

Depreciation of Business R&D Capital

Topic: Organized session: The Measurement of Intangible 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 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, many of their calculations rely on unverifiable or oversimplified assumptions. As of now, measuring R&D depreciation rates remains an unresolved problem.

To incorporate the effect of industries' technological and competition environments, as well as gestation lags, I develop an R&D investment model to derive industry-specific R&D depreciation rates for four R&D intensive industries, the pharmaceutical industry, the IT hardware industry, the semiconductor industry, and the software industry. Based on Compustat company-based dataset, the model has produced results that not only align with recent research results that R&D depreciation rates should be greater than 15% but also indicate the dynamic technological changes across industries. The data cover the period from 1989 to 2008. The constant industry-specific R&D depreciation rates are: 11.82 ± 0.73 % for the pharmaceutical industry, 37.64 ± 1.00 % for the IT hardware industry, 17.95 ± 1.78 % for the semiconductor industry, and 30.17 ± 1.89 % for the software industry. The industry rankings of these R&D depreciation rates are consistent with the conclusions in most recent literature. Time-varying industry-specific R&D depreciation rates are also presented in this paper, and they further enhance our understanding about the dynamics of technological change and competition across industries.