STATISTICS DENMARK

Capital Stocks and Consumption of Fixed Capital

Christian Gysting, February 2021

Overview

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- Statistics Denmark use 2 different methods for compiling capital stocks and consumption of fixed capital
  - Perpetual Inventory Method (PIM)
    - Non-residential buildings, Other structures, Machinery and equipment, R&D, Software and others
  - Direct measurement
    - Dwellings and Transport equipment
  - Both methods has Capital Stocks and Consumption of Fixed Capital as output

PIM - introduction

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- Perpetual Inventory Method (PIM)
  - Most widely used approach towards measuring stocks and flows of fixed asset
  - Based on the simple idea that a given point in time the Capital Stock consist of past investments corrected for retirement and efficiency loss (and price changes)
  - The OECD manual “Measuring Capital” from 2009 is the main guide for calculating capital stocks
  - Requires one to make a number of assumptions, such as geometric or linear deprecation and assumptions on retirement pattern

PIM

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- Statistics Denmark's approach
  - Compile Capital Stocks and Consumptions of Fixed Capital by using PIM with the geometric deprecation pattern
    - Advantage: Easy to compile compared to other PIM-approaches, common used, recommended by the OECD
    - Disadvantage: No direct estimate of the Gross Stock, assumption of year of discard/scrapping
  - Compilation at the level of type of asset, industry and product
    - Subsequent subdivision by sectors

PIM – Basic equations

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- Basic equation behind the Danish capital stock compilation
  - At constant prices, the net stock is compiled by using the following equation:
    N(t,e) = N(t,b) + GFCF(t) – CFC(t)
  - At constant prices, consumption of fixed capital is compiled by using the following equation: **CFC(t) = [N(t,b) + ½*GFCF(t)] * (DBR / SL)**
  - Variables:
    - **N(t,b):** net stock at the beginning of the period *t*
    - **N(t,e):** net stock at the end of the period *t*
    - **GFCF(t):** Gross Fixed Capital Formation, period *t*
    - **CFC(t):** Consumption of fixed capital, period *t*
    - **DBR:** Declining balance rate
    - **SL:** Service life
  - Other changes in volume is omitted

– It becomes much more complicated when different products and price changes are included in the calculations

PIM – Simplified example at constant prices

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GFCF	1000						
DBR	2						
SL	10						
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**
Net(t,b)	0,0	900,0	720,0	576,0	460,8	368,6	294,9
GFCF	1000,0	0,0	0,0	0,0	0,0	0,0	0,0
CFC	100,0	180,0	144,0	115,2	92,2	73,7	59,0
Net(t,e)	900,0	720,0	576,0	460,8	368,6	294,9	235,9
CFC(t) = [N(t,b) + ½*GFCF(t)] * (DBR / SL)			Net(t,e) = Net(t,b) + GFCF(t) - CFC(t)			Constant prices:	
CFC(1) = [0 + 0,5*1000] * (2 / 10) = 100			Net(1,e) = 0 + 1000 - 100 = 900			Net(2,b) = Net(2,e) = 900	
CFC(2) = [900 + 0,5*0] * (2 / 10) = 180			Net(2,e) = 900 + 0 - 180 = 720				

PIM compilation in practice

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- PIM is compiled at level of assets, products and industries for each vintage
- Capital Stock time series start at year 1966
- Break downs by asset/industry or asset/sector are published

Type of assets	Number of products
Non-residential buildings	2
Other structures	3
Machinery and equipment	
Telecommunication	6
Computer hardware	15
Other machinery	346
Research and develpment	6
Software	2

PIM compilation in practice

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- Requirements
  - GFCF figures available at the level of assets, products and industries
  - GFCF figures available at constant prices (previous year's prices)
  - Long time series with GFCF or a initial benchmark
  - Assumptions on service lives (SL)
  - Assumptions on declining balance rates (DBR)
  - Assumptions on year of discard/scrapping
    - When a capital good reach 2,5 per cent of its initial value it will be discarded

Average service lives

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2017, Average service lives	years
Dwellings	
New and capital repair	75,0
Costs of ownership transfer	30,0
Non-residential buildings	56,6
Other Structures	39,9
Other Machinery	14,3
R&D	9,6
Software	5,0

Price change and revaluation

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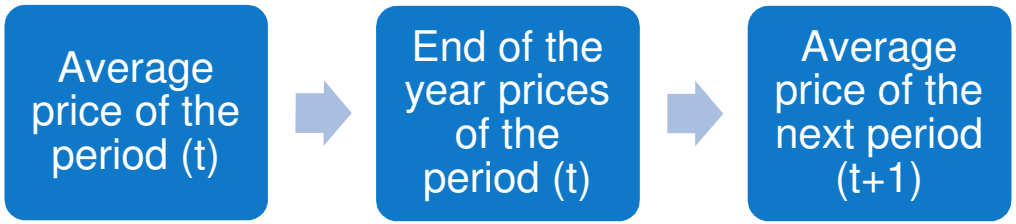
- Figures needs to be compiled at current prices as well as constant prices
  - Figures for the Gross stock and the Net stock are revalued by using suitable price indices
  - Revaluations are compiled at a most detailed level as possible, if possible by product, industry and type of asset



Other changes in volume

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- Other changes in volume of assets records changes that is not due to transactions in assets
  - Examples: Catastrophic losses, Uncompensated seizures, changes in classifications
  - Occurs rarely, unusually severe natural disasters with major damage

PIM

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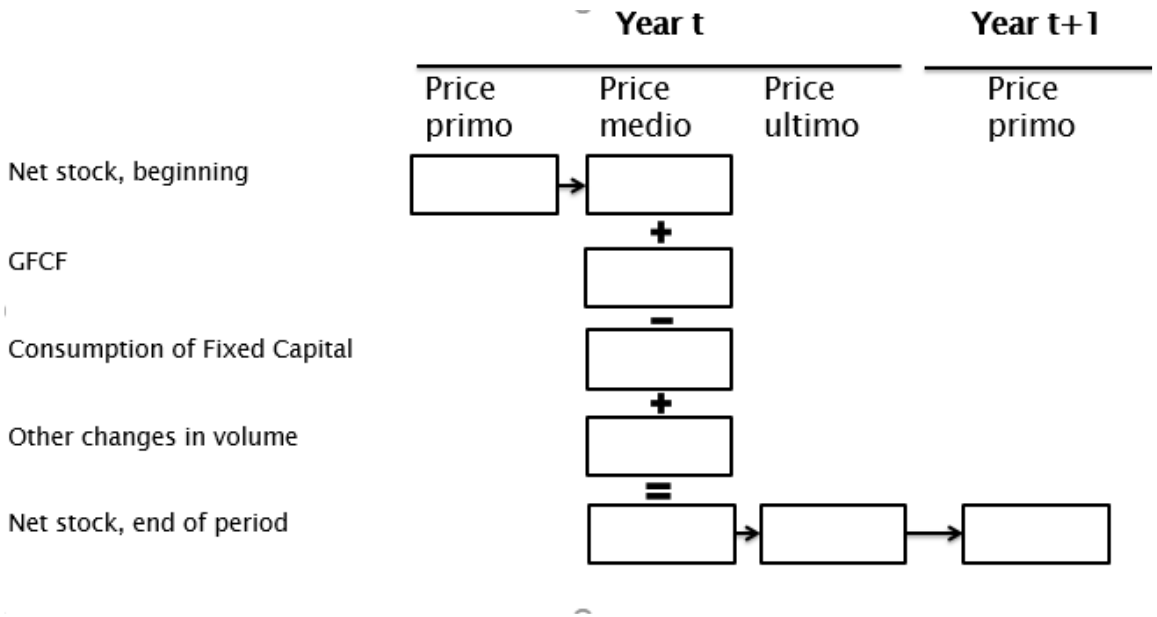
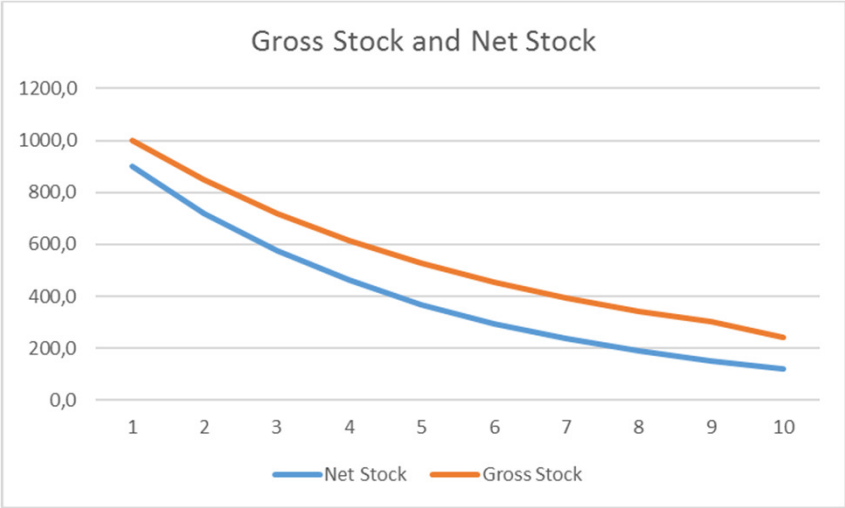


Gross Stock

- One major disadvantage with using the geometric approach; No direct estimate of the Gross Stock
- Statistics Denmark's method for compiling Gross Stock:
  - Mark-up on the net stock (ratio between gross stock and net stock)
  - Mark-up depend service life and number of years until scrapping



Direct measurement

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- Statistics Denmark use direct measurement for compiling the Capital Stocks and Consumption of Fixed Capital for Dwellings and Transport equipment
- Direct measurement means an estimate for the Gross Stock is estimated every year based on observed units in the stock
  - In practice: Number of units in the stock multiplied with price per unit

Direct measurement

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- The stock of dwellings is measured by using information on the number of square meters of dwellings (multiplied with a price per square meters) in Denmark
  - Information on number of square meters of dwellings in Denmark can be found in the Register of Buildings and Dwellings (BBR)
- The stock of Transport equipment is measured by using information on the number of vehicles, aircraft, ships and trains (multiplied with appropriate prices) in Denmark
  - Information on the number of vehicles can be found in the Register of Motor Vehicles. Information on units of aircraft, ships and trains can also be identified, either from register information or company statements

Direct measurement

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- Direct measurement require standard assumptions on service lives, declining balance rates, mark-up for Gross Stock/Net Stock and depreciation profile (geometric) for each type of units in the stock
- Because the year of investment is known for each unit in the stock, net stock and consumption of fixed capital can be derived based on standard assumptions
- Direct measurement does not require long time series of GFCF which is an advantage

Sub-division into sectors

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- Estimation of Net Stock and Consumption of Fixed Capital by sectors are done at the level of asset and industry:
  - An initial benchmark for the Net Stock (by asset, industry and sector) was estimated by using information on output by industry and sector
  - Consumption of fixed capital by asset, industry and sector is derived by using the same shares as for the Net Stock at the beginning of the period
  - GFCF by asset, industry and sector is known from GFCF calculations
  - Net stock (by asset, industry and sector) at the end of the year is derived as a residual
  - The net stock (by asset, industry and sector) at the beginning of the period is derived by using the same shares as the net stock at the end of last year

Sub-division into sectors

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- Capital Stocks (Gross stock and Net stock) and Consumption of Fixed Capital are available with the following breakdown:
  - Non-financial corporations (S.11)
  - Financial corporations (S.12)
  - General Government (S.13)
  - Households (S.14)
  - Non-profit institutions serving households (S.15)

Eurostat TF

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- Recommendations on service lives from Eurostat Task Force on measuring capital
- Measuring Capital (OECD, 2009) advice on estimation of initial capital stock:

$$Net(t,b) = GFCF(t) / (\delta + \theta)$$

  - δ = geometric depreciation rate
  - θ = long-term growth rate of investment or GDP