The Art and Science of Revenue Forecasting

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Humility is in order

• “We really can't forecast all that well and yet we pretend that we can but we really can't.” – Alan Greenspan (The Daily Show, 10/21/2013 – referring to markets)

• “If you have to forecast, forecast often” – Edgar R. Fiedler, former Assistant Secretary Secretary of the Treasury for Economic Policy
Outline

• Introduction

• How and why have forecast errors changed over time?

• How do forecast errors vary across states?

• Why is it so hard to forecast April tax returns?

• What are good forecasting practices?

• What forecasting issues should states worry about over the next few years?
Introduction

• Forecasts ALWAYS will be wrong. Forecasting must be part of larger fiscal management process.

• Tax revenue is much more volatile than economy. Volatile taxes are harder to predict. Volatility has increased over last several decades.

• Corporate tax % forecast errors are largest, followed by PIT, then sales tax

• Further diversification would not reduce error much

• Gov’t forecasters underpredict more than they overpredict. ("Asymmetric costs")

Note: In this ppt: (1) forecast error is actual minus predicted (positive error corresponds with an underestimate), (2) % error is % of actual, (3) “3 major taxes” are PIT, sales, CIT, (4) naïve model is a form of extrapolation ("exponential smoothing"), (5) RIG analysis based primarily on NASBO Fiscal Survey data
% forecast error for sum of 3 major taxes, 1987-2013

Source: NASBO Fall Fiscal Survey, various years
Corporate tax % forecast errors are largest, followed by PIT, then sales tax

Median absolute percentage forecast errors by tax, 1987-2013

Source: Rockefeller Institute analysis of data from NASBO Fall Fiscal Surveys.
Note: Bars show the median, over all states and years, of the absolute value of forecast error as a percentage of actual revenue.
State forecasters have fewer large negative errors, and more small positive errors, than naïve model.
Comments & Reactions?
How have forecast errors changed over time?

• Errors became much larger in and around the 2001 and 2007 recessions

• It wasn’t that forecasters got worse, but circumstances changed. Even “naïve” models had much larger errors.

• Tax revenue became more volatile

• Much of that volatility appears related to capital gains (see later section)
When economy catches a cold, forecasters get the flu – esp. last 2 recessions

Revenue forecasting errors & change in the economy, United States as a whole
Sum of personal income, sales and corporate income taxes

Sources: Rockefeller Institute analysis of data from NASBO and Bureau of Economic Analysis.
Increasing volatility of state tax revenue driven mostly by PIT & CIT. Not much increase in volatility in economy.
Comments & Reactions?
How do forecast errors vary across states?

• CAUTION: MANY reasons why reported errors are larger in some states than others: forecast difficulty, how far ahead forecast was prepared, possible data errors. Comparative data raise questions, do not answer them.

• Most states tend to have positive errors
• Smaller states, resource-rich states tend to have larger errors, as do many states with high forecast difficulty by our measure
• 2nd-year errors in biennial states tend to be larger than 1st-year errors
• States with larger errors appear more likely to have positive errors.
Most states usually have POSITIVE errors

State revenue forecasting % errors, 1987-2013
(Box shows median and 25th and 75th percentiles)
Sum of PIT, sales, and corporate income tax

Source: Rockefeller Institute analysis of NASBO data
Forecast difficulty (error from naïve model) is large for many states with larger errors (prior graph).
Comments & Reactions?
Why are April tax returns so hard to forecast, and so dangerous?

• They reflect “settling up” on last year’s taxable income – the residual between taxes already paid (withholding, estimated payments) and taxes owed on the tax return.

• By December or January, you have pretty good information with which to estimate some parts of what were owed last year – you know a lot about wages, for example, and you have some information that will help estimate interest, dividends, and business income.

• But there is virtually no information available to estimate capital gains.
  • You know how the stock market did
  • You know how much people paid in estimated taxes
  • You have models that try to tie all of this together with the economy
  • But still, those models have huge errors
  • And taxpayers can really alter payments from one year to the next
  • So April returns are extraordinarily uncertain, even in the month before they are due
Capital gains

• Capital gains are not like other income: they reflect a decision to rearrange assets (e.g., sell stock, get cash)
  • Value of assets depends on economy, stock markets, bond markets, etc. – hard enough to predict; markets subject to large swings
  • Decision to sell depends on personal circumstances, investing strategies, current tax rates, expected future tax rates, tax rates on other income, etc. – this behavior is subject to large swings
• Tax payments related to capital gains can be even more volatile
• Net capital gains are only 5.4% of adjusted gross income (2013). About 1 in 6 taxpayers has some capital gains income. But...
• ~60% of capital gains received by 0.2% of taxpayers, with AGI >= $1 million
• Essentially all CG taxed at top rates (unless preferences provided)
• Decisions by relatively few taxpayers can have big impacts on state tax revenue. Much of this appears in April when taxpayers file their tax returns
• Capital gains ranges from 9.3% of AGI in NY to 2.1% in WV (income-tax states)
• Top 5 states with greatest budgetary dependence on capital gains are NY, CA, OR, CT, and MA. Next 5 runners up: MN, MT, NJ, CO, ID. (Rockefeller Institute index that takes into account CG share of AGI, state tax rates on CG, and budgetary dependence on the income tax.)
April returns on prior year’s income are a very big deal.
Comments & Reactions?
Selected good forecasting practices

• Forecast often. Update forecasts close in time to when they will be used, to incorporate latest data.
• Use quantitative methods where data allow
• Incorporate judgment, but do so in formal and structured ways
• Seek additional hard-to-find data (always)
• Seek outside opinions and advice
• Combine forecasts. (NOTE: This is not the same as consensus forecasting. But consider consensus forecasting.)
• Protect forecasts from political manipulation. Openness, outside experts, consensus forecasting, and other approaches can accomplish this.
• Track revenue collections closely during the year. Work with the revenue department.
• Decompose forecast errors – e.g., errors in economic forecast, tax liability forecasts, tax payment forecasts. Use this process to improve modeling.
Comments & Reactions?
Issues to worry about over the next few years -- Discussion
Commercial: Rockefeller Institute pension modeling project

• Public pension fund assets now $3.7 trillion
• ~ 2/3 in equity-like assets
• Analysts often think std deviation of returns ~12% or more
• If returns are normal → ~ 1 in 6 chance of single-year shortfall of ~$450 billion or more; risk grows with time
• Pension plans take this risk but gov’t stakeholders bear the risk (higher taxes, lower infrastructure spending, benefit cuts, …)
• And legislatures have to make these decisions
• Our project is analyzing this risk. We’re interested in speaking with legislative policymakers and staff who want to know more – please feel free to contact us.
• For more, see https://drive.google.com/file/d/0B3CNIsnO8JaHdmFSRmpFYzhDT00/view?usp=sharing. First two pages provide a summary.