MEMORADUM

To: Interested Parties
From: John Dunham
Date: December 13, 2017
RE: Methodology Used in John Dunham & Associates Tax Scoring Model

---

The process used to determine the economic and revenue implications of changes to the tax code is called *scoring*. At the Federal level, tax bills and proposals are scored by the Congressional Budget Office (CBO) and the Joint Tax Committee (JTC) using a process called *static scoring*. Under this process, the CBO and JTC estimate the revenue implications of tax proposals arithmetically based on rate or base changes to an existing base model. In other words, if a proposal calls for an across the board decrease in say personal income tax rates of 25 percent, the static score would reduce forecast revenues by 25 percent.

There has been significant criticism of this process over the years, with most economists and fiscal experts suggesting that a static score is generally much too conservative an approach to forecasting, since it does not take into account market reactions to a tax change. For example, that same 25 percent cut in the PIT would lead to increases in spending and savings on the part of taxpayers, which in turn would effect economic growth, wages, inflation, and other economic forces that, would lead to increases or decreases in tax revenues. In addition, there are certain *cross elasticities* between taxes. A reduction in corporate taxes, for example would lead to a concurrent increase in personal income taxes as the cut would be passed through as both increased wages and payments to investors.

One reason why the Federal government does not use a dynamic scoring approach to forecasting tax revenues is that any dynamic model is entirely dependent on the assumptions used in its construction, and these assumptions are subject to political forces. How, for example, do lower taxes result in higher deficits, and how do these deficits impact interest rates? How do changes in corporate post-tax revenues impact wages? With so many assumptions needed to construct a dynamic model, it becomes easier for bureaucratic agencies to default to the simplest model.

On the other hand, policy groups, private economists and consulting firms are not subject to the types of criticism that staff at the CBO or JCT might find themselves under, and many have developed their own dynamic models. One model that has received a lot of attention during the current debate on Federal tax reform has been the Tax Foundation's Taxes and Growth (TAG) macroeconomic model, which is forecasting a much smaller effect from the current proposals on the Federal deficit than has the official JTC model. The Tax Foundation has even included forecasts of potential job growth resulting from changes in the tax code, suggesting that the Senate plan would result in the creation of roughly 925,000 new full-time equivalent jobs. Other models are more modest in their assumptions. The left leaning Center for Budget and Policy Priorities, for example, has forecast that the Senate bill would add $1.5 trillion to deficits.

The John Dunham & Associates Dynamic Forecasting Model:

At John Dunham & Associates (JDA) we developed a dynamic forecasting model to help determine the economic and fiscal effects of specific flat tax proposals. This model has been updated, recalibrated and expanded to forecast the economic and fiscal effects of the more complicated tax bills now making their way through Congress. As with all models developed by JDA, the basic structure is a micro-economic model that takes into account the interactions between different types of taxpayers, and different industries. This differs from many of the other models being used by different organizations which are developed around macroeconomic forecasting platforms known as Computerized General Equilibrium (or CGE) models. We believe that this provides both a more flexible structure, particularly for forecasting state and industry level effects of a tax proposal. It also allows us to dispense with most of the ore controversial and complicated assumptions needed to run a CGE model, relying instead on the time tested national input-output model structure, which has been used since it was first developed to assist in industrial production planning during the Second World War.

Personal Income Tax Model

The JDA Dynamic Forecasting Model, like all of the models being used, starts with the existing tax and revenue structure which is presented in the US Department of Treasury, Internal Revenue Service, Statistics of Income (SOI) data. These data present a detailed accounting of the Personal Income Tax, the Federal Estate and Gift Tax, and the Corporate Income Tax across income categories for the 2015 tax year. The data are broken out by different detailed income classification (i.e. wages, dividends, income from farms, income from gaming), as well as deductions, and tax payments. They are also produced at the national and individual state level.

The data are converted into excel spreadsheets and simplified to some extent and are calibrated slightly to match reported personal income tax collections and wages from the CBO's most recent budget and economic forecasts. They are then forecast forward to a new base year of 2017 using forecast growth in inflation, interest rates, population, wages, GDP, interest rates (proxied by the yield on the 10-year Treasury Note, and forecast change in the S&P 500 from the CBO reports. The models are adjusted slightly (by modifying the inflation, interest rate, population, and wage changes) in order to match reported personal income tax collections for the 2017 tax year. The base model is then forecast forward through 2027 using the assumed growth rates published by the CBO.

Once the base model is constructed, a static forecast is created for 2018 and each of the out years based on a simplified version of the changes presented in the proposal being analyzed. The data available for the forecasting model simply is not detailed enough to calculate most of the smaller changes that are found in the tax bills (for example changes in income levels for Roth IRA deductions, or changes in small tax deductions). Considering that the revenue implications of the vast majority of these minor tax code provisions is very small considering that the PIT alone generates $1.6 trillion in revenues, they represent only statistical noise in a ten-year tax forecast.

Corporate Tax Model

A similar model is constructed for the Corporate Income tax based on SOI data from the IRS. The total incidence of the Corporate Income tax is broken out based on the SOI data, and values are forecast out from the 2015 data to a 2017 base year. In addition, since the current tax reform proposals all include provisions for the direct expensing of capital expenditures, both a depreciation waterfall and an expensing model were constructed.

The assumed implications of a shift from the current tax system to a territorial based tax code are also included in the model. Under a territorial system, corporate income would be taxed if it was earned in the United States no matter if those earnings were from a domestic or international entity. The difference between the GDP and the GNP was used as a basis for the potential corporate income. Another aspect of the territorial system is the potential for the de-taxing of unremitted profits. While there is no official estimate of the amount of taxable profits being held off-shore, for the purpose of this model, JDA uses an amount of $2.6 trillion based on a report from the Institute on Taxation and Economic Policy. Our model estimates that approximately half of this amount will come back and be taxed and reenter the US economy.

The changes in the tax code are applied to the corporate tax model and a static change is calculated for 2018. This is linked to the result from the PIT model described above for each income category, with changes flowing through by income category based on the tax incidence rates from the 2015 SOI data.

Estate and Gift Tax Model

The IRS provides data on Estate and Gift Tax revenues; however, it does not provide data based on the taxpayers income, but rather the size of the estate. To put these revenues into the Personal Income Tax income categories, JDA created a distribution model using a parabolic function. Estates larger than $5 million in size were assumed to be included in the income taxes of filers with the same level of income as the estate. As with the income tax and corporate tax model small adjustments were made to ensure that the taxes reported collected in the SOI data matched the values reported in the Budget. Thee figures were then forecast to 2017 and beyond based on the number of taxpayers in each income category in the SOI data.

The Dynamic Model Structure

The static tax changes for 2018 are aggregated by each of the 19IRS income category and these are collapsed to the 9 income categories in the IMPLAN input-output model. The implant model is designed to calculate the micro level effects of change in income (either positive or negative) and since all taxes are eventually passed through to people, the assumption that income would either rise or fall with changes in revenues across each tax incidence category is likely sound. The 2016 input-output tables are used in this particular model (as they are the latest available having just come out two weeks ago). The results are inflated to 2018 dollars. Resulting changes in wages (using labor income as a proxy) and GDP (using output as a proxy) are fed through to the 2019 baseline forecasts with the increase in wages over output used to forecast expected additional growth in inflation.

Using this structure, the overall economy grows along with changes in investment, spending, taxes, etc, that would result were the reductions (or increases) in tax payments above (or below) the baseline were to flow through the existing economy. This increased growth will lead to higher tax revenues which are then recorded in the 2019 tax year for reporting purposes. This same process is continued through 2027, with each year's dynamic effects layered over the initial baseline.

Tax Revenue Effects

Changes in tax revenues from the dynamic model are calculated from the initial baseline structure for each of the out years. Over time, due to both wage and economic growth in each of the IRS income categories, there is a tax bracket creep that occurs, particularly in the higher income levels where the brackets are more progressive. This happens because wages grow at a faster rate than inflation, and the brackets are adjusted based on changes in the inflation rate rather than the wage rate. This bracket creep is accounted for in the dynamic revenue structure in that overall tax payments eventually grow beyond the static forecast. When this occurs, the model begins to deduct income from taxpayers in those brackets which helps to ensure that the model is constrained.

Economic Effects

Changes in economic effects are derived from the output of the IMPLAN model.

- Wages are calculated to grow/decline by the CBO estimate plus any additional labor income forecast from each individual model run.
- GDP is forecast to change by the CBO estimate plus any change in economic output forecast from each model.
- Inflation is forecast to change by the CBO estimate plus the additional percentage change in nominal labor income from the model.
- Growth in the S&P 500 is forecast by taking the CBO estimate and adding the inflation adjusted change in nominal GDP.
- All other economic and demographic variables including interest rates and population are expected to grow/decline based solely on CBO estimates.

Job and Wage Implications

One of the benefits of using a microeconomic forecasting model is that changes across business categories are automatically calculated. The IMPLAN economic modeling structure includes data on 536 separate industry categories ranging from farming to steel production, from restaurants to government bureaucracies. Each time the model is run for each projected year the IMPLAN structure calculates not only changes in wages and economic output, but also changes in employment – and all across each of the industry categories. As such the model is automatically calculating the investment and spending implications of the tax cuts (or increases). These job and wage numbers are calculated each year, and represent what would be an annual increase, which would be impacted by each subsequent year's changes. If, for example the model suggests that 1 million new jobs are created by the increased spending and investment in 2018, and the increase is not sustained in the following year, the number of jobs would fall. This means that over the course of the 10 year period, the number of new jobs created actually falls slightly sine in the out-years, the model forecasts that taxes are actually rising for certain income categories due to the bracket creep effects.

In the case of the current House and Senate proposals these differences will be relatively small since the majority of the implications are due to changes at the corporate tax level.

The model is run separately for each state using a state specific input-output structure. These input-output tables, by their very nature, do not take into account trade between states, so if a company uses its increased after tax revenues to purchase a new machine that is manufactured in a different state, the transaction does not show up in the model, This is accounted for using a model that JDA developed to allocate these *lost transactions* to different states based on the current physical location of company facilities producing each of the 536 industrial categories in the IMPLAN structure. So if half of the machines in the above example are produced in Ohio, and the remainder in Massachusetts, 50 percent of the relevant *lost transactions* are allocated to Ohio and 5 percent to Massachusetts. The entire model is then balanced to the IMPLAN results for the United States as a whole.