Introduction

The Singapore Department of Statistics (DOS) compiles the national accounts by the 3 approaches, i) Output approach; ii) Expenditure approach and iii) Income approach. Estimates by the output and expenditure approaches, at current and constant market prices, are available on a quarterly and annual basis. The output approach is the main approach used to compile GDP in Singapore.

Singapore’s annual GDP series by the output approach starts from 1960, and quarterly GDP series starts from 1Q1975, by broad SSIC (Singapore Standard Industrial Classification) 2010 categories. The SSIC adopts the basic framework and principles of the International Standard Industrial Classification of All Economic Activities (ISIC) revision 4, with appropriate modifications to take into account characteristics of Singapore’s economic landscape while enhancing international comparability.

Current Practice

Estimation methods of quarterly output-based GDP

Annual GDP estimates are compiled from data obtained from administrative sources as well as annual industry surveys. The industry-specific quarterly estimation methods are elaborated below:

• Manufacturing: constant price estimates are derived through extrapolation with the index of industrial production. Current price estimates are then obtained through inflation with appropriate price indicators.

• Construction: data on certified progress payments are used to extrapolate current price estimates. Constant price estimates are mainly derived through deflation with appropriate price indicators. Additional estimates are made for alterations, maintenance and repair works which may not be reflected in the certified progress payments.

• Utilities: current price estimates are derived directly from utilities companies’ income and expenditure statements. Constant price estimates are derived by extrapolation with volume indicators on the consumption of electricity, gas and water.

• Agriculture: current price estimates are obtained through inflating constant price estimates with the price indices of local farm products. Constant price estimates are derived by extrapolation with volume indicators such as the quantity of farm production.

• Wholesale and Retail Trade: value added estimates are obtained by extrapolation with the Wholesale Trade Index, Retail Sales Index and external trade statistics.
• Transportation and Storage: current price estimates are derived directly from the statements of income and expenditure, and inflating constant price estimates with appropriate price indicators. Constant price estimates are derived by extrapolating with volume indicators, such as volume of cargo, passenger-kilometres and number of postal articles.

• Accommodation and Food Services: data on hotel revenue and restaurant turnover are used to derive current price estimates. Constant price estimates are obtained by extrapolation with indicators such as room days occupied, visitor arrivals and the Food and Beverage Services Index.

• Information and Communications: current price estimates are derived directly from statements of income and expenditure from telecommunications companies. Constant price estimates are mainly derived from deflating current price estimates with appropriate price indicators.

• Finance and Insurance: current price estimates are mainly derived from the quarterly survey of financial institutions. Constant price estimates are mainly derived through deflation with appropriate price indices and extrapolation with volume indicators.

• Business Services: current price estimates are mainly derived from income and expenditure statements and inflating constant price estimates. Constant price estimates are mainly derived through extrapolation with volume indicators such as number of property transactions and employment.

• Other Services Industries: current price estimates are derived from government administrative data on wages, income and expenditure statements of statutory boards, and inflating constant price estimates with appropriate price indicators. Constant price estimates are mainly derived from extrapolation with volume indicators such as employment, number of students, number of outpatient visits and admission tickets to performances.

• Ownership of dwellings: assessed annual values of properties are used to derive the current price estimates. Movements in the housing stock are used to derive the constant price estimates.

Estimates are also made on production of own-account workers.

Annual Benchmarking

Annual GDP figures are revised by benchmarking against comprehensive annual industry survey results, when they are available (with a time lag of around 9-15 months). The annual surveys cover the manufacturing, construction, agriculture and fishing, utilities and services industries.

Denton-benchmarking (D4 proportional benchmarking method) is employed to align the quarterly GDP estimates to the annual survey benchmarks. Benchmarking is essential as it combines the relative strength of the low and high frequency data. The annual data provide the most reliable information on the overall level and long-term movements in the series, while the quarterly source data provide the only available explicit information about the short-term movements in the series.

Benchmarking preserves the quarterly trend of the data as well as ensures that the annual data is close to the overall level. It is important to preserve both the long and short term trends to estimate
future quarterly data movements, as it provides a systematic approach to review the indicators for quarterly GDP compilation.

**Denton benchmarking**

\[
D4 = \min \sum_{t} \left( \frac{GVA_t}{I_t} - \frac{GVA_{t+1}}{I_{t+1}} \right)^2
\]

Subject to:
\[
\sum_{t=4y-3}^{4y} GVA = AGVA_y, \quad y \in \{1, 2, ..., Y\}
\]

where \( D4 \) = proportional Denton

**National accounts rebasing**

Rebasing is carried out every 5 years to revalue GDP on the basis of prices prevailing in the new base year. By doing so, the weights assigned to various components are updated to reflect current patterns of production or uses of output. Rebasing reconciles the different estimates of GDP by the 3 approaches, and also provides the occasion for methodological and conceptual reviews and improvements.

DOS completed the rebasing of Singapore’s national accounts from base year 2005 to 2010 in May 2014. The major improvements implemented during this exercise were the capitalisation of R&D expenditure, inclusion of employers’ pension scheme as compensation of employee, refinement in methodology of the informal sector and incorporating the results of the Census of Construction.

**Challenges**

**Suitability of proxy indicators for estimating quarterly GDP**

For some industries for which no suitable output indicators are currently available, proxy input indicators (e.g. employment) may be used, though they may not necessarily correlate well with the output or VA of the industries. Periodic reviews are carried out to assess if these indicators could be replaced with output or revenue data from short-term surveys.

**Revisions to GDP estimates**

As some proxy indicators may not be timely enough for quarterly GDP estimation, revisions are expected when complete data are available for the reference quarter. Revisions can sometimes be significant, due to late survey responses or occasional errors in earlier reported data. In these instances, the revisions and their underlying reasons have to be carefully conveyed to data users, to ensure confidence in the GDP estimates.
Quality Practices

To ensure that national accounts methodologies and practices are up-to-date, Singapore continually researches on international best practices and participates in international discussion platforms on various methodological issues. Refinements to compilation methodologies are adopted at suitable occasions, for example, during rebasing exercises.

Singapore subscribed to the IMF Special Data Dissemination Standard (SDDS) specifications in Aug 1996, and met the SDDS specifications in 2001. The SDDS comprises 4 dimensions: (a) coverage, periodicity, and timeliness of data; (b) access by the public; (c) integrity of the disseminated data; and (d) quality of the disseminated data.

The national accounts data are compiled and disseminated on a timely basis. An advance release calendar is available on the SingStat website. Metadata relating to the national accounts are provided and made available on the IMF bulletin board. These practices help to ensure that the quality of Singapore’s national accounts continue to be of a high standard.