B-Tax: An Open Source Model for Calculating Business Taxes

Jason DeBacker
University of South Carolina
Ben Gardner
BYU

OSPC Lab Meetings
July 7, 2016

B-Tax

- B-Tax is an OSPC model for business taxes
- Initially: Computes marginal effective tax rates on investment
    - By tax treatment (corp/noncorp)
    - By asset
    - By production industry
- Potentially: Other business tax analysis, including revenue effects

Marginal Effective Tax Rates

- METRs provides a summary of the incentives to invest provided by tax law
- It's not an average rate
  - It does not include the effect of taxes on old investment
- It's a forward looking measure
  - How do taxes effect new investments?

Marginal Effective Tax Rates

- Two versions of marginal effective tax rates:
    1. *Marginal Effective Tax Rate* (METR): tax on new investment at the business-entity level only
    2. *Marginal Effective Total Tax Rate* (METTR): tax on new investments at both the business entity level and individual level
        - Full burden of taxes on investment
        - Reflects incentives of savers
        - For "pass-through" businesses, METR=METTR
- We'll focus on the METRs, but METTRs and intermediate output are of interest also

Marginal Effective Tax Rates

- The METR is found as the difference between the pre-tax return on investment and the after-tax return, divided by the pre-tax return to investment:

$$METR = \frac{\rho - (r - \pi)}{\rho}$$

  - $\rho =$ before tax return investment must earn
  - $r =$ nominal discount rate of the business
  - $\pi =$ inflation rate

Before Tax Returns

- The before-tax return to the firm is given as:

$$\rho = \frac{(r - \pi + \delta)}{1 - u}(1 - uz) - \delta$$

  - $\delta =$ economic rate of depreciation
  - $u =$ statutory tax rate on business entity level income
  - $z =$ NPV of depreciation deductions

- Assumption: we are considering marginal investments, so pre-tax return must just offset costs, including those from taxes

- $\implies \rho =$ pre-tax return $=$ cost of capital

Marginal Effective Total Tax Rates

- The METTR is given as:

$$METTR = \frac{\rho - s}{\rho}$$

  - $s =$ the real, after-tax return to savers
- The return to savers accounts for individual level taxes on capital income: interest, dividends, capital gains
- The METTR gives the full distortions of the tax system on new investment
- We assume the "old view" of dividend taxes, where such taxes do affect incentives to invest

Parameter	Source	Vary by asset	Vary by industry	Vary by tax treatment
π	CBO, user input	No	No	No
i	CBO, user input	No	No	No
E_c	Fin Accts	No	No	N/A - only for corp
u_j	IRC, user input	No	No	Yes
$w_{i,m,j}$	User input	Maybe	Maybe	Maybe
$z_i(y)$	IRC, user input	Yes	No	No
δ_i	BEA	Yes	No	No
$f_{m,j}$	Fin Accts + SOI	No	Yes	Yes
$\alpha_{d,ft,j}$	Fin Accts + SOI	No	No	Yes
$\alpha_{d,td,j}$	Fin Accts + SOI	No	No	Yes
$\alpha_{d,nt,j}$	Fin Accts + SOI	No	No	Yes
$\alpha_{e,ft,j}$	Fin Accts + SOI	No	No	Yes
$\alpha_{e,td,j}$	Fin Accts + SOI	No	No	Yes
$\alpha_{e,nt,j}$	Fin Accts + SOI	No	No	Yes
m_c	Fin Accts + SOI	No	No	N/A - only for corp
$\tau_{div,j}$	Tax Calculator	No	No	Yes
$\tau_{int,j}$	Tax Calculator	No	No	Yes
τ_{scg}	Tax Calculator	No	No	N/A - only for corp
τ_{lcg}	Tax Calculator	No	No	N/A - only for corp
$\tau_{td,j}$	Tax Calculator	No	No	Yes

Computing METRs by industry

First, calculate the weighted average cost of capital:

$$\rho_{m,j} = \frac{\sum_{i=1}^{I} \widetilde{FA}_{i,m,j} \rho_{i,j}}{\sum_{i=1}^{I} \widetilde{FA}_{i,m,j}},$$

Second, use the industry-level cost of capital to find the industry-level METR:

$$METR_{m,j} = \frac{\rho_{m,j} - (r_{m,j} - \pi)}{\rho_{m,j}},$$

User Defined Parameters

Policy parameters and macroeconomic assumptions can be defined by user:

- Policy parameters:
    - Entity level income tax rate (u)
    - Tax depreciation schedules (z)
    - Interest deductibility
    - Allowance for corporate equity
    - Individual-level taxes (through `Tax Calculator` integration)
- Macroeconomic parameters:
    - Nominal interest rate
    - Rate of return on equity
    - Inflation rate

Web Form Mock-up

Business Income Tax Rates:

Top corporate rate	0.35
Tax pass-throughs at entity level	☐ yes
Rate on pass-throughs	0

Depreciation:

Asset class	Asset Life	GDS or ADS	Full Expensing?	Tax=Economic?
3-year property	3	☐GDS ☐ ADS	☐ yes	☐yes
5-year property	5	☐GDS ☐ ADS	☐ yes	☐yes
7-year property	7	☐GDS ☐ADS	☐yes	☐yes
10-year property	10	☐GDS ☐ADS	☐yes	☐yes
15-year property	15	☐GDS ☐ADS	☐yes	☐yes
20-year property	20	☐GDS ☐ADS	☐yes	☐yes
25-year property	25	☐GDS ☐ADS	☐yes	☐yes

Other:

Haircut to interest deduction	0
Allowance for corporate equity	☐yes

Macroeconomic variables:

Nominal interest rate	0.055
Inflation rate	0.018

CALIBRATION

- To compute the cost of capital, we need to put values on a number of parameters
- We generally follow the CBO's methodology
- Data sources include:
  - BEA capital stock
    - Detailed fixed asset data
    - Inventories
    - Land
  - SOI tabulations by business entity type
  - United States Financial Accounts data
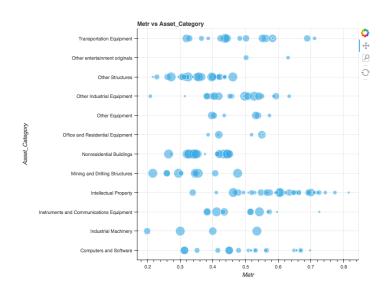 - A few misc other sources (e.g. for farms)

Stocks vs Flows

- The BEA reports detailed investment flows by asset type and industry
- We chose to use data on the stock of assets
- It's an open question:
  - Investment series may reflect more recent mix of assets
  - Investment may be more noisy, overweights short-term assets
- Key assumptions:
  1. The mix of asset types doesn't change in future
  2. The mix of asset types does not respond to changes in taxes

How the Data Sources Interact

- BEA and SOI
  - BEA gives capital stock by type of asset and production industry
  - SOI data on depreciable assets allow us to attribute these stocks across tax treatment
    - **Assumption** is that the mix of asset types is the same across tax-treatment within a given production industry
- Financial Accounts and SOI
  - Financial Accounts give debt and equity by corporate/non-corporate
  - SOI data on interest paid and equity allow us to attribute these stocks across tax-treatment and industry
    - **Assumption** is that stocks of debt proportional to interest paid and stock of equity proportional to that reported on Schedule L, across industry and tax treatment

Baseline METRs

Metr vs Asset_Category

Illustrative Example

Consider a corporate reform example where:

1. Slow depreciation deductions
   - Switch to Alternative Depreciation System (ADS) for all depreciable assets

Illustrative Example

Table: Corporate METRs After Switch to ADS

Asset Category	Baseline	ADS	Δ
Computers and Software	0.61	0.73	0.11
Industrial Machinery	0.45	0.63	0.18
Instruments and Communications Equipment	0.58	0.66	0.07
Intellectual Property	0.68	0.72	0.03
Mining and Drilling Structures	0.38	0.45	0.07
Nonresidential Buildings	0.42	0.44	0.01
Office and Residential Equipment	0.54	0.64	0.10
Other entertainment originals	0.63	0.63	0.00
Other Equipment	0.55	0.66	0.11
Other Industrial Equipment	0.54	0.62	0.08
Other Structures	0.40	0.42	0.02
Transportation Equipment	0.57	0.63	0.06

Illustrative Example

Table: Corporate METRs After Switch to ADS

NAICS	Baseline	ADS	Δ
11	0.31	0.55	0.23
21	0.29	0.55	0.25
22	0.22	0.46	0.24
23	0.35	0.60	0.25
31-33	0.34	0.60	0.26
42	0.32	0.59	0.27
44-45	0.28	0.51	0.23
48-49	0.25	0.51	0.26
51	0.34	0.57	0.23
52	0.33	0.58	0.25
53	0.33	0.58	0.25
54	0.42	0.64	0.22
55	0.26	0.55	0.29
56	0.31	0.59	0.28
61	0.25	0.48	0.22
62	0.28	0.51	0.24
71	0.31	0.53	0.22
72	0.26	0.51	0.25
81	0.27	0.49	0.22

Where we are

- Still a work in progress:
  - Calibration of financing parameters to be completed
  - Land and inventories to be added to fixed assets
  - Development of webapp
  - Integration with `Tax Calculator`

Questions/Comments?

- We'd particularly like to hear about:
  - Levers in webapp
  - Best default output to present?
    - METR vs METTR?
    - Cost of capital?
    - Deprec rates?
    - By asset vs by industry?
- Anything else?

Want to contribute to B-Tax?

- We'd love your help!
- https://github.com/open-source-economics/B-Tax