

**A TOP-DOWN VIEW OF PERSONAL INCOME TAX RECEIPTS:
THE ROLE OF THE STOCK MARKET AND THE BUSINESS CYCLE**

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Abstract

This paper illustrates how the technical relationship between personal income tax receipts and total taxable personal income was related to key economic variables reflecting the relative valuation of the stock market and the performance of the business cycle over the past decade and a half. The estimated relationships indicate that the cyclical performance of the economy affects the technical personal tax receipts relationship with a lag of about 2 to 3 quarters. Similarly, the relative valuation of the stock market affects the technical receipts relationship and with a lag of about a year and a half. Such relationships have potentially important implications for government projections of personal income tax receipts. The relationships illustrate greater sensitivity of receipts projections to the performance of the economy than typically realized. The results also highlight the volatile and unreliable nature – from a forecasting perspective – of the personal income tax base, the largest component of the overall tax base for Federal government tax revenues.

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I. Introduction

Over the past decade, personal income tax receipts for the Federal government have been highly volatile and difficult to predict. At various times, “revenue surprises” have suddenly occurred, leading to unexpected and large changes in actual and projected Federal budget receipts. The first notable occurrence of a revenue surprise was in 1997 when a surge of tax receipts led both the Office of Management and Budget (OMB) and the Congressional Budget Office (CBO) to suddenly revise their receipts estimates and projections upward by large “economic” and “technical” adjustments amounting to multiple tens of billions of dollars per year.¹ The sudden change in the outlook for receipts had notable policy consequences, helping to contribute to the enactment of important pieces of budget legislation that put the Federal budget on a path to balance while yielding tax relief: The Balanced Budget Act of 1997 and the Taxpayer Relief Act of 1997. As it happened, further positive revenue surprises continued for the following 3 years – through FY2000. Those revenue surprises played a significant role in generating Federal budget surpluses over the FY1998-FY2001 period. Analogously, the sudden reversal to negative revenue surprises in 2001 and 2002 contributed substantially to the change in the Federal budget position to actual and projected deficits in FY2002-FY2003 and beyond.

Many commentators and analysts have speculated on the reasons underlying the volatile behavior of tax receipts. An obvious source is the behavior of the economy. The U.S. economy’s surprisingly strong performance in the mid- to-late 1990s led to positive surprises in Federal receipts – and the *direct*

¹ Economic revisions to budget estimates result from the changes in the economic assumptions; technical receipts revisions are those that result from factors other than legislative and economic changes. In September 1997, the OMB receipts economic and technical revisions were \$73 billion for FY1997 and roughly \$30 billion to \$60 billion range for subsequent projection years; CBO’s receipts economics and technicals at that time were \$69 billion for FY1997 and in the \$70 billion to \$80 billion range for the projection years. See Kitchen (2003) for detailed data and discussion on OMB and CBO receipts economics and technicals.

effects of the better economic performance could be identified by revenue estimators in OMB and CBO.² As real and nominal GDP increased faster than expected – generating increases in taxable corporate and personal income – tax liabilities and payments increased as well. Analogously, when the economy slowed in mid-2000 and entered a recession in 2001, taxable income and tax receipts fell sharply. To the extent the changes in tax receipts could be identified as being related to the changing levels of nominal GDP and nominal taxable incomes (such as wages and salaries and corporate profits) the direct “economic” source of the changes in tax receipts could be identified.

But the source of a large share of the receipts gains in the late 1990s and subsequent losses after 2000 could not be identified by traditional estimation methods. Some of the inability to identify the source of tax receipts changes can be attributed to the lack of sufficient and timely data on specific types of income at the time estimates must be made. Although the Treasury Department publishes daily and monthly data on the flow of tax receipts into Federal accounts and, as a result, the absolute dollar amounts of Federal tax receipts may be known on a very timely basis, the specific sources for much of the receipts flow is not identified. Even the attempt to track the sources by following the types of incomes and tax liability is subject to substantial delays of available data. For example, about a 2-year lag exists before detailed income and income tax data become available, as in the Statistics of Income data produced by the Internal Revenue Service and the more-detailed source data used by government estimators. And, even when more complete income data become available in subsequent years, the ultimate source of much of the receipts flow remains unidentifiable even with the more complete data. For example, once more-detailed data on personal income and tax payments became available, Kasten, Weiner and Woodward (1999) and Congressional Budget Office (2003, pp. 55-57) showed that the positive revenue surprises of the mid-to-late-1990s were largely attributable to several identifiable factors, including: higher capital gains realizations and taxes; growth of taxable income relative to GDP; the bracket creep from higher real

² For Administration budget estimates, receipts estimates are primarily generated by the Office of Tax Analysis (OTA) in the Treasury Department. Because the receipts estimates are published by the OMB (and with occasional small adjustments) in the Administration’s budget documents, OMB is often referred to as the source of the estimates.

income growth; and a change in the income distribution with a greater growth of income in high-tax regions. Even so, a significant portion of the revenue surprise remained unexplained.³

The typical methods for the *ex ante* estimation of tax receipts and the *ex post* identification of the ultimate sources of tax receipts represent the standard “bottom-up” approach. That is, tax estimation and analysis typically is based on identifying and estimating specific types of taxable incomes and the associated tax liabilities, and then building up the total receipts estimates from those individual building blocks (see Congressional Budget Office (2001)). In contrast, in this paper the attempt is to examine income tax receipts with a “top-down” approach, essentially treating total income tax receipts as a macroeconomic variable. The experience of the past decade and a half, and a casual empiricism of the data over that period, suggest that personal income tax receipts have been closely related to key macroeconomic variables – and to a greater extent than suggested by the typical allocation to “economics” factors estimated by Federal government estimators. As shown in Kitchen (2003), initial receipts forecasting errors in CBO and OMB estimates and projections were largely related to changing economic factors, as even the “technical” forecasting errors for receipts were statistically related to “economic” forecasting errors for receipts. What hasn’t been explained in a potentially useful way, however, is the broader relationship between key economic variables over time and the “technical” tax-to-income relationship. The “top-down” approach in this paper attempts to cast light on that relationship by examining how total personal income tax payments relative to total taxable personal income – the effective personal income tax rate – has varied over time, and relative to key economic variables.

The use in this paper of the effective personal income tax rate as the key tax variable introduces various benefits – and various challenges. On the beneficial side, the use of the effective personal income tax rate allows for a focus on the behavior of the changing relationship between taxes and taxable income – that is, the overall “technical” relationship for income taxes and taxable income. From the perspective of the detailed economic forecast underlying the determination of tax receipts estimates and projections,

³ As a revision of this paper was being completed, the Organization for Economic Cooperation and Development (OECD) released a study examining issues related to government revenues and financial asset valuations (see OECD (2004)).

the “economics” factors for personal income taxes are primarily associated with the level of nominal income by type of income. The variables that determine that relationship in the forecast are (1) the growth rates and levels of nominal gross domestic product (GDP) – which are built from the growth rates and levels of real GDP and the GDP price index – and (2) the “income shares” of GDP by form of taxable income. Hence, changes in real GDP growth, or GDP price inflation, or in the amount of national income that goes to wages and salaries or corporate income would all be examples of “economic” factors that would affect receipts. “Economic” factors for revisions of receipts estimates are largely those that affect the levels of taxable income. In contrast, movements in the effective tax rate result primarily from changing “technical” receipts estimation relationships, for example, factors altering the relative relationship of taxes to total taxable income. Such technical factors include changes in the income distribution and changes in income beyond the economic assumptions (for example, capital gains income). Hence, if we identify a relationship between macroeconomic variables and the effective tax rate, it will be helping to explain the relative, technical relationship between taxes and taxable income rather than the direct economic factors that are more related to the absolute nominal levels of income.

A potentially serious challenge with using an aggregate measure of the effective personal tax rate, however, is the fact that the statutory income tax structure has changed over time. Changes in tax policy have frequently occurred and, as a result, they have altered the intertemporal consistency of the actual effective tax rate in a time-series sense. In this paper, an effort is made to construct an approximate policy-independent measure of the personal effective income tax rate over the past decade and a half. That estimated policy-independent series is then used to examine, from a macroeconomic perspective, the relationship between key macroeconomic variables (as well as key statutory tax variables) and the effective personal income tax rate. Such an approach can help to explain the broader, indirect economic relationships that have affected the technical revenue forecast errors of the past decade in a more detailed and useful fashion.

II. Taxable Income and Income Taxes

Federal budget estimates and projections on the part of the Congressional Budget Office (CBO) and the Office of Management and Budget (OMB) are based on a broad set of economic assumptions, including estimates and projections of the growth of real gross domestic product (GDP), GDP price index inflation, consumer price index (CPI) inflation, the unemployment rate, and short- and long-term Treasury security interest rates. In addition, the allocation of national income among various types of income within the forecast also is of fundamental importance for estimates and projections of Federal tax revenue. Once budget projections are made and published, changes to any of these economic assumptions result in subsequent “economic” revisions in budget outlay and receipts estimates.

The key measures of GDP and income in the economic assumptions are based on the National Income and Product Accounts (NIPAs) data produced by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. A critically important part of any economic forecast is determining the amount of taxable income for the given path for nominal GDP in the forecast. In practice, the comprehensive macroeconomic forecast and modeling methods assure the consistency of all the variables within the forecast – both on the “product” and “income” sides of the NIPAs. Government economic forecasters pay particular attention to the “income shares” – the percentage share of GDP that each type of income represents – and their behavior on a historical basis. Economic models with their accounting identities assure that the income shares “add up” properly to be consistent within the forecast.

An important aggregation of income measures in the economic forecasts is “total taxable income” which is comprised of the sum of wages and salaries of employees, proprietors’ income, rental income of persons, personal interest income, personal dividend income, and corporate book profits. Table 1 shows the data for these income components for calendar year 2003.⁴ Government economic forecasters pay close attention to the total taxable income share of GDP, as any changes in that measure would directly affect the aggregate tax base for budget projections for a given GDP projection. Changes in specific income shares are important as well; for example, shifts between corporate profits and wages and salaries

⁴ Tables and charts are presented at the end of the paper.

would affect overall receipts estimates because of differing effective tax rates on wages and salaries income and corporate profits. Because the focus in this paper is on the behavior of personal income taxes, we drop corporate book profits from the list above to attain “total taxable personal income.”

The aggregate tax measure considered in this paper is the “average effective personal income tax rate,” defined as personal income tax receipts divided by total taxable personal income. The effective personal income tax rate will vary over time for a variety of reasons. For example, for any given projection in the economic assumptions of the total level of wages and salaries income, different distributions of that income across income levels are possible. If more taxable income were to occur in higher taxable income portions of the income distribution – thereby resulting in higher taxes for given total income amounts because of progressive income tax rates – then the effective tax rate would rise. Such a change would initially be defined as a “technical” revenue forecast error. Similarly, if taxpayers choose to sell assets and realize greater capital gains and pay the associated taxes, then the effective tax rate would rise for that reason as well. It is worth noting that the capital gains effect can have particularly large effects on the effective tax rate as capital gains income is not a part of the taxable income components available from the NIPAs.⁵ Another important factor that affects the effective personal income tax rate is changing tax policy. For example, as statutory tax rates are changed by legislation, the effect of the statutory tax rate change on tax receipts would lead to a change in the effective tax rate as well. This last factor would be defined as a “policy”-induced change to the revenue forecast, in contrast to the “economic” and “technical” changes described above.

In practice, quarterly data are available from the NIPAs for federal personal income taxes and the components of total taxable personal income as defined above.⁶ Chart 1 shows the calculated effective personal income tax rate on a quarterly basis, from 1988.1 to 2003.4 using the NIPA data. The volatile

⁵ For example, the CBO (2002b, p. 2) states: “The jump in [capital gains] realizations accounted for about 30 percent of the growth in income tax receipts in excess of GDP growth that occurred from 1994 to 1999. No one yet knows for sure, but a fall in capital gains realizations may have played a similar role in the drop in receipts in 2002.”

⁶ The data for the calculation of the effective personal income tax rate as described in this paper are available from the BEA website at www.bea.gov. Specifically, the components of total taxable personal income are available in NIPA Table 2.1. Personal Income and Its Disposition; federal “personal current taxes” are available in NIPA Table 3.2. Federal Government Current Receipts and Expenditures.

nature of the effective tax rate helps to illustrate the difficulties that federal revenue forecasters have faced over the past decade. The effective personal tax rate rose steadily in the late 1990s, rising from about 11½ percent to over 14 percent in 2000. This run-up in the effective tax rate coincided with the series of positive technical revenue shocks of the late 1990s. Analogously, the sudden fall of the effective tax rate after 2001 coincided with the negative revenue shocks that adversely affected the Federal budget outlook. One contrast, however, is that the increase in the effective tax rate in the mid- to late-1990s occurred as relatively small tax policy changes occurred, while the decline in the effective rate after 2001 occurred at least in part from significant tax cuts in important tax legislation: the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) and the Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA). In fact, the sharp downward spike in the effective tax rate in the chart in the third quarter of 2001 is associated with the advance tax relief payments for 2001 from the EGTRRA tax relief that were mailed to households at that time; a similar downward spike occurred in the third quarter of 2003 from advance payments for the child tax credit from the JGTRRA tax relief.⁷

The dependence of the actual measured effective tax rate (as shown in Chart 1) on changes in tax policy limits its usefulness as a measure through which we can perform a “top-down” examination of the behavior of personal income taxes. Hence, the next step discussed is the effort to produce an approximate measure of the effective personal income tax rate that adjusts for changes in the statutory tax structure – that is, a “fixed policy” or “policy independent” effective tax rate measure.

III. An Approximation of the Fixed-Policy Effective Tax Rate

The approach adopted here to adjust the actual effective tax rate to remove the effects from policy changes ultimately can only be viewed as an approximation to the “pure” actual – and unobservable – policy-independent measure. Nonetheless, the potential value from a better understanding of the

⁷ The BEA fully accounts for temporary tax effects – such as mailed checks for advance payments of refunds or credits -- in the quarter in which they occur. In contrast, tax policy changes that affect income tax rates and payments are introduced as an equal quarterly amount spread across the four quarters of the calendar year.

underlying relationships driving the “technical” relationship over time between personal income and personal income tax receipts warrants the effort.

The methodology used for removing the effects on the effective tax rate from changes in tax policy is relatively straightforward. First, Joint Committee on Taxation (JCT) estimates of the effects on personal income tax receipts from tax legislation enacted since 1988 (the beginning of the sample period considered here) were collected.⁸ The major tax legislative acts affecting personal income taxes during the sample period under consideration are shown in Table 2.⁹ Second, the year 2000 was chosen as the “base” period for the “fixed-policy” effective personal income tax rate. Third, the annual data from the JCT estimates for tax legislation were converted to quarterly data by spreading the estimated tax effects over the relevant quarters, including adjustments from the annual fiscal year estimates to the “proper” calendar year quarters. In some instances, receipts effects were concentrated in specific quarters: for example, the advance payment checks mailed out in 2001 and in 2003 resulting from the EGTRRA and JGTRRA legislations were concentrated in the third quarters of those years. Fourth, the estimated tax changes were added to or subtracted from the actual tax values to generate the fixed policy measure relative to the fixed base year of 2000. For example, for periods after 2000, estimated legislated reductions in personal income taxes were added back to the actual personal income taxes to attain the policy-independent level; for periods prior to 2000, legislated reductions in personal taxes were entered with the opposite sign from the published estimates. That is, relative to the year 2000, the effect of tax cuts after 2000 extended forward for succeeding periods reduced the actual effective tax rate relative to that for the statutory tax structure of 2000 (hence needing to be added back in to return to the fixed-policy basis). For periods prior to 2000, a tax cut (increase) in the prior years extended backwards into

⁸ The JCT estimated budget effects are available on its web site at: <http://www.house.gov/jct/tableofcnts.html>. For recent years, the estimates were taken directly from estimates published at the time the legislation was passed. In some cases in earlier years, the estimates were drawn from the “General Explanation Of Tax Legislation” documents published annually or at the end of the two-year period for a specific Congress. The receipts effects for the Omnibus Reconciliation Act of 1990 were obtained from Joint Committee on Taxation (1990).

⁹ See Tempalski (2003) for a review of major tax legislation and the budget effects over the past 6 decades.

preceding periods would have to be subtracted from (added to) the actual to get the fixed-policy amount for a 2000 base year.

One nuance in the methodology is the approach used to extend the estimated effects beyond the time periods covered by the original JCT estimates. A specific example will illustrate the approach used. The Omnibus Budget and Reconciliation Act of 1993 increased income tax rates and the JCT estimates of the revenue effects for that legislation covered the 1993-1998 period. After the fact, we know that the income tax rates of the 1993 legislation continued through 2000. Hence, the actual effective tax rate for the periods prior to when the 1993 legislation was fully in effect would have to be adjusted to be equivalent on a policy basis to the effective tax rate for policy in place during 2000. In order to make that adjustment, the JCT estimate of the tax effect when fully phased in (in billions of dollars) was divided by the total taxable personal income (again in billions of dollars) in that time period. That calculation yields an estimate of the effect of the tax change relative to total taxable personal income on a percentage basis that is then carried back in time to make the adjustment to be consistent with tax policy in place in 2000. Analogous adjustments were made for other changes in tax policy that affected personal income taxes during the 1988-2003 period.

Some specific issues related to the attempt to calculate the policy independent measure should be mentioned.¹⁰ First, scored estimates of the effect of tax legislation made at the time of enactment are fixed, but the “true” effects would vary with subsequent changes in the economy and other factors. The methodology employed partly accounts for this problem by extending the estimated effects as a percentage of taxable income. Second, some business provisions of legislation could affect personal income tax receipts. Third, the use of NIPA data could yield some timing differences relative to the estimated receipts effects because the NIPA data are recorded on an accrual basis while budget estimates are done on a cash basis.¹¹ Fourth, some tax legislation expires, with legislated tax changes in effect for only a specific period of time. On this last point, for our purposes such effects would matter if the

¹⁰I thank Mark Booth for comments that led to much of the discussion in this paragraph in the text.

¹¹ See Tsehaye and Robinson (2004) for discussion of the differences between NIPA and budget estimates.

expiration date were beyond the period covered by the scored estimates. Provisions that expire within the scoring window aren't a problem, because in the methodology the extension beyond the scoring period is based on the final "settled" value for the tax legislation effect relative to personal taxable income. For the second and third issues – business provisions affecting personal receipts and liabilities versus receipts – no specific accounting can be made.

These problems highlight the fact that the calculated measure is an approximation to the actual. What matters in practice is that any errors in the approximate measure be small and random. That is, the implicit assumption as we move forward in using the measure in empirical analysis, is that any remaining error (noise) in the measure would not distort the true "signal" in terms of its observed relationship to other important economic variables.

Chart 2 shows the resulting estimated fixed-policy effective tax rate compared to the actual effective tax rate. The effects of various changes in tax policy are clearly evident. For example, the effects of the income tax reductions of the post-2000 period are fairly obvious in the chart, including the temporary spikes associated with the advance payment checks in the third quarter of 2001 and in the third quarter of 2003, as mentioned above.

IV. Empirical Estimation and Results

In recent years, the casual observation of many analysts, as well as selected empirical results (e.g., Congressional Budget Office (2002a), Kitchen (2003)), have pointed to the close relationship between the behavior of the economy and the unexplained behavior of personal tax receipts. Speculation also has focused on the role of the stock market in the determination of federal tax receipts (e.g., Congressional Budget Office (2002b, 2002c)). From a macroeconomic perspective, two key relationships reflect the casual empiricism of analysts, and describe key behavioral relationships of the U.S. economy over the past decade and a half: the relative valuation of the stock market; and the business cycle behavior of the economy – e.g., the economy's deviation from potential, typically measured by the output or employment "gap." These relationships – in particular, the stock market bubble and its bursting – are

viewed by many as the explanation for the large positive tax revenue shocks of the late 1990s and the subsequent negative revenue shocks after 2001. This section addresses those issues by using the approximate measure of the fixed-policy effective personal tax rate described above, and estimating the empirical relationships between the effective tax rate and the key macroeconomic variables.

Consider the following representation of the relationship of personal income tax receipts (R) to total taxable personal income (Y) through the aggregate effective personal tax rate (τ):

$$(1) \quad R = \tau Y$$

An alternative version of equation (1) can be expressed in the following form:

$$(2) \quad R = t_Y^* Y^* + t_Y^C (Y - Y^*) + t_G G$$

where Y^* is the trend level of taxable personal income (consistent with full-employment, potential GDP), G is realized taxable personal capital gains, t_Y^* is the effective tax rate for trend personal income, t_Y^C is the effective tax rate on cyclical income, and t_G is the effective tax rate on capital gains. Using equations (1) and (2) yields:

$$(3) \quad \tau = \frac{t_Y^* Y^* + t_Y^C (Y - Y^*) + t_G G}{Y}$$

Consider the logic behind equation (3). First consider the special case when the economy is operating at full employment and the stock market is valued at a normal long-run valuation (with the market valuation of corporate equities equal to the net worth, or replacement cost of corporate assets). With the economy and the stock market valuation evolving smoothly along their trend paths, the relationship of personal taxes to total taxable income would be fixed in (3), or, in practice, at least relatively predictable. In a smoothly evolving economy, the distribution of income for a given total income level and the likely path of realized capital gains likely would be relatively stable and predictable. In contrast, with cyclical volatility in the economy and in taxable incomes, and with stock market valuations that significantly rise or fall relative to normal long-run valuation relationships, the effective tax rate will tend to rise and fall accordingly. In practice, it is expected that $t_Y^C > t_Y^*$, that is, the effect of cyclical income on the behavior

of tax receipts would be greater than the effect from personal income along its trend. Such an effect would occur, for example, if the distribution of cyclical income (in the income distribution) was positively related to the performance of the economy. In “boom” times, the additional income flow could be skewed to the upper end of the distribution; in slack or “bust” times, the distribution of income could be less skewed toward the upper income levels.¹²

The casual empiricism of the past decade and equation (3) suggest a specification like the following for estimation:

$$(4) \quad T_t = a + b(L) \text{GAP}_t + c(L) \text{STOCK}_t + d_1 X_{1t} + d_2 X_{2t} \dots + d_n X_{nt} + e_t$$

where T_t is the fixed-policy effective personal income tax rate in period t ;
 GAP_t is a measure of the economy’s business cycle deviation from potential;
 STOCK_t is a measure of the stock market’s relative valuation;
 X_{it} are measures of other variables affecting the effective personal tax rate;
 $b(L)$ and $c(L)$ are lag operators for distributed lag coefficients, b_i and c_i to be estimated;
 d_i are coefficients to be estimated;
 e_t is a random error term.

The measure of the economy’s business cycle deviation from its full-employment potential used here is the unemployment rate deviation from the CBO’s measure of the non-accelerating inflation rate of unemployment (NAIRU) (see Chart 3). Other measures of the economy’s gap from potential were considered and examined in initial estimations, including the deviation of real GDP from potential GDP and the deviations of the total and manufacturing industrial production capacity utilization measures from their historical averages. It is not surprising that the unemployment rate gap is the more appropriate measure given the effective tax rate we are examining. That is, a gap measure based on the employment

¹² Note that changes associated with “real bracket creep” would occur for both cyclical and trend reasons. Both the cyclical and trend components would generate changes in the effective tax rate for the given tax policy in place.

status of individuals in the population is more applicable for examining personal income and income taxes than the overall level of production in the economy, or the behavior of production relative to capacity for manufacturing, utilities and mines. The measure used for the relative valuation of the stock market is the percentage deviation of a calculated value of Tobin's "q ratio" – the ratio of the stock market value of corporate equities to the net worth or replacement value of corporate assets -- from its long-run average (see Chart 4).¹³ The calculated value of the q ratio was derived from the Federal Reserve's Flow of Funds data.¹⁴

Table 3 shows results from ordinary least squares estimation of equation (1). The results in the first line show significant coefficient estimates for the effects of the unemployment rate gap and the excess valuation of the stock market. For the unemployment rate gap term, the lag structure used was a first order polynomial distributed lag of the second and third lagged values of the unemployment rate deviation from NAIRU with the far end tied to zero. For the stock market valuation term, a second order polynomial for the fourth to sixth lagged values of the stock market valuation deviation with the far end tied to zero was used. The use of lagged values assures the exogenous nature of the explanatory variables. The distributed lag specifications were chosen in order to minimize the standard error of the regression. The sum of the lag coefficients for the unemployment rate term of -0.47 indicates that the effective tax rate increases by about 0.5 percentage point for each percentage point that the unemployment rate is below the NAIRU, and the effects occur with a mean lag of about $2\frac{1}{2}$ quarters. The sum of the coefficient estimates for the stock market deviation of 0.017 indicates that the effective tax rate would increase by 0.17 percentage point for each 10 percent increase in market valuation relative to replacement cost, with a mean lag of about 5 quarters.

¹³ See Brainard and Tobin (1968), Tobin (1969), Smithers and Wright (2000), and Harney and Tower (2003) for background and discussion of Tobin's q and its usefulness as a measure of the relative valuation of the stock market. An alternative measure considered was the price-earnings ratio (see, e.g., Shiller (2000)) for the Standard & Poor's 500, but that measure was observed to be inferior to the deviation from average q in terms of explanatory power.

¹⁴ Specifically, Table B.102, Balance Sheet of Nonfarm Nonfinancial Corporate Business. The historical period used for calculating the historical average was 1952.1 to 2002.4.

Although the equation exhibits a high degree of fit as reflected in the adjusted R-squared of 0.916, the low Durbin-Watson statistic indicates significant serial correlation. As a first effort to address that concern, the second line of Table 3 shows the estimation with an autoregressive order 1 (AR(1)) correction. The AR(1) term is highly significant, yet the estimated coefficients on the key macroeconomic variables with the AR(1) estimation are very similar to those in the first line.

Despite the relatively robust estimation of the regression with and without an AR(1) correction as shown in Tables 2 and 3, the existence of significant serial correlation in the original estimation begs the question of potential improper specification for the equation. In a first effort to address these concerns, the residuals of the original equation (as estimated in the first line of Table 3) were examined. Large positive residuals were observed in late 1992 and late 2003, and large negative residuals were observed in late 1993 and throughout 1994 and 1995. From a historical perspective, the 1992 – 1995 period represented a time of uncertainty and evolving expectations about changes in personal taxes and statutory tax rates. For example, in late 1992, then President-elect Clinton was advocating increases in income tax rates as part of a deficit reduction plan to be implemented in his first year of office, 1993. To the extent possible – taking early bonuses or exercising stock options, for example – individuals likely shifted income forward into 1992 to avoid expected higher tax rates in 1993. Analogously, by mid-to-late 1994, prospects for a Republican Congress – and the associated advocated tax cuts – were increasing, potentially leading to a delay in realizing taxable income on the part of forward-looking individuals. Such income shifting to avoid actual and expected changes in taxes and tax rates has been found by various researchers to be an important determinant of taxpayer behavior.¹⁵ Hence, although the effort had been made to create a policy-independent measure by removing the effects of changing legislation according to JCT scoring, these observations suggest additional tax-policy-related *behavioral* changes that were not yet captured.

¹⁵ The CBO (1995, pp ix-x) recognized the shifting of taxes during 1994-1995: “In the projection made for CBO’s January 1995 economic and budget outlook, the projection ... was adjusted to reflect a hypothesized shift in realizations from 1994 to 1995 and 1996 as some taxpayers deferred sales of assets until the prospects for a capital gains tax reduction became clearer.”

To reflect the possible tax shifting behavior in the estimation employed here, several alternative variables were employed. To address the role of legislated changes in tax rates, the quarterly series of the change in the top statutory income tax rate was calculated. Alternative specifications of lags and leads for the change in the tax rate were used in estimation. The use of lagged values is straightforward: the hypothesis is that the effective tax rate would be negatively related to changes in the statutory tax rate in the recent past. Higher statutory tax rates would provide an incentive to individuals – to the extent possible – to avoid realizing and reporting taxable incomes in order to avoid paying the higher taxes. The use of lead values for changes in statutory tax rates is a type of “certainty-equivalence” approach for expectation of changes in tax rates. Over short-run periods of time, such a treatment is quite reasonable. Plans for adopting policies with changing statutory tax rates are often known well in advance of the actual implementation into law. For example, Presidential candidates Clinton in 1992 and G. W. Bush in 2000 campaigned on and published defined policy proposals with advocated changes in tax rates. Similarly, proposed legislation for changes in tax rates often goes through months of debate and consideration in Congressional committees and House and Senate votes before becoming law. The hypothesis is that current realization of taxable income would be positively related to anticipated and known changes in tax rates in the near future. That is, if it is highly expected or known that the tax rate will increase in the near future, to the extent possible income will be taken prior to the increase in the tax rates rather than after.

The possibility that the anticipation of a Republican Congress and the related expectation for lower taxes in 1994 and 1995 led to lower taxes than otherwise is a more difficult consideration to examine empirically. The approach chosen was to use an exogenous proxy variable to approximate the anticipation factor. The proxy variable was based on the results of a search of media sources and stories via Lexis-Nexis. The search covered the period from January 1994 through June 1996. The search parameters were defined as: Republican AND Congress AND “tax cuts” – thereby gauging the media attention to Republican efforts to take control of Congress and cut taxes. The proxy variable constructed was derived on a quarterly basis as the deviation from a baseline level of media stories normalized to zero

at or near the baseline values and to 1.0 at the peak quarterly rate of stories. The resulting series is defined as the following values for the following quarters:

<u>1994.4</u>	<u>1995.1</u>	<u>1995.2</u>	<u>1995.3</u>	<u>1995.4</u>	<u>1996.1</u>	<u>1996.2</u>
0.742	1.000	0.637	0.331	0.778	0.150	0.330

and zero otherwise.

Table 4 presents results for regression estimates of equation (1) augmented to include the lead and lag variables for changes in the top tax rate (DRATE lead using the forward operator (F) and DRATE lag using the lag operator (L)) and the anticipated 1994-95 Congressional and tax change variable (NEXIS9496). A number of points are worth highlighting. First, in this broader specification, the estimates for the sums of the coefficients for the GAP and the STOCK terms are very similar to those shown in Table 3; those estimates appear to be relatively robust. Second, the hypothesized relationships for past and future changes in statutory tax rates are confirmed. The sum of the estimated coefficients for the lagged values of the DRATE term (the change in the top statutory tax rate as described above) is negative and significantly different from zero.¹⁶ The estimated value of -0.176 indicates, for example, that a one-time increase in the top statutory tax rate by 5 percentage points would result in a decline in the effective tax rate of nearly 1 percentage point spread over a four quarter period about one year after the fact. Analogously, the estimate for the sum of the coefficients for the lead changes in the top tax rate is 0.082, indicating that a foreseen change in the top statutory tax rate of 5 percentage points would lead to a reduction in the effective tax rate in the preceding quarters of about 0.4 percentage point.¹⁷ In both cases, the implied behavioral responses of the effective tax rate to the lead and lag values of the change in the top statutory tax rate are significant, but temporary. The coefficient on the NEXIS9496 term for the effect of expectations for a Republican Congress and tax cuts over 1994-1996 also confirms the hypothesized relationship. The coefficient estimate of -0.899 suggests a peak effect on the effective

¹⁶ A second order polynomial distributed lag for the fourth through the seventh lagged values of the DRATE term was used in the estimation, with the far end tied to zero.

¹⁷ A first order polynomial with no endpoint restrictions for the first and second lead quarter values of the change in top tax rate was used in the estimation.

personal tax rate of nearly -1 percentage point in the first quarter of 1995, and negative effects in the -0.3 to -0.7 percentage point range for the other quarters from 1994.4 to 1995.4.¹⁸ Final observations about the results in Table 4 concern the summary regression statistics: the standard error of the regression is much lower than in the results shown in Table 3, the adjusted R-squared is higher, and the Durbin-Watson statistic now indicates that first-order serial correlation of the residuals is no longer a problem.

How do such estimates of tax shifting conform to the broader literature on such effects? A broad literature exists – with a mix of results – but a full review of the literature is beyond the scope of this paper. One example is the results of Feldstein and Feenberg (1996) that showed that the income tax rate increases of OBRA 1993 resulted in a significant reduction in taxable income. Other examples of research showing a responsiveness of taxable income to changes in statutory tax rates include Lindsey (1987), Feldstein (1995), Carroll (1998), and Gruber and Saez (2002). Gruber and Saez (2002) note, in particular, that the overall elasticity of taxable income to tax rate changes results primarily from the responsiveness of taxable income for high-income taxpayers. Such changes in taxable income at the upper end of the income distribution would directly affect the distribution of income and the overall observed “technical” relationship between personal taxes and total taxable personal income (as observed in this paper).

Concerning the responsiveness of tax payments to the behavior of the stock market, research has examined the issue of capital gains realizations and projections of realizations (Congressional Budget Office (1995)), but the focus of research often has been on the responsiveness of the behavior of taxpayers and realizations to changes in tax law (e.g., see Burman and Randolph (1994) and Auerbach and Siegel (2000)). In the approach used in this paper, the role of the stock market in affecting the

¹⁸ It should be stated again at this point that the changes observed and described in this analysis are in the “technical” receipts to income relationship – e.g, the personal tax revenues that would be expected to be received for a given total taxable personal income – and not in the broader macroeconomic variables. Hence, broader income and tax revenue changes could occur in response to tax rate changes than those shown here. For example, if a cut in statutory tax rates led to a short-run increase in GDP and income, then the results shown here indicate that the expected effect on tax revenues would be comprised of three parts: a decline from the lower level of the statutory tax rate; an increase from the tax shifting effect yielding an increase in the policy-independent effective tax rate; and the increase in the income tax base from higher GDP and income.

behavior of tax receipts is not limited to only the effects of capital gains, but also includes other potential factors such as income from exercising stock options, stock market related bonus payments, and other stock market related income that may be difficult to identify. These effects could be particularly pronounced if the resulting income is realized in the regions of the income distribution with higher tax rates.

An additional possible concern about the estimation of equation (1) given the observed Durbin-Watson statistic, is whether the dependent variable – the level of the effective tax rate – is stationary. Test statistics from the augmented Dickey-Fuller unit root test show that the hypothesis that the effective tax rate series has a unit root cannot be rejected – that is, it is non-stationary. Similarly, test statistics indicate that the series for the key explanatory variables, the unemployment rate deviation from NAIRU and the q ratio deviation from average, also have unit roots (although the results for the unemployment rate deviation were of varying significance). Hence, the concern is that the regression results reported above using the level of the effective tax rate may simply be spurious (Granger and Newbold (1974), Engel and Granger (1987)). Augmented Dickey-Fuller test statistics indicate that the first-differences of the key series – the effective tax rate series, the unemployment rate deviation from NAIRU, and the q ratio deviation from average – are stationary. Additional alternative tests for cointegrating relationships among the effective tax rate, unemployment rate gap, and stock market valuation terms were conducted. Generally, the tests rejected cointegrating relationships for the unemployment rate gap term; mixed results were observed for the presence of a cointegrating relationship between the effective tax rate and the stock market valuation term.

To address these concerns, Table 5 shows additional estimation results for estimating equation (1). The first line of Table 5 shows results for estimation of the full specification using first differences. The unemployment rate gap and the stock market valuation terms continued to be significant and of similar magnitude to the results observed in the levels specifications in Tables 3 and 4. The second line shows the full specification in first difference form including an error correction term for the relationship between the effective tax rate and the stock market deviation term. The inclusion of the error correction

term reduces the absolute magnitude of the coefficient estimates for several of the other explanatory variables, including the unemployment rate gap, the Nexis variable, and the forward tax rate change term. The stock market deviation term continues at a similar magnitude and significance. In that specification, the error correction term is not significant. The last two lines of Table 5 show additional estimations, with only the stock market valuation and error correction terms present in the final estimation. Even though the unemployment rate gap and Nexis variables do not reach the standard levels of significance in the results shown in the third line, that specification yields the lowest standard error of the regression and the highest adjusted R-squared for the first-difference specifications. In all cases, the relative stock market valuation variable continues to be significant and with robust estimates of the magnitude of its effect. The error correction term varies in significance depending on the variables included in the specification.

It is not unusual to observe inconclusive results in terms of the “best” specification as observed here when considering variables with possible unit roots and that are potentially cointegrated (see for example, Roberts and Morin (1999) and Diebold and Killian (1999). And, as Cochrane (1991) discusses, unit root tests are low in power, and the false assumption of a unit root in practice can distort the choice of the best model for small sample estimation. From an economic perspective, one has to question whether bounded variables such as the effective tax rate, the relative valuation of the stock market (without a persisting bubble), and the unemployment rate gap should be considered nonstationary. Regardless of the uncertainty about the best specification, the estimation results across the various specifications clearly show that the technical relationship between personal income taxes and total personal income is significantly related to the relative valuation of the stock market. The estimation results for the other variables – the unemployment rate gap and the variables associated with statutory tax rate changes – were also fairly robust. Generally, the relatively robust estimation of the effects of the various variables across the levels and first-difference specifications indicate that the results in the broader specification in levels form of Table 4 shouldn’t be considered to be spurious. The levels specification in Table 4 has clear economic meaning that provides further justification for its use in practice.

V. Possible Applications in Practice and Limitations

The top-down approach adopted here and the results presented above should not be viewed as a sufficient substitute for the standard bottom-up, more micro-based methodologies for estimating and projecting personal income tax receipts for the Federal government. Rather, the top-down approach could serve as a potentially useful complementary approach that would provide additional information about the likely performance of personal tax receipts. The top-down approach and the above results may be particularly useful for “real-time” analyses of aggregate receipts data, and for estimations and projections during the lag when detailed income data are not available.

In practice, the Administration and the Congressional Budget Office have produced their estimates of Federal government receipts in a multi-stage process (see Donihue and Kitchen (2000) and Congressional Budget Office (2001)). In the Administration, the economic forecast has been produced first by the “Troika” (political officials and staff from the three primary economic policy agencies, the Department of the Treasury, the Council of Economic Advisers, and the Office of Management and Budget). The economic forecast covers a broad set of macroeconomic variables of the NIPAs, with close attention paid to key income measures (as described above). At the time the economic forecast is being completed, initial rough estimates of the budget effects (spending, receipts, deficits) from the changing economic assumptions are produced and considered. These initial estimates are largely based on the existing, fixed technical receipts-to-income relationships of the prior budget estimates. The observed estimated changes in the budget outlook are essentially the first estimates of the “economic” change in receipts projections from one set of budget estimates to the next. Once the Troika completes the economic forecast, the detailed data are provided to the Office of Management and Budget for distribution to the agencies for more complete budget estimates, and to the Treasury Department’s Office of Tax Analysis for the detailed “bottom-up” estimation of receipts. Similarly, for the Congressional Budget Office, the staff economic forecast is considered first (including a preliminary review by a “Panel of Economic Advisers”), with the final set of economic assumptions then used for making the detailed receipts estimates.

In practice, the approach presented here potentially could serve to provide an alternative view of the likely performance of receipts, and the potential macroeconomic-generated effects on the technical receipts-to-income relationships. As an example, and with the benefit of hindsight, consider the situation that existed in late 1999 and early 2000 as the economic and budget forecasts were being prepared for the fiscal year 2001 budget. The economy at that time was in an expansionary phase of the business cycle with an unemployment rate below NAIRU and the stock market at a high valuation relative to its historical trend. A reasonable macroeconomic forecast would have shown a gradual increase in the unemployment rate toward NAIRU – and a gradual elimination over time of the excess valuation of the stock market by historical standards (e.g., as shown by q as described above).¹⁹ Based on the results in this paper, that macroeconomic forecast, combined with relationships described in the estimation results presented above, would have pointed to a declining effective tax rate on personal income. As we look back, and with the benefit of hindsight, we now know that the effective tax rates associated with the government’s receipts projections at that time were too high – yielding budget surplus projections that we also now know were too optimistic.

Nonetheless, it needs to be recognized that such an approach also requires projections of the performance of the stock market, an especially difficult or nearly impossible task. But as discussed in Shiller (2000), Smithers and Wright (2000), and Harney and Tower (2003), intermediate-term predictions for the likely future returns and stock market valuations can be gleaned from current stock market valuation measures. Significant short-term errors could occur (e.g. for at least the first and second forecast years) but medium- to longer-term errors (at the three- to five-year horizon and beyond) likely could be less prone to error. For example, in 1998 and 1999, projections of a stock market gradually returning towards its long-run trend valuation from its overvalued position would have missed the additional stock market gains in 1999 and 2000; but it would have more accurately reflected what actually

¹⁹ The CBO and Administration economic forecasts from early 2000 did, in fact, show a gradually increasing unemployment rate in their projections. Also, CBO acknowledged the possible overvaluation of the stock market: “A number of observers believe that equity prices are higher than can be justified by corporate earnings, perhaps by as much as 25 percent to 30 percent.” (CBO, 2000).

occurred in 2001 and subsequent years. Such a projection for the stock market would then also have led to an underestimate of receipts in the initial years, but a more accurate projection in subsequent years. Without a fully specified “fiscal policy loss function” with clearly identified discount rates, we can’t really say which situation is to be preferred. It is easy to imagine, however, that from a prudent and disciplined fiscal policy approach, temporary, one-time errors would be given relatively low weight relative to persisting and compounding longer-term errors.

Consider what has occurred over the past 3 years. In January 2000, the Congressional Budget Office projected that total taxable personal income would rise from about \$6.8 trillion in FY2000 to about \$7.7 trillion in FY2003, and that personal income tax receipts would rise from \$945 billion in FY2000 to \$1.068 trillion in FY2003. Based on those data, the CBO’s projection for the aggregate effective personal income tax rate was for the effective rate to remain essentially unchanged from 13.8 percent in FY2000 to 13.8 percent in FY2002 and 13.9 percent in FY2003. Although direct comparisons cannot be made because of revisions to the NIPAs that have altered the measured levels of taxable personal income, the key point to recognize is that the CBO projections implicitly expected the technical relationship between taxable personal income and personal tax receipts to remain largely unchanged. After the fact, and based on the fixed-policy effective tax rate calculated above, we now know that the effective tax rate actually declined (on a fixed-policy basis) by roughly 2 percentage points over the FY2000 to FY2003 period. The January 2000 overstatement of the projected effective tax rate led to an overstatement of personal income tax receipts – independent of the subsequent policy changes – by roughly \$150 billion for FY2003. Of course the CBO in January 2000 did not know that the economy was soon to enter the slowdown and recession of 2000-2001 or that the stock market would peak in early 2000 and fall sharply thereafter.²⁰ The estimates presented in this paper suggest that the business cycle effect, as represented by

²⁰ Because of changes in the estimated levels of income in the NIPAs from comprehensive revisions, only an estimated difference of taxable income can be made related to the FY2003 projected levels made in January 2000. For FY2003, the approximate shortfall in total taxable income was roughly \$400 billion. That amount would be consistent with an “economic” shortfall of roughly \$50 billion on top of the \$150 billion “technical” effective tax rate effect cited in the text. Of course, as the thesis and evidence of this paper illustrates, the technical effective tax rate effect is also seen to have resulted from broader economic changes.

the unemployment rate gap, accounted for about a 0.6 percentage point decline in the effective tax rate in FY2003 relative to the projected in 2000 (6.0 percent actual unemployment rate for FY2003 compared to the projected 4.6 percent rate for FY2003 in January 2000, and a estimated coefficient of roughly 0.4). The stock market valuation effect accounted for roughly 1.7 percentage points of decline in the effective tax rate (e.g., the decline of roughly 100 percentage points of relative valuation and coefficient estimates of about 0.017). Hence, the estimates in this paper indicate that roughly two-thirds of the decline in the policy-independent effective tax rate was attributable to the stock market decline; about one-third was attributable to the worse than expected business cycle performance.

Beyond the potential use for government economic and revenue projections, the approach and results presented here also hold potentially useful applications for macroeconomic forecasters that do not have a fully specified income tax model within their macroeconomic model. For example, many macroeconomic forecasting models use effective tax rates applied to taxable incomes to generate estimates of government tax receipts. The results of this paper illustrate how the effective tax rates could be allowed to vary given the behavior of the unemployment rate and the relative stock market valuation. Including such relationships in the parameters of a macroeconomic model could allow for improved projections of government receipts and deficit projections.

The analysis does have limitations, however, particularly for purposes of extended projections. For example, in the current situation, as we look forward, the alternative minimum tax (AMT) will play an increasing role in affecting the behavior of personal income tax receipts relative to total taxable personal income. Because the AMT relationship going forward will be different from that which has been observed historically, care would have to be taken in accounting for the potential future drift in the effective personal tax rate related to future AMT tax liabilities. Also, because of changes in key tax rates – notably the reductions in tax rates on capital gains and dividends in the EGTRRA tax legislation – the future effective tax rate may not be as sensitive to the relative valuation of the stock market as in the past. Although it is likely that the relative valuation of the stock market affects taxable income beyond capital gains and dividends (for example, through bonus income and stock options), one would still have to be

careful in applying the estimated relationships going forward. These concerns illustrate the earlier recognition that the “top-down” approach presented here should be viewed as a complementary approach and not a complete substitute to the standard “bottom-up” estimation and projection of tax receipts.

VI. Summary

The role of the economy and the stock market in the revenue surprises for personal income tax receipts over the past decade has been the subject of much speculation in recent years. Large “technical” forecasting errors on the part of the OMB and the CBO have coincided with large – and similarly signed – economic forecast errors. This paper illustrates how the technical relationship between personal income tax receipts and total taxable personal income is related to key economic variables reflecting the performance of the business cycle and the relative valuation of the stock market. The estimated relationships presented in the paper illustrate that the cyclical performance of the economy affects the technical personal tax receipts relationship, and with a lag of about 2 to 3 quarters. Similarly, the relative valuation of the stock market affects the technical receipts relationship, and with a lag of about a year and a half. Such relationships have potentially important implications for government projections of personal income tax receipts. The results suggest that roughly two-thirds of the unexpected technical decline in personal income tax receipts from 2000 to 2003 was attributable to the decline in the stock market; roughly one-third of the decline was attributable to the worse than expected business cycle performance. In addition, an interesting subset of the results shows that the effective tax rate for personal income was sensitive to actual and anticipated changes in tax policy. The relationships observed in this paper illustrate greater sensitivity of receipts projections to the performance of the economy than typically has been realized. The results also highlight the volatile and unreliable nature of the personal income tax base, the largest component of the overall tax base for Federal government tax revenues.

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Table 1 -- Key Income Components in the National Income and Product Accounts

<u>Income Measure</u>	<u>Calendar Year 2003 Averages</u>	
	<u>Nominal Level</u> <u>\$Billions</u>	<u>Share</u> <u>% of GDP</u>
Gross domestic product	10,988	100.0
Wages and salaries of employees	5,100	46.4
Proprietors' income	847	7.7
Rental income	164	1.5
Personal dividend income	429	3.9
Personal interest income	965	8.8
Corporate profits before tax	856	7.8
Total taxable income	8,361	76.1
Total taxable personal income	7,504	68.3

Source: Bureau of Economic Analysis, Department of Commerce

Table 2 -- Major Tax Legislation Affecting Personal Taxes, 1990-2003

Omnibus Budget Reconciliation Act of 1990

Omnibus Budget Reconciliation Act of 1993

Taxpayer Relief Act of 1997

Economic Growth and Tax Relief Reconciliation Act of 2001

Jobs and Growth Tax Relief Reconciliation Act of 2003

Table 3 -- Ordinary Least Squares Regression Results

$$T_t = a + b(L) \text{ GAP}_t + c(L) \text{ STOCK}_t + e_t$$

Sample: 1988.1 - 2003.4

a	GAP _{t-2}	GAP _{t-3}	STOCK _{t-4}	STOCK _{t-5}	STOCK _{t-6}	SE	Adj. R ²	DW	AR(1)	Sum b _i	Sum c _i
11.63** (0.05)	-0.331** (0.036)	-0.157** (0.018)	0.0069** (0.0026)	0.0063** (0.0009)	0.0042** (0.0017)	0.315	0.916	0.84		-0.470** (0.054)	0.017** (0.001)
11.59** (0.10)	-0.280** (0.061)	-0.140** (0.031)	0.0057* (0.0025)	0.0068** (0.0011)	0.0049** (0.0017)	0.256	0.944	1.88	0.551** (0.098)	-0.420** (0.092)	0.017** (0.002)

Note: Sum of lag coefficients

Notes: Standard errors in parentheses beneath coefficient estimates.

* significant at the 0.05 level.

** significant at the 0.01 level.

Polynomial distributed lags used for the GAP and STOCK coefficients with far end tied to zero;

GAP was first order, STOCK was second order.

Table 4 -- Regression Results for Broader Specification

$$T_t = a + b(L) \text{ GAP}_t + c(L) \text{ STOCK}_t + d_1(L) \text{ DRATE}_t + d_2(F) \text{ DRATE}_{t+1} + d_3 \text{ NEXIS9496} + e_t$$

Sample: 1988.1 - 2003.4

a	Sum b _i	Sum c _i	Sum d _{1i}	Sum d _{2i}	NEXIS9496	SE	Adj. R ²	DW
11.62** (0.05)	-0.357** (0.047)	0.018** (0.001)	-0.176** (0.051)	0.082** (0.033)	-0.899** (0.141)	0.212	0.965	1.67

Notes:

Standard errors in parentheses beneath coefficient estimates.

* significant at the 0.05 level.

** significant at the 0.01 level.

Polynomial distributed lags used for the GAP, STOCK, and lead and lag DRATE terms.

Table 5 -- Regression Results for First-Difference Specifications

$$DT_t = a + b(L) DGAP_t + c(L) DSTOCK_t + d_1(L) DRATE_t + d_2(F) DRATE_{t-1} + d_3 DNEIXIS9496 + e_t$$

Sample: 1989.4 - 2003.4

a	Sum b _j	Sum c _j	Sum d _{1j}	Sum d _{2j}	DNEIXIS9496	EC	SE	Adj. R ²	DW
0.011 (0.034)	-0.605** (0.196)	0.015** (0.005)	-0.087** (0.027)	0.066 (0.043)	-0.326 (0.202)		0.243	0.427	2.47
0.005 (0.033)	-0.395 (0.221)	0.016** (0.005)	-0.088** (0.027)	0.034 (0.045)	-0.302 (0.197)	-0.092 (0.048)	0.236	0.455	2.51
0.006 (0.033)	-0.323 (0.198)	0.017** (0.004)	-0.088** (0.026)		-0.295 (0.196)	-0.106* (0.045)	0.235	0.460	2.57
-0.023 (0.035)		0.019** (0.005)				-0.128** (0.045)	0.261	0.337	2.43

Notes:

Standard errors in parentheses beneath coefficient estimates.

* significant at the 0.05 level.

** significant at the 0.01 level.

EC is an error correction term for the relationship between the effective tax rate and the stock market deviation.

Chart 1 -- Effective Personal Income Tax Rate, 1988.1 - 2004.1

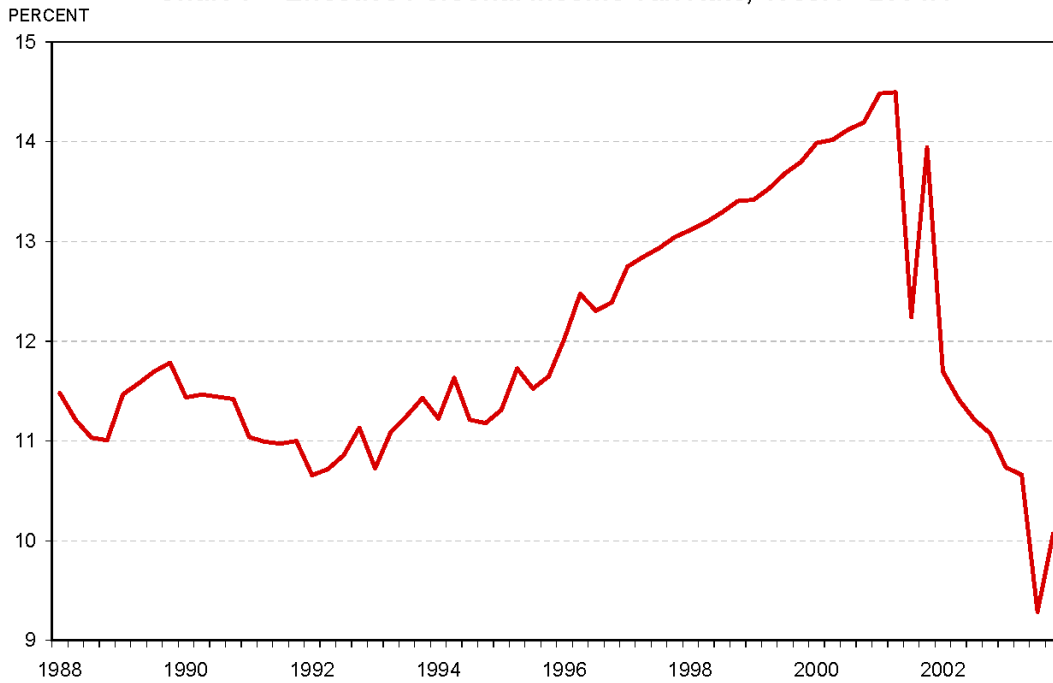


Chart 2 -- Actual and Fixed Policy Effective Personal Tax Rates

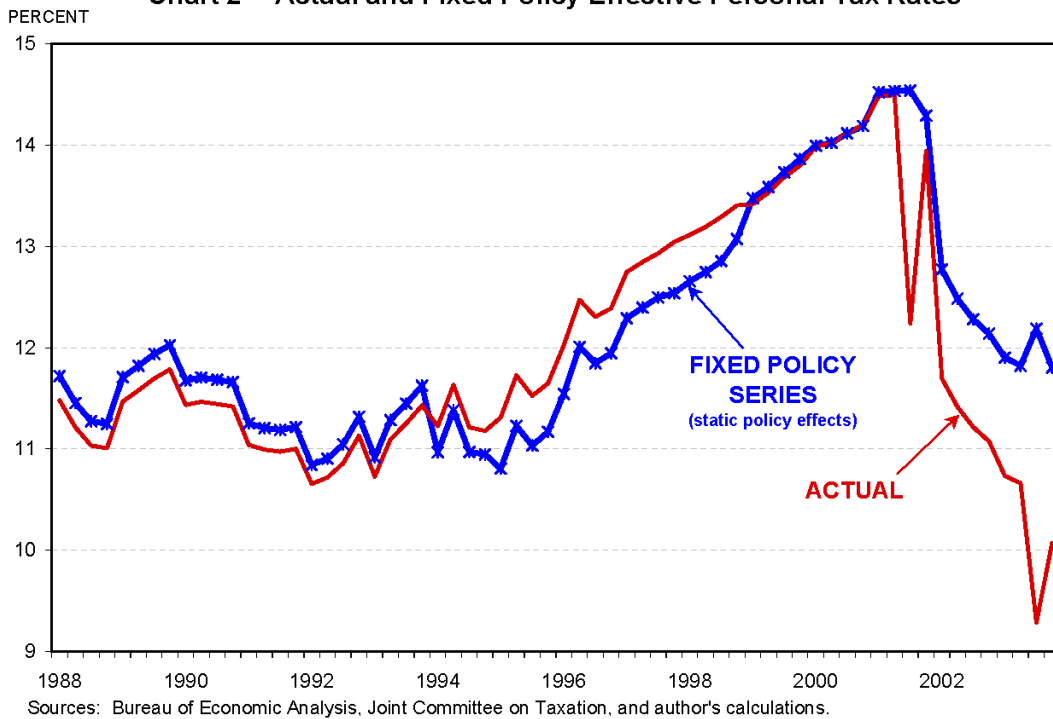


Chart 3 -- Unemployment Rate Deviation From NAIRU

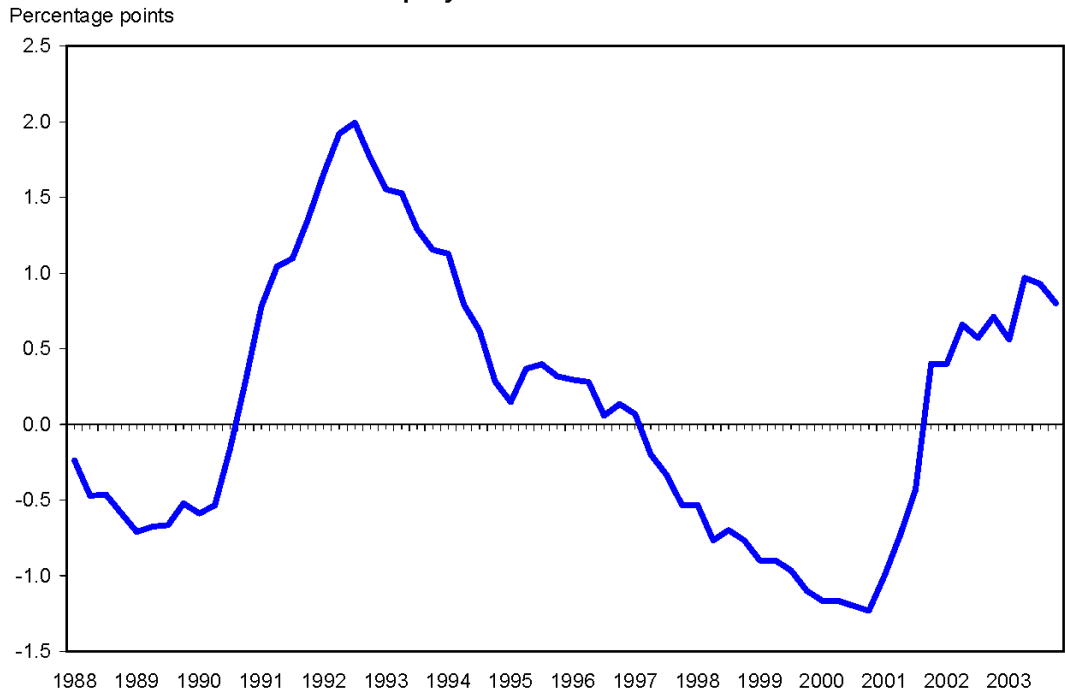


Chart 4 -- Percentage Deviation of Q from Long-Run Average

