Projecting Revenues that Fund Transportation Infrastructure

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All views and estimates presented here are solely those of the author
Budgetary Pressures

• Vehicle miles traveled have plateaued and are below their pre-recession peak
• Fuel economy will continue to improve
• Per unit tax rates generally dampen revenue elasticity
  – Stagnant rates since 1991 in TN
• Political opposition to tax increases of any kind including road user fees
• Federal highway trust fund
  – Uncertainty
  – Likely increased state/local financing obligations
• Costs of construction and maintenance above overall inflation rate
• States still grappling with aftermath of recession
Recent Policy Responses (egs)

• Increase per unit rates on gasoline and/or diesel
  – Wyoming increased gasoline and diesel tax rates from 14 to 24 cents per gallon, first increase since 1998

• General sales tax on consumer fuel purchases
  – Generally combined with per unit levies

• Wholesale ad valorem levies
  – Virginia replaced per unit levies with wholesale rates of 3.5% on gas and 6.0% on diesel. Price floors based on prices on 2/20/13.

• Indexed tax rates
  – Rhode Island will index its 32 cent rate effective July 1, 2015 with a floor of 32 cents
Policy Responses (cont.)

• Broadened base
  – Indiana now includes LNG & CNG in the base using a rate equivalent to its 16 cent diesel rate

• Fees/registrations
  – Pennsylvania doubled license and title fees and enabled a $5 local county option registration fee

• Alternative revenue sources
  – Virginia raised the sales tax and increased the allocation of revenues to transportation funding

• Mixed policy changes
  – Indiana combined its per unit levies with 7% levy based on previous month’s avg price (included in posted price of fuel); ad valorem levy collected at wholesale
Transportation Infrastructure Funding Mechanisms in Tennessee, 2012

- Gasoline tax
  - 47.7 percent of trust fund revenues
- Petroleum special products tax
  - 4.3 percent of revenues
- Motor fuel/diesel
  - 14.8 percent of revenues
- Motor vehicle registration fees
  - 25.7 percent of revenues
- Other
  - 7.5 percent of trust fund revenues
Building Models & Capturing Behavioral Effects: Gasoline and Diesel Taxes

- New policies not embedded in historical data
  - Indexing and tax increases, for example
    - Good news, we *do* know that price elasticities approach zero
  - New CAFÉ standards
    - Affect light vehicle stock and overall efficiency and fuel economy

- Potential consequences of federal tax increase
  - Vertical pressures on state revenues
  - Small price elasticities will minimize behavioral responses
  - Affect political will at the state level?

- Accounting for state and national influences on own-state revenues
  - In-state activity
  - Pass-thru freight and interstate traffic
  - In-state production and transportation for national markets

- To what extent do trends capture regime changes?
  - For example, millennials & movement to cities
  - Incremental changes embedded in history v. shocks
Model Building (cont)

• Must account for policy levers as possible
  – Gas and diesel prices accommodate tax scenarios
  – A VMT tax?

• Need projected drivers to run forecast
  – IHS Global Insight for national projections
  – TN long-term econometric model extended to 2038
  – EIA projections to capture CAFÉ standards
  – EIA, other sources, Delphi method to validate

• Project total revenues by source
  – Allocation of revenues to various funds may change from baseline
Gasoline Tax Equation

• ARIMA with double exponential smoothing
• TN’s gas consumption as a share of U.S.
• TN variables
  – Nominal personal income per capita
  – Nonfarm employment
  – Unemployment rate
  – Selected year and quarter dummies
• U.S. variables
  – Average miles per gallon, light vehicle stock
  – Nominal GDP
  – Average tax inclusive price
  – End use petroleum demand
• De-trend and remove seasonality; stationary data
• RMSE, AIC and BIC used to help with model selection
Diesel Tax Equation

• Same general approach to estimation
• TN variables
  – Population
  – Mfg employment
  – Wholesale trade employment
  – Selected year and quarter dummies
• U.S. variables
  – Avg tax inclusive price
  – Gross business purchases of new vehicles
  – Nominal GDP
  – End use petroleum demand
Motor Vehicle Registrations

• Same general approach
• We do not have detail on registrations for all vehicle types; messy history
• TN Variables
  – Nominal income per capita
  – Nonfarm employment
  – Unemployment rate
  – Selected year and quarter dummies
Motor Vehicle Registration Revenues

- Total Revenues
- Highway Fund Revenues
Gas and Petroleum Special Products Revenues

- Revenues with 5 cent increase
- Revenues with indexed rate (CPI Growth)
- Revenues with indexed rate & 5 cent increase
- Gasoline & Petroleum Revenues

Forecast with price elasticity of -0.1
Motor Vehicle Fuel (Diesel) Revenues

Revenues with 5 cent increase
Revenues with indexed rate (CPI Growth)
Revenues with indexed rate & 5 cent increase
MV Fuel Revenues

Forecast with price elasticity of -0.1
Forecast with price elasticity of -0.1
Forecast with price elasticity of -0.1
Some Lessons

• Rate increases generally enhance yield but do nothing to improve elasticity
• Indexing to CPI produces gas tax revenue growth in excess of historical growth (depending on time period)
• Diesel tax revenues show decent historical growth (CAGR 2.3 %, 1991-2014)
  – Stronger mileage growth
  – Lower fuel economy gains
Lessons (cont.)

• Indexing to CPI produces diesel tax revenue CAGR of 4.4 %, 2015-2025, well above historical growth

• Funding policy run amok?
  – A simple, effective tax made less transparent and more costly to administer and comply with
    • A tax rate that changes monthly?
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Gas and Petroleum Special Products Revenues

ACTUAL CHART; NO ANIMATION

Revenues with 5 cent increase
Revenues with indexed rate (CPI Growth)
Revenues with indexed rate & 5 cent increase
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