

Depreciation of Business R&D Capital

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R&D depreciation rates are critical to calculating the rates of return to R&D investments and capital service costs, which are important for capitalizing R&D investments in the national income and product accounts and harmonizing BEA statistics with those of the productivity program of BLS. Although important, measuring R&D depreciation rates is extremely difficult because both the price and output of R&D capital are generally unobservable. To resolve these difficulties, economists have adopted various approaches to estimate industry-specific R&D depreciation rates, but the differences in their results cannot easily be reconciled. In addition, they many of their calculations rely on unverifiable assumptions.

Unlike tangible capital which depreciates due to physical decay or wear and tear, business R&D capital depreciates because its contribution to a firm's profit declines over time. Based on this understanding, I develop an R&D investment model with a gestation lag to derive both constant and time-varying industry-specific R&D depreciation rates for ten R&D intensive industries that are identified in BEA's R&D Satellite Account. I used two data sources, Compustat SIC based database and BEA-NSF NAICS based database, to perform model calculations. The data cover the period from 1989 to 2008. The results align with major conclusions from existing studies that R&D depreciation rates should be higher than the traditional assumption, 15% and vary across industries. Moreover, each industry's time-varying R&D depreciation rates exhibit its depreciation pattern that further enhances our understanding about the dynamics of technological competition across industries. Lastly, this paper is the first to present the comparison between our model estimates and the R&D depreciation rates derived from the new and most comprehensive survey on the service lives of R&D assets conducted by BEA, Census Bureau, and NSF.