

Quarterly Gross Domestic Product: Sources and Methods



Second edition



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A large, stylized graphic in the bottom-left corner of the page, composed of several overlapping circles of different sizes and shades of grey, creating a complex, organic shape.

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Preface

Gross domestic product (GDP) is a core macroeconomic statistic that measures New Zealand's economic performance. It is an important tool that helps a range of users, including policymakers, to understand and manage the New Zealand economy.

This second edition is an update of the sources and methods, in summary form, used for all quarterly GDP series produced by Statistics New Zealand, both in chain-volume measures and current prices. New Zealand produced its first quarterly GDP series in 1984. This was a constant price series with a base year of 1977/78. Since then, annual chain-linking has been introduced and both measures of GDP (production and expenditure) are expressed in 1995/96 prices. This means the series more appropriately reflects the change in relative prices of goods and services currently prevailing in the economy.

Significant changes to compilation methods and data sources have been introduced since the publication of the first edition of this report in 1996. These include the implementation of the new international standard, *System of National Accounts 1993*; the rebasing of the constant price series from 1991/92 to 1995/96 prices; the introduction of chain-linking; and the adoption of a new industry classification, the Australian and New Zealand Standard Industrial Classification 1996 (ANZSIC96).

Statistics New Zealand currently has a quarterly quality improvement programme that aims to improve its GDP estimates by reviewing methodologies and data sources. In addition, a new industrial classification (ANZSIC 2006) is due to be introduced to the national accounts by the end of 2011 along with future changes from the revised international framework.

All of these initiatives ensure that Statistics New Zealand maintains accurate and relevant GDP estimates for New Zealand, and that they are compiled using best practice methodologies and reliable data sources.



Geoff Bascand
Government Statistician

Standards and further information

Percentage changes

Percentage movements are, in a number of cases, calculated using data of greater precision than published. This could result in slight variations.

Rounding procedures

On occasion, figures are rounded to the nearest thousand or some other convenient unit. This may result in a total disagreeing slightly with the total of the individual items as shown in tables. Where figures are rounded the unit is in general expressed in words below the table headings, but where space does not allow this the unit may be shown as (000) for thousands, etc.

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1 Introduction

Monitoring the economy and forecasting its key variables are fundamental aspects of modern economic management and analysis. They are activities that require a range of timely and accurate quarterly economic statistics such as gross domestic product (GDP) and its components.

This publication describes the quarterly series currently published, namely:

- the production-based GDP in chain-volume measures – GDP(P)
- the expenditure-based GDP in both current prices and chain-volume measures – GDP(E).

Tracking the economy over time: chain-volume measures

The compilation of a system of national accounts generates various time series. These are reflective of a multitude of transactions that have to be expressed in terms of a common denominator – money. Over time, comparisons using variable, current money values are not very meaningful, as the changes observed may only be a reflection of varying price levels rather than the volume of goods and services produced or consumed.

To overcome this problem, a time series of national accounts is expressed in the prices of one selected year, in chain-volume measures (CVM) or real terms. The aim of a system of national accounts in chain-volume measures is to give numerical expression, free of price effects, to gross domestic product and its components.

Expressing gross domestic product in chain-volume measures involves revaluing a current price time series of goods and services in the prices of a chosen base period. This allows observation of the real changes in volumes in the New Zealand economy.

Since June 2001, the quarterly production and expenditure-based GDP series are available as chain-volume measures expressed in average prices of the 1995/96 year (rather than single year fixed-weighted constant prices) because the base year weights are updated annually. This has the advantage of helping to understand the changes in the relative size of each GDP component – that is, structural changes in the economy – while keeping the series free of price effects.

Future developments

There are three key areas for future development in New Zealand's national accounts over the next few years, some of which will be done concurrently.

The international framework for national accounts, the *System of National Accounts 1993*, has been revised and work is under way to investigate the implementation of the recommendations to the NZ national accounts. Changes will affect the annual and quarterly national accounts. For further information on the update of the 1993 System of National Accounts (SNA) see <http://unstats.un.org/unsd/sna1993/snarev1.asp>.

Statistics New Zealand currently has a quarterly quality improvement programme that aims to improve its GDP estimates by reviewing methodologies and data sources. A number of potential improvements to the annual and quarterly national accounts have been identified and prioritised. Over the next few years, a number of quality improvement projects will be undertaken and the outcomes from these projects will be incorporated into the annual and quarterly national accounts statistics. Any significant methodological changes will be noted in the quarterly GDP Hot Off The Press publication.

The industry classification currently used in the New Zealand System of National Accounts (NZSNA) is the 1996 edition of the Australian and New Zealand Standard Industrial Classification (ANZSIC). A revised version of ANZSIC was published in 2006 (ANZSIC06), where some industry classifications at both the detailed and group level have changed. The new classification aims to better reflect the structure of the current NZ economy. A programme is currently being set up by Statistics New Zealand to introduce this new standard into the New Zealand accounts and its underlying statistics, with implementation to the national accounts scheduled by the end of 2011.

Statistics New Zealand will provide an updated edition of the sources and methods publication upon completion of these developments.

2 The national accounting framework

The GDP accounts

The New Zealand System of National Accounts (NZSNA) provides a systematic statistical analysis of the overall performance of the New Zealand economy. The system is based on the *System of National Accounts 1993* (SNA93) which facilitates international comparability despite adaptations to better reflect the NZ economy.

The NZSNA consists of basic concepts, definitions and classifications for economic agents and their transactions.

The principal totals in the GDP accounts are:

- gross domestic product – GDP(P), which is the total of goods and services produced in New Zealand at market value after deducting the cost of goods and services used in the process of production, but before deducting allowances for the consumption of fixed capital (depreciation).¹
- gross national expenditure (GNE), or the total expenditure within a given period on final goods and services by New Zealand residents (that is, excluding goods and services used up during the process of production).
- expenditure on GDP – GDP(E), which relates to final purchases of goods and services produced in the New Zealand domestic territory. Consequently, GDP(E) is derived by adding to GNE the expenditure by foreign residents on New Zealand goods and services (exports) and deducting the expenditure by New Zealand residents on goods and services produced abroad (imports).
- gross national disposable income (GNDI), which is the income received (less income payable) of New Zealand residents from both domestic and overseas sources after taking account of income redistribution by way of international transfers.

Measuring gross domestic product

Three approaches can be used to calculate GDP:

- Production approach. This method calculates what each separate producer adds to the value of final output (value added), by deducting intermediate consumption from gross output. Value added is summed for all producers. In practice, the components of value added are also independently estimated.
- Income approach. This approach directly measures the incomes received by the owners of the factors of production. These represent the returns to the labour and capital employed such as wages and salaries, and profits.
- Expenditure approach. This method sums the values of all final demands, that is, final consumption expenditures (of households, government and private non-profit institutions serving households), changes in inventories, gross capital formation, and net exports.

Theoretically all three approaches must produce the same result. Like all statistical estimates, these will contain errors and omissions which are usually reconciled.

¹ GDP(P) also takes account of unallocated taxes and duties. See section on Gross domestic product by industry for more detail.

In New Zealand, neither production nor income-based GDP in current prices is produced quarterly. A quarterly measure of GDP using the income approach is not produced due to lack of survey information. Because of this, it is not possible to reconcile (in current terms) the quarterly measure of GDP(E). As the chain-volume measure (CVM) of GDP(E) is derived by deflating the current series, small errors or inconsistencies in the current price series and/or the price index used for deflation can affect the CVM series.

The availability of annual and quarterly GDP (current price and chain-volume measures) is summarised in table 1.

Table 1

Availability of GDP Series by Method

	Current price series	Chain-volume series
Annual	<ul style="list-style-type: none"> • Production • Income • Expenditure 	<ul style="list-style-type: none"> • Production • Expenditure
Quarterly	<ul style="list-style-type: none"> • Expenditure 	<ul style="list-style-type: none"> • Production • Expenditure

Conceptually, both the production and expenditure approaches of measuring GDP are the same. However, as each series uses independent data and estimation techniques, some differences between the alternative measures arise. The expenditure approach series has historically shown more quarterly volatility and is more likely to be subject to timing and valuation problems. For these reasons, the production-based measure is the preferred measure for short-term quarter-on-quarter and annual changes.

Annual current price production and expenditure estimates are reconciled within a supply and use framework. However, the accounts for the latest three years are provisional and are not balanced. Following data confrontation and reconciliation the balanced data is introduced to the quarterly series, both in current and real terms. Annually the underlying weights used to aggregate GDP are updated – replacing the previously published provisional data.

Gross domestic product and its compilation are central to any national accounting system. So far, Statistics NZ has focused on developing and publishing GDP and related series. When adopting the SNA93 in 2000, Statistics NZ introduced several major improvements and a new industry classification, the Australian and New Zealand Standard Industrial Classification 1996 (ANZSIC96). Apart from incorporating new source data, new methods such as chain-linking gross domestic product (GDP) series and the development of new measures such as capital stock and consumption of fixed capital (depreciation) at replacement cost were also introduced.

Terms and definitions

GDP is a frequently used measure of economic activity. It describes in a single figure, and with no double counting, all output or production carried out by all enterprises, government and non-profit institutions and households in New Zealand during any given time. The SNA93 defines the scope of output and production measured in the national accounts. Activities that are difficult to track down, such as illegal activities and unpaid work, are excluded from the scope of the national accounts.

As outlined above there are three approaches to measuring GDP. Statistics New Zealand produces quarterly GDP estimates using the production and expenditure approach. The production-based GDP is derived by industry, whereas the expenditure-based GDP series is calculated by final demand categories.

Gross domestic product by industry

A major objective of national accounts is to measure the value added resulting from production. If all production, including non-marketed output, were added together, considerable duplication would occur because many goods and services provided by one producer are purchased by another for use in subsequent production. As a result, the value of some goods and services becomes incorporated in the value of other goods and services. The national accounting process removes the value of intermediate consumption and arrives at a value of production free from duplication. This is the concept of value added, or production-approach GDP.

$$\begin{array}{l}
 \text{Gross output} \\
 - \text{ Intermediate consumption} \\
 \hline
 = \text{ Gross value added} \\
 \hline
 \end{array}$$

The derived value added is a 'gross' measure because consumption of fixed capital – that is the 'use' of capital (depreciation) – has not been deducted from the output measure.

Gross output is the value of goods and services produced during a time period, irrespective of whether they are produced for sale on the market or for own use. Any changes in inventories (stocks) also need to be taken into account.

$$\begin{array}{l}
 \text{Value of goods and services sold} \\
 + \text{ Value of goods and services for own use} \\
 + \text{ Changes in inventories} \\
 \hline
 = \text{ Gross output} \\
 \hline
 \end{array}$$

Intermediate consumption consists of the value of all goods and services consumed as inputs by a process of production. It includes raw materials used up directly in the production of goods or services, as well as general operating costs such as rent, electricity, accounting and legal fees, and the like. Excluded are transactions not directly associated with current production of goods and services such as interest paid, bad debts, donations and losses on the sale of assets.

$$\begin{array}{l}
 \text{Goods and services purchased for use in production} \\
 - \text{ Raw material inventory change} \\
 \hline
 = \text{ Intermediate consumption} \\
 \hline
 \end{array}$$

For individual producers, gross output less intermediate consumption measures their value added and represents the producer's contribution to GDP.

For industries, value added equals the value of gross output of each industry less the cost of goods and services used in production.

The sum of the value added for each industry, however, is not equal to GDP. The difference relates to import duties and taxes on production (mainly GST). Collectively, these duties and taxes are referred to as 'unallocated taxes'. Unallocated taxes are levied on the purchaser of the taxed commodity and not on the seller, so they are not recorded in the production accounts as a charge against the value of output.

GDP, therefore, equals the sum of value added for all producers, plus unallocated taxes.

The value added series is derived at producers' prices. This means that output is valued at producers' prices and intermediate consumption at purchasers' prices. Both valuations exclude GST, which the producer collects on behalf of the government. However, the valuation at purchasers' price takes distribution and transport charges into account.²

Broad industry groups

Industry groups for GDP are combined to form the following broad groupings, based on the *Australian and New Zealand Standard Industrial Classification 1996* (ANZSIC96):

- primary industries (agriculture; fishing, forestry and mining)
- goods-producing industries (manufacturing; electricity, gas and water; construction)
- service industries (wholesale trade; retail, accommodation and restaurants; transport and communications; finance, insurance and business services; government administration and defence; personal and community services).

In addition to these industrial groupings there exists an 'unallocated' category, which includes unallocated taxes on production and imports and bank service charge (see chapter 4 for more details).

Expenditure on GDP

All output from production is destined for either intermediate or final consumption. Since the national accounts aims to measure the unduplicated value of production, this is equivalent to examining the value of all final uses or demands. By summing the components of final demand, expenditure on GDP is obtained.

In the economy, the categories of final demand are:

- final consumption expenditure of households and private non-profit institutions serving households
- government final consumption expenditure
- capital accumulation by producers, including changes in inventories held by producers
- exports to the rest of the world.

When calculating GDP by this method, the value of imports must be deducted since they are implicitly included in the final sales and represent foreign rather than New Zealand production.

² Internationally, total industry value added is often derived at basic prices. Those are producers' prices less any other taxes or subsidies on products.

Expenditure on GDP is calculated as:

Private final consumption expenditure	
+ Government final consumption expenditure	
+ Changes in inventories	
+ Gross fixed capital formation	
<hr/>	
= Gross national expenditure	
<hr/>	
+ Exports of goods and services	
– Imports of goods and services	
<hr/>	
= Expenditure on gross domestic product	
<hr/>	

Private final consumption expenditure

Private final consumption expenditure is the sum of household expenditure or outlays on consumer goods and services, and the final consumption expenditure on non-capital items of private non-profit institutions serving households. Private final consumption expenditure comprises:

Household consumption expenditure

This covers all outlays on consumer goods and services, including expenditure on durables such as motor vehicles and furniture, and the imputed rent of owner-occupied dwellings. Households consist of New Zealand-resident individuals and families and consumption expenditure relates to their outlays both within New Zealand and overseas. Because most of the source data used records total spending in New Zealand (by residents and non-residents), final consumption expenditure of households is derived as follows:

Final consumption expenditure in the domestic market	+ Expenditure overseas by New Zealand residents	– Expenditure in New Zealand by foreign residents	= Final consumption expenditure by New Zealand resident households
------------------------------------------------------	-------------------------------------------------	---------------------------------------------------	--------------------------------------------------------------------

Expenditure on the following are included:

- new durable and non-durable goods, excluding dwellings
- services
- second-hand goods, reduced by the value of sales by households of similar goods. Transactions directly between households net out (for example, garage sales) and for transactions between households through a dealer, only the dealer's margin plus any associated transfer costs are included (for example, second-hand car sales).

Transactions are recorded when ownership is deemed to have changed and where there is a direct link between the payment and the acquisition. Therefore interest, donations, subscriptions to non-profit institutions, and compulsory fees to government (for example, motor vehicle licence fees) are excluded.

Treatment of the following items should be noted:

- Owner-occupied dwellings. Ownership of owner-occupied dwellings is considered to be a market activity undertaken by households. All expenditure associated with purchase, alteration and maintenance of owner-occupied dwellings is classified as gross fixed capital formation or intermediate consumption, so is excluded from final consumption expenditure. Included, however, is the payment of imputed rent by

owner-occupiers. This measures a service flow back to households valued at market rates.

- Gambling. Transactions are recorded net, that is, bets laid or lottery tickets purchased, less winnings.
- Insurance and pension funds. Only the service or administration charge component of insurance premiums and pension fund contributions paid by households is included.

Private non-profit institutions serving households expenditure

Private non-profit institutions serving households include such bodies as charities, sports clubs, trade unions and religious organisations. Their final consumption expenditure is measured as the sum of the costs they incur purchasing goods and services, employing labour and 'using' capital (depreciation), less any income received from actual sales. This represents the cost of services used by the non-profit producers themselves on behalf of the community.

Government final consumption expenditure

General government final consumption expenditure includes both central and local government. This is measured in the same way as the final consumption expenditure of private non-profit institutions serving households. Additionally, social assistance benefits in kind are included in central government final consumption expenditure.

Government final consumption expenditure comprises expenditure by:

- central government, which includes organisational units responsible for such traditional functions as taxation, law and order, and defence, as well as those responsible for advancing the economic and social well-being of the country. Units included are government departments, offices of Parliament, ministries and Crown entities (for example, Accident Compensation Corporation, Transit New Zealand, New Zealand Fire Service Commission, public schools and hospitals). Government-owned trading organisations are excluded.
- local government, which includes the non-trading organisations of local government responsible for such activities as libraries, museums, the maintenance of roads and drainage, and the provision of other sanitary services, as well as the general administrative functions associated with territorial and regional authorities. Local government-owned trading organisations are excluded.

Changes in inventories

This represents the change in the value of inventories of raw materials, work in progress, and finished goods between the beginning and the end of the period. In principle, the changes in inventories are measured in the appropriate market prices at the time additions and withdrawals are made. This principle of valuing additions and withdrawals to and from inventories is consistent with the principles of valuing gross output and intermediate consumption.

The correct valuation of the changes in inventories requires information on the quantities of individual commodities held in inventory together with appropriate prices. As this data is rarely available or difficult to collect, the usual practice is to revalue inventories at the end of the period in order to approximate as closely as possible the value of the physical change in inventories during a given period.

The closest feasible approximation to the desired measure is taken to be the difference between the levels of inventories at the beginning and end of the period, both valued at the appropriate average prices ruling over the period. This is the basis of the inventory valuation adjustment. The changes in inventories in current prices are calculated excluding holding gains or losses (see chapter 4 for details). It involves making

assumptions on inventories turnover rates, accounting procedures (last in, first out (LIFO), first in, first out (FIFO), etc) and valuation (direct cost, etc).

Inventories comprise:

- Materials and supplies: all materials, components, parts and supplies; coal, oil and other fuels purchased for immediate consumption; and non-durable containers, factory packaging, office and other similar supplies.
- Work in progress: goods partly complete. Partly completed buildings, other construction and land developments are excluded and are included in gross fixed capital formation.
- Livestock: according to the SNA93, breeding stock, sheep raised for wool, racehorses and draught animals should be classed as capital assets. However, it is impractical to differentiate between these and livestock raised for slaughter or sale. Thus in the NZSNA, all livestock is included as stock.
- Timber grown only for felling: comprises the value of growing exotic timber. Excludes orchards, vineyards, hedges, and the like, where the trees themselves are not destroyed in the production process. These are regarded as fixed capital.
- Finished goods (other than livestock or trees): those goods are not necessarily ready for final use, but have completed production, and are ready to be sold on to others.
- Trading inventories: inventories normally held by the wholesale and retail industries. They are held for resale without transformation other than breaking down and repacking or repackaging.

Gross fixed capital formation

This comprises the outlays of producers on fixed assets such as buildings, motor vehicles, plant and machinery, hydro-electric construction, roading, improvements to land, software and mineral exploration rights. In measuring the outlays, sales of fixed assets are deducted. While improvements to land are included, net purchases of land itself are excluded. Also included is the value of construction work done by a firm's own employees.

Fixed capital goods are used repeatedly in production and have a usable lifetime of one year or more. The term 'gross' indicates that consumption of fixed capital (depreciation) has not been deducted from the value of outlays.

Expenditure on existing capital assets is included in gross fixed capital formation if it increases the productivity of the asset (for example, extending its life, increasing quality of quantity or output). Expenditure that is intended to maintain the current level of productivity is considered to be intermediate consumption.

Included in gross fixed capital formation is expenditure relating to:

- The original purchase costs (including any non-deductible GST).
- Transfer costs such as real estate agent fees, customs fees or other taxes (for example, sales tax and stamp duty).
- The cost of transporting the assets to their site and installing them (including the wages of own employees if they install the goods).
- Fees of architects, designers and engineers.
- Legal fees not associated with financing.

Excluded from gross fixed capital formation is expenditure relating to:

- Households: with the exception of dwellings, which are included in ownership of owner-occupied dwellings.
- Military (excluding civil defence) equipment. Weapons are treated as final consumption expenditure, as they are not used repeatedly or continuously in production.
- All financial assets.
- The costs of financing the additions such as underwriters' commission, costs of advertising share issues and any interest on monies used to finance the purchase are excluded.
- Purchase and sale of land, patent rights, trademarks, goodwill, mining rights and other non-produced intangible assets. Associated transfer costs are included.
- Research and development, including technological research, market research and advertising.
- Expenditure on small tools, in cases where the expenditure is regular, and relatively low.
- Interest on progress payments.

Gross national expenditure

Gross national expenditure (GNE) is the total expenditure within a given period on final goods and services by New Zealand residents (not taking into account depreciation). It is also referred to as internal demand. GDP(E) can be derived from GNE by adding exports and deducting imports of goods and services.

Exports of goods and services

Exports include all goods and services produced by New Zealand residents and purchased by the rest of the world. Exports of merchandise are valued free on board (fob), that is, the value of goods as they cross the customs border.

Imports of goods and services

Imports include all goods and services produced by the rest of the world and purchased by New Zealand residents. Imports of merchandise are appraised at value for duty (vfd) on which customs duty is based. It equates approximately with the free on board cost of the goods in the exporting country and excludes freight and insurance.

Real gross national disposable income

Not all of the income generated from New Zealand's domestic production accrues to New Zealand residents. Whereas GDP is a measure of domestic production and GNE is a measure of the internal demand for that production, the focus of the income aggregate, gross national disposable income (GNDI), shifts to measuring the total incomes New Zealand residents receive, not only from domestic production but also from the net income flows with the rest of the world.

In order to measure how the economy changes over time, the standard approach is to remove the effects of price changes and express the various series in chain-volume measures. This results in the conventional CVM or real GDP figure, which removes inter-temporal price changes and measures the volume of production. It does not necessarily follow, however, that a change in the volume of domestic output will lead to a corresponding change in the nation's real income. One reason is that domestic product relates to the value of goods and services produced by the resources physically located in New Zealand, but the income available to the nation for consumption or investment also takes account of net investment income and net current transfers paid overseas. A second reason occurs because the movements in export and import prices may differ, such that a given volume of domestic output may be exchanged for a varying volume

of overseas output (imports). A chain-volume income measure, real gross national disposable income (RGNDI), is calculated to measure these effects.

RGNDI, therefore, is not an alternative measure of real production. It is best viewed from a broader welfare perspective, in that it measures the real purchasing power of national disposable income, taking into account changes in the terms of trade, and real gains from net investment and transfer income with the rest of the world. Effectively, it is a measure of the volume of goods and services New Zealand residents have command over.

RGNDI is calculated as follows:

$$\begin{array}{r}
 \text{Chain-volume measure of gross domestic product} \\
 + \text{ Terms of trade effect (trading loss/gains)} \\
 \hline
 = \text{ Real gross domestic income} \\
 + \text{ Real value of total net investment income} \\
 \hline
 = \text{ Real gross national income} \\
 + \text{ Real value of total net transfers} \\
 \hline
 = \text{ Real gross national disposable income} \\
 \hline
 \end{array}$$

The terms of trade effect is defined as current price exports deflated by an imports implicit price index less chain-volume measure of exports. When the terms of trade increase, more imports can be funded by a fixed quantity of exports. The terms of trade increase when export prices rise more than the prices of imports.

The real value of total net investment income equals investment income from the rest of the world (credits) less investment income payable to the rest of the world (debits), both deflated by an imports implicit price index.

The same deflator is used to derive the real value of total net transfers as the difference between transfer credits and debits.

Published series

New Zealand produced its first quarterly GDP series in 1984. This was a constant price series with a base year of 1977/78. It was later rebased at 1982/83 prices which was also the base year for the quarterly constant price expenditure on GDP series when it was introduced. In June 1996, both the GDP and expenditure series rebased to 1991/92 prices were released. The currently published series has moved from a base-weighted to a chain-volume method and is best described as annually reweighted chained Laspeyres volume indexes. Series are expressed in 1995/96 dollars rather than as index numbers, since this has the advantage of showing the relative size of each component.

The quarterly GDP series provide a snapshot of the economy's performance and are published within three months after the end of the reference quarter. The chain-volume measures of GDP and expenditure on GDP and their components – available from the June 1987 quarter onwards – have been developed within the framework of the New Zealand System of National Accounts based on SNA93. Therefore, these are conceptually consistent with the equivalent annual current price figures.

A brief history of the availability of these series is given in table 2.

Table 2

Availability of Quarterly GDP Series

	Base/expression year	Start of series	End of series	First release of official estimates
Constant price series				
GDP (P)	1977/78	June 1977 quarter	March 1987 quarter	November 1984
	1982/83	June 1977 quarter	December 1995 quarter	October 1987
	1991/92	June 1977 quarter	June 2000 quarter	June 1996
GDP (E)	1982/83	June 1982 quarter	December 1995 quarter	June 1990
	1991/92	June 1982 quarter	June 2000 quarter	June 1996
Chain-volume measures (CVM)				
GDP (P)	1995/96	June 1987 quarter	Ongoing	November 2000
GDP (E)	1995/96	June 1987 quarter	Ongoing	June 2001
Current price series				
GDP (E)	n/a	June 1982 quarter	June 2000	February 1995
	n/a	June 1987 quarter	Ongoing	June 2001

3 General methodology

Introduction

Over time, comparisons using variable, current money values are not very meaningful, as the changes observed may only be a reflection of varying price levels rather than the volume of goods and services produced or consumed. The key aggregate series of GDP are compiled as chain-volume measures to present the underlying change in volumes free of any inflation effects. The low-level or elemental series of each component of GDP are derived in constant prices (single year base weighted) and aggregated together using a chain-linking approach. In addition to deriving chain-volume measures of GDP using the production and expenditure approach, current price series of GDP(E) and its components are produced. The following sections cover: the methods used to derive low-level GDP series in constant prices for both approaches (production and expenditure); chain-linking; the methods of deriving GDP(E) in current prices; the link between the annual and quarterly accounts; the derivation and use of implicit price deflators; standard treatments such as the revisions cycle and seasonal adjustment.

When comparing an aggregate value between two time periods, any observed change is generally a combination of changes in quantity and/or price. There are two approaches to removing the changes in prices (inflation) and these are fixed base period (constant prices) or chain-volume measures. Both measures indicate changes in volumes between two points in time by keeping the prices of goods and services constant. Chain-volume measures are regarded as more accurate and were introduced into the New Zealand System of National Accounts in 2000. In order to put chain-volume measures in context, it is helpful look at constant price estimates first.

Any value (stock or flow) involving goods or services can be disaggregated into a price component and a volume component (price x volume ($P \times Q$)). After disaggregation, the price and volume components may be considered separately. A constant price or fixed base period series of goods or services is a time series of the volume components expressed in the prices of a single period. This contrasts with the 'nominal' value which is expressed in the prices prevailing at the time. The period to which the prices relate is called the 'base' or 'base period'. In a constant price series, the base period prices may be the prices pertaining to a particular point in time or the average prices over some period of time.

In some cases transactions or values will not relate to goods or services, so these may not be considered as price multiplied by volume. Tax payments, for example, have no obvious volume or price components. However, they can still be expressed in 'real' (or deflated) terms by removing the effects of price changes over a time series. This is done by dividing (deflating) the current price series by a suitable proxy of price change (or 'price index').

Constant price estimates expressed in dollar terms only change with changes in the underlying quantities because the prices have been held constant. Therefore, the estimates usually become less accurate the further the current period is from the base year. It is a consequence of the price relativities (ie, the ratios of the prices of commodities to the prices of other commodities) of goods and services changing. A solution to overcome the changing in price relatives is to regularly update the base period which is used to aggregate the underlying volumes. This is referred to as chain-linking.

The problem with changing price relatives was the main reason the SNA93 recommended moving away from calculating GDP and its components in constant prices, to a chaining process. The use of chain-volume measures allows the base year to be updated more regularly and therefore to more accurately reflect the structural changes of the economy. Calculations are carried out in the prices of the previous year and aggregated to give chain-volume measures. The term constant price has been

replaced with chain-volume measures to describe components of 'real' GDP. The chain-linked volume measures are presented in monetary terms (the average prices of the year ended March 1996) and are therefore not constant price measures in the 'true' sense. Only measures based on single year fixed-price weights should be labelled constant prices measures.

The basic methods of deriving constant price series

Nominal or current price series can be considered as the sum of transactions in quantities of goods and services (Q_n) expressed using the price at the time the transaction took place (P_n). The corresponding real series uses the same quantities (Q_n) expressed in the prices at which the transactions would have occurred in some base period (P_0). Thus, a current price series, of the form $\sum P_n Q_n$, when expressed as a series free of the price effect, is of the form $\sum P_0 Q_n$.

In principle, there are three methods of deriving the constant price series:

- quantity revaluation
- price deflation
- volume extrapolation.

Quantity revaluation

Quantity revaluation substitutes for each item, or each group of homogeneous items, the price of the base period for the price of the current period. The elemental series, that is, $\sum P_0 Q_n$, is calculated directly. This method can only be applied if the commodities are defined enough to ensure they are homogeneous in content, and sufficiently free from quality change over time (since a change in quality is defined as a change in quantity). This requires an extensive range of quantity data and base period prices for each commodity or group of homogeneous commodities in the series. These demands are not often met.

Quantity revaluation is usually adopted for measuring the value added of agricultural and livestock industries where generally, information on quantities and prices are available at a very detailed level.

Price deflation

In the series, the change in prices is approximated by the price changes in a sample of items typical of those in the series to be deflated. This is presented in the form of a price index. Because each elemental series is a Laspeyres volume index, the price index used should be of a Paasche formulation. This uses the symmetry between Laspeyres and Paasche price and volume indexes. A current price series divided (deflated) by a Paasche price index results in a Laspeyres volume measure:

$$\sum P_0 Q_n = \frac{\sum P_n Q_n}{(\sum P_n Q_n) / (\sum P_0 Q_n)}$$

However, the information on current weights required to prepare Paasche price indexes is rarely available, and, in practice, price deflation is carried out using Laspeyres base-weighted price indexes. This provides only an approximation of the desired result. Nevertheless, it is satisfactory, provided that there has not been a significant change in the relative quantities of each item since the base period, and the prices of the items have not moved at markedly different rates.

The weakness inherent in this approximation can be minimised if the deflation is carried out at the most detailed level practicable.

Volume extrapolation

The alternative to quantity revaluation or deflating current value series using a price index is to multiply the base period value by a volume index. This volume index should be of Laspeyres type with base period prices as weights, and the results should be a constant price series that equals the base period value times the volume index, or

$$\sum P_0 Q_n = \sum P_0 Q_0 * \frac{\sum P_0 Q_n}{\sum P_0 Q_0}$$

Comparison of the methods

The question is if it is preferable to extrapolate using a Laspeyres volume index or to deflate using a Paasche price index, even in its approximated form. Usually, when both indexes measure only a representative sample of the commodities included in the time series, they will not produce identical results.

However, there can be a number of advantages in using price deflation as opposed to quantity revaluation or extrapolation:

- Price relatives may tend to be more stable and have a smaller dispersion than the corresponding quantity relatives. Consequently, as the indexes represent a sample of the items being revalued, price relatives will display less variation than quantity relatives. Thus, compared with the quantity indexes, changes in the sampled items in the price index are a better representation of the changes in the non-sampled items.
- A quantity index may require more commodity detail than a price index (due to the properties mentioned above).
- In the preparation of price indexes, specific attention can be given to excluding price changes which are ascribed to quality change. Hence, the quality change will be reflected in the deflated value as a quantity change. Similarly, new products can normally be incorporated more easily in a price index, which is not subject to frequent revision.

Often, the main constraints with information are incomplete coverage, unreliability or insufficiency of details. Furthermore, there is also the need to consider the methodology used to develop the current price accounts.

The volume measures of gross domestic product

The sections above outlined how the underlying constant price series are constructed. The following section describes the application of these basic methods to estimating value added and expenditure on GDP components. The methods of deriving estimates can vary depending on data availability for each industry or component series. A section on reconciliation, interpolation and extrapolation outlines how indicator data is linked to annual benchmarks and if necessary, how quarterly results are derived without quarterly indicators. The link between the annual and quarterly national accounts is described as well as the chain-linking process which aggregates the elemental series to derive chain-volume measures.

Estimating value added

There are two basic approaches to estimating value added by industry before chain-linking: double and single (indicator) deflation. The ideal approach is double deflation, which is subject to data constraints (availability and robustness). Double price deflation, which is the most commonly used double deflation method, can often only be used for the years for which the current price balanced national accounts are available. Therefore single deflation is used for provisional estimates. Single deflation indicators are selected to proxy the economic activity within an industry.

Double deflation indicator methods

The value added of an individual producer is measured as the difference between gross output and intermediate consumption.

An identical approach can be taken when deriving industry value added. Gross output and intermediate consumption expressed in constant prices (each of which can be derived either by quantity revaluation, price deflation or volume extrapolation) are deducted from each other. This method is known as double deflation. Conceptually, this is the ideal approach because it accounts for changes in the volumes of both inputs and outputs during the production period.

Double indicator methods are:

- Quantity revaluation of output and intermediate consumption – the current price series of gross output and intermediate consumption are both expressed in volumes and revalued at the corresponding prices in the base year.
- Double price deflation – the current price series of gross output and intermediate consumption are both deflated by price indices, which measure the change in price of output on the one hand, and of inputs of goods and services on the other. This method takes account of new products and the phasing out of obsolete ones without creating breaks in the time series.
- Double extrapolation – the base year levels of gross output and of intermediate consumption are extrapolated using volume or physical quantity indicators.
- Price deflation and extrapolation combinations can be used to deflate either current price gross output or intermediate consumption using price indices and extrapolate base year estimates using volume indicators for the remaining series.

The double deflation methods described cannot be used in all situations. The level of methods applied to remove price effects depends on the robustness of information available. It demands a high level of reliability in the current price production accounts and in the price or quantity data used for deflation. In situations where data may not meet the required standards, this technique introduces the possibility of numerous and compounding measurement errors. For example, in industries where the value added is the difference between two relatively large flows subject to measurement error, value added in chain-volume measures derived by double deflation may be volatile over time because of the cumulative effect of the errors. In extreme situations the size of the accumulated errors may be larger than the recorded value added.

When the input/output price or quantity ratios are considered stable and yet deficiencies are present in the data, it is considered preferable to reject double deflation in favour of conceptually inferior, but practically superior, techniques. These involve the use of single indicators. Or, as outlined above, a combination of both is used for different time spans, that is, double deflation for the years where balanced national accounts production data is available and single deflation for the years thereafter.

Single indicator methods

1) Direct deflation of current price value added

This method deflates the value added estimate in the current price accounts by a reliable current-weighted Paasche price index. It assumes that the actual price movements of intermediate consumption and gross output are similar. In practice both Laspeyres- and Paasche-type price indexes are used for deflation.

Statistics New Zealand uses direct deflation for industries that are expected to display variable volume input/output ratios and that have existing reliable data on the components of value added. These industry estimates are usually derived from the Annual Enterprise Survey. An implicit price deflator based on output is used where possible. When this is unavailable, a Laspeyres output price index is used at the most detailed level available.

2) Extrapolation of base year value added

This approach assumes that changes in real value added vary in the same proportion to changes in the chosen indicator, or, equivalently, that actual movements in real intermediate consumption and gross output series are similar. This assumption is considered valid in the short term due to the detailed industry level at which the analysis is made and provided the base period is revised frequently.

The method involves extrapolating the base year value added by any one of a number of different types of single indicators. These indicators need not be directly linked to the current price accounts, and in a number of instances volume measures are used as proxies for the actual quantities of goods or services being produced.

There are three types of indicators, and within each are several variations.

- a) *Gross output* assumes that real value added has similar movements to real gross output. The variations used in the accounts are:
 - a Laspeyres output quantity index based on actual quantities revalued at base year prices, for example, logging
 - an approximate Laspeyres output quantity index based on deflation of current price output, for example, manufacturing excluding primary food processing
 - an output volume index based on physical activity indicators weighted by the relative value in the base year of the relevant activity, for example, rail transport.
- b) *Intermediate input* indicators assume that real value added has similar movements to real intermediate consumption. It is preferred over the gross output method only in situations where there is little or no information on outputs (for example, where industry output is imputed), or where the variance of the errors in the output price or volume indexes is known to be greater than those of the inputs indexes. In practice this method is not used for any industry in compiling GDP(P).
- c) *Factor of production* indicators (employment and/or capital) acting as proxies for movements in real value added are used only in the absence of more satisfactory alternatives. They are used on their own or combined with input data.

Using these indicators allows for changes in the structure of the workforce and capital stock, but not for changes in the real value added per unit. Ignoring changes in productivity is a major limitation with this method.

Despite this weakness, employment indicators are used widely to estimate the real value added of producers of government services who cannot obtain measures of real output. While the actual number of hours worked is the preferred indicator, hours paid for, numbers employed or deflated salaries and wages are also used where necessary.

Summarising the methods

Table 3 summarises the current general methodology for production approach gross domestic product, GDP(P). When the method is used to calculate the annual value, it is denoted with an 'A'. Quarterly methods are denoted with a 'Q'.

Table 3

Summary of Methods Used in GDP(P)

Industry	Method				
	Double deflation	Single indicator			No indicator
		Deflate	Extrapolate value added		
		Value added	Output	Factor of production	
Agriculture and hunting					
Farming	A (part)		A (part) Q (part)		Q (part)
Agricultural contracting			A		Q
Hunting			A Q (held constant)		
Forestry and logging			A Q		
Fishing		A	Q		
Mining and quarrying					
Coal mining, gas and condensate extraction			A Q		
Petroleum exploration			A Q		
Other mining and quarrying; services			A Q (part)		Q (part)
Manufacturing			A Q		
Electricity, gas and water					
Electricity	A Q (part)		Q (part)		Q (part)
Gas	A		Q		
Water			A Q		
Construction		A (part)	Q (part)	A (part) Q (part)	
Wholesale trade			A Q		
Retail trade			A Q		
Restaurants, hotels			A Q		
Transport and communication					
Rail			A Q		
Road	A		Q		
Water	A (part)		A (part) Q (part)		Q (part)
Services to transport	A		Q		
Air			A Q		
Communication		A (part)	A (part) Q (part)		Q (part)

Table 3 *continued*

Summary of Methods Used in GDP(P)

Industry	Method				
	Double deflation	Single indicator			No indicator
		Deflate	Extrapolate value added		
		Value added	Output	Factor of production	
Finance, insurance, real estate and business services					
Finance			A (part) Q (part)	A (part)	Q (part)
Insurance			A Q		
Services to finance and insurance			A Q (part)		Q (part)
Real estate			A Q (part)		Q (part)
Business services	A			Q	
Owner-occupied dwellings	A		Q		
General government services					
Public administration and defence				A Q	
Other central government services			A (part)	A (part)	Q
Local government services				A Q	
Personal and community services					
Education			A		Q
Health			A	Q	
Cultural and recreational services	A			Q	
Personal and other community services	A		Q (part)	Q (part)	
Unallocated			A Q		

Estimating expenditure on GDP

In constructing the chain-volume series of GDP(E), consistency of both scope and method with the annual current price values is maintained whenever possible.

The basic methods of deriving chain-volume series for value added – described above – are the same used for expenditure on GDP, for example:

- Quantity revaluation is used on exports series where volumes are homogeneous, such as kiwifruit. In categories such as seafood exports, quantity revaluation is carried out at the species level then aggregated to give total seafood exports.
- Price deflation is used on imports of food and beverages and is deflated by the food and beverages imports overseas trade price index.
- Volume extrapolation is used in household consumption expenditure on postal services, where the volume indicator is the total number of articles posted.

Reconciliation, interpolation and extrapolation

Often, data available on an annual basis is usually more complete. This section outlines how quarterly estimates are formed to be consistent with the annual estimates, using one of two basic approaches.

Benchmarks set the level of activity in an industry or expenditure component and are traditionally annual data. There are however benchmark series such as the Household Economic Survey (HES) or the census which are available less frequently, every three and five years, respectively.

An indicator series is a proxy which is expected to mirror the quarterly movements or changes of the 'true' series. The level of the indicator series may vary considerably from the annual benchmark. For example, this could be because the quarterly series is derived from a sample of businesses.

Benchmarks are considered more reliable but are available less frequently than quarterly indicators. The purpose of benchmarking is to combine the relative strengths of the low and high frequency data.

Where quarterly estimates are linked to annual benchmarks one of two basic approaches is used. Reconciliation is used when a quarterly indicator series and a set of annual benchmarks are available. Interpolation is conducted when no indicative quarterly series is available.

These methods can also be applied to less frequent benchmarks.

A. Reconciliation and extrapolation

In this method a quarterly indicator series is obtained and reconciled to the annual value. The quarterly indicator may be derived by any of the three methods used to obtain chain-volume series (quantity revaluation, price deflation or volume extrapolation). Production indicators will preferably be output-based measures, but data limitations can result in input measures needing to be used. As a general rule, the quarterly indicator will represent a subset of the series being measured.

The indicator series is reconciled to the annual benchmark, preserving the quarter on quarter movements of the indicator series but scaling its values to sum to the annual. When the annual value is not available for the latest periods, the movements in the quarterly series are extrapolated from the last available annual estimate. As more recent annual values become available the indicator series is reconciled to the new benchmark.

B. Interpolation and extrapolation

When no quarterly data is available, a quarterly series can be derived from the annual estimate by a process of interpolation. This method derives a quarterly series which gives the best quarterly line between the annual points.

When annual estimates are not yet available for the latest periods, an extrapolation is made of the annual values for the required periods. Forecasting of benchmarks can be achieved by using a weighted average of the movements in previous years. If there is no evidence of a strong trend in the annual series, or other available data is found to be superior to make a forecast, the moving average technique is replaced.

Interpolation and extrapolation of an annual value without an indicator series is the least desirable method for deriving quarterly estimates. This is used only for areas within the published statistics, where little short-term variation in value added is expected, or where no quarterly data is obtainable. Examples in the quarterly production accounts are:

- hunting
- insurance (except life insurance).

The link between annual and quarterly series

Compared with data used to produce the annual series, the quarterly series for both production and expenditure measures of GDP are derived from a smaller range of data. As a result they are regarded as being less accurate. Although the same sources and methods are used whenever possible, alternative sources and methods for the quarterly series are necessary when corresponding quarterly data is not available.

There are three separate types of relationships between quarterly and annual data:

- Quarterly and annual series are derived from the same information sources. In this case, the annual figures are calculated by summing the estimates for the four appropriate quarters.
- Quarterly and annual series are derived from different sources. In this situation, the quarterly indicator provides the basis of the quarterly movements. The independently derived annual series provides the annual benchmark levels. The quarterly indicator is reconciled to the annual series in a way that preserves the quarterly distribution within the time series with the condition that the annual sum of the resultant reconciled series equals the annual estimate (see section on Reconciliation and extrapolation above).
- No quarterly indicator series is available and quarterly estimates are prepared by interpolating between annual benchmarks. The estimates are generated using the same mathematical techniques used to reconcile quarterly indicators to annual benchmarks. For the latest quarters, estimates are prepared by extrapolating the interpolated quarterly series. This method is used sparingly (see section on Interpolation and extrapolation above).

Balanced national accounts provide reconciled production data using the supply-use framework. This is particularly relevant for the value added approach that is GDP(P).

Provisional estimates of expenditure components (including capital stock and consumption of fixed capital) are timelier but less detailed. These estimates can be revised following the confrontation with alternative information in the supply-use framework.

Both annual national accounts statistics (the balanced and provisional estimates) provide benchmarks for various quarterly statistics. For example, each commodity of household's final consumption expenditure is reconciled with the estimates of the total production (supply) of that commodity within the supply-use framework. Annual results for intermediate consumption, gross output or value added are used in deriving GDP(P) whenever price deflation is used. The perpetual inventory model (PIM) provides estimates of the capital stock. When either capital input is required as an indicator or the consumption of fixed capital needs to be derived (for example for the final consumption expenditure of private non-profit institutions and government) the data is sourced from the PIM.

The quarterly GDP(P) series uses the weights from the balanced current price national accounts. The weights of the expenditure of GDP chain-volume series are first determined by the provisional national accounts. These can then be revised as a result of data confrontation using the supply-use framework. Because the estimates for the latest year are more likely to have revisions of a higher level, only the expenditure weights from provisional estimates of the year before last (t-2) are used.

Chain-linking

In November 2000, National Accounts released the 'real' production measure of GDP as an official annually reweighted chained Laspeyres volume measure series. In June 2001, the expenditure measure was released using the same technique. Chain-linking is simply rebasing annually and linking the resulting series of movements into an index. Each period's volume movement is weighted according to its price weight in the previous period. These are then expressed at the average prices of the year ended March 1996 (1995/96). This has the advantage of showing the relative size of each GDP component.

Many of the techniques used previously to compile constant price series are still being used in the accounts for low-level series (as discussed above). In most cases, chain-linking will occur at a more aggregate level. For example, in household consumption there are a large number of components that are used to prepare more aggregate constant price series using one of the three measures mentioned further below (quantity revaluation, price deflation and volume extrapolation). In many cases where volume extrapolation or quantity revaluation is used at a detailed level, there is no sufficient current price data available after the reference year to use in chain-linking calculations. As a general rule, chain-linking aggregation occurs at the level the annual current price series is published. Exceptions do exist however, for example within plant, machinery and equipment in gross fixed capital formation (GFKF), which is chain-linked below the published level.

The chain-volume production measure of GDP is a result of a chain-linked aggregation of each ANZSIC working industry. Because the latest balanced annual production accounts are usually some time behind the latest quarter, the price weights of the most recent balanced current price annual national accounts are used for all future period's chain-volume measures. This gives a fixed base-weighted aggregation for the later periods which is referred to as a Laspeyres tail.

The basic steps in forming the chain-linked annual series are:

1. The detailed series in each year are valued at the prices of the previous year.
2. These values are summed to the level of aggregation of the published series to form the numerator of the movement for each year.
3. The numerator value for each year is divided by the previous year's current price value (also at the published level of aggregation). This gives a series of direct Laspeyres movements between each consecutive pair of years.
4. The movements are compounded to form an annually chain-linked volume index.
5. The volume index is scaled so that the value in 1995/96 is equal to the current price value of the series in that year. The result is an annually linked volume measure, which is expressed in the prices of 1995/96.

The year-to-year indexes are joined to form a continuous time series. An annual chain Laspeyres volume measure in year t (beyond the reference year r, t>r), L_t^C is given by:

$$\sum Q_r P_r * \prod_{i=r+1}^t \left(\frac{\sum Q_i P_{i-1}}{\sum Q_{i-1} P_{i-1}} \right)$$

where

L_t^c = chain Laspeyres volume measures at year t

P_{i-1} = prices in year i-1, the base year for values in period i

P_r = prices in year r, the reference year (for example, the year ended March 1996)

Q_i = quantities in year i

Q_{i-1} = quantities in year i-1

Q_r = quantities in year r, the reference year

The terminology around base, weight and reference year can be confusing and it appears that there is conflicting use of these terms internationally. Chain-linked indices do not have a particular base or weight period. Each link of a Laspeyres chain-linked series has a base period or weight period changing from link to link. The full run of the series derived by chaining each link together therefore does not have a particular base period. However, it has a fixed reference period. The quarterly GDP series are expressed in the average prices of the year ended March 1996 (1995/96). Instead of referring to this as the reference period, the preferred terminology is 'expression' base. The 'weighting' base period is updated annually and subject to the availability of annual national accounts. The weighting base period for the GDP estimates by industry released on 28 March 2008 is the year ended March 2004. For expenditure on GDP estimates, the latest weighting base period is the year ended March 2006 because those estimates are timelier than the balanced industry accounts. Once new annual data is released the quarterly GDP accounts are updated accordingly (see Revisions policy). For all cases, the weighting base period is the previous year except for the most recent years, which have a fixed tail.

The annually chain-linked quarterly series are formed similarly to the annual series.

Points to note are:

- Movements between consecutive quarters are formed using annual as opposed to quarterly price weights.
- Movements between consecutive quarters within the same March year are weighted using the annual prices of the previous March year. For example, movements between the June, September, December and March quarter of the year ended March 2005 are weighted using the annual prices of the year ended March 2004.
- Movements between the last quarter in each March year and the first quarter in the following March year (ie, March–June movements) are weighted using the annual prices of the earlier March year. For example, the movements between the June 2006 quarter (first quarter of the year ended March 2007) and the March 2006 quarter estimates are weighted using the annual prices of the year ended March 2006.

Chain-linked indexes for changes in inventories series are not formed like other series. As these changes can have an either positive or negative value, often movements cannot be calculated. Consider the case for example, when the current price value of the published series is zero in a year. In this case it is not possible to form the series of direct Laspeyres movements in step 3 above because this requires division by zero. These and other related problems mean that the standard approach to forming chain-linked series produces unsatisfactory results.

For these reasons some countries do not publish chain-linked indexes for change in inventories series. Statistics New Zealand has adopted the approach of the Australian Bureau of Statistics, which is to form chain-linked series of inventories levels and take the difference between these to form a 'changes in inventories' series.

In some cases, chaining is not adopted, either because relative price changes are not considered significant or (more likely) the detailed information needed for annual weights is not available.

It is important to note that chain-volume series are not additive (that is, the chain-volume series for an aggregate will not equal the sum of the values of its components). Chain-volume measures are only additive when the expression year precedes the latest year.

Chain-linking in Statistics New Zealand's national accounts, particularly the expenditure on GDP series, is explained more fully in the report, *Chain-volume Measures in National Accounts*, available on our website, www.stats.govt.nz.

The current price series of expenditure on gross domestic product

Methods and data sources used to derive quarterly current price estimates of GDP(E) are consistent, whenever possible, with both the annual current price estimates and the chain-volume series. As a result, two basic approaches are used, and these are direct measurement in current prices and reflation of a chain-volume measure estimate. If no appropriate quarterly information is available then the annual value must be interpolated and extrapolated without an indicator. This is only used in a few instances.

Direct measurement

This method uses quarterly current price data to either calculate directly the quarterly expenditure values or to provide an indicator of the series to be measured. Direct measurement of the current price values is used widely in household consumption, where quarterly data is available from the Retail Trade Survey. In exports and imports, quarterly Overseas Trade data is used.

Reflation

Reflation is done by one of two ways:

- A price index or unit values can be used to re-express a chain-volume measure or volume series back to current prices. This method is used when there is no single price applicable to the volume series being revalued, or the volume series provides only an indicator of the desired series rather than the actual level. The quarterly indicator for private electricity consumption is derived by this method. The volume of electricity generated is reflated by an electricity sub-index of the consumers price index. This will provide a quarterly indicator that is then reconciled to annual expenditure on electricity by households.
- Individual unit prices are used to quantity revalue a volume series. Similar to quantity revaluing a constant price series, this second method of reflation requires very detailed data on both prices and volumes. It is used in calculating investment on new vehicles by reflating the number of vehicles purchased using average prices based on the capital goods price index.

Interpolation and extrapolation

Like data available for the quarterly chain-volume estimates, good quality data for the quarterly current price series is often more difficult to obtain than what is available annually. In these cases, reconciliation, interpolation and extrapolation are used to ensure consistency of the quarterly estimates with the annual estimates.

Similarly, where no quarterly data is available, a quarterly series is derived from the annual figures by using interpolation. Examples are gross fixed capital formation on land improvements and spending on lotteries by households.

Implicit price deflators

The implicit price deflator of GDP(E) is the broadest measure of price change for the NZ economy. It provides an indicator of the overall movement in the prices of all final goods and services produced in New Zealand. Implicit price deflators (IPDs) reflect a combination of changing composition and prices unlike pure price indexes such as the consumers price index (CPI).

Change in an implicit price deflator between any two periods, neither of which is the base period, represent a combination of the effects of actual price changes and the changes in relative quantity weights. At the extreme it is possible for changes in the physical composition of the relevant series to produce an increase in the implicit price deflator between two periods when all the component prices have decreased. This is a particular problem with series which are highly seasonal in composition.

Consequently, implicit price deflators derived from seasonally adjusted quarterly data are easier to interpret, as the compositional shift from one quarter to another is minimised.

Movements in an individual implicit price deflator between two periods should not be taken in isolation from other relevant information. For instance, the change in an implicit price deflator between two periods should be considered in the context of movements of the implicit price deflator in adjacent periods, particularly for quarterly comparisons. In general, annual movements in implicit price deflators are more reliable indicators (seasonal shifts removed) of price change than are quarterly movements. Comparisons of implicit price deflators over several years should be done with care as the commodity composition of the series can change significantly in the longer term.

An implicit price deflator is an index obtained by dividing a current price value by its corresponding chain-volume measure. As a result, implicit price deflators can be seen as derived measures of price change (hence 'implicit'), as opposed to a direct measure such as a properly compiled price index.

Quarterly implicit price deflators are calculated by dividing the seasonally adjusted current price value of the major expenditure series by their equivalent chain-volume value. However, one expenditure component, changes in inventories, is subject to positive or negative values. No separate implicit price deflator for changes in inventories is calculated.

The implicit price deflators below the published level are regularly analysed. This is because any unexplained quarterly changes may reflect possible inconsistencies in the current/chain-volume measures series from which they are derived. Analysis of implicit price deflators so far has led to improvements in the methodology of some series. In particular, some volume indicators used previously have been replaced in favour of deflation.

Standard treatments

Revisions policy

Current prices series

The current price production accounts are released annually. The annual national accounts release includes the provisional accounts for the latest years and revisions to earlier years as a result of the industry analysis. The detailed industry analysis of GDP (the production accounts) on which the chain-volume industry value added series are based is currently published with a three-year lag.

The provisional annual GDP(E) series are more timely. However, the data is less detailed and subject to revisions as more information for data confrontation becomes available. The GDP(E) estimates are also used in the supply-use framework and reconciled with the annual current price production accounts. This procedure ensures coherence and consistency within the national accounts.

Chain-volume series

In principle, there are two causes for revisions to the GDP(P) and GDP(E) chain-volume series from the annual national accounts. Where annual results are used as benchmarks for underlying series, the incorporation of new and revised annual data will cause subsequent revisions to the quarterly series. Revisions also result from the annual update of the price weights used for chain-linking.

The provisional and revised annual GDP(E) figures and the revised GDP(P) figures with a three-year lag from the reference period are then incorporated in the chain-volume series. This is normally done in two stages. The annual expenditure estimates are incorporated in the quarter that follows the annual national accounts release. In the next quarter, the annual balanced production estimates are introduced to the quarterly accounts.

One of the key benefits gained through adopting chain-volume measures in place of single year fixed-weight series is that the relative weights of the component series are more up to date and therefore better reflect structural changes in the NZ economy. Updating the price weights for linking the underlying series reduces the likelihood of introducing biases in the volume measures, which would otherwise become progressively unrepresentative as relative prices change. Reweighting is part of the annual revisions cycle and is usually timed to coincide with the introduction of other new annual data from the current price GDP accounts.

Each quarter, revisions to previously published series may be made. Sometimes, revisions to data that feed directly into the national accounts series, for example, Balance of Payments or Retail Trade Survey data, are released. These revisions are incorporated into the national accounts as soon as possible to maintain consistency between published macroeconomic statistics.

Revisions may also be due to methodological changes and other quality improvements to the annual as well as the quarterly national accounts.

In addition, each of the above causes for revision, and/or the addition of a new point in the actual quarterly series, has the potential to alter seasonal factors and therefore lead to a revision in the seasonally adjusted series.

Table 4

Revisions Policy

	Current price series	Chain-volume series
GDP (P)		
Annual	Annual estimates and revisions are released once a year. Industry analysis is usually not available for the three years following the reference period.	As for the current price series. Further revisions released in the following June quarter to incorporate the latest annual estimates and update chaining weights from the annual industry accounts.
Quarterly	Not produced.	Revised each quarter, usually only back to the last balanced annual.
GDP (E)		
Annual	Revisions with the release of the annual accounts.	As for the current price series. Further revisions in the quarter following the release of annual expenditure accounts to update chaining weights.
Quarterly	Revised each quarter, usually only back to the last annual.	As for the current price series.

Seasonal adjustment

Seasonal variations occur in many quarterly series. These may be caused by several factors, such as the effect of Christmas on household spending patterns, or the influence of seasons on stock building in the dairy industry. The extent and nature of seasonality varies markedly between series. Not all seasonal influences are regular, strong, or of sufficient duration to permit reliable seasonal adjustment.

Seasonal adjustment attempts to remove seasonal variation from a series allowing the remaining sources of change (trend and irregular components) to be more easily observed.

The seasonal adjustment method used by Statistics New Zealand for quarterly national accounts is the X-12 variant of the seasonal adjustment programme developed at the United States Bureau of the Census. Because the technique uses all observations in a series to determine the seasonal pattern, extra periods added to the series can alter the pattern and cause revisions.

The level at which series are seasonally adjusted is important. The indirect approach seasonally adjusts the individual component series of the main economic variables and then sums them. For example, seasonally adjusted total household consumption expenditure is the sum of its 20+ component series, most of which are individually seasonally adjusted. Component series that cannot be seasonally adjusted are still included in the total.

The indirect approach, however, may produce unsatisfactory results if a high proportion of the component series cannot be seasonally adjusted, that is, seasonality in the component series is not sufficiently strong to warrant adjustment. When such groups of non-seasonal series are added together, underlying seasonality often becomes more apparent and can be adjusted. To remove this residual seasonality, a number of series are seasonally adjusted at the total level, independently of the seasonal adjustment of their components. The seasonal adjustment of the total of an aggregate series is called a direct seasonal adjustment.

A summary of the method of seasonal adjustment for the expenditure and production based series is listed below.

Gross domestic product

Table 5 indicates whether industries, at the broadest level, are directly or indirectly adjusted. When an industry is indirectly adjusted, it may be done at the lowest level of aggregation, the level immediately below the published level or at a mixture of levels. For example, seasonally adjusted agriculture is calculated by seasonally adjusting value added for total farming and total agricultural services and aggregating the results. Seasonally adjusted manufacturing is calculated by adjusting the components of other food processing and basic metals manufacturing, adjusting the total value added of each of the other manufacturing production groups, and aggregating to total manufacturing. Seasonal adjustment can be done at any level in a series hierarchy that results in the seasonally adjusted published form of that series.

Table 5

Seasonal Adjustment for GDP(P)

Industry	Direct or indirect adjustment
Agriculture	Indirect
Forestry and logging	Direct
Fishing	Direct
Mining	Indirect
Manufacturing	Indirect
Electricity, gas and water	Indirect
Construction	Indirect
Wholesale trade	Direct
Retail trade	Indirect
Restaurants and hotels	Direct
Transport and storage	Direct
Communication services	Indirect
Finance and insurance	Not adjusted
Real estate and business services	Not adjusted
Owner-occupied dwellings	Not adjusted
Central government, administration and defence	Indirect
Local government administration	Direct
Personal and community services	Indirect
Unallocated	Indirect
Total GDP	Direct

Expenditure on gross domestic product

Table 6 indicates whether the expenditure components are directly or indirectly adjusted.

Table 6

Seasonal Adjustment for GDP(E)

Expenditure component	Current price	Chain-volume
Private final consumption expenditure	Indirect	Indirect
Government final consumption expenditure	Indirect	Indirect
– Central government	Indirect	Indirect
– Local government	Direct	Direct
Changes in inventories	Direct	Direct
Gross fixed capital formation	Indirect	Indirect
Exports	Indirect	Direct
– Goods	Direct	Direct
– Services	Direct	Direct
Imports	Indirect	Direct
– Goods	Indirect	Direct
– Services	Direct	Direct
Total expenditure on GDP	Direct	Direct

In a number of countries amendments are made during the seasonal adjustment process to account for changes in the number of trading days when they occur. That happens during a leap year – resulting in an additional trading day during the March quarter and when public holidays – such as the Easter holidays – move from one quarter to another. On several occasions Statistics New Zealand investigated the impact of this change. It is difficult to estimate the effect accurately; however, reviews indicated this was not able to be observed within the quarterly GDP growth rates.

4 Detailed sources and methods

Gross domestic product by industry GDP(P) industry weights

Table 7

Relative Weights (Current Prices) of Industry Groups for 2004⁽¹⁾⁽²⁾

Industry	Contribution to value added %	Contribution to industry value added %	Value added \$(million)	Industry value added \$(million)
Agriculture	5.6		7,539	
Horticulture and fruit growing		15.2		1,143
Livestock and cropping farming		33.4		2,521
Dairy cattle farming		34.0		2,562
Other farming		3.7		282
Services to agriculture, hunting & trapping		13.7		1,031
Forestry and logging	0.7		1,000	
Fishing	0.2		262	
Mining	1.0		1,329	
Mining & quarrying		36.9		490
Oil & gas exploration & extraction		63.1		839
Food, beverage and tobacco manufacturing	4.9		6,544	
Meat and dairy manufacturing		34.0		2,225
Other food manufacturing		29.6		1,936
Beverage, malt & tobacco manufacturing		36.4		2,383
Textile and apparel manufacturing	0.7		899	
Wood and paper product manufacturing	1.6		2,093	
Wood product manufacturing		58.1		1,216
Paper & paper product manufacturing		41.9		876
Printing, publishing and recorded media	1.2		1,586	
Petroleum, chemicals, plastic and rubber product manufacturing	1.7		2,341	
Petroleum & industrial chemical manufacturing		35.8		839
Rubber, plastic and other chemical product manufacturing		64.2		1,502
Non-metallic mineral product manufacturing	0.6		778	
Metal product manufacturing	1.8		2,373	
Basic metal manufacturing		27.4		651
Structural, sheet & fabricated metal product manufacturing		72.6		1,722

(1) These weights were published in May 2007 and have been revised in April 2008. However, the weights from the annual national accounts in April 2008 are only due for implementation in the quarterly accounts for the Gross Domestic Product: June 2008 release, which is due in September 2008.

(2) Figures may not sum to totals due to rounding.

Table 7 *continued*

Relative Weights (Current Prices) of Industry Groups for 2004

Industry	Contribution to value added %	Contribution to industry value added %	Value added \$(million)	Industry value added \$(million)
Machinery & equipment manufacturing	2.3		3,129	
Transport equipment manufacturing		28.8		902
Machinery and other equipment manufacturing		71.2		2,227
Furniture & other manufacturing	0.5		723	
Electricity, gas and water supply	2.9		3,875	
Electricity generation & supply and gas supply		91.5		3,547
Water supply		8.5		328
Construction	4.9		6,582	
Wholesale trade	7.4		10,021	
Retail trade	6.3		8,542	
Accommodation, restaurants and bars	1.9		2,537	
Transport and storage	4.3		5,789	
Road & rail transport		44.3		2,568
Water & air transport		20.8		1,202
Services to transport		34.9		2,020
Communication services	3.1		4,231	
Finance & insurance	6.6		8,835	
Finance		71.2		6,287
Insurance		15.3		1,355
Services to finance & insurance		13.5		1,193
Property services	6.2		8,393	
Real estate		84.4		7,080
Equipment hire & investors in other property		15.6		1,313
Ownership of owner-occupied dwellings	6.9		9,255	
Business services	8.6		11,544	
Central government administration & defence	3.2		4,249	
Local government administration	1.2		1,646	
Education	4.2		5,652	
Health & community services	5.5		7,398	
Cultural & recreational services	2.6		3,444	
Personal & other community services	1.5		2,042	
Total all industries	100		134,620	
Unallocated			5,132	
Financial service charge			-5,165	
GST on production			9,578	
Import duties			719	
Other taxes on production			-	
Gross domestic product			139,753	

Gross domestic product by industry

Production-based GDP is derived from the difference between gross output and intermediate consumption for each industry, that is, value added and the 'unallocated' category. For most industries value added is compiled below the published level at working industry level. The exact breakdown for each industry is mainly subject to source data availability and quality.

Gross output

Gross output is the value of all goods and services produced during a period of account, irrespective of whether they are produced for sale or for own use. This includes any additions to or removals from inventory. Finished goods produced but not sold are included and those goods sold from stock (since they were not produced in the current period) are excluded.

Gross output is valued at producers' prices. The producer's price is the value of the goods and services sold at the producer's door. It excludes goods and service tax (GST), which the producer collects on behalf of the government.

Intermediate consumption

Intermediate consumption consists of the value of the goods and services consumed as inputs in the production of goods and services. Typical examples from the business accounts are: stationery, rent of buildings, electricity, accounting fees, repairs and maintenance, legal fees, prospecting, advertising and printing costs, telephone expenses, royalties paid, and research and development.

The valuation of intermediate consumption is at purchasers' values. This is the cost of goods and services in the market up to the point of delivery, inclusive of any distribution and transport margins. This price includes taxes on commodities such as sales tax and excise duties or import duties. GST is included in cases where the tax is non-deductible. This is because producers regard themselves only as agents for GST collection. When the input tax component of the production costs cannot be reclaimed it represents part of the value of the intermediate consumption.

Special cases

Applying the concepts of gross output and intermediate consumption can be confusing, in particular for the distribution, finance and insurance industries.

Distribution industry

The distribution industry is primarily engaged in selling goods in the same form as they are purchased. Purchases for resale are not included in intermediate consumption but are deducted from sales in gross output. This is because the goods sold are not used up in production.

For the distribution industry, the actual value of gross output is considered to be the wholesale or retail margin earned on the sale of goods.

$$\begin{array}{r}
 \text{Sales of goods for resale} \\
 - \text{Cost of goods sold} \\
 \hline
 = \text{Gross margin on sales} \\
 \hline
 \end{array}$$

Finance industry

Banks and other financial intermediaries provide services to both depositors and borrowers. However, they generate only part of their income from explicit charges. The main portion of their income arises from the margin between the interest they earn from lending and the costs they incur in funding that lending (that is, from deposits, borrowing, or use of own funds). If the transactions of these institutions were treated the same way as those of other industries, their gross operating surplus would be negative.

This is because NZSNA records income from investment in the income and outlay accounts and not as an item of gross output in the production account.

Within the finance industry, a service charge is imputed in addition to the charges actually received. Both charges, the actual and imputed service charge, are the gross output of that industry. Currently, following SNA68 rather than SNA93, this imputed or notional charge is calculated 'globally' as the difference between income received on loans and other investments and interest paid out. This is termed the bank service charge. This is not specifically allocated to users of bank services but appears as a separate entry in the GDP accounts as a cost against GDP.

Having no gross output, this nominal industry makes a negative contribution to GDP equal to the imputed intermediate consumption. The nominal industry is shown separately from the industry accounts. Its negative operating surplus counteracts the increased gross operating surplus of all other industries, which are not recorded as paying any of the imputed bank service charges. Therefore, the overall contribution to GDP remains unchanged.

Statistics New Zealand is investigating the introduction of the according SNA93 concept – financial intermediation services indirectly measured (FISIM) – to the national accounts. When allocating the cost as FISIM, the GDP total will change (increase) by the value of the charge, as final consumption expenditure by households, government and private non-profit institutions serving households will increase.

Insurance industry

Similar to banks, the insurance industry has an imputed service charge. The SNA93 defines the value of the output of the insurance industry. In practice, however, it is difficult to estimate this service charge.

This industry comprises life, non-life (general and health) insurance, and superannuation. Premiums paid to insurance companies and superannuation funds comprise:

- charge for the service of insuring
- a payment for the risk of insuring
- in the case of life insurance and superannuation funds, a substantial element of savings.

Gross output of the insurance industry is defined as the charge for the service of insuring. The service charge is an expense recorded in intermediate consumption of producers and final consumption expenditure of households. For non-life insurance the service charge is measured as the excess of premiums earned and investment income earned from the insurer's technical reserves over claims. For life insurance the earnings of the fund and net change in total value of the fund are also taken into account.

Benchmarks

When the annual method is given as the 'sum of the quarters', the annual value is derived as the sum of the deflated quarterly series. Reconciliation to the annual value, therefore, is not necessary.

If the method is described as 'extrapolation by a quarterly indicator', then the quarterly series is reconciled to the annual value. As each new annual value becomes available this involves interpolation between the latest annual values using the quarterly indicator.

Price deflation can only be used when current price annual data is available from the balanced national accounts. Currently, the balanced accounts are produced at a lag of three years. Beyond three years (referred to as 'provisional'), the quarterly method is used to derive value added estimates. For example, road transport annual estimates are derived by double price deflation for the years where balanced industry accounts data is

available. For the provisional years, the quarterly method – volume extrapolation – is used to derive quarterly and annual estimates.

The same applies for cases where the annual benchmarks do not come from balanced industry accounts but from other sources. The annual benchmarks are usually revised once the data becomes available. The most common method applied to derive annual values is extrapolation.

Table 8

Methods of Deriving Gross Domestic Product by Industry

Industry	Annual method	Quarterly method
Agriculture and farming		
<i>Total farming</i>	Double deflation. Gross output is calculated using quantity revaluation. Intermediate consumption is deflated by sub-indexes of the producers price index (PPI), other than purchases of livestock which uses quantity revaluation. Beyond the provisional years, value added is derived by extrapolation using gross output as indicator.	Quarterly farming value added is reconciled with annual farming value added using quarterly gross output as indicator.
– Livestock	Gross output is calculated using annual sales and inventories change derived by quantity revaluation.	Gross output is calculated by volume extrapolation using births, live exports, inter-farm sales and slaughter data.
– Dairy	Sum of the quarters.	Gross output is calculated by quantity revaluation, using volumes of milk fat and town milk produced.
– Horticulture	Gross output is calculated by quantity revaluation using annual tonnes of production.	Interpolation of the annual with no indicator.
– Other farming	Gross output is calculated by quantity revaluation using annual volume of production.	Interpolation of the annual with no indicator.
<i>Agricultural contracting services</i>	Single deflation. The current price annual gross output for both final and provisional estimate years is deflated by a sub-index of the PPI. A moving average is used to rate forward the value added beyond the provisional estimates.	Interpolation of the annual with no indicator.
<i>Hunting</i>	The value added is now insignificant and the 1995/96 base year value added is held constant.	Interpolation of the annual with no indicator.
Forestry and logging		
<i>Forestry</i>	Sum of the quarters.	Extrapolation by an output volume index. The index is based on forestry inventories change. The changes in inventories are produced using roundwood removals, plus annual inventories of standing timber. Data is provided by the Ministry of Agriculture and Forestry (MAF).
<i>Logging</i>	Sum of the quarters.	Extrapolation by an output volume index. The index is based on logging sales derived from removal volumes. Data is provided by MAF.
Fishing		
	Single deflation. Deflation of value added by an implicit price index. The implied deflator is based on volumes from catch statistics provided by FishServe and sales values from the annual national accounts.	Extrapolation by an output volume index. The index is based on quarterly catch volume statistics from FishServe.

Table 8 *continued*

Industry	Annual method	Quarterly method
Mining and quarrying		
<i>Coal mining</i>	Sum of the quarters.	Extrapolation by an output volume index. The index uses coal production from the Survey of Coal Sales.
<i>Gas and condensate extraction</i>	Sum of the quarters.	Extrapolation by an output volume index. The index is based on quarterly volumes extracted.
<i>Petroleum exploration</i>	Sum of the quarters.	Extrapolation by an output volume index. The index is based on metres drilled quarterly in exploration, provided by Crown Minerals, Ministry of Economic Development.
<i>Other mining and quarrying</i>	Extrapolation by an output volume index. The index is based on mineral production statistics provided by the Ministry of Economic Development (MED).	Interpolation of the annual with no indicator.
<i>Services to mining</i>	Sum of the quarters.	Extrapolation by an output volume index using the total value added for crude petrol and natural gas exploration and other mining and quarrying.
Manufacturing		
<i>Primary food manufacture</i>		
– Meat production	Sum of the quarters	Extrapolation by an output volume index using the actual production volume.
– Dairy production	Sum of the quarters.	Extrapolation by an output volume index. The index is based on volumes of final dairy products processed including fresh milk supply.
<i>Other food, beverage and tobacco manufacture</i>	Extrapolation by an output volume index. The same as the quarterly method. However, sales and inventories from the balanced national accounts are deflated by sub-indexes of the PPI for each area of manufacturing.	Extrapolation by an output volume index. The quarterly index is compiled in two parts. Sales and inventories, as measured by the Economic Survey of Manufacturing, are deflated by sub-indexes from the PPI. Commodity taxes use volumes produced of wine and beer, and deflated sales of tobacco.
<i>Manufacturing other than other food, tobacco and beverages production</i>	Extrapolation by an output volume index. The same as the quarterly method. However, sales and inventories from the balanced national accounts are deflated by sub-indexes of the PPI for each area of manufacturing.	Extrapolation by an output volume index. Separate output volume indexes are used for each area of manufacturing. The indexes are compiled in two parts. The first uses sales from the Economic Survey of Manufacturing deflated by sub-indexes from the PPI. The second part uses finished goods' change in inventories, which is deflated by sub-indexes of the PPI. For the basic metal products and chemical products industries, however, some large companies are extrapolated separately.

Table 8 *continued*

Industry	Annual method	Quarterly method
Electricity, gas and water supply		
Electricity		
<ul style="list-style-type: none"> – Electricity generation and retail 	<p>Double deflation. Gross output less own account capital formation is extrapolated by an output volume index, which is the average of the movement of electricity generation and of electricity consumption.</p> <p>Intermediate consumption is split into two components: fuels inputs and other inputs. Fuels inputs are extrapolated by a volume index using electricity generated by fuels. Other inputs are extrapolated by a volume index, which is the average of the movement of electricity generation and of electricity consumption. Data is provided by the Ministry of Economic Development (MED).</p> <p>Own account capital formation is deflated using sub-indexes of the capital goods price index (CGPI).</p>	<p>Gross output less own account capital formation is extrapolated by a volume indicator using total electricity generated.</p> <p>Intermediate consumption is extrapolated by a quarterly volume indicator using the volume of electricity from thermal generation for fuel inputs, and total electricity generated for the remainder. All totals for electricity generated are net of own use by generators.</p> <p>Own account capital formation is calculated by interpolation.</p>
<ul style="list-style-type: none"> – Electricity transmission 	<p>Value added less own account capital formation is extrapolated by an output volume index using annual total electricity generated (net of own use by generators).</p> <p>Own account capital formation is deflated using sub-indexes of the CGPI.</p>	<p>Value added less own account capital formation is extrapolated by a volume indicator using total electricity generated (net of own use by generators).</p> <p>Own account capital formation is calculated by interpolation.</p>
<ul style="list-style-type: none"> – Electricity distribution 	<p>Value added less own account capital formation is extrapolated by an output volume index, which is the average of the movement of electricity generation and of electricity consumption.</p> <p>Own account capital formation is deflated using sub-indexes of the CGPI.</p>	<p>Value added less own account capital formation is extrapolated by a volume indicator using total electricity generated (net of own use by generators).</p> <p>Own account capital formation is calculated by interpolation.</p>
Gas	<p>Double deflation. Gross output is extrapolated by an output volume index. The index uses volumes of gas sold, except for own account capital formation which is deflated by sub-indexes of the labour cost index (LCI) and the PPI. Intermediate consumption is deflated by sub-indexes of the PPI except for gas purchased which is extrapolated by a volume index using volumes of gas purchased.</p>	<p>Extrapolation by an output volume index. The index uses volumes of gas deliveries by the industry.</p>
Water	Sum of the quarters.	Extrapolation by a quarterly population indicator.

Table 8 *continued*

Industry	Annual method	Quarterly method
Building and construction		
<i>Private sector</i>	Deflation of current price balanced value added from the national accounts by an output price index. The index is compiled at the sub-industry level for building construction, owner-builders and other construction using sub-indexes of the PPI.	Extrapolation by an output volume index. The quarterly index is compiled in two parts. Building construction uses the value of building work put in place deflated by a sub-index of the PPI. Other construction uses gross fixed capital formation for other construction deflated by a sub-index of the CGPI. Work put in place is sourced from the Value of Building Work Put in Place Survey.
<i>Public sector</i>	Extrapolation by an employment indicator. The indicator uses salaries and wages paid, deflated by a sub-index of the LCI.	Extrapolation by an employment indicator. The indicator uses salaries and wages paid, deflated by a sub-index of the LCI except for the local government component which uses hours worked from the Quarterly Employment Survey.
Wholesale		
<i>Oil companies</i>	Sum of the quarters.	Quantity revaluation of volumes of exports and domestic oil deliveries.
<i>Wholesale trade excluding oil companies</i>	Sum of the quarters.	Sub-components from the Wholesale Trade Survey are deflated using sub-indexes of the PPI. For kiwifruit, export volumes are used as an output volume index. The indicator for apples and pears is derived by deflating sales using a sub-index of the PPI.
Retail trade, restaurants and accommodation		
	Sum of the quarters.	Extrapolation by a volume index using quarterly deflated sales from the Retail Trade Survey.
Transport and communication		
<i>Rail</i>	Sum of the quarters.	Extrapolation by a volume index using rail freight volumes and rail passenger revenues.
<i>Road</i>	Double deflation. The current price balanced intermediate consumption and gross output from the national accounts are deflated by annualised versions of the quarterly PPI.	Extrapolation by a volume index using road user charges.
<i>Water</i>		
– Ferry	Sum of the quarters.	Extrapolation by a volume index using ferry passengers, cars, commercial vehicles and freight.
– Other	Double deflation. The current price balanced intermediate consumption and gross output from the national accounts are deflated by annualised versions of the quarterly PPI.	Interpolation and extrapolation of the annual with no indicator.
<i>Air</i>	Sum of the quarters.	Extrapolation by an output volume index using revenue per passenger, per kilometre and revenue per tonne, per kilometre.
<i>Services to transport</i>	Double deflation. The current price balanced intermediate consumption and gross output from the national accounts are deflated by annualised versions of the quarterly PPI.	The quarterly indicator is calculated as a combination of all the other transport industries indicators as well as a measurement of ports and the volumes of aircraft movements as a proxy for services provided to air transport industry.

Table 8 *continued*

Industry	Annual method	Quarterly method
Transport and communication <i>continued</i>		
Communications		
– Postal and courier services	Postal – sum of the quarters. Other postal and courier services – current price balanced value added from the national accounts is deflated by a derived gross output implicit price deflator.	Extrapolation by an output volume index using the number of posted items.
– Telecommunications	Sum of the quarters.	Extrapolation by an output volume index using domestic toll minutes, international toll minutes, cellphone minutes, phone connections, number of internet customers and deflated revenue.
Finance, insurance and business services		
Finance		
– Reserve Bank	Extrapolation by an employment volume indicator.	Interpolation of the annual with no indicator.
– Other finance	Sum of the quarters.	Extrapolation by an output volume index. The volume index is calculated in two parts. The bank service charge component uses deflated funding and claims for all financial intermediaries, sourced from the Reserve Bank of New Zealand, deflated by sub-indexes of the PPI and CPI. Other income uses annual numbers of current account transactions from the Bankers Association. The indicator for other income is interpolated from the annual value.
Insurance	Sum of the quarters.	Extrapolation by an output volume index using premium income from the Investment Savings and Insurance Association, the Insurance and Superannuation Unit of the Ministry of Economic Development, and the Insurance Council of NZ, deflated by according sub-indexes of the PPI.
Services to finance and insurance	Sum of the quarters.	Extrapolation by an output volume index. The index is based on the combined quarterly series for the finance and insurance industries.
Property services		
– Real estate	Extrapolation by an output volume index. The index uses the number of dwellings rented for private property rental and the number of property sales for real estate agents deflated by a sub-index of the PPI. For commercial property rental, the output of commercial property companies and the real estate activities of insurance and superannuation funds companies are deflated by a sub-index of the PPI.	Extrapolation by an output volume index. Residential property operators are estimated quarterly from the Census of Population and Dwellings benchmarks and projections. For commercial property operators the component series are interpolated and extrapolated from the annual value with no quarterly indicator. Real estate agent activity is measured using REINZ data for the number of residential property sales and quotable value data for non-residential property sales.

Table 8 *continued*

Industry	Annual method	Quarterly method
Finance, insurance and business services <i>continued</i>		
Property services <i>continued</i> – Other property services	Double deflation. Current price balanced intermediate consumption and gross output from the national accounts are deflated by sub-indexes of the PPI. Annual benchmarks beyond the balanced years are derived by using an annual constant price net capital stock series from the capital stock model.	Interpolation and extrapolation of the annual with no indicator.
Business services	Double deflation. Current price balanced intermediate consumption and gross output from the national accounts are deflated by sub-indexes of the PPI. For provisional years, working proprietors and paid employees are treated separately. Working proprietors are rated forward using Linked Employer-Employee Data (LEED). Employees are rated forward using paid hours from the Quarterly Employment Survey (QES).	Extrapolation by an employment volume index using hours worked by employees and number of working proprietors from the QES.
Ownership of owner-occupied dwellings	Double deflation. Output is extrapolated by an output volume index using the number of owner-occupied dwellings. Intermediate consumption is deflated by a sub-index of the PPI.	Extrapolation by an output volume index using quarterly estimates of the number of owner-occupied dwellings.
General government services		
Public administration and defence	Sum of the quarters.	Extrapolation by an employment volume indicator. The indicator is based on salaries and wages paid by departments (from the Central Government Enterprise Survey and the Crown Financial Information System) deflated by a sub-index of the LCI.
Other central government services <i>(Non-public account)</i>	Deflation of compensation of employees by a sub-index of the LCI except for the Accident Compensation Corporation (ACC) and the Fire Service Commission. The ACC uses extrapolation by a volume index based on the number of claims. The Fire Service Commission uses extrapolation by an employment volume index based on the number of employees.	Interpolation and extrapolation of the annual with no indicator.
Local government services	Sum of the quarters.	Extrapolation by an employment volume indicator using salaries and wages from the Quarterly Local Authority Survey deflated by a sub-index of the LCI.

Table 8 *continued*

Industry	Annual method	Quarterly method
Personal and community services		
Education	Extrapolation by a volume indicator. The indicator is based on the number of pupils taught in private and public schools, provided by the Ministry of Education.	Interpolation of the annual value with no indicator.
Health	Extrapolation by a volume index.	Extrapolation by a volume indicator.
– Public	The index is a composite using the number of hospital discharges, in-patient cases and the average length of stay in hospitals from Ministry of Health.	The indicator is salaries and wages from Ministry of Health deflated by a sub-index of the LCI.
– Private	The index is derived from sales as recorded by AES, which are deflated by annualised sub-indexes of the CPI.	The indicator is total hours worked from the Quarterly Employment Survey.
Cultural and recreational services	Double deflation. Current price balanced intermediate consumption and gross output from the national accounts are deflated by sub-indexes of the PPI.	Extrapolation by an employment volume indicator. Total hours worked for each of the sub-industries from the Quarterly Employment Survey are used as indicator.
Personal and other community services		
– Personal and household services	Double deflation. Current price balanced intermediate consumption and gross output from the national accounts are deflated by sub-indexes of the PPI.	Extrapolation by a volume indicator using deflated sales of personal and household services from the Retail Trade Survey.
– Private households employing staff		Extrapolation by a quarterly population indicator.
– Other		Extrapolation by an employment volume indicator using hours worked from the QES.
Unallocated taxes		
GST	The annuals for GST are equal to the sum of the quarters for all components.	Extrapolation by a volume indicator is done for each of four components, as follows.
– Household consumption expenditure		Uses total household consumption expenditure less the non-GST leviable items.
– Gross fixed capital formation		The index uses the chain-volume series for investment on residential buildings.
– Exports		The index uses the chain-volume series for travel credits.
– GST paid by unregistered and exempt industries		The value added indexes for banking, financial services, insurance, ownership of real estate and owner-occupied dwellings are weighted together to form a volume index.
Import duties	Sum of the quarters.	Extrapolation by a volume index using import volumes, weighted by base-year import duties.

Expenditure on gross domestic product

GDP(E) components weights

Table 9

Relative Weights (Current Prices) of Expenditure Components for 2006⁽¹⁾

	Components \$million	Current prices \$million	2006 Weight	Component contributions
Private final consumption expenditure		93,560	0.59	1.00
Households	91,547			0.98
Private non-profit services to households	2,013			0.02
Government final consumption expenditure		28,416	0.18	1.00
Central government	25,140			0.88
Local government	3,276			0.12
Changes in inventories		828	0.01	1.00
Gross fixed capital formation		37,744	0.24	1.00
Residential buildings	10,531			0.28
Non-residential buildings	5,485			0.14
Other construction	4,529			0.12
Land improvements	582			0.02
Transport equipment	4,465			0.12
Plant, machinery and equipment	9,492			0.25
Intangible assets	2,661			0.07
Exports of goods and services		43,786	0.28	1.00
Goods	31,580			0.72
Services	12,206			0.28
Imports of goods and services		-47,444	-0.30	1.00
Goods	-35,685			0.75
Services	-11,759			0.25
Expenditure on gross domestic product		156,889	1.00	

(1) These weights have been published in November 2007. Updated expenditure account estimates were released on 1 April 2008. These results are due for implementation in the quarterly accounts for the Gross Domestic Product: March 2008 quarter release, which will be released on 27 June 2008.

Private final consumption expenditure

This component is comprised the final expenditure by households and non-profit institutions serving households.

Households

Household final consumption expenditure can be classified in two different ways. Firstly, according to purpose:

- food and beverages
- clothing and footwear
- housing
- household goods and services
- health and medical
- transport
- recreation and education
- hotels and restaurants
- other goods and services
- travel debits
- travel credits.

And secondly also according to type or durability:

- durables
- non-durables
- services
- net tourist expenditure.

Final consumption expenditure of households measures the final purchases made by New Zealand resident households. Conceptually it includes expenditure by New Zealanders overseas, and excludes expenditure by overseas tourists in New Zealand as they are not part of the NZ economy. The main data source is the retail trade survey which does not distinguish between consumption by residents or non-residents. Adjustments are made to bring the consumption by non-residents in NZ and NZ residents overseas into the scope of the New Zealand economy.

Final consumption expenditure by resident households is calculated as:-

$$\begin{array}{r}
 \text{Final consumption expenditure in the domestic market} \\
 + \text{ Expenditure overseas by New Zealand residents} \\
 - \text{ Expenditure in New Zealand by foreign residents} \\
 \hline
 = \text{ Household final consumption expenditure} \\
 \hline
 \end{array}$$

When the annual method is given as 'sum of the quarters', reconciliation to the annual value is not necessary. When the quarterly series is estimated using an indicator, reconciliation to the annual value is required.

When the method for quarterly chain-volume series is derived as 'extrapolation by a quarterly indicator', the quarterly series is extrapolated from the latest annual available. As each new annual value becomes available this involves interpolation between the latest annual values using the quarterly indicator.

Benchmarks

Unlike the quarterly production approach series, which draws most of its annual benchmarks from the balanced industry accounts, there are additional benchmarks for household final consumption expenditure. These include the AES and the Retail Trade Survey. The information on commodity expenditure from these sources is used to confront the industry production data. All benchmarks are therefore subject to revision.

All quarterly current price estimates are reconciled to annual values based on the supply-use confrontation.

In cases where data is not available for every year, interpolation techniques are used for the time span. Suitable indicators are used to breach the span of the non-benchmark years. Once produced, these estimates feed into the supply-use framework to allow data confrontation.

Use of Retail Trade Survey data

A large proportion of household final consumption expenditure comprises sales by retail stores. Benchmarks are a combination of commodity data from the inter-industry study (1995/96) and the point-of-purchase information from HES which allows conversion from industry or storetype data to a product dimension. For provisional years (that is, not yet balanced within the supply-use framework), and for the quarterly indicator series which are reconciled to these annual values, estimates are derived using movements in sales by storetype from the Retail Trade Survey. This method is used for all commodities purchased from retail trade outlets except for motor vehicles and alcohol and tobacco products where alternative information is available. Quarterly chain-volume series are derived by price deflation of commodities using sub-indexes of the consumers price index and Retail Trade Survey storetype deflators.

Net tourists' expenditure

Estimates by consumption product are derived from retail trade data, which does not distinguish between resident and non resident sales. Subsequently, estimates are made for expenditure by non-resident households in New Zealand (as these are recorded as exports) and alternatively expenditure by resident households overseas (imports). This ensures no double counting.

Private non-profit institutions serving households

Private non-profit institutions serving households (NPISH) provide goods or services to households either free or at prices or fees that are not economically significant (costs not covered). These units also have independent legal status and are generally not controlled or financed by government.

This sector includes the following two kinds of institutions that provide goods or services to their members or to other households:

- Trade unions, professional or learned societies, consumers' associations, political parties, churches or religious societies, and social, cultural, recreational and sports clubs.
- Charities, relief and aid organisations financed by voluntary transfers in cash or kind from other institutional units (for example households, enterprises).

In order to value their production, a gross output is imputed which is considered to be equal to the sum of their gross inputs. This is referred to as the input approach, which is non-market (as these units do not provide goods or services at economically significant prices). The amount that has been imputed, less any actual sales of goods and services, is shown as being consumed by the organisations themselves, so that:

Intermediate consumption
+ Compensation of employees
+ Unallocated taxes
+ Consumption of fixed capital
– Sales of goods and services
<hr/>
= Private non-profit institutions final consumption expenditure
<hr/>

Table 10

Methods of Deriving Private Final Consumption Expenditure

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Households final consumption expenditure				
<i>Durable goods</i>				
<i>Clothing and footwear</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Current expenditure is deflated using the clothing and footwear sub-indexes of the consumers price index (CPI).
<i>Furniture and major appliances</i>	Sum of the quarters.	Retail Trade data. Except for the computer component which is directly measured from the external trade balance.	Sum of the quarters.	Deflated using the furniture sub-index of the CPI, except for computers which is deflated using a computer price index sourced from the US.
<i>Household textiles and tableware nec</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the household textiles, dinner, kitchenware sub-indexes of the CPI.
<i>Household textile curtains and upholstery</i>	Estimated using the Household Economic Survey (HES) or if unavailable, GST sales data.	Interpolated from the annual benchmark.	Deflated by the household textiles sub-index of the CPI.	Interpolated from the annual benchmark.
<i>House maintenance materials of tenants of rental dwellings</i>	Estimated using HES. Expenditure by households paying rent is multiplied by the number of rental households. When HES data is unavailable, the sum of the quarters is used.	Reflation of the volume indicator used for the chain-volume quarterly series. The reflation uses the Retail Trade Survey hardware storetype price index.	Sum of the quarters.	Extrapolation by a volume indicator using the number of rented dwellings.
<i>Personal leisure goods hire and repair</i>	Estimated using HES. When this is unavailable, retail trade data is used.	Interpolated from the annual benchmark.	Deflated using the personal and household services sub-index of the producers price index (PPI).	Interpolated from the annual benchmark.
<i>Recreational goods, personal supplies and goods nec</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the leisure and recreation supplies and the personal care supplies, personal accessories and stationery supplies sub-index of the CPI.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Durable goods continued</i>				
Vehicles				
– New vehicles	Sum of the quarters.	<i>Direct measurement.</i> The number of new non-business vehicle registrations is multiplied by the average prices from the transport equipment components of the capital goods price index (CGPI).	Sum of the quarters.	Deflated using implicit price deflators derived from quarterly indicator series.
– Used vehicles	Sum of the quarters.	Direct measurement using motor vehicle registrations data, and change of ownership data from public to dealer.	Sum of the quarters.	Deflated using implicit price deflators derived from quarterly indicator series.
– Recreational vehicles	Estimated using HES. When this is unavailable, Retail Trade Survey sales for sports and camping equipment, marine equipment, motor vehicle retailing, trailers and caravans, and cars is used as an indicator.	Interpolated from the annual benchmark.	Deflated using the bikes, motorcycles and trailers sub-indexes of the CPI.	Interpolated from the annual benchmark.
Motor vehicle maintenance	Estimated using HES. When this is unavailable, the sum of the quarters is used.	Retail Trade data.	Deflated using the vehicle servicing and repairs sub-index from the CPI.	Deflated using the retail trade deflator for specialist motor vehicle repairs.
Motor vehicle repairs	Estimated using motor vehicle net insurance claims occurred for commercial and private motor vehicles from the Insurance Council.	Estimated using motor vehicle net insurance claims occurred for private motor vehicles from the Insurance Council.	Deflated using the vehicle servicing and repairs sub-index from the CPI.	Deflated using the retail trade deflator for specialist motor vehicle repairs.
Recreational vehicle costs	Estimated using HES. When this is unavailable, retail sales and GST sales for motor vehicle hiring are used as an indicator.	Interpolated from the annual benchmark.	Deflated using the vehicle servicing and repairs sub-index of the CPI.	Interpolated from the annual benchmark.
Tyres, motor vehicle parts and accessories	Estimated from HES. When this is unavailable, the sum of the quarters is used as an indicator.	Retail Trade data.	Deflated using the vehicle servicing and repairs sub-index of the CPI	Deflated using the vehicle servicing and repairs sub-index of the CPI.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Durable goods continued</i>				
<i>Office equipment hire and repair</i>	Estimated from HES. When this is unavailable, the indicator is held constant.	Interpolated from the annual benchmark.	Deflated using the personal and household services sub-index of the PPI.	Interpolated from the annual benchmark.
<i>Non-durable goods</i>				
<i>Cigarettes and tobacco</i>	Direct measurement using 'volumes available for consumption' from the NZ Customs Service and sub-indexes for cigarette and tobacco products, by type, from the CPI.	Interpolated from the annual benchmark.	Sum of the quarters.	Deflated using the cigarettes and tobacco products sub-index of the CPI.
<i>Alcohol (not consumed in restaurants and hotels)</i>	Sum of the quarters.	Estimated as a residual: total alcohol consumption less alcohol consumed in restaurants and hotels (included in 'food and beverages eaten out' services). Total consumption is estimated using 'beer, wine and spirits available for consumption' from the NZ Customs Service and reflatd using sub-indexes of the CPI.	Sum of the quarters.	Deflated using the take-away alcoholic drinks sub-index of the CPI.
<i>Food and non-alcoholic beverages not consumed in restaurants and hotels</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the food and soft and fruit drinks sub-indexes of the CPI.
<i>Medical goods</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the medical and health supplies sub-index of the CPI.
<i>Printed matter</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the newspapers, magazines and books sub-index of the CPI.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Non-durable goods continued</i>				
<i>Agricultural home consumption</i>	Direct measurement using number of livestock slaughtered on farms for domestic use from the agriculture industry account.	Interpolation from the annual value with no indicator.	Sum of the quarters.	Volume extrapolation using movements in volumes of livestock slaughtered on farms for domestic use from the agriculture industry account.
<i>Energy</i>				
– Electricity	Estimated using HES. When this is unavailable, the sum of the quarters is used as an indicator.	Estimated using electricity generation multiplied by prices from the energy sub-index of the CPI.	Sum of the quarters.	Deflated using the energy sub-index of the CPI.
– Other domestic fuel	Estimated using HES. When HES data is unavailable, energy data volumes from the Ministry of Economic Development and prices from the gas sub-index of the CPI are used as indicators.	Interpolated from the annual benchmark.	Sum of the quarters.	Deflated using the gas index of the CPI.
– Retail other fuel			Deflated using the energy sub-index of the CPI.	Interpolated from the annual benchmark.
<i>Petrol, oil, grease, etc, for motor vehicles</i>	Estimated using HES. When this is unavailable, the sum of the quarters is used.	Retail Trade data.	Deflated using the petrol sub-index of the CPI.	Deflated using the petrol sub-index of the CPI.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Services				
<i>Imputed rent (owner-occupied dwellings)</i>	Sum of the quarters.	Direct measurement. Number of owner-occupied households, multiplied by the ownership of the owner-occupied dwellings sub-index of the PPI.	Sum of the quarters.	Volume extrapolation. The number of owner-occupied households is multiplied by the base year owner-occupied rental price.
<i>Rent</i>	Sum of the quarters.	Direct measurement. Number of renting households, multiplied by the average rental price. Benchmarks are estimated using the Census of Population and Dwellings. Non-benchmark rental prices use CPI movements.	Sum of the quarters.	Volume extrapolation using number of households renting, multiplied by the base year rental price.
<i>Rental expenses (bond payments, administration fees and charges)</i>	Expenditure recorded in HES multiplied by the number of rental dwellings. When HES data is unavailable, the sum of the quarters is used.	Reflation of the volume indicator used for the chain-volume quarterly series. The reflation uses the rented dwellings sub-index of the CPI.	Sum of the quarters.	Extrapolation by a volume indicator using number of rental dwellings multiplied by the base year price.
<i>Maintenance services of tenants of rental dwellings</i>	Expenditure recorded in HES multiplied by the number of rental dwellings. When HES data is unavailable, the sum of the quarters is used.	Reflation of the volume indicator used for the chain-volume quarterly series. The reflation uses the maintenance materials and services sub-index of the CPI.	Sum of the quarters.	Extrapolation by a volume indicator using number of rented dwellings multiplied by the base year price.
<i>Food and beverages eaten out (includes alcohol)</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the restaurant meals, soft drinks and alcoholic drinks sub-indexes of the CPI.
<i>Take-away food</i>	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the ready-to-eat food sub-index of the CPI.
<i>Medical and welfare services</i>				
– Medical services	Direct measurement using revenue data from the annual current price industry accounts. Includes cash sales by government and private non-profit institutions.	Reflation of the volume indicator used for the chain-volume quarterly series. The reflation uses the medical and health services sub-index of the CPI.	Deflated using the medical and health service sub-index of the CPI.	Extrapolation by an employment volume indicator. The indicator uses hours worked in the health sector, from the QES.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Services continued</i>				
Medical and welfare services <i>continued</i> – Welfare services	Direct measurement using revenue data from the annual current price industry accounts. Includes private market gross output and private non-market sales for community services.	Reflation of the volume indicator used for the chain-volume quarterly series. The reflation uses the personal and other services sub-index of the PPI.	Extrapolation by an employment volume indicator, from the Quarterly Employment Survey (QES).	Extrapolation by an employment volume indicator using hours worked in private welfare services, from QES.
Education, government and private – Government education	Direct measurement using market output for the education industry accounts. Provisional estimates are used beyond benchmark years.	Interpolated from the annual benchmark.	Deflated using the tuition and examinations sub-index of the CPI.	Interpolated from the annual benchmark.
– Private education	Direct measurement using private non-market sales and private market output from the education industry accounts. Provisional estimates are used beyond benchmark years.	Interpolated from the annual benchmark.	Deflated using the tuition and examinations sub-index of the CPI.	Interpolated from the annual benchmark.
Private transport costs nec	Estimated using HES. When HES data is unavailable, the sum of the quarters is used.	Retail Trade data.	Deflated using the vehicle and repairs services sub-index of the CPI.	Deflated using the vehicles and repairs services sub-index of the CPI.
Domestic air travel	Estimated using a combination of revenue data for resident airlines, and the domestic air travel CPI series.	Reflation of the volume indicator used for the chain-volume quarterly series. The reflation uses the domestic air travel sub-index of the CPI.	Deflated using the domestic air travel sub-index of the CPI.	Extrapolation by a volume indicator using gross output from the air transport industry account.
Ferry travel – Urban ferries	Estimated using GST sales data.	Interpolated from the annual benchmark.	Deflated using the land and sea travel sub-index of the CPI.	Interpolated from the annual benchmark.
– Other ferries	Sum of the quarters.	Reflation of the volume indicator used for the chain-volume quarterly series.		Extrapolation by a volume indicator using the numbers of passengers and cars carried.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Services continued</i>				
Taxis	Estimated using a combination of QES data (bus transport & taxi hire) and the taxi and shuttle hire sub-index of the CPI.	Interpolated from the annual benchmark.	Deflated using taxi and shuttle hire sub-index of the CPI.	Interpolated from the annual benchmark.
Rental cars	Estimated using spending by tourists in NZ, from the International Visitors Survey.	Reflation of the volume indicator used for the chain-volume quarterly series. The reflation uses the rental car sub-index of the CPI.	Deflated using rental car hire sub-index of the CPI.	Extrapolation by a volume indicator using number of hired cars from the Ministry of Tourism.
Rail and bus				
– Long distance and urban buses	Estimated by using GST sales data.	Interpolated from the annual benchmark.	Deflated using sub-indexes of the CPI.	Interpolated from the annual benchmark.
– Rail		Direct measurement using quarterly gross passenger revenue.		Volume extrapolation using volumes of rail passengers.
Expenditure by New Zealand resident households on holiday accommodation	Estimated using HES. When HES data is unavailable, the Accommodation Survey is used as an indicator.	Currently held constant with the same quarter previous year and reconciled to the annual benchmark.	Deflated using the accommodation and board sub-index of the CPI.	Deflated using accommodation and board sub-index of the CPI.
Holiday expenditure nec	Estimated using HES. When HES data is unavailable, the sum of the quarters is used.	Currently held constant with the same quarter previous year, and then reconciled to the annual benchmark.	Deflated using the leisure and recreation services sub-index of the CPI.	Deflated using the leisure and recreational services sub-index of the CPI.
Holiday accommodation of non-resident households	Estimated using accommodation guest nights figures, multiplied by the accommodation and board sub-index of the CPI.	Direct measurement using a fixed proportion of total expenditure by non-resident households in NZ. The proportion is based on the International Visitors Survey.	Sum of the quarters.	Deflated using the accommodation and board sub-index of the CPI.
Recreation, admission and entertainment services	Estimated using HES. When HES data is unavailable, the sum of the quarters is used.	Reflation of the volume indicator used for the quarterly chain-volume series. The reflation uses the leisure and recreational services sub-index of the CPI.	Sum of the quarters.	Extrapolation by a volume indicator. The indicator uses total output from the cultural and recreational services industry accounts.
Overseas airfares and travel packages				
– Overseas airfare	Estimated using volumes of NZ residents travelling overseas, multiplied by the international air travel sub-index of the CPI.	Short-term departures are reflated using the international air travel sub-index of the CPI.	Deflated using the international air travel sub-index of the CPI.	The quarterly indicator uses total expenditure by NZ residents overseas.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Services continued</i>				
Overseas airfares and travel packages continued – Travel packages	Estimated using volumes of NZ resident tourist visitor days overseas, multiplied by the international air travel sub-index of the CPI.	The quarterly indicator uses total expenditure by NZ residents overseas.		
Post and telephone	Estimated from HES. When HES data is unavailable, the sum of the quarters is used.	Reflation of the volume indicator used for the quarterly chain-volume series. The reflation uses the postal charges and telephone rental and call-charge sub-indexes of the CPI.	Deflated using the postal charges and telephone call charges sub-indexes of the CPI.	– Post only: Extrapolation by a volume indicator using the number items posted. – Telephone only: Extrapolation by a volume indicator. The indicator uses total output from the telecommunication services industry account.
Services to households	Estimated from HES. When HES data is unavailable alternative indicators are used.	Interpolated from the annual benchmark.	Deflated using the household services sub-index of the CPI.	Interpolated from the annual benchmark.
Gambling and betting – Gambling – Casinos and lotto	Direct measurement using revenue and net expenditure from Totalisator Agency Board (TAB), Internal Affairs and the NZ Lotteries Commission.	Direct measurement using gross TAB turnover for on- and off-course racing. Interpolated from the annual benchmark.	Deflated using the all groups excluding personal and health care index of the CPI.	Deflated using the all groups excluding personal and health index of the CPI. Interpolated from the annual benchmark.
Fringe benefits (motor vehicles and other)	Sum of the quarters.	Direct measurement using the value of motor vehicle and other fringe benefits recorded by the Inland Revenue.	Sum of the quarters.	Deflated using the all non-wage labour costs sub-index of the labour cost index (LCI).
Wages in kind (non-cash income to households, imputed as expenditure)	Estimated using defence force data for clothing and rations.	Interpolated from the annual benchmark.	Sum of the quarters.	Deflated using the all groups index of the CPI.
Hair and other personal services	Estimated from HES. When HES data is unavailable, retail trade data for hairdressing and beauty salons is used.	Interpolated from the annual benchmark.	Deflated using the personal and household services sub-index of the PPI.	Interpolated from the annual benchmark.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Services continued</i>				
<i>Veterinary services</i>	Estimated by rating the balanced annual forward using vet numbers from the Vet Council of NZ, multiplied by the veterinary services sub-index of the CPI.	Interpolated from the annual benchmark.	Deflated using the veterinary services sub-index of the CPI.	Interpolated from the annual benchmark.
<i>Pay TV</i>	Sum of the quarters.	Direct measurement using the number of subscribers, multiplied by the average subscription revenue per customer.	Deflated using the leisure and recreation services sub-index of the CPI.	Deflated using the leisure and recreation services sub-index of the CPI.
<i>Repairs</i>				
– Appliance repairs, shoe, clothing, floor cover lay and repair, furniture repair	Estimated from HES. When HES data is unavailable, retail trade or GST sales data is used.	Interpolated from the annual benchmark.	Deflated using the personal and household services sub-index of the PPI.	Interpolated from the annual benchmark.
– Furnishing repairs	Estimated from HES. When HES data is unavailable, the indicator is held constant.			
<i>Funerals</i>	Sum of the quarters.	Reflation of the volume indicator for the quarterly chain-volume series using the funerals sub-index of the CPI.	Sum of the quarters.	Quantity revaluation using the number of registered deaths from Vital Statistics.
<i>Domestic services</i>	Estimated from HES. When HES data is unavailable, GST sales for personal services is used as an indicator.	Interpolated from the annual benchmark.	Deflated using the all groups index of the CPI.	Interpolated from the annual benchmark.
<i>Miscellaneous household services (laundry, dry cleaning, newspaper advertising, etc)</i>	Estimated from HES. When HES data is unavailable, retail sales for personal and household services is used as an indicator.	Interpolated from the annual benchmark.	Deflated using the household services sub-index of the CPI.	Interpolated from the annual benchmark.
<i>Mortgage service charge</i>	Estimated from HES. When HES data is unavailable, alternative indicators are used.	Interpolated from the annual benchmark.	Sum of the quarters.	Deflated using a combination of the health and insurance sub-indexes of the CPI.
<i>Legal fees</i>	Estimated using HES. When HES data is unavailable, alternative indicators are used.	Interpolated from the annual benchmark.	Deflated using the personal and household services sub-index of the CPI.	Interpolated from the annual benchmark.
<i>Bank fees</i>	Estimated using HES. When HES data is unavailable, bank payments data from the Bankers Association is used as an indicator.	Interpolated from the annual benchmark.	Deflated using the finance and insurance sub-index of the PPI.	Interpolated from the annual benchmark.

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Services continued</i>				
Government fees	Estimated using government market output from government transactions.	Interpolated from the annual benchmark.	Deflated using the government administration sub-index of the CPI.	Interpolated from the annual benchmark.
Hire of TVs, VCRs, video cassettes	Sum of the quarters.	Retail Trade data.	Sum of the quarters.	Deflated using the household appliance and equipment hire sub-index of the CPI.
Hire of premises/catering	Estimated from HES. When HES data is unavailable, alternative indicators are used.	Interpolated from the annual benchmark.	Sum of the quarters.	Deflated using the all groups index of the CPI.
Other services nec	Estimated from HES. When the HES data is unavailable, GST sales data for secretarial services is used as an indicator.	Interpolated from the annual benchmark.	Deflated using the personal and household services sub-index of the PPI.	Interpolated from an annual benchmark.
Insurance	<p>– <i>Life:</i> Estimated using the service charges from the annual insurance industry account. Investment savings and insurance data is used to rate forward for the post-balanced years.</p> <p>– <i>Medical and superannuation:</i> Estimated using services charges from insurance industry accounts.</p> <p>– <i>Contents and vehicle:</i> Estimated using the HES. When HES data are unavailable, the sum of the quarters is used as an indicator.</p> <p>– <i>Travel:</i> Estimated from HES. When HES data is unavailable, alternative indicators are used</p>	<p>– <i>Life:</i> Direct measurement using quarterly commissions and other management expenses from the Investment Savings and Insurance Association.</p> <p>– <i>Medical and superannuation:</i> Interpolated from the annual benchmark.</p> <p>– <i>Contents:</i> Direct measurement using domestic building premiums and domestic contents premiums from the Insurance Council.</p> <p>– <i>Vehicle:</i> Direct measurement using the sum of private motor premiums and commercial motor premiums.</p> <p>– <i>Travel:</i> Interpolated from the annual benchmark</p>	<p>– <i>Life:</i> Deflated using the finance and insurance sub-index of the PPI, and insurance and financing sub-index of the LCI.</p> <p>– <i>Medical:</i> Deflated using medical insurance sub-index of the CPI.</p> <p>– <i>Superannuation:</i> Sum of the quarters.</p> <p>– <i>Contents and vehicle:</i> Deflated using the contents insurance and the vehicle insurance sub-index of the CPI.</p> <p>– <i>Travel:</i> Sum of the quarters.</p>	<p>– <i>Life:</i> Deflated using the finance and insurance sub-index of the PPI, and insurance and financing sub-index of the LCI.</p> <p>– <i>Medical:</i> Interpolated from the annual benchmark.</p> <p>– <i>Superannuation:</i> Deflated using sub-index of the CPI.</p> <p>– <i>Contents and vehicle:</i> Deflated using the contents insurance and the vehicle insurance sub-index of the CPI respectively.</p> <p>– <i>Travel:</i> Deflated using sub-index of the CPI.</p>

Table 10 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Net tourists				
<i>Expenditure abroad by New Zealand residents (travel debits)</i>	Sum of the quarters.	Direct measurement. Expenditure abroad by NZ residents, as recorded in the External Transactions Account, is used. It is based on average expenditures per visitor using 1984 actual values rated forward by weighted exchange rate and CPIs, and the number of visitor days. This estimate was benchmarked to the 1992 Survey of Returned New Zealanders.	Sum of the quarters.	Deflated using the overseas price index for travel imports.
<i>Expenditure in New Zealand by foreign tourists (travel credits)</i>	Sum of the quarters.	Direct measurement. Total expenditure in NZ by short-term visitors, less business expenditure in NZ by short-term visitors, as recorded in the External Transactions Account, is used. This is based on the quarterly International Visitors Survey with some adjustments made by Balance of Payments.	Sum of the quarters.	Deflated using the overseas price index for travel exports.
Private non-profit institutions serving households				
<i>Final consumption expenditure equals intermediate consumption, compensation of employees, taxes and consumption of fixed capital (CFK) by the institutions, less sales.</i>	Estimates from the balanced national accounts. Annual data for provisional years are derived rating forward from the latest balanced year.	Interpolated from the annual benchmark.	Deflated at industry level, for each component of final consumption expenditure. Annualised sub-indexes of the PPI, CPI, LCI, CGPI and Retail Trade Survey are used. CFK is sourced directly from the capital stock system (PIM) and annual benchmarks are derived rating forward the most recent movements from the PIM.	Interpolated from the annual benchmark.

Government final consumption expenditure

Government final consumption expenditure is the value of goods and services provided by the government sector for current consumption by the community. It is valued at the net cost of providing government services (purchasing goods and services, employing labour and 'using' capital (depreciation), less any income received from actual sales) plus social benefits in kind.

When the annual method is given as 'sum of the quarters', the annual value is derived as the sum of the quarterly series. Reconciliation to the annual value is therefore not necessary. When quarterly current price series are estimated directly using an indicator, reconciliation to the annual value is necessary.

When the method for quarterly chain-volume series is described as 'extrapolation by a quarterly indicator', then the quarterly series is reconciled to the annual value. As each new annual value becomes available this involves interpolation between the latest annual values using the quarterly indicator.

Central government

Central government services include all non-market activities of central government, such as departments, offices of Parliament, ministries and Crown entities (for example, Accident Compensation Corporation, Transit New Zealand, New Zealand Fire Service Commission, public schools and hospitals).

The main data source is the financial accounts of government departments, ministries, offices of Parliament and Crown entities, sourced from Treasury's Crown Financial Information System (CFIS).

Local government

This includes non-trading activities of local authorities and data is sourced from the Quarterly Local Authority Survey. The survey covers the non-trading activities such as local government administration, provision of water supply, roading, parks and reserves, and planning and regulation. The quarterly survey results are reconciled to the equivalent annual values provided by the annual Local Authority Census.

Table 11

Methods of Deriving Government Final Consumption Expenditure

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Central government				
<i>Scientific research and technical services</i>				
<i>Intermediate consumption plus taxes on production and imports.</i>	Estimated from the Central Government Enterprise Survey, Crown Financial Information System (CFIS) and annual reports.	Direct measurement using data from Central Government Enterprise Survey and CFIS as indicators.	Current expenditure is deflated by public administration sub-indexes of the producers price index (PPI).	Current expenditure is deflated by sub-indexes of the PPI.
<i>Compensation of employees</i>	Estimated from the Central Government Enterprise Survey, CFIS and annual reports.	Direct measurement using Central Government Enterprise Survey, CFIS and direct enquiries as indicators.	Sum of the quarters.	Extrapolation by an employment indicator. The indicator is wages and salaries from the Central Government Enterprise Survey and CFIS, deflated by a sub-index of the Labour cost index (LCI).
<i>Sales</i>	As for compensation of employees.	Direct measurement using Central Government Enterprise Survey and CFIS as indicators.	Sales are deflated by public administration sub-indexes of the PPI. Deflation is done separately for some departments.	Sales are deflated by sub-indexes of the PPI.
Public administration				
<i>Intermediate consumption plus taxes on production and imports.</i>	Estimated from the Central Government Enterprise Survey, CFIS and annual reports.	Direct measurement using Central Government Enterprise Survey and CFIS data as indicators.	Current expenditure is deflated by public administration sub-indexes of the (PPI).	Current expenditure is deflated by public administration sub-indexes of the PPI. (Deflation is done separately for the Treasury.)
<i>Compensation of employees</i>	As for intermediate consumption.	As for intermediate consumption.	Sum of the quarters.	Extrapolation by an employment indicator. The indicator is wages and salaries from the Central Government Enterprise Survey and CFIS, deflated by a sub-index of the LCI.
<i>Sales</i>	As for intermediate consumption.	As for intermediate consumption.	Sales are deflated by public administration sub-indexes of the PPI. Deflation is done separately for some departments.	Sales are deflated by public administration sub-indexes of the PPI.

Table 11 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Public order and safety services</i>				
<i>Intermediate consumption plus taxes on production and imports.</i>	Estimated from the Central Government Enterprise Survey, CFIS and annual reports.	Direct measurement using Central Government Enterprise Survey and CFIS data as indicators.	Current expenditure is deflated by public administration sub-indexes of the PPI.	Current expenditure is deflated by sub-indexes of the PPI.
<i>Compensation of employees</i>	As for intermediate consumption.	As for intermediate consumption.	Sum of the quarters.	Extrapolation by an employment indicator. The indicator is wages and salaries from the Central Government Enterprise Survey and CFIS, deflated by a sub-index of the LCI.
<i>Sales</i>	As for intermediate consumption.	As for intermediate consumption.	Sales are deflated by sub-indexes of the PPI. Deflation is done separately for some departments.	Sales are deflated by sub-indexes of the PPI.
<i>Defence</i>				
<i>Intermediate consumption plus taxes on production and imports.</i>	<i>Ships and aircraft</i> Sum of the quarters. <i>Remainder</i> Estimated from CFIS.	<i>Ships and aircraft</i> Direct measurement from imports data or Ministry of Defence, where separately available, otherwise estimated from CFIS. <i>Remainder</i> Direct measurement using CFIS data as an indicator.	<i>Ships and aircraft</i> Current expenditure is deflated by overseas price indexes. The indexes are those applying in the country of origin of the imports. <i>Remainder</i> Current expenditure is deflated by sub-indexes of the PPI.	<i>Ships and aircraft</i> Current expenditure is deflated by overseas price indexes. The indexes are those applying in the country of origin of the imports. <i>Remainder</i> Current expenditure is deflated by sub-indexes of the PPI.
<i>Compensation of employees</i>	Estimated from CFIS.	Direct measurement using CFIS data as an indicator.	Sum of the quarters.	Extrapolation by an employment volume indicator. The indicator uses wages and salaries from CFIS deflated by a sub-index of the LCI.
<i>Sales</i>	Estimated from CFIS.	Direct measurement using CFIS data as an indicator.	Sales are deflated by sub-indexes of the PPI.	Sales are deflated by sub-indexes of the PPI.

Table 11 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Education				
<i>Intermediate consumption plus taxes on production and imports.</i>	Estimated from CFIS and Ministry of Education financial data (schools) and annual reports.	Direct measurement using CFIS funding payments to schools, tertiary institutions, etc, as indicators.	Current expenditure is deflated by education sub-indexes of the PPI.	Current expenditure is deflated by education sub-indexes of the PPI.
<i>Compensation of employees</i>	As for intermediate consumption.	As for intermediate consumption.	Extrapolation by an output volume indicator. The indicator is based on roll numbers of early childhood, primary, secondary and tertiary education institutions.	Extrapolation by an employment indicator. The indicator is based on wages and salaries data from CFIS/Ministry of Education.
<i>Sales</i>	As for intermediate consumption.	Interpolation and extrapolation of the annual value with no indicator.	Sales are deflated by education sub-indexes of the PPI.	Interpolation of the annual value with no indicator.
Health				
<i>Intermediate consumption plus taxes on production and imports.</i>	Estimated from Ministry of Health financial data.	Direct measurement using Ministry of Health financial data as an indicator.	Current expenditure is deflated by health sub-indexes of the PPI.	Current expenditure is deflated by health sub-indexes of the PPI.
<i>Compensation of employees</i>	As for intermediate consumption.	As for intermediate consumption.	Extrapolation by an output volume index. The index is based on numbers of case-mix inpatient discharges, day patient discharges and length of stay data.	Extrapolation by an employment volume indicator. The indicator uses wages and salaries from the Ministry of Health deflated by a sub-index of the LCI.
<i>Sales</i>	As for intermediate consumption.	As for intermediate consumption.	Sales are deflated by health sub-indexes of the PPI.	Sales are deflated by health sub-indexes of the PPI.

Table 11 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Cultural and recreational services</i>				
<i>Intermediate consumption plus taxes on production and imports.</i>	Estimated from CFIS and annual reports.	Direct measurement using CFIS data as indicators.	Current expenditure is deflated by public administration sub-indexes of the PPI.	Current expenditure is deflated by public administration sub-indexes of the PPI.
<i>Compensation of employees</i>	As for intermediate consumption.	As for intermediate consumption.	Sum of the quarters.	Extrapolation by an employment volume indicator. The indicator is wages and salaries from CFIS, deflated by a sub-index of the LCI.
<i>Sales</i>	As for intermediate consumption.	As for intermediate consumption.	Sales are deflated by public administration sub-indexes of the PPI. Deflation is done separately for some departments.	Sales are deflated by public administration sub-indexes of the PPI.
<i>Consumption of fixed capital</i>				
	Estimated from the capital stock series using a perpetual inventory model (PIM).	Interpolation of the annual value with no indicator.	Current price estimates are deflated using annual implicit price deflators.	Interpolation of the annual value with no indicator.
<i>Social benefits in kind</i>				
	Estimated from CFIS and annual reports.	Interpolation of the annual value with no indicator. Except for health: direct measurement using CFIS as an indicator.	Current price estimates are deflated by sub-indexes of the CPI.	Interpolation of the annual value with no indicator. Except for health: deflated by CPI for health.

Table 11 *continued*

Local government				
<i>Intermediate consumption plus taxes on production and imports.</i>	Current expenditure excluding employment expenses, from the Local Authority Census. Where this information is not available for latest years, the Quarterly Local Authority Survey (sum of the quarters) is used as an indicator.	Extrapolation by a volume indicator. The indicator uses salaries and wages from the Quarterly Local Authority Survey.	Sum of the quarters.	Current expenditure is deflated by the local government services inputs sub-index of the PPI.
<i>Compensation of employees</i>	Estimates from the current price annual accounts which are derived from the Local Authority Census.	Extrapolation by a volume indicator. The indicator uses wages and salaries from the Quarterly Local Authority Survey.	Sum of the quarters.	Employment expenses are deflated by a sub-index of the LCI.
<i>Sales</i>	Current income for all activities, from the current price annual accounts which are derived from the Local Authority Census.	Extrapolation by a volume indicator. The indicator uses sales data from the Quarterly Local Authority Survey.	Sum of the quarters.	Sales are deflated by the local government services inputs sub-index of the CPI.
<i>Consumption of fixed capital</i>	Estimated from the capital stock series using a perpetual inventory model (PIM).	Interpolation of the annual value with no indicator.	Current price estimates are deflated using annual implicit price deflators.	Interpolation of the annual value with no indicator.

Changes in inventories

Changes in inventories are the increase or decrease in the value of stocks of raw materials, work in progress, and finished goods, between the beginning and the end of the period.

The principal method of deriving changes in inventories can be described as follows. The current price closing value of inventories held at the end of a period is deducted from the opening value in order to derive the change that occurred during the accounting period. This derived change in inventories is then revalued using one of two methods, price deflation or quantity revaluation. This results in a volume measure of the change in inventories. This change is then revalued to produce a current price measure which does not include holding gains or losses.

Changes in inventories in chain-volumes

The changes in inventories are derived in constant prices before chaining. The closing and opening inventories levels are chain-linked using according expenditure weights. Chain-volume measures of changes in inventories are derived by taking the difference in the inventories levels from one period to the next. Constant price estimates are calculated as part of the revaluation of the current price data using the two methods as described below, depending on data availability.

Changes in inventories in current prices

In principle, the changes in inventories can be calculated by valuing the volume of additions and withdrawals to and from inventories at prices prevailing at the time. In practice, this valuation procedure can rarely be followed as it requires extensive data on the volumes added and withdrawn to and from inventories, hence, an approximation is required.

Two methods are used:

A. Price deflation

Generally, the only available data is the book values of inventory holdings at the beginning and end of each period as they are recorded in business accounts. Over a time period inventories are subject to changes in prevailing prices. This is referred to as a holding gain or loss. To remove the effect of the price change over a period a valuation adjustment is made to the book value. This adjustment is referred to as the inventory valuation adjustment and the resulting series represents the value of physical increase in inventories.

The process is carried out in three parts:

- Book value opening and closing inventories levels are deflated to the prices of a chosen base year, that is, they are expressed in the average prices of the year ended March 1996, which is also the base year for the constant price series. The price index deflator chosen reflects the prices prevailing at the time the additions to inventories occur, which involves making estimates of turnover rates and assumptions on valuation and accounting practices.
- The constant price change in inventories is calculated as the difference between the constant price closing and opening values.
- The change in inventories is revalued (revalued) using the average prices for the period in which the change occurred. This gives the value of the physical increase in inventories.

B. Quantity revaluation

When detailed data on the volumes of inventories is available, the value of the physical increase in inventories is directly calculated by revaluing the volume change. The preferred method is to value the additions and withdrawals to and from inventories as they occur. Usually, volume data is available at the beginning and end of the period only. In these cases the volume change is calculated and then revalued to the average prices for the current period.

Table 12

Methods of Deriving Changes in Inventories

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Agriculture				
<i>Farming</i>	These measure the change in the value of livestock held on farms. Quantity revaluation is used for all animal types. Lambs, sheep, cattle, deer, pigs and goats are estimated separately.			
– Livestock				
• Lambs for slaughter	Sum of the quarters.	Calculated by measuring growth and deducting slaughter. Growth is estimated using a forecast of the number of lambs grown for slaughter. Slaughtering statistics are sourced from the Ministry of Agriculture and Forestry (MAF). Average meat schedule prices are used for valuation.	Sum of the quarters.	As for the current price series except base year average prices are used.
• Other livestock	Opening and closing inventories numbers from the annual agricultural production statistics are adjusted to 31 March using kill statistics. The difference in inventories levels between years is then valued using average annual prices for each inventory type, within detailed categories.	For sheep, cattle, and deer, the quarterly chain-volume change in inventories series is used as a volume indicator. For pigs and goats the annual values are interpolated with no quarterly indicator.	As for the current price series except base year average prices are used.	For sheep, cattle, and deer, quarterly volume indicators are based on quarterly growth pattern/births, which are calculated based on data from the agricultural production statistics. The birth indicators are used to interpolate quarterly values from the annual value. For pigs and goats the annual values are interpolated with no quarterly indicator.
• Forestry	Standing exotic timber grown by farmers is calculated as a proportion of the total forestry changes in inventories.	Standing exotic timber grown by farmers is calculated as a proportion of the total forestry changes in inventories.	Standing exotic timber grown by farmers is calculated as a proportion of the total forestry changes in inventories.	Standing exotic timber grown by farmers is calculated as a proportion of the total forestry changes in inventories.
• Other crops	No changes in inventories are calculated.	No changes in inventories are calculated.	No changes in inventories are calculated.	No changes in inventories are calculated.
<i>Agricultural contracting</i>	Price reflation. Book value inventories data is from the Annual Enterprise Survey (AES). Sub-indexes of the producers price index (PPI) are used for revaluation.	Interpolation and extrapolation of the annual value with no indicator.	As for the current price series except values are expressed in base year prices.	Interpolation and extrapolation of the annual value with no indicator.

Table 12 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Forestry and logging				
<i>Standing timber grown for felling</i>	Quantity revaluation. The annual volume (m ³) of standing timber is calculated using the current annual recoverable increment in growth, provided by MAF.	Quarterly levels are estimated using growth and removals data. The change in volumes of standing timber is valued using a weighted quarterly price from a sample of valuations of commercial forestry plantations.	Sum of the quarters.	As for the current price series except base year average prices are used.
<i>Raw materials</i>	Price reflation. Book value inventories data is from AES. Sub-indexes of the PPI are used for revaluation.	Interpolation of the annual value with no indicator.	As for the current price series except values are expressed in base year prices.	Interpolation and extrapolation of the annual value with no indicator.
Manufacturing				
	Price reflation. Book value inventories data is from AES. Revaluation is carried out at the industry level using sub-indexes of the PPI for finished goods and raw materials. For post-balanced years the quarterly method is used.	Price reflation. Quarterly inventories levels from the Economic Survey of Manufacturing are reconciled to AES industry data. This is carried out at the industry level using sub-indexes of the PPI for finished goods and raw materials.	As for the current price series except values are expressed in base year prices.	As for the current price series except the chain-volume quarterly inventories level series are reconciled to their annual counterparts.
Distribution				
<i>Oil companies (raw materials and finished goods)</i>	Sum of the quarters.	Price reflation. Book value inventories data is from the Wholesale Trade Survey returns of the oil companies. Fuel price indexes are used.	Sum of the quarters.	As for the current price series except values are expressed in base year average prices.
<i>Other wholesale trade (raw materials and finished goods)</i>	Sum of the quarters.	Book value inventories are from the Wholesale Trade Survey. Reflation is carried out at the industry level using sub-indexes of the PPI. For the apple and pear producer board, annual price data from MAF are interpolated and used to revalue the book value inventories.	Sum of the quarters.	As for the current price series except values are expressed in base year average prices.

Table 12 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Distribution continued</i>				
<i>Retail trade (finished goods)</i>	Sum of the quarters.	Price reflation. Book value inventories data is calculated by rating forward 1996 inter-industry levels using movements in Retail Trade Survey levels. The resulting series of inventories levels is revalued at the storetype level to average prices of the quarter using retail trade deflators.	Sum of the quarters.	As for the current price series except values are expressed in base year average prices.
<i>Hotels and restaurants (raw materials)</i>	Sum of the quarters.	Price reflation. Book value inventories data is calculated by rating forward 1996 inter-industry levels using movements in Retail Trade Survey levels. The resulting series of inventories levels is revalued at the storetype level to average prices of the quarter using retail trade deflators.	Sum of the quarters.	As for the current price series except values are expressed in base year average prices.
Other				
<i>Services to agriculture; fishing; mining and quarrying; electricity, gas and water; construction; transport; communication; finance, insurance, real estate and business services</i>	Price reflation. Book value inventories data is from the AES. Sub-indexes of the PPI are used.	Interpolation and extrapolation of the annual value with no indicator.	As for the current price series except values are expressed in base year average prices.	Interpolation and extrapolation of the annual value with no indicator.

Table 12 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Central government				
	Price reflation. Book value inventories levels are from the financial accounts. Data is obtained from the Crown Financial Information System, Central Government Enterprise Survey, annual reports, Ministry of Health and the Ministry of Education, etc. Sub-indexes of the PPI are used.	Interpolation and extrapolation of the annual value with no indicator.	As for the current price series except that values are expressed in base year average prices.	Interpolation and extrapolation of the annual value with no indicator.
Local government				
	Price reflation. Book value inventories levels are from the Local Authority Survey. Sub-indexes of the PPI are used for revaluation.	Interpolation and extrapolation of the annual value with no indicator.	As for the current price series except that values are expressed in base year average prices.	Interpolation and extrapolation of the annual value with no indicator.
Personal services				
	Price reflation. Book value inventories data is from the AES. Sub-indexes of the PPI are used for revaluation.	<p>– Personal services (those covered by the Retail Trade Survey): Book values are interpolated using the appropriate Retail Trade Survey storetype levels and reflatd using average prices of the quarter using retail trade deflators.</p> <p>– Other industries (those not covered by the Retail Trade Survey): Interpolation and extrapolation of the annual value with no indicator.</p>	As for the current price series except values are expressed in base year average prices.	<p>– Personal services: As for the current price series except values are expressed in base year average prices.</p> <p>– Other industries: Interpolation and extrapolation of the annual value with no indicator.</p>

Gross fixed capital formation

In the NZSNA, capital formation is grouped into seven broad asset types. These are:

- residential buildings
- non-residential buildings
- other construction
- land improvements
- transport equipment
- plant, machinery and other equipment
- intangible fixed assets.

For a number of asset types (residential buildings, transport, plant, machinery and other equipments) a supply total is calculated. The general government total for these asset types is estimated separately. The private sector total is the residual. The remaining asset types are estimated separately to provide a sector breakdown.

Government data for all asset types is sourced from the Crown Financial Information System (CFIS), Central Government Enterprise Survey, Ministry of Education financial data, Ministry of Health financial data, annual reports and local authority surveys.

The Annual Enterprise Survey (AES) supplies production account information by industry and sector currently with a three-year lag. In the absence of information from AES alternative indicators and methods are used to derive estimates for the government and private sector. CFIS provides the government sector information for the provisional years used for the calculation of a sector split.

The supply total for buildings (both residential and non-residential) uses work put in place as measured in the Value of Building Work Put in Place Survey by sector.

For road vehicle and bus transport equipment the supply total is calculated using vehicle registrations. To calculate the supply total for air, rail (including rolling stock) and water transport equipment, net imports and domestic production estimates are used.

For plant, machinery and other equipment the supply total is calculated as the sum of domestic production and (net) imports adjusted for additions and withdrawals from inventories. Distribution margins are added to obtain market values.

When the annual method is given as 'sum of the quarters', reconciliation to the annual value is not necessary. When, however, quarterly current price series are estimated directly using an indicator, it is reconciled to the annual value.

Some points to note on gross fixed capital formation are:

- Own account capital formation (OAKF) – This is construction work done by a firm's own employees in producing a capital good to be used in future production, or installing a capital good purchased from another producer. The value of the asset is the sum of the costs of producing it.
- Industry of ownership – The capital outlays are classified to the industry owning the capital formation and not to the industry that produces the asset.
- Ownership of incomplete capital assets – The acquisition of fixed assets should, in principle, be recorded in the capital accounts of the purchaser at the moment they take legal possession of the assets. In the case of construction, the buyers are considered to take possession of assets as work put in place on the project occurs. This means that work in progress on buildings and construction works is

not classified as stock of the construction industry but as the gross fixed capital formation of the client who commissioned the job.

- Second-hand assets – When a transaction relating to a second-hand fixed asset occurs, the purchaser records the purchase price plus any transfer costs as gross fixed capital formation. The seller records negative gross fixed capital formation to the value of the purchase price, rather than their book value for the asset.

Table 13

Methods of Deriving Gross Fixed Capital Formation

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Residential buildings				
<i>Private including transfer costs.</i>	Estimated using Annual Enterprise Survey (AES) data. Post-balanced years annual benchmarks are derived by applying a moving average.	Direct measurement using all sector work put in place from the quarterly Value of Building Work Put in Place Survey <i>Less:</i> estimates for total government (local and central government; refer separate methods, following) <i>Plus:</i> transfer costs and GST.	Sum of the quarters.	Current expenditure is deflated by the capital goods price index (CGPI) for residential buildings.
<i>Local government</i>	Estimated using the Local Authority Census for non-market units and the Annual Enterprise Survey (AES) for market units.	Direct measurement using work put in place.	Sum of the quarters.	Current expenditure is deflated by the CGPI for residential buildings.
<i>Central government: Market units include state-owned enterprises and government corporations such as the Housing Corporation.</i> <i>Non-market units include government departments, offices of Parliament, ministries and Crown entities.</i>	– <i>Market:</i> Purchases less sales based on financial accounts of Housing New Zealand and other market enterprises. – <i>Non-market:</i> Purchases less sales based on the Central Government Enterprise Survey, the Crown Health Enterprise Survey and departmental accounts.	– <i>Market:</i> Purchases are measured using direct enquiries and the Value of Building Work Put in Place Survey. Sales are interpolated from the annual value using work put in place values as an indicator. – <i>Non-market:</i> Direct measurement of purchases less sales based on the Central Government Enterprise Survey and the Crown Health Enterprise Survey.	Sum of the quarters.	Current expenditure (purchases less sales) is deflated by the CGPI for market and non-market residential buildings.

Table 13 continued

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Non-residential buildings				
<i>Private including transfer costs.</i>	Estimated using Annual Enterprise Survey (AES) data.	Direct measurement using work put in place from the Value of Building Work Put in Place Survey. Total private sector includes private producer enterprises, producer boards, private financial intermediaries, non-profit institutions serving households and households.	Sum of the quarters.	Current expenditure is deflated by sub-indexes of the CGPI: <ul style="list-style-type: none"> shops and offices warehouses and factories motels and hotels farm buildings.
<i>Local government</i>	Estimated using the Local Authority Census for non-market units and AES for market units.	Direct measurement using work put in place from the Value of Building Work Put in Place Survey.	Sum of the quarters.	Current expenditure is deflated by sub-indexes of the CGPI: <ul style="list-style-type: none"> shops and offices warehouses and factories motels and hotels farm buildings.
<i>Central government: Market units include state-owned enterprises and government corporations such as the Housing Corporation.</i> <i>Non-market units include government departments, offices of Parliament, ministries and Crown entities.</i>	– <i>Market:</i> Purchases less sales based on AES and the Value of Building Work Put in Place Survey supplemented by financial accounts of state-owned enterprises. – <i>Non-market:</i> Purchases less sales from the Crown Financial Information System (CFIS) and departmental annual reports, except for health. – <i>Health:</i> Purchases less sales from Ministry of Health data.	– <i>Market:</i> Direct measurement using work put in place from the Value of Building Work Put in Place Survey. – <i>Non-market:</i> Direct measurement of purchases from CFIS, except for health. – <i>Health:</i> Direct measurement using data from the Ministry of Health.	Sum of the quarters.	Current expenditure is deflated by sub-indexes of the CGPI: <ul style="list-style-type: none"> education buildings hospitals and rest homes farm buildings shops and offices.

Table 13 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Other construction				
<i>Private including transfer costs.</i>	Purchases are estimated from survey sources including AES, tax return data for agriculture-related industries, Economic Survey of Manufacturing, and quarterly surveys of major purchasers (particularly 'major projects').	Interpolation and extrapolation of an annual value with indicators for major projects. These projects are measured by way of direct enquiries.	Sum of the quarters.	Current expenditure by sub-asset type is deflated by sub-indexes of the CGPI: <ul style="list-style-type: none"> • transport ways • pipelines • electrical works • earth-moving and other site works • tanks, reservoirs, other work and telecommunication • other construction and transportable containers.
<i>Local government</i>	Purchases derived from the Local Authority Census for non-market units and AES for market units.	Interpolation and extrapolation from the annual value with no indicator.	Sum of the quarters.	Current expenditure is deflated by sub-indexes of the CGPI.
<i>Central government: Enterprises that used to be government but are now private were initially included in central government.</i>	– <i>Market:</i> Estimated from annual accounts or quarterly surveys of major projects such as power projects and transmission lines, and railways.	– <i>Market:</i> For major projects, direct measurement, using data as obtained for the annual method. For other projects, interpolation and extrapolation of the annual value with no indicator.	Sum of the quarters.	Current expenditure is deflated by sub-indexes of the CGPI: <ul style="list-style-type: none"> • transport ways • electrical works • earth-moving and other site works • tanks, reservoirs, other work and telecommunication • other construction and transportable containers.
<i>Non-market units include government departments, offices of Parliament, ministries and Crown entities.</i>	– <i>Non-market:</i> Estimated from the Central Government Enterprise Survey and departmental annual reports, eg, Transit NZ's expenditure on roads.	– <i>Non-market:</i> Interpolation and extrapolation of the annual value with no indicator except for Transit NZ, measured using direct enquiries.		The major projects are deflated separately using sub-indexes of the CGPI.
Land improvements				
<i>Private including transfer costs.</i>	Expenditure is derived from the annual Agriculture Production Survey and AES.	Interpolation and extrapolation of the annual value with no indicator.	Sum of the quarters.	Current expenditure is deflated by a sub-index of the CGPI.

Table 13 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Land improvements <i>continued</i>				
Local government	Expenditure derived from the Local Authority Census for non-market units and AES for market units.	Interpolation and extrapolation of the annual value with no indicator.	Sum of the quarters.	Current expenditure is deflated by a sub-index of the CGPI.
Central government (not significant)				
Transport equipment				
Transport equipment is calculated and sorted in two ways. The first is to derive estimates for ships, road vehicles, rolling stock, aircraft, and buses. Secondly, estimates are derived by sector of ownership, such as private, local government, or central government.				
Ships	<i>All sectors</i> Estimated using AES data, sales from the Economic Survey of Manufacturing and net import data.	– <i>Private</i> Direct measurement using net imports data and sales from the Economic Survey of Manufacturing. – <i>Central and local government</i> Interpolation of the annual value with no indicator.	Sum of the quarters.	Current expenditure is deflated by a sub-index of the CGPI, and US and Japanese ship price indexes, adjusted for exchange rate changes.
Road vehicles	<i>All sectors</i> Sum of the quarters.	<i>All sectors</i> Direct measurement. <i>New passenger & commercial</i> Vehicle registrations by private and government organisations, multiplied by an average price. Pricing is by type of vehicle and is extrapolated using movements in the new car components of the CGPI. <i>Used commercial</i> Estimated using commercial vehicle sales by category as indicator. <i>Used passenger</i> Net sales of passenger vehicles by businesses to household based on change of ownership data multiplied by an average price.	<i>All sectors</i> Sum of the quarters.	<i>All sectors</i> Extrapolation by a volume indicator using the number of new vehicle registrations.

Table 13 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Transport equipment <i>continued</i>				
Road vehicles <i>continued</i>	<p>– <i>Central government</i> Estimated using CFIS data.</p> <p>– <i>Local government</i> Estimated using the Local Authority Census.</p> <p>– <i>Private</i> Estimated using AES data.</p>	<p>– <i>Central and local government</i> Interpolation and extrapolation of the annual value with no indicator.</p> <p>– <i>Private</i> Derived as a residual (all sectors less central and local government).</p>	<p>– <i>Central and local government</i> Current expenditure is deflated by the CGPI for road vehicles.</p> <p>– <i>Private</i> Derived as a residual.</p>	<p>– Central and local government Interpolation and extrapolation of the annual value with no indicator.</p> <p>– <i>Private</i> Derived as a residual.</p>
Rolling stock	Direct measurement from annual reports data.	Estimated using quarterly additions to rolling stock (referred to as workshop) and net imports.	Sum of the quarters.	<p>The two components (net imports and workshops components) are deflated separately and re-added to give total rolling stock.</p> <p>Deflators used are the Japan transport deflator, adjusted for exchange rate changes, for imports and the producers price index (PPI) for the workshop components.</p>
Buses	Estimated from AES, Local Authority Census and CFIS data. For post-balanced years sum of the quarters is used.	Quarterly chain-volume series is reflatd using a sub-index of the CGPI.	Sum of the quarters.	Direct measurement using new bus registration volumes.
Aircraft	<i>All sectors</i> Estimated from AES data for domestic demand, Economic Survey of Manufacturing data for domestic production and trade data for net imports.	<p>– <i>Private</i> Private net imports are the residual of total net aircraft imports less net imports for central government. Domestic production is estimated using sales data from the Economic Survey of Manufacturing.</p> <p>– <i>Local government</i> Interpolation of the annual value with no indicator.</p> <p>– <i>Central government</i> Direct measurement using net imports of aircraft.</p>	Sum of the quarters.	Current expenditure is deflated by a sub-index of the CGPI, and US and Japanese aircraft price indexes, adjusted for exchange rate changes.

Table 13 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Plant, machinery and equipment (PME)				
PME is calculated and sorted in two ways. The first is by various types of goods, the second by sector of ownership. PME estimates are derived by adding domestic production, net imports and import duty and deducting changes in inventories. Estimates for the private sector are derived as residual.				
All sector supply total	<p><i>Domestic production</i> Sales of capital goods by manufacturing industries. Total sales are separated between capital and other goods using commodity data from the 1995/96 inter-industry study.</p> <p><i>Net imports</i> Sum of the quarters.</p> <p><i>Changes in inventories</i> Price reflation.</p>	<p><i>Domestic production</i> Direct measurement using sales from the Economic Survey of Manufacturing.</p> <p><i>Net imports</i> Direct measurement using external trade data, including import duties.</p> <p><i>Changes in inventories</i> Price reflation. The book value inventories levels are from the Wholesale Trade survey. Reflation is carried out using the PME sub-index of the PPI</p>	<p><i>Domestic production</i> The current price series is deflated using an implicit price deflator derived from the quarterly series.</p> <p><i>Net imports</i> Sum of the quarters. Import duty annual is the sum of the quarters.</p> <p><i>Changes in inventories</i> Sum of the quarters.</p>	<p><i>Domestic production</i> Current expenditure is deflated by a total domestic PME deflator made up of domestic production 1996 weights applied to the relevant sub-indexes of the CGPI.</p> <p><i>Net imports</i> Current expenditure by sub-asset type is deflated by sub-indexes of the CGPI and a computer price index sourced from the US. Import duty is deflated using the import implicit price deflator multiplied by a base rate.</p> <p><i>Changes in inventories</i> As for the current price series except values are expressed in base year average prices.</p>
<p>Central government Market units include state-owned enterprises.</p> <p>Non-market units include government departments, offices of Parliament, ministries and Crown entities.</p>	<p><i>Market:</i> Purchases less sales are estimated using the financial accounts of market enterprises.</p> <p><i>Non-market:</i> Purchases less sales are estimated using the Central Government Enterprise Survey, and departmental annual reports.</p>	<p><i>Market:</i> Interpolation and extrapolation of the annual value with no indicator, except for major investors. The latter are measured by way of direct enquiries and reconciled to an annual.</p> <p><i>Non-market:</i> Direct measurement using the Central Government Enterprise and Crown Health Enterprise Surveys except for education which is interpolated from the annual value with no indicator.</p>	<p>Current expenditure is deflated by an implicit price deflator except for state-owned enterprises.</p> <p>The deflator is based on data for imports, exports and domestic production and sub-indexes of the CGPI (for state-owned enterprises).</p>	<p><i>Market:</i> Current expenditure is deflated by an implicit price deflator except for state-owned enterprises. The deflator is based on data for imports, exports and domestic production and sub-indexes of the CGPI (for state-owned enterprises). Major projects are reconciled to annuals.</p> <p><i>Non-market:</i> Interpolation of the annual value with no indicator.</p>

Table 13 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Plant, machinery and equipment (PME) <i>continued</i>				
Local government	Purchases less sales are derived from the Local Authority Census and AES.	Interpolation and extrapolation of the annual value with no indicator.	Current expenditure is deflated by an implicit price deflator. The deflator is constructed from imports, exports and domestic production data.	Extrapolation and interpolation of the annual value with no indicator.
Transfer costs				
– Residential buildings – Non-residential buildings – Other construction – Land improvements	Sum of the quarters.	Direct measurement. Real estate agents' and conveyance fees are derived using the number of sales (by type of asset) as reported by Quotable Value New Zealand multiplied by the average sale price and rate of fees.	Sum of the quarters.	Extrapolation by a volume indicator using the number of transactions by type of asset.
Intangibles				
Private	<p><i>Exploration</i> Mineral and other exploration data comes from the Ministry of Economic Development.</p> <p><i>Software</i> The supply side information comes from the Information and Communication Technology Supply Survey, Overseas Trade Survey, population census and business demographic statistics for market and non-market units.</p> <p>There are three types of software components: off-the-shelf, customised, and own account.</p>	<p><i>Oil and gas exploration</i> Estimated using on-shore and off-shore metres drilled as an indicator.</p> <p><i>Software</i> Software is divided into three parts, with each one having its own private annual benchmark and indicator for interpolation:</p> <p><i>Off-the-shelf</i>: import data</p> <p><i>Customised</i>: GST sales data</p> <p><i>Own account</i>: no quarterly indicator</p>	Sum of the quarters.	<p><i>Oil and gas exploration</i> Current expenditure is deflated by the oil and gas exploration sub-index of the PPI.</p> <p><i>Software</i> Each software type has its own deflator: <i>Off-the-shelf</i>: An exchange rate adjusted price index from the U.S Bureau of Economic Activity as an annual benchmark, and quarterly movements from the U.S Bureau of Labor Statistics.</p> <p><i>Customised</i>: A weighted average of off-the-shelf and own account.</p> <p><i>Own account</i>: Uses the labour cost index, adjusted to take account of labour productivity gains.</p>
Central and local government (<i>software only</i>)	Same as for the private sector outlined above.	Same as for the private sector outlined above, except an annual government figure is used as a benchmark for interpolation.	Sum of the quarters.	Same as for the private sector outlined above.

Exports and imports

Exports of goods and services comprise all goods and services produced by New Zealand residents and purchased by non-residents (rest of the world). Conversely, imports of goods and services comprise all goods and services produced by the rest of the world and purchased by New Zealand residents.

Exports and imports are not reconciled to annual values, being in all cases the sum of the four relevant quarters.

Data on exports and imports of goods are sourced mainly from the New Zealand Customs Service. For merchandise trade statistics, exports and imports of goods are recorded when they cross a customs frontier (ie, when goods leave or arrive in New Zealand). In order to meet national accounts and balance of payments conventions a number of conceptual adjustments are made to merchandise trade data. These adjustments include:

- Goods that cross the customs frontier without a change in ownership are removed from imports and exports data. An example of this is large capital items imported or exported on an operational lease. In this case the large capital item is still owned by the leaser, who is a non-resident.
- Goods that are intended for sale but not actually sold at the time they cross the border of the exporting country (sold on consignment) are removed from trade data, as no change of ownership has occurred. However, when these goods are subsequently sold they are added back into exports. In this respect goods on consignment represent a timing adjustment for change of ownership.
- Freight and insurance charges are removed from the imports of goods, and reclassified as services.

Services differ from goods in two respects: they are not physical objects, and they cannot be traded separately from their production. Services categories include travel, transportation and business services.

Exports of services are services delivered by New Zealand resident individuals or enterprises to non-residents. Exports of services include the expenditure of overseas tourists while visiting New Zealand. Imports of services are services received by New Zealand residents from non-residents. Imports of services include the expenditure of New Zealanders while traveling overseas.

For more details on balance of payments methodology, refer to *Balance of Payments – Concepts, Sources and Methods 2004* (Statistics New Zealand, Wellington).

Table 14

Methods of Deriving Imports and Exports

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Imports of goods				
	The base source in all cases is merchandise trade imports data. Imports of merchandise are valued at value for duty (vfd). Conceptual adjustments to the trade data are made where indicated.		Generally price deflation is by the relevant overseas trade price index.	
Capital equipment <ul style="list-style-type: none"> – Machinery and plant – Transport equipment (includes aircraft, ships and other industry transport equipment) 	Sum of the quarters.	Direct measurement using the merchandise trade vfd value. An adjustment is made for capital goods using Balance of Payments (BOP) quarterly survey.	Sum of the quarters.	<ul style="list-style-type: none"> – Machinery and plant: Imports are deflated using the overseas trade price index (OTI) for machinery and plant. – Transport equipment: All sub-components are deflated using the relevant OTI.
Intermediate goods <ul style="list-style-type: none"> – Primary food and beverages mainly for industry – Processed food and beverages mainly for industry – Primary industry supplies nes – Processed industry supplies not elsewhere specified (nes) – Primary fuel and lubricant – Processed fuel and lubricant, other than motor spirit. – Parts and accessories of capital goods 	Sum of the quarters.	Direct measurement using the merchandise trade vfd value. An adjustment is made for intermediate goods using BOP quarterly survey.	Sum of the quarters.	All sub-components are deflated using the relevant OTI.
Passenger motor cars	Sum of the quarters.	Direct measurement using the merchandise trade vfd value. An adjustment is made for passenger motor cars using BOP quarterly survey.	Sum of the quarters.	Imports are deflated using the passenger motor cars OTI.

Table 14 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Imports of goods <i>continued</i>				
Consumption goods – Primary food and beverages mainly for household consumption – Processed food and beverages mainly for household consumption – Non-industrial transport equipment other than passenger motor cars – Durable consumer goods nes – Semi-durable consumer goods nes – Non-durable consumer goods nes	Sum of the quarters.	Direct measurement using the merchandise trade vfd value. An adjustment is made for consumption goods using BOP quarterly survey.	Sum of the quarters.	Imports are deflated using the relevant OTI.
Motor spirit	Sum of the quarters.	Direct measurement using the merchandise trade vfd value. An adjustment is made for motor spirit using BOP quarterly survey.	Sum of the quarters.	Imports are deflated using the motor spirit overseas trade price index.
Military and other goods	Sum of the quarters.	Direct measurement using the merchandise trade vfd value. An adjustment is made for military and other goods using the BOP quarterly survey.	Sum of the quarters.	Imports are deflated using the OTI for military and other goods.
Imports of services				
Sea and air freight, air passenger transport, port services	Sum of the quarters.	Direct measurement. Part of the transportation item from the quarterly BOP current account is used.	Sum of the quarters.	Imports are deflated using the relevant OTI.
Travel services	Sum of the quarters.	Direct measurement. The travel item from the quarterly BOP current account is used. The travel item measures expenditure on commodities by NZ residents overseas.	Sum of the quarters.	Imports are deflated using the OTI for travel services.

Table 14 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Imports of services <i>continued</i>				
<i>Insurance services</i>	Sum of the quarters.	The insurance item from the quarterly BOP current account is used. It measures the value of insurance services purchased by NZ residents from foreign resident insurers.	Sum of the quarters.	Imports are deflated using the OTI for insurance services.
<i>Government services</i>	Sum of the quarters.	Direct measurement. The government item from the quarterly BOP current account is used. This includes expenditure on commodities by NZ embassies and consulates overseas.	Sum of the quarters.	Imports are deflated using the OTI for government services.
<i>Royalties</i>	Sum of the quarters.	Direct measurement from the quarterly BOP current account.	Sum of the quarters.	Imports are deflated using the OTI for royalties.
<i>Miscellaneous services</i>	Sum of the quarters.	Direct measurement. The miscellaneous item from the quarterly BOP current account is used. This includes labour income, advertising and communication services, and rent other than operational leases on transport equipment.	Sum of the quarters.	Imports are deflated using the OTI.
Exports of goods				
	The base source in all cases is merchandise trade export fob (free on board) values. Conceptual adjustments to the trade data are made where indicated.		Generally price deflation is by the relevant overseas trade price index.	
<i>Agriculture, fishing & forestry products, primary products, coal, crude petrol, mineral & gas</i>	Sum of the quarters.	Direct measurement using the merchandise trade fob value.	Sum of the quarters.	Exports are deflated using the relevant OTI.

Table 14 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
Exports of goods <i>continued</i>				
<i>Meat products and dairy products</i>	Sum of the quarters.	Direct measurement using the merchandise trade fob value. An adjustment is made for goods on consignment.	Sum of the quarters.	Exports are deflated using the relevant OTI for meat and meat goods/ dairy and dairy goods on consignment.
<i>Other food, beverages and tobacco, textiles, apparel and leather products, wood and paper products, metal products, machinery and equipment</i>	Sum of the quarters.	Direct measurement using the merchandise trade fob value.	Sum of the quarters.	Exports are deflated by components using the relevant OTI.
<i>Chemical rubber, plastic and other non-metal products</i>	Sum of the quarters.	Direct measurement using the merchandise trade fob value.	Sum of the quarters.	Exports, except furniture, other transportable goods nec are deflated by components using the relevant OTI. Furniture and other transportable goods are deflated using the producers price index (PPI) for other manufactured goods.
Exports of services				
<i>Sea and air freight, air passenger transport, port services</i>	Sum of the quarters.	Direct measurement. Part of the transportation item from the quarterly BOP current account is used.	Sum of the quarters.	Exports are deflated using the relevant OTI.
<i>Travel services</i>	Sum of the quarters.	Direct measurement. The travel item from the quarterly BOP current account is used. This includes expenditure on NZ by tourists and business visitors.	Sum of the quarters.	Exports are deflated using the OTI for travel services.
<i>Insurance services</i>	Sum of the quarters.	The insurance item from the quarterly BOP current account is used. The insurance item is the value of insurance services provided by NZ resident insurers to foreign residents. An adjustment is made for resident insurance services on imports using the BOP survey of insurance underwriters and brokers.	Sum of the quarters.	Exports are deflated using the OTI for insurance services.

Table 14 *continued*

Component	Current price series		Chain-volume series	
	Annual method	Quarterly method	Annual method	Quarterly method
<i>Exports of services continued</i>				
<i>Royalties</i>	Sum of the quarters.	Direct measurement from the quarterly BOP current account.	Sum of the quarters.	Exports are deflated using the OTI for royalties.
<i>Government services</i>	Sum of the quarters.	Direct measurement. The government item from the quarterly BOP current account is used. This includes expenditure on commodities by foreign embassies and consulates within NZ.	Sum of the quarters.	Exports are deflated using the OTI for government services.
<i>Miscellaneous services</i>	Sum of the quarters.	The miscellaneous item from the quarterly BOP current account is used. It includes labour income, advertising and communication services, and rent other than operational leases on transport equipment.	Sum of the quarters.	Exports are deflated using the OTI for total other services.

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