSD_F	Oregon personal income: Wage and salary disbursements
PENS_DBSHARE	Share of defined benefit pension plans
PENS_PARTICIP	Participation rate: Employer sponsored pension plans
POP_OR_65	Share of population 65 years or older
RMTB3M	Interest Rate: 3-month T-Bill
TOPRATE_FED	Federal top rate on capital gains
Wage_Adjustment	Last quarter deviation of withholdings from personal income wages estmiate
WL5000	Wilshire 5000 stock price index
ZB	Corporate profits