Investment and capital services
Two improvements for the 2018 comprehensive update:

• Incorporate capital services into the estimates of own-account investment in software and R&D

• Re-classify software R&D from software investment to R&D investment
Own account software and R&D

• Own-account investment is performed by a business in-house for its own use
  – A portion of software, R&D, entertainment originals, and construction investment is own-account

• BEA estimates investment in own-account R&D and software using a “sum of costs” approach
  – Production costs include compensation, intermediate expenses, depreciation
  – BEA’s estimates currently exclude an estimate of “capital services”
Private own-account investment in software and R&D
Capital services and the SNA

• Capital services measure the flow of production coming from the stock of fixed assets
  — Depreciation
  — Net return

• The 2008 SNA recommends including the value of capital services when estimating output for own final use
  — A3.41 ...when estimating the value of the output of goods and services produced by households and corporations for own final use, it is appropriate to include a return to capital as part of the sum of costs when this approach is used for estimating output in the absence of comparable market prices.
Measuring capital services

• Capital services (from Christensen and Jorgenson, 1969):
  \[ S_{a,i,t} = q_{a,i,t} \times K_{a,i,t-1} \]
  
  – \( S_{a,i,t} \) is the capital service flow of an asset
  – \( q_{a,i,t} \) is the capital service price of an asset
  – \( K_{a,i,t-1} \) is the real net stock of an asset (from the fixed assets accounts or FAAs)
  – Estimated for asset \( a \), industry \( i \), time \( t \)

• The capital service price or rental price \((q)\) of a capital asset equals the discounted flow of services
  \[ q_{a,i,t} = p_{a,i,t-1} r_{i,t} + p_{a,i,t} \delta_a - (p_{a,i,t} - p_{a,i,t-1}) \]
  
  – \( p_{a,i,t} \) is the price of an new asset (from the NIPAs)
  – \( r_{i,t} \) is the rate of return
  – \( \delta_a \) is the depreciation rate (from the FAAs)
Measuring rates of return

• Option 1: Internal rates of return:

\[ r_{i,t} = \frac{N_{i,t}}{K_{eq+st+ipp,i,t}} \]

– \( r_{i,t} \) is the rate of return of industry \( i \) at time \( t \)
– \( N_{i,t} \) is the net operating surplus of industry \( i \), at time \( t \)
– \( K_{i,t} \) is the current cost stock of fixed assets (equipment, structures, intellectual property) for industry \( i \), at time \( t \)
– Additional adjustments added for the effects of taxes, self-employed income etc.

• Option 2: External rates of return, obtained from BLS productivity accounts
Internal and external rates of return: NAICS 5415

Source: BLS
Proposed method for incorporating capital services

- Continue to estimate own-account investment as the sum of costs
- Replace depreciation with estimates of capital services
- Detailed estimates performed in benchmark years
Summary: capital services

• The addition of capital services to own account investment will...

  – Improve consistency with international standards
  – Provide more complete estimates of the opportunity cost of own account investment
  – Provide improved measures of sources of economic growth and productivity
  – Contribute to the literature on measuring own-account investment and intangibles
Re-classify software R&D

- Own-account software currently includes the development of software originals, which is similar in concept to own-account software R&D

- Proposed new approach
  - Re-classify software R&D from software to R&D
  - New approach is conceptually appealing and will lead to more consistent estimates of R&D spending from BEA and NSF
  - Reconcile NSF-based software R&D with software originals reflected in own-account software