

Comparing the Perpetual Inventory Method and the Whole of Government Accounts for depreciation

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Abstract

This article looks at key differences between the Whole of Government Accounts (WGA) and Perpetual Inventory Method (PIM) estimates of capital consumption (depreciation). It precedes publication of the first WGA data. It describes conceptual differences between the two methods and announces ONS's proposal to use WGA data for Central Government depreciation estimates as a replacement for the equivalent PIM estimates for Blue Book 2012.

Introduction

The Office for National Statistics (ONS) regularly publishes National Accounts estimates which provide detailed information on the state of the economy both quarterly and annually.

One annual component is the net capital stock in the economy. Net capital stock is calculated in the National Accounts as gross capital stock less capital consumption (depreciation). Net capital stock is published annually in the Capital Stocks, Capital Consumption and Non-Financial Balance Sheets release (ONS, 2010).

Currently, like many other national statistical institutions, ONS uses a Perpetual Inventory Method (PIM) to calculate capital stock and capital consumption. This method uses gross fixed capital formation (GFCF) and assumptions about the length of time that different assets are expected to last (life lengths) in different industries. The PIM models the net capital stock for the whole of the UK economy, not just the public sector. An alternative approach to the PIM is to use depreciation information from administrative accounting sources. In principle this is preferable if it gives more accurate and reliable information than could be obtained from necessarily broad asset life assumptions within the PIM.

Administrative data for both central government and local authorities has been collected as part of the preparations for the first Whole of Government Accounts (WGA) being produced by Her

Majesty's Treasury (HMT). This data is extracted directly from each government department's independently audited accounts. The use of this administrative data rather than the PIM data was originally proposed in the Atkinson review (2005) which recommended that:

'We endorse the ONS decision to move towards use of the accounts of departments and other public bodies as a basis for estimating capital consumption, rather than its own Perpetual Inventory Model, and recommend that transition should continue, as technical issues are resolved. (Recommendation 5.6)'

This article provides an update and overview on the progress made in the use of WGA within the derivation of net capital stock, specifically for the use of depreciation. It is currently proposed that data from WGA (except for roads data, see later) will be used for central government depreciation within net capital stock coinciding with the release of Blue Book 2012.

A separate article describing the proposed use of WGA for other public sector estimates is available on the ONS website.

An audited dataset for WGA will be published annually by HMT, with the first set for the year 2009-10 to be released in 2011.

Overview of the Perpetual Inventory Method (PIM)

The measurement of capital stocks is a complex issue, as explained in an OECD review of capital stocks (OECD, 2001). An internationally recognised approach to calculate capital stock is the PIM.

The main input datasets entering the PIM model are: investment data, price indices, life lengths and premature scrapping. The PIM uses GFCF estimates across all assets, industries and sectors. Currently the industries are classified using the 2003 version of the Standard Industrial Classification (SIC03). In future the SIC 2007 classification will be used.

Within the PIM, net capital stock is calculated as the value at a point in time of assets, at the prices for new assets of the same type, less the cumulative value of consumption of fixed capital accrued up to that point.

In practice, the PIM uses annual chained volume measures of gross capital formation to calculate the cumulative gross capital stock, net capital stock and the gross capital consumption. This is calculated back to a chosen reference year, which is currently 2006. Annual chained volume measures are calculated by deflating GFCF data which government departments have provided to ONS, for use in the Public Sector Accounts, from current to constant prices.

Different rates of depreciation can be assumed in the PIM for different asset types, and for different industries. New additions over the year to the capital stock, that is net investments, are also taken into account.

Assumptions about the life lengths of the capital stocks are used to ensure that they are withdrawn from the PIM when they are no longer economically useful. For estimates of capital consumption and net capital stocks, these assets are depreciated over their lifetime. For gross capital stocks, the asset is valued at its new replacement cost until such time as it is retired. For example, some

buildings have long life-lengths, so the PIM will aggregate those years of investment data to measure gross capital stocks.

To measure net capital stocks, each different investment is adjusted to reflect capital consumption (depreciation). The PIM assumes straight-line depreciation, so that the stock of a particular start date (or vintage) decreases each year by a constant amount, falling to zero at the end of the asset's life-length. The depreciation of each asset and industry within each year is aggregated to provide the capital consumption measure. While an asset might have an average life length of ten years that does not mean that all such assets are retired exactly ten years after being purchased. In fact it is likely that these assets will be retired over a period of a few years, with ten being the average. This is taken into account in the PIM by the use of a retirement function.

The main measures produced by the PIM are gross capital stocks, net capital stocks and capital consumption by asset, industry and sector. OECD (2001) and ONS (2010 and 2008) give more detail on the PIM process.

Availability of Whole of Government Accounts

Whole of Government Accounts (WGA) are full accruals-based accounts covering the whole public sector and are audited by the National Audit Office. WGA is a consolidation of the accounts of about 1,500 bodies from central government, devolved administrations, the health service, local government and public corporations. WGA will be published for the first time for the year ending 31 March 2010 during 2011.

As WGA is only now becoming available, the focus of work to date has been on the central government component of the data. Local authority and public corporation data will be considered in the future.

Conceptual and theoretical differences between PIM and WGA

There are a number of important conceptual and theoretical differences between WGA data and frameworks used within the UK National Accounts that have been identified and considered. Some of these factors will have greater practical impact than others, and work will continue on quantifying the numerical impact.

The main conceptual and theoretical differences are:

1. The UK National Accounts are produced in accordance with the European System of Accounts (ESA 95) and the System of National Accounts (SNA) to ensure consistency and comparability of accounts across countries. The WGA data is prepared using International Financial Reporting Standards (IFRS) as adapted and/or interpreted for the public sector, which is not the same as the System of National Accounts (SNA) reporting framework (which are in line with ESA 95). The use of IFRS has now replaced the use of the UK Generally Accepted Accounting Practice (GAAP) for both central government and local government, where local government moved to IFRS in 2010–11, a year after central government.

2. Different asset classifications are used in the WGA when compared to the SNA. This requires a comprehensive mapping to ensure the correct elements are included within the National Accounts. For example, Single Use Military Equipment is not included as an asset within the SNA, but is recorded separately as an asset within WGA.
3. The life lengths which are used for different assets are an important conceptual difference. The PIM uses assumed asset life lengths from historic Inland Revenue data in order to calculate consumption of fixed capital. In comparison, the WGA data is compiled at the end of each year, from accounts that have recorded used (consumed) assets. For example, departments record asset life lengths on an individual asset basis and regularly review asset lives and may also re-life assets when they come to the 'end of their useful lives'. The practical impact of using different life lengths is considered in more detail in a later section.
4. The PIM uses annual chained volume measures of Gross Fixed Capital Formation (which are recalculated each time the reference year changes) to calculate estimates of gross and net capital stock and consumption of fixed capital. These measure volume rather than value. In comparison, assets in WGA are re-valued each year in line with movements in current replacement costs, and then the re-valued gross book values are depreciated. This is effectively a difference in price measurement.
5. The GFCF input for the PIM includes additions, payments on account, assets in the course of construction (such as work in progress) and disposals. The WGA data includes revaluation of assets, transfers and reclassifications from other asset categories. In WGA, capital consumption (depreciation) is calculated when the assets enter use in service, or on completion of construction, or when transfers from assets in the course of construction or payments on account occur. The PIM recognises capital consumption in the year that the additions and payments on account have occurred.
6. PIM takes into account assumed impairment functions by the use of models. In WGA impairments are often reversed and may vary significantly from year to year. For example, this can be due to the professional revaluation of assets which invariably impacts on the level of impairments.
7. The treatment of roads is fundamentally different between WGA and PIM. The PIM assumes that road assets have set life lengths (or expiry dates, by which time they will be of such a low standard that they will need to be replaced); whereas the WGA sets no limit on the length of time that roads are on the balance sheets, so they are effectively never-ending assets. Due to this large conceptual difference, the treatment of road assets needs to be carefully considered within the National Accounts. This work is currently in progress.

Although there are a number of conceptual and theoretical differences, it is considered that incorporating WGA data for the central government sector, adjusted for these differences, will be an overall improvement to the PIM estimates for this particular sector. The PIM would still continue to be used for other sectors.

Example: Life length comparisons

Published data is currently not available for the WGA and will be released by HM Treasury in 2011. However, the Treasury has provided aggregate estimates based on dry run data, and this has been used to derive implied life lengths for different industries and assets. These have been compared against those currently used in the PIM to highlight potential differences.

Table 1 gives a comparison between life lengths currently used in the PIM and implied life lengths from the dry run WGA data. These estimates of life length are subject to change once the final WGA data has been published.

Table 1 shows that the majority of implied lengths are consistent between the two different data sources. However, there are some differences. For example, vehicles in fishing show a large difference; 25 years for the PIM whereas implied life length from WGA are 43 years. Similarly new dwellings show a large difference; 100 years for the PIM whereas implied life length from WGA is 32 years.

Once published WGA data is available, these differences in life-lengths will be further assessed.

The availability of implied life lengths, as a by-product from the WGA data, will enable the assumptions used within the PIM to be updated and improved. The availability of reliable life lengths is a known practical issue (OECD, 2001, p47).

Proposed implementation into the UK National Accounts

The intention is to implement usage of WGA data for central government depreciation into the Blue Book to be released in 2012. This approach will allow for a planned implementation to assess the impact of the use of WGA data.

The use of WGA for public sector estimates has been considered separately in another article available on the ONS website.

Potential implementation issues for the UK National Accounts include:

1. WGA data is only available for the financial year 2009/10 which means that linkage issues and impact on earlier years need to be considered.
2. It is possible that changes to historical capital stock data will impact the UK measures of Gross Domestic Product (GDP) and ultimately Gross National Income (GNI) when capital consumption results flow into their production systems. The actual value of the impact on GDP will not be known until the supply-use balancing process is complete for Blue Book 2012.
3. Only the use of central government data (excluding roads) is currently planned in the short term. In future, it is possible more information may be available for roads, local authorities and public corporations.

4. The WGA data is provided on a financial year basis which is not entirely in line with the timings of the National Accounts deliveries timetable. This is part of the reason why implementation will not occur until Blue Book 2012. The timeliness of the WGA data needs to be carefully considered. For example, the most recent audited WGA data may not be available in time for use within the standard National Accounts production time frames. A process will be considered on how best to manage the data availability.

Summary

Preparation for the implementation of WGA data into the UK National Accounts will continue. This will enable ONS to ensure a consistent and coherent use of WGA data within the UK National Accounts.

It is proposed to implement data from WGA for Central Government into the PIM estimates for the Blue Book to be released in 2012. A further article will be released closer to that time to provide an updated analysis of any potential impact.

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Table 1: Comparison of life lengths between PIM and aggregated dry run WGA data

Industry	Asset	PIM average life length in years	WGA implied life length in years
Agriculture	Buildings	30	34
Agriculture	Plant and machinery	13	11
Education	Buildings	75	84
Fishing	Plant: computers	5	4
Fishing	Buildings	50	56
Fishing	Vehicles	25	43
Fishing	Plant: other than CNC or computers	12	10
Fishing	Plant: computer-controlled equipment	4.8	4
Health	Plant: computers	5	4
Health	Vehicles	10	17
Health	Buildings	75	84
Health	Plant: other than CNC or computers	15	13
Health	Plant: computer-controlled equipment	6	5
Military defence	Plant: computers	5	4
Military defence	Vehicles	10	17
Military defence	Buildings	75	84
Military defence	Plant: other than CNC or computers	20	17
Military defence	Plant: computer-controlled equipment	8	7
New dwellings	Dwellings	100	32
Non-military administration	Plant: computers	5	4
Non-military administration	Vehicles	10	17
Non-military administration	Buildings	75	84
Non-military administration	Plant: other than CNC or computers	20	17
Non-military administration	Plant: computer-controlled equipment	8	7
Other manufacturing	Plant: computers	5	4
Other manufacturing	Buildings	60	67
Other manufacturing	Plant: other than CNC or computers	23	19
Other manufacturing	Plant: computer-controlled equipment	9.2	7.7
Property	Plant: computers	5	4
Property	Vehicles	10	17
Property	Buildings	80	89
Property	Plant: other than CNC or computers	30	25
Property	Plant: computer-controlled equipment	12	10
Recreational, culture & leisure	Buildings	80	89
Roads	Plant: computers	5	4
Roads	Vehicles	10	17
Roads	Buildings	75	84
Roads	Plant: other than CNC or computers	20	17
Roads	Plant: computer-controlled equipment	8	7
Sea Transport	Plant: computers	5	4
Sea Transport	Buildings	20	22
Sea Transport	Plant: other than CNC or computers	10	8
Sea Transport	Plant: computer-controlled equipment	4	3
Total	Intangible: computer software	5	7
Water supply	Buildings	80	89