Calculation of Capital Costs

Simcha Barkai

$$RK = \sum_s R_s P_s K_s \tag{1}$$

$$R_s = \underbrace{\left(\left(\frac{D}{D+E} i^D (1-\tau) + \frac{E}{D+E} i^E\right) - \mathbb{E}(\pi_s) + \delta_s\right)}_{\text{Weighted average cost of capital}} \frac{1 - z_s \tau}{1 - \tau} \tag{2}$$

Data for the U.S. non-financial corporate sector

- s capital types. 3 NIPA asset types: non-residential structures, equipment, and intellectual property products.
- $P_s K_s$ nominal value of capital stock. Table 4.1. Current-Cost Net Stock of Private Non-residential Fixed Assets by Industry Group and Legal Form of Organization, 1925-2018, https://apps.bea.gov/iTable/iTable.cfm?ReqID=10&step=2
- D market value of debt. Data on market values are taken from the Integrated Macroeconomic Accounts for the United States Table S.5.a https://apps.bea.gov/itable/itable.cfm?reqid=14&step=1, 1960-2018
  - Bonds is the sum of lines 132 and 133
  - Commercial Paper is line 131
  - Loans is line 134
- i^D debt cost of capital. Combine data on rates and market values of bonds, commercial paper, and loans. The debt cost of capital is computed as the weighted average of

- the (annual) yield on Moody's Aaa (Bonds), https://fred.stlouisfed.org/series/AAA#0, 1919-2019
- the 3-Month AA Nonfinancial Commercial Paper Rate (Commercial Paper), https://fred.stlouisfed.org/series/CPN3M#0, 1997-2019 and
- the rate for commercial and industrial loans made by all commercial banks (Loans), Survey of Terms of Business Lending - Table E.2 - line 1 column 1=Weighted-average effective loan rate (percent) https://www.federalreserve.gov/releases/E2/default.htm, 1997Q2-2017Q2 (or https://fred.stlouisfed.org/series/EEANQ same quarterly data but with option to download annual data).

The weights are proportional to the market values.

- E market value of equity. Line 145, Integrated Macroeconomic Accounts for the United States Table S.5.a https://apps.bea.gov/itable/itable.cfm?reqid=14&step=1, 1960-2018.
- i^E equity cost of capital. Approximate the equity cost of capital as the sum of the yield on the 10-year U.S. treasury (https://fred.stlouisfed.org/series/DGS10, 1962-2019) and a constant 5% equity risk premium.
- τ corporate income tax rate. Corporate income tax rate - shows the basic central government statutory (flat or top marginal) corporate income tax rate. OECD Tax Database: Statutory corporate income tax rates, 2000-2019, https://www.oecd.org/tax/tax-policy/tax-database/
- π_s inflation rate of capital of type s. Table 1.1.7. Percent Change From Preceding Period in Prices for Gross Domestic Product, 1930-2018, Lines 10, 11, and 12, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=11#reqid=19&step=3&isuri=1&1921=survey&1903=11
- δ_s depreciation rate of capital of type s. For private non-residential structures and equipment and private intellectual property products https://bea.gov/national/pdf/BEA_depreciation_

rates.pdf. Depreciation rates are disaggregated to assets within these 3 categories of capital. OR https://apps.bea.gov/national/FA2004/Details/Index.htm and then go to Nonresidential Detailed Estimates (Implied rate of depreciation, 1947-2018)

- z_s net present value of depreciation allowances for capital of type s. A capital allowance is the percentage of total investment that a business can recover through the tax code via depreciation. Tax Foundation:
  - Net Present Value of Capital Allowances, OECD, 2019, Table 1, Data for machinery, buildings and intangibles https://taxfoundation.org/capital-cost-recovery-across-the-oecd-2019/
  - Net Present Value of Capital Allowances, OECD, 2018, Table 1 https://taxfoundation.org/capital-cost-recovery-across-oecd-2018/
  - OECD Capital Allowances, Three Assets (Industrial Buildings, Machines, or Intangibles), 1979-2012, https://taxfoundation.org/oecd-capital-allowances-three-assets-1979-2012/#ind

Nonresidential structures consists of new construction—including own-account construction; improvements to existing structures; expenditures on new mobile structures; expenditures on mining exploration, shafts, and wells; brokers' commissions on sales of structures; and net purchases of used structures by private businesses and by nonprofit institutions from government agencies. In addition, it includes equipment that is considered to be an integral part of the structure (such as plumbing, heating, and electrical systems).

Nonresidential equipment consists of purchases by private businesses and by nonprofit institutions of new equipment (such as machinery, furniture, and motor vehicles) that meets the above definition of a fixed asset. It also includes dealers' margins on sales of used equipment to businesses and to nonprofit institutions; net purchases of used equipment from government agencies, from persons, and from the rest of the world; and own-account production of equipment. It is measured net of the value of worn out equipment sold for scrap.

Nonresidential intellectual property products consists of purchases and ownaccount production of software, of research and development (R&D), and of entertainment, literary, and

artistic originals. R&D includes depreciation on other fixed assets used to produce R&D. Entertainment originals includes theatrical movies, longlived television programs, books, music, and other artistic originals that are used to produce copies for the public.