Guide to Calibration of Financial Policy Cost Function Parameters in the OLG Dynamic Scoring Model

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Abstract

This will be the section in the dynamic scoring model handbook on calibrating the parameters affecting financial policy.

1 Calibrating the Financial Policy Parameters

Financial policy affects the firm's cost of capital, and thus marginal effective tax rate (METR) through its affect on the firm's nominal discount rate, $r_{C,m}$:

$$r_{C,m} = f_{C,m}\left[i(1-u_C)\right] + (1-f_{C,m})(E_{C,m}+\pi), \tag{1.1}$$

where $f_{C,m}$ is the fraction of investment financed by debt, i is the nominal market interest rate, u_C is the statutory tax rate at the business entity level, and E_C is the required real rate of return on firm equity (i.e., the rate savers could earn if they owned shares in other firms). The subscripts denote tax treatment, $C \in \{\text{Corporate}, \text{Noncorporate}\}$, and production industry, $m \in \{1, 2, ..., M\}$.

This guide explains the calibration of the $f_{C,m}$ parameters. Note that $u_{C,m}$, i, π and $E_{C,m}$ will be taken as given.

Note that our treatment of sector will correspond to the tax-treatment of the business entity. Therefore, we consider subchapter S corporations as non-corporate since they do not remit an entity level tax. See Table **??** for this breakdown. Note that these definitions are in contrast to the methodology used by BEA, where both subchapter C and subchapter S corporations fall into the "corporate" sector and partnership and proprietorships fall under the non-corporate grouping.

Table 1: Legal Form of Organization vs. Tax Treatment

Entity	Legal Form of Organization	Tax Treatment
C Corporation	Corporate	Corporate
S Corporation	Corporate	Non-corporate
Partnership	Non-corporate	n.a.
Share of partnership income attributable to corporate partners	n.a	Corporate
Share of partnership income attributable to individual partners	n.a.	Non-corporate
Sole Proprietorship	Non-corporate	Non-corporate

2 Measuring Debt by Industry

We measure total debt from the Financial Accounts of the United States. In particular, we use the following tables to capture debt, which we measure separately for corporate financial and nonfinancial businesss, noncorporate business, and household mortgage debt:

- B.100: Value of owner-occupied houses;
- L.102: Liabilities of nonfarm nonfinancial corporations, by type of instrument;
- L.103: Liabilities of nonfarm noncorporate business, by type of instrument;
- L.104: Liabilities of farm businesses, by type of instrument;
- L.208: Commercial paper outstanding (financial corporations);
- L.210: Agency- and GSE- (government-sponsored enterprise) backed securities outstanding (financial corporations);
- L.212: Corporate bonds outstanding (financial corporations);
- L.213: Corporate equity outstanding, by sector (nonfinancial, financial);
- L.215: Bank loans (n.e.c., not elsewhere classified) outstanding (financial corporations);
- L.216: Other loans and advances outstanding (financial corporations);
- L.217: Total mortgages (financial corporations);
- L.218: Home mortgages (households); and
- L.228: Proprietors? equity in noncorporate business, by sector (farm, nonfarm).

To allocate debt across tax treatment, we use SOI Tax Stats Data (see the Depreciation Calibration Guide for details on the specific files to use). The Financial Account Data combine both S corporations and C corporations in the "corporation" definition. We thus use SOI data to identify the portion of debt and equity attributable to S corporations. Debt is assigned in proportion to interest deductions. Equity is assigned in proportion to the sum of capital stock, additional paid-in capital, and retained earnings minus treasury stock. The resulting S corporation amounts were subtracted from corporate totals (leaving the amount for C corporations) and added to noncorporate businesses. We do the same to allocate the noncorporate across sole proprietorships and partnerships. We further allocate the amount of debt and equity attributable to corporate partnerships using a similar method.

Specifically, we make the following calculations:

Let $debt_{corp}$ be the total amount of nonfinancial corporate debt reported in the Financial Accounts of the Untied States Table L.102. We then allocate this total across S-corporations and C-corporations and industry m as follows:

$$debt_{C,m} = debt_{corp} \frac{INTRST\_PD_{C,m}}{\sum_{C \in s,c} \sum_{m=1}^{M} INTRST\_PD_{C,m}} \tag{2.1}$$

Similarly, for equity. Let $X = CAP\_STCK + PD\_CAP\_SRPLS + RTND\_ERNGS\_APPR + COMP\_RTND\_ERNGS_UNAPPR - CST\_TRSRY\_STCK$ and $equity_{corp}$ be total non-financial corporate equity from the Financial Accounts of the United States Table L.213. We have:

$$equity_{C,m} = equity_{corp} \frac{X_{C,m}}{\sum_{C \in s,c} \sum_{m=1}^{M} X_{C,m}} \tag{2.2}$$

We then have calculate $f_{C,m} = \frac{debt_{C,m}}{equity_{C,m} + debt_{C,m}}$.

For the corporate financial services industry, we use the the debt and equity totals directly from Tables L.104, L.208, L.210, and L.212 (for debt) and Table L.213 (for equity).

For non-corporate debt, we can divide between partnerships and sole props by industry using

$$debt_{NC,m} = debt_{noncorp} \frac{INTRST\_PD_{NC,m}}{\sum_{NC \in p,sp} \sum_{m=1}^{M} INTRST\_PD_{NC,m}} \tag{2.3}$$

Not quite sure how to separate equity. We can see partners capital accounts for partnerships, but for sole props we don't have a good measure of the equity of proprietors. Let's just allocate across industry in the same way for each. And since we don't really need to separate partnership and sole prop equity (we'll just care about "non-corporate").

2.1 Owner-Occupied Housing

Financial Accounts Data: B B.100: Value of owner-occupied houses; B L.218: Home mortgages (households)

For purposes of an analysis of effective tax rates, home- owner debt consists entirely of home mortgages?$5,909.5 billion, according to the Flow of Funds report. The total value of owner-occupied housing was $13,701.4 billion, and the average share financed by debt was 43.1 percent. As with the corporate and noncorporate sectors, CBO assumed that the marginal investment in owner- occupied housing, fh, is funded with the same share of debt.

Of course, individual homeowners typically have their highest debt share at the time of purchase. The share of debt is gradually reduced as the mortgage is paid off and as the home appreciates in value. Refinancing interrupts the process, but the trend is still toward a lower share of debt over time. The methodology of effective tax rates, how- ever, is concerned with the debt share over the life of an investment, not with the vari- ation within those years. From that perspective, the average share of debt among all homeowners is a better guide to the debt share of a marginal investment than is the debt share at the time a home is purchased.

3 Measuring New Equity Issues by Industry

To measure equity outstanding, we use the Financial Accounts of the United States, Table L.213: Corporate equity outstanding, by sector (nonfinancial, financial) and Table L.228: Proprietors? equity in noncorporate business, by sector (farm, nonfarm).

We should confirm that we can't find equity by industry. The Census' Quarterly Financial Reports. The has industry breaktouts and include balance sheet data. If totals don't match the Financial Accounts data, we can use an adjustment to hit.

We then allocate this equity across industry (if we don't get it from the QFR data) and tax treatment using the distribution of capital across industry and tax treatment. The assumption here is that the equity/capital ratio is the same (within industry) across corporate and non-corporate.

4 A Note on Industry Classifications

For our computational model, we would like to model the industries outlined in Table **??**. These are mostly at the 2-digit NAICS classification level, with some exceptions for industries that may face special tax treatment. The data sources do not all share the same level of industry detail. For example, the BEA Detailed Fixed Asset Tables report fixed assets by asset type and by industry, where industry categories are generally at the 3-digit NAICS level. IRS data is generally reported at the 2-digit NAICS level, with some items being available at finer levels of aggregation and others at more coarse levels. BEA's Standard Fixed Asset Tables report fixed asset by industry, but only at a very coarse level.

Table 2: Production Industries

#	NAICS Code	Industry
1	11	Agriculture, Forestry, Fishing and Hunting
2	211	Oil and Gas Extraction
3	212 and 213	Mining and Support Activities for Mining
4	22	Utilities
5	23	Construction
6	32411	Petroleum Refineries
7	336	Transportation Equipment Manufacturing
8	3391	Medical Equipment and Supplies Manufacturing
9	Other codes in 31-33	Manufacturing
10	42	Wholesale Trade
11	44-45	Retail Trade
12	48-49	Transportation and Warehousing
13	51	Information
14	52	Finance and Insurance
15	53	Real Estate and Rental and Leasing
16	54	Professional, Scientific, and Technical Services
17	55	Management of Companies and Enterprises
18	56	Administrative and Support and Waste Management and Remediation Services
19	61	Educational Services
20	62	Health Care and Social Assistance
21	71	Arts, Entertainment, and Recreation
22	72	Accommodation and Food Services
23	81	Other Services (except Public Administration)
24	92	Public Administration

When moving across these data sources, we try to retain the finest level of detail with regard to industry classification. In cases where we cannot, we apply the most detailed industry information we can across the sub-classifications. However, to maintain notational consistency, we refer to the industry with the subscript m, even if the industry category level differs.