MEFMI
Macroeconomic and Financial Management
Institute of Eastern and Southern Africa

THE MEFMI GUIDELINES FOR

QUARTERLY GROSS DOMESTIC PRODUCT

EARLY ESTIMATES AND NON-OBSERVED ECONOMY

Macroeconomic and Financial Management Institute of Eastern and Southern Africa (MEFMI)
9 Earls Road, Alexandra Park, Harare, Zimbabwe, Tel: +263 4 745988/9/91-94
Email: capacity @mefmi.org Web: www.mefmi.org

ISBN:

EAN:

Foreword

The development of the MEFMI Guidelines for Quarterly GDP, Early Estimates and Non-Observed Economy is a timely process. Countries today are increasingly pressured from all angles to provide accurate and reliable information faster and more efficiently. The MEFMI region also requires more timely and frequent picture of current economic developments as well as more comprehensive representation of all economic production that are included in the GDP estimate. The informal sector constitutes a large proportion of economic activity but data from the sector is not captured comprehensively. This negatively affects the robustness of national accounts data. Furthermore, many institutions have no scientific mechanism for estimating GDP in the interim before actual data is released by statistical offices, usually with a considerable lag.

The objective was to develop guidelines and a framework for early indicators of GDP using a set of leading indicators (e.g. perception surveys and/or indices and non-survey methods) and to develop standardized methods for measuring informal activities (GDP). This work is expected to improve the timely monitoring of the economy by informing policy decisions before regular statistics are available and to provide more accurate estimation of the GDP from the informal sector and integrate it into macroeconomic analysis. The guidelines were developed under the background of Inventory of Materials and literature on early indicators and related topics that were useful for the MEFMI region framework and guidelines. These included the Quarterly national accounts/ GDP, flash estimates of GDP, leading indicators and other relevant issues. The MEFMI Guidelines for Quarterly GDP, Early Estimates and Non-Observed Economy also benefited immensely from the sound foundations laid by the International Monetary Fund on this topic.

As expressed earlier, the MEFMI Guidelines for Quarterly GDP, Early Estimates and Non-Observed Economy seek to compliment the comprehensive work done by IMF in 2001 on the Quarterly National Accounts Manual. The intention is to provide a general understanding of Quarterly GDP rather than detailed knowledge for which the reader can refer to the IMF Manual for a deeper understanding of issues involved in the compilation of Quarterly GDP. This work was achieved through working with IMF on the review process. We greatly appreciate the valuable comments and inputs from the reviewers from AFRITAC South (AFS) which were incorporated in order to ensure that the Manual is a more complete guide.

MEFMI recognises the fact that our work does not end here. There is a need to continue working closely with member countries and international organisation such as IMF to close the capacity gap in improving the quality of financial and macroeconomic statistics in line with latest international compilation and reporting standards.

Caleb M. Fundanga
EXECUTIVE DIRECTOR

Preface and Acknowledgements

The MEFMI Guidelines on Quarterly GDP, Early Estimates and Non-Observed Economy is one of the major products of MEFMI's Projects aimed at providing adequate skills and knowledge in the production and management of statistics to latest regional and international standards. The guidelines gather and present up-to-date knowledge based on international standards and good practices. It is intended as a comprehensive source of information for compilers, policymakers and practitioners in the National statistics offices who are in need of bridging documents to assist them to start compiling quarterly national accounts and the non-observed economy, as well as policy institutions that do not produce national accounts such as central banks and ministries of finance and planning.

The guidelines are aimed to serve sophisticated users of economic statistics to forecast the national accounts and develop economic indicators, as well as to deepen their understanding of the quarterly accounts and the non-observed economy. They are also intended to support statistical offices to start compiling quarterly accounts and the non-observed economy by serving as an introduction and bridging document to the international manuals on these aspects of national accounts. The guidelines are not meant to replace these manuals, but to render them more easily accessible.

The manual was developed by Dr. Anna Lennblad and Mr. Jan Redeby under the guidance of the Macroeconomic Management Programme of MEFMI. They provided eminence work, great level of professionalism, sound guidance and leadership for which MEFMI is very grateful. MEFMI also appreciates the significant effort and expertise of the reviewers, Mr. Moffat Nyoni (an independent consultant), IMF-Africa Training Institute and East Afritac, without whom this manual would not have been published. Their experience of a wide range of knowledge in the subject benefited this manual.

MEFMI also acknowledges the initial contribution by Amos Kipronoh Cheptoo, Senior Adviser to the Executive Director in Africa Development Bank representing Tanzania, Ethiopia, Eritrea, Kenya, Rwanda, Seychelles and Uganda who was a programme manager in MEFMI and was key in conceptualising and contributing to the daft manual.

The guidelines were constructed under the overall supervision of Dr Sehliselo Mpofu, Programme Director, Macroeconomic Management Programme and Mr Senei Molapo, Programme Manager who both finalised them.

Table of Contents

List of abbreviations and acronyms

ARIMA	Autoregressive Integrated Moving Average
ANA	Annual National Accounts
BEC	Broad Economic Categories
BI	Bench-to-Indicator
BON	Bank of Namibia
BOS	Bureau of Statistics
CBL	Central Bank of Lesotho
CBS	Central Bureau of Statistics
CIEA	Composite Indicators of Economic Activity
CPI	Consumer Price Index
EAI	Economic Activity Indicator
GDP	Gross Domestic Product
HBS	Household Budget Survey
MEFMI	Macroeconomic and Financial Management Institute of Eastern and Sothern Africa
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KNBS	Kenya National Bureau of Statistics
LFS	Labour Force Survey
NBR	National Bank of Rwanda
NOE	Non-Observed Economy
NISR	National Institute of Statistics of Rwanda
PPI	Producer Price Index
QGDP	Quarterly Gross Domestic Product
QNA	Quarterly National Accounts
RMSE	Root Mean Square Error
SAPS	South African Police Services
SARS	South African Revenue Services
SWEAT	South African Sex Worker Advocacy and Task Force
SUT	Supply and Use Table
SNA	System of National Accounts
VAT	Value Added Tax

1. Background

1.1 Objectives and Demand for Guidelines

The national accounts are a complete record of all economic transactions involving at least one resident. Its main purpose is to serve as a foundation for decision making. This purpose cannot be accomplished unless data are robust and comprehensive, compiled in line with international recommendations, and made available in a timely manner. The national accounts then provide information on a country's economic performance, and enable decision makers to formulate economic policies and monitor their implementation. The national accounts are also essential for evaluation, and making cross-country and multilateral comparisons. Furthermore, they serve the needs of market participants through the provision of timely and useful information on the economy.

In the MEFMI region, the national accounts broadly accomplish these purposes, even though there are some problems besetting the compilation efforts. First, the non-observed economy constitutes a large proportion of economic activity in many of the MEFMI countries, but data from the sector remains evasive. Thus, the national accounts are frequently not comprehensive. Second, many policy institutions have no sound methodology for estimating GDP in the interim before actual data is released by statistical offices. This problem is compounded by the fact that actual data often are released with a considerable lag. Even where statistical offices meet the ninety (90) day international standard of producing and releasing quarterly national accounts, policy institutions like central banks and ministries of finance, which have forward looking mandates with regard to monetary policy and the macro-fiscal framework, need early estimates for the current year.

To tackle these problems, MEFMI Phase IV Project (2012-2016) identified the development of guidelines for the measurement of the non-observed economy and early indicators of GDP as critical areas of intervention for capacity building. The need for guidelines was further emphasised during the MEFMI Needs and Impact Assessment exercise in 2014. Subsequent retreats by policy makers from client institutions identified the need for guidelines to address certain data problems that are emerging as some of the most critical policy tool gaps in the region.

The need for the guidelines and a framework for early indicators of GDP and the non-observed economy has featured in many MEFMI planning activities including:

- Needs and Impact Assessment exercise of 2009;
- MMP Brainstorming Retreat for Phase IV in 2011;
- Five in-country requests for technical assistance from 2010 to 2015; and
- Heads of Research and Policy Units in May 2015.

On the basis of these, the project was identified and incorporated in Phase IV Strategic Project Document (2012-2016) for implementation.

During ensuing discussions, two additional issues were recognized as follows: the lack of practical guidelines on the compilation of quarterly accounts and a toolbox for short-term forecasting of the national accounts. The conceptual framework and the basic practical steps underpinning the quarterly national accounts are not always understood, making them hard to interpret for users and difficult to start compiling for some statistical offices. Separately, policy institutions such as central banks and ministries of finance are often required to make short-term forecasts of GDP and require a basic toolbox to do so.

The MEFMI Guidelines are inventory of materials, literature and best practices based on the latest macroeconomic accounting rules. Besides, the Guidelines are based on country specific missions over the last five years, dealing with quarterly GDP, early estimates and forecasting of GDP. These include missions to Botswana, Kenya, Lesotho, Namibia, Rwanda and Zimbabwe.

1.2 Target Users, Coverage and Properties

The guidelines have a dual purpose: on the one hand, they will serve sophisticated users of economic statistics to forecast the national accounts and develop economic indicators, as well as to deepen their understanding of the quarterly accounts and the non-observed economy. On the other hand, they will assist statistical offices to start compiling quarterly accounts and the non-observed economy in that they will serve as introduction and bridging document to the international manuals on these aspects of the national accounts. The guidelines are not meant to replace these manuals, but to render them more easily accessible.

The primary users will be:

- National statistics offices in need of bridging documents to assist them to start compiling quarterly national accounts and the non-observed economy.
- Policy institutions that do not produce national accounts - examples are central banks and ministries of finance and planning.
- Economic think-tanks and the general public will feature among the secondary users.

Building on the work done in Member States and identified needs, the guidelines provide three critical outputs:

- A summary description of issues involved in estimating quarterly GDP. Although this is the task of the national statistical offices, other institutions need a general understanding of the issues involved (Chapter 2).
- Guidelines for early indicators of GDP and projections (Chapter 3 and 4).
- Recommendations on the framework for measurement and capture of the Non-Observed Economy output for more robust GDP estimates (Chapter 5).

2. Quarterly National Accounts

2.1 Introduction

Quarterly national accounts (QNA) constitute a system of integrated quarterly time series coordinated through an accounting framework. The main purpose of QNA is to provide a picture of current economic developments that are more timely and frequent than what is provided by Annual National Accounts (ANA) and more comprehensive than that provided by individual short-term indicators.

In principle, the only difference between QNA and ANA is the reference period. Thus, QNA adopt the same principles, concepts, definitions and structure as ANA. These are laid out in the 2008 SNA, the latest international guidelines. In practice, constraints of data availability and resources mean that QNA are usually less complete than ANA. Therefore, QNA in most countries in Africa are restricted to the compilation of quarterly GDP (QGDP). Preferably, QGDP should be compiled by both the production and expenditure approaches. Due to data constraints, however, many countries start the compilation of QGDP with the production approach, sometimes only at constant prices, and aim to develop expenditure estimates later.

This chapter presents an overview of issues involved in the compilation of QGDP. The intention is to provide a general understanding of QGDP rather than detailed knowledge. The chapter draws on the Quarterly National Accounts Manual published by the IMF in 2001 and draft chapters of an update which is currently in progress. The reader is referred to the IMF Manual for a deeper understanding of issues involved in the compilation of QGDP.

National accounts and QGDP in Africa are normally compiled by the national statistical offices (NSO). Important users include ministries of finance and central banks. To be useful, QGDP should be available not long after the end of the latest quarter. An acceptable international standard is 90 days. This might not be sufficient for certain purposes. Central banks, for instance, often need an early indication of the movement of GDP and its components before QGDP is available. Furthermore, some countries do not compile QGDP or are still developing sources and methods and, in addition, NSOs often struggle with resource constraints. Therefore, central banks could consider compiling estimates of QGDP on their own or proxy estimates such as the Economic Activity Indicator (EAI) developed by the Central Bank of Lesotho. These should be bridging solutions until the NSO has been able to develop estimates of QGDP. It is generally undesirable to have different organisations involved because of the potential problems of inconsistent data and methods, as well as the loss of synergies between the annual and quarterly systems.

This chapter contains seven sections after the introduction. First, QGDP by activity is discussed in Section 2.2, including a note on GDP by income components. This is followed by QGDP by expenditure in Section 2.3. The issues include definitions, methodology and data sources. The following two sections then deal with issues that are specific to QNA. First, QNA must be consistent with ANA, i.e. the sum of four quarters must add up to the annual estimate. Bringing

the two together requires benchmarking, which is discussed in Section 2.4. Seasonal adjustment is an analytical technique that is specific to quarterly and monthly time series; it is discussed in Section 2.5. Flash estimates are discussed in Section 2.6. The term usually refers to a first release of QNA data fairly shortly after the reference period, say 45-60 days. Section 2.7, finally, presents a case study of the EAI in Lesotho.

2.2 Quarterly Estimates of GDP by Activity

2.2.1 Concepts and definitions

GDP compiled by the production approach (GDP by activity) is derived as:

Sum of gross values added at basic prices
+ Taxes on products
– Subsidies on products
= GDP (2.1)

The contribution of each economic activity to GDP is its value added, which is derived in the production account:

Output at basic prices
– Intermediate consumption at purchasers' prices
= Gross value added at basic prices (2.2)

The values of output and intermediate consumption, which are flows of goods and services, can be factored into two components, one reflecting changes in the prices of the goods and services concerned and the other the changes in their volumes. Measures in volume terms are derived by using the prices of a base year, hence the term "at constant prices". In broad terms, there are two ways of deriving constant prices: a) by deflating the current price value by an appropriate price index; and b) by moving the base year value with a volume index or volume indicator. Constant prices can also be derived by chain-linking, i.e. the previous year is the base year.

Box 2.1: Definitions for the production account

There are three categories of **output**:

Market output consists of output intended for sale at economically significant prices, measured as the value of sales plus the value of changes in inventories (including work-in-progress) of products intended to be sold. Note that output of wholesale and retail trade is measured as the trade margins, i.e. the difference between the sales and purchases of goods for resale, adjusted for changes in inventories.

Output for own final use includes:

- Goods retained by households for final consumption; valued at the market prices for similar goods. In practice, goods include food and collection of firewood and water.
- Goods retained by producers for fixed capital formation; valued at the cost of production.
- The imputed services of owner-occupied dwellings; valued at the rent actually paid for similar dwellings.

Non-market output consists of goods and services produced by government or non-profit institutions serving households (NPISH) that are supplied free, or at prices that are not economically significant. It is valued as the sum of costs: intermediate consumption + compensation of employees + consumption of fixed capital + other taxes on production.

Intermediate consumption consists of the value of the goods and services consumed as inputs by a process of production. It is measured as the value of acquisition of products intended for intermediate consumption minus the value of changes in inventories of those products. Fixed assets are used over many years; the cost of using them is recorded as consumption of fixed capital.

Value added is so called because it measures the value created by production; it represents the contribution of labour and capital to the production process. Value added is normally measured gross, i.e. it includes the consumption of fixed capital, which is the reduction in the value of fixed capital due to its use in production. The gross value added by an economic activity is its contribution to GDP. Because output is measured at basic prices, value added is also described as being at basic prices. The components are: compensation of employees, operating surplus or mixed income, and other net taxes on production.

Basic prices exclude taxes on products and include subsidies on products, while purchasers' prices include taxes on products and exclude subsidies on products.

Taxes on products are payable on goods and services when they are produced, imported, sold or used and are proportional to or vary otherwise with the value or quantity of the goods and services on which they are levied. Import taxes are levied on imports.

Subsidies on products – price subsidies – are the opposite of taxes on products.

2.2.2 Measurement of QGDP by activity

Data sources for the compilation of QGDP by activity are generally more readily available compared to data sources for the expenditure approach. Therefore, many countries begin with QGDP by activity when embarking on QNA, sometimes only at constant prices as a start.

Ideally, annual GDP should be measured by deriving values added for each economic activity as per equation 2.2 above. Constant prices should then be derived in the same way, i.e. by deflating output and intermediate consumption by their own appropriate price indexes. In practice, however, a benchmark estimate is often derived for many economic activities on the basis of intermittent surveys, which collect the necessary detailed data; other years are then estimated by using less detailed data, often on output, and assuming fixed ratios of intermediate consumption over output. It makes more sense to apply fixed ratios at constant prices as the movement of output and input prices can differ. The assumption of fixed ratios should not run for too many years. An acceptable international standard is to update the base year at least every five years; this should also be applied to fixed ratios.

Whatever the case in the estimates of annual GDP, data sources used for estimates of QGDP are generally more limited in detail and coverage than those available for the annual estimates. An important factor is that the data sources must be timelier than the data used for the annual estimates. Thus, estimates of QGDP are often based on indicators that capture the movements in the target variable, i.e. output and value added in estimating QGDP by activity. The relationship between the annual estimate (the benchmark) and the quarterly indicator is called the benchmark-indicator ratio. Again, the indicator should capture the movements as accurately as possible; the level of the indicator is not important. In short, the estimates of QGDP have to be based on less detailed data. There are a couple of possibilities:

a) Using indicators to estimate output both at current and constant prices as described above. Intermediate consumption is derived by assuming fixed ratios at constant prices and reflated using appropriate price indexes. Value added is then derived as per equation 2.2 above.

b) Using output indicators to move value added and assume that the ratio of intermediate consumption over output is fixed at constant prices; although not preferable, a fixed ratio could also be assumed at current prices. A value indicator, such as sales reported in VAT-submissions, can be used to estimate current prices, which are then deflated by an appropriate price index to derive constant prices. A volume indicator, such as a production volume index, can be used to estimate constant prices, which are then reflated to derive current prices.

c) The use indicators to move value added is based on the assumption that the ratio of intermediate consumption over output is fixed. This is acceptable at constant prices but generally not at current prices. Therefore, separate deflators should be used as far as possible for output and intermediate consumption.

d) Using input indicators to move value added if output indicators are not available. Data on major construction inputs, such as cement, are often available. Another example is to use employment as an indicator for value added. Such methods are inferior and should be used only if data are not available for the methods above.

e) The value added by government activities is calculated as the sum of costs: compensation of employees (the major part) and consumption of fixed capital. Data on government salaries are often available on a quarterly basis and can be used as an indicator for value added at current prices. Bonuses paid at the end of the year should then be allocated to the appropriate quarters. A quarterly salary index needs to be constructed for the estimates at constant prices.

2.2.3 Work-in-progress

Crops and animals are output while they are growing, not only when they are harvested or slaughtered. This is recorded as work-in-progress (changes in inventories). A clear example is maize in Southern Africa, which is planted in the fourth quarter and harvested in the second quarter of the following year. The output values can be calculated using a cost profile together with actual totals (for past years) or forecasts (for the current year). A simplified numerical example is shown in Table 2.1.

Table 2.1: Work-in-progress

		2014	2015
Fourth quarter	w-i-p	150	
First quarter	w-i-p		10
Second quarter	w-i-p		-160
Second quarter	harvest		200

The value of the harvest is 200 in the example. The major part of the costs is incurred when planting and a minor part during the first and second quarters. Thus, the value of the harvest is allocated as output to three quarters: 150 (2014-4), 10 (2015-1) and 40 (2015-2). The output in the second quarter is equal to the value of the harvest minus a decrease of work-in-progress.

It is often possible to calculate work-in-progress for crops as data on cost profiles may be available although it can involve big revisions; the estimates involve forecasts of the expected crops. Thus, the method does not produce plausible results in cases of unseasonal weather, for example when growing crops have been decimated or destroyed by floods. Besides, Table 2 illustrates estimates at constant prices. An aspect of uncertainty concerns the estimates at current prices: what prices to assign to output in non-harvest periods. There may be no or only a very limited market for crops in those periods and, therefore, the observed prices would not be relevant for valuing the harvest. Given the uncertainties in estimating work-in-progress for crops, some countries record production simply as the harvest value, in the periods of harvest, which is still acceptable according to the IMF-manual. Another solution discussed in the manual is a pro-rata distribution of the harvest value over the quarters from planting to harvest.

Estimates of quarterly and annual work-in-progress of livestock require recurrent data on herd numbers by species and sex, as well as numbers slaughtered, exported and imported. Information is also needed on the gestation period of breeding females as well as the time from young to full grown animal. A perpetual inventory model can then be constructed. However, the required data are often not available in enough detail and, therefore, some countries use synthetic quarterly values for the estimates of animal production. See Section 2.2.6 below.

2.2.4 Taxes and subsidies on products

Equation 1 above indicates that taxes on products are added to and subsidies on products deducted from the sum of values added to derive GDP. Thus, quarterly estimates of these items must be compiled. Data on government revenue (taxes) and expenditure (subsidies) are often available on a monthly or quarterly basis. Preferably, such data should be reported on an accrual basis. In general, constant prices should be based on the taxed transactions. Examples:

- Non-deductible VAT is mainly charged to household consumption and, therefore, VAT at constant prices can be estimated to move with relevant parts of household consumption.
- Import duties at constant prices can be estimated to move with relevant parts of imports at constant prices.
- Excise duties can be estimated to move with the output (less exports) and imports of the relevant goods, e.g. the output and imports of alcoholic beverages.

2.2.5 Data sources

The following list of possible data sources gives a few examples and is far from exhaustive.

- Quarterly business surveys are generally limited to collect data on a few major variables such as output and employment, sometimes also on quantities of fairly homogenous products. Such surveys are often designed to provide data for the construction of producer price indices and production volume indices to be used as indicators for QGDP.
- Administrative data sources include tax collection systems, notably VAT, which is an important type of administrative data for the compilation of QGDP. Enterprises registered for VAT report turnover with their submission; this can be used as an indicator for output at current prices. However, administrative data sources are not designed to meet statistical objectives and may have to be edited.
- Some industries export a major part or all of its output. In such cases, export values can be used as an output indicator; exports by product are often available on a timely basis. As with VAT data, exports reflect sales which can differ from output because of changes in inventories.
- Quantities of goods produced are often available from producers more readily than values. Government agencies may also collect data on important commodities. Quantities should be used as indicators only for commodities that are fairly homogenous.
- Number of visitors may be an acceptable indicator for hotels and restaurants in countries where foreign visitors constitute a significant proportion of the number of persons staying in paid accommodation. Some countries collect data on hotel nights for administrative purposes.
- The supply of important construction materials such as cement is often used as an indicator for construction.
- Labour inputs is another possible input that is mainly used for service industries. The number of hours worked is preferable to the number of employees as an indicator of labour input.
- Price data: Virtually all countries produce a monthly consumer price index (CPI). Besides, a producer price index (PPI) is needed although it remains for many African countries to develop a PPI.

2.2.6 Synthetic quarterly values

Quarterly data may not be available for a few economic activities. In order to derive GDP, estimates have to be compiled for such cases by creating synthetic quarterly values on the basis of the annual values: The trend in the annual data is used to construct a quarterly series that equals the annual totals. The method requires a forecast for the current year, i.e. an annual value is needed.

The main goal if quarterly indicators are missing is to select a method to fill the gaps that is simple and can be implemented easily. The benchmarking methods discussed in Section 2.4 below can be used also to create synthetic quarterly values.

Rental of dwellings is an example where quarterly data are often missing. In that case, synthetic quarterly may be close to "the truth", as this activity is generally moving smoothly over time without significant quarterly variations.

Finally, a word of caution: Synthetic quarterly values should be avoided as far as possible. If they cover a significant part of GDP, the estimates of QGDP become less useful if not meaningless. Sources and methods should be clearly stated and indicate where synthetic quarterly values are used.

2.2.7 GDP by income components

In addition to the production and expenditure approaches, GDP can also be compiled by the income approach:

$$
\begin{aligned}
&+ \text{Compensation of employees} \\
&+ \text{Operating surplus / mixed income, gross} \\
&+ \text{Taxes on production and imports} \\
&- \text{Subsidies on production and imports} \\
&= \text{GDP at market prices (purchasers' prices)} \qquad (2.3)
\end{aligned}
$$

The values of operating surplus, other taxes on production and other subsidies cannot be factored into price and volume components and, thus, GDP derived by the income approach cannot be estimated at constant prices.

GDP is normally not compiled by the income approach, i.e. there is no estimate of GDP derived independently by adding up the income components. It may be possible to show the income components of GDP with operating surplus / mixed income derived as a residual.

Box 2.2: Definitions of the income components

Compensation of employees is the total remuneration payable to the employees for work done; it includes wages and salaries in cash and kind, allowances and social contributions.

Operating surplus and Mixed income constitute the surplus accruing from the production process and can be measured gross or net depending on whether value added is measured gross or net. Mixed income is used for household enterprises and indicate that part of the surplus is remuneration for the owner's labour.

Taxes on production and imports include taxes on products as defined in Box 1. It also includes Other taxes on production such as business licenses that do not vary with output or sales.

Subsidies on production and imports include subsidies on products as defined in Box 1. An example of Other subsidies is subsidies on payroll.

Annual GDP is rarely compiled independently by the income approach, QGDP even less so. Some countries do compile quarterly values added by components with operating surplus derived as a residual. QGDP can then be presented by income components. QGDP by income components should have lower priority compared to the production and expenditure approaches.

2.3 Quarterly Estimates of GDP by Expenditure

2.3.1 Concepts and definitions

GDP compiled by the expenditure approach (GDP by expenditure) is derived as:

+ Final consumption expenditure by government
+ Final consumption expenditure by households
+ Final cons. expenditure by non-profit institutions serving households (NPISH)
+ Gross fixed capital formation
+ Changes in inventories
+ Acquisitions less disposals of valuables
+ Exports of goods and services
– Imports of goods and services
= GDP (2.4)

The values of the expenditure items are flows of goods and services, which can be factored into two components. Thus, constant prices can be calculated as described in Section 2.1 above.

2.3.2 Measurement of QGDP by expenditure; data sources

Like for QGDP by activity, data sources used for the quarterly estimates are generally more limited in detail and coverage than those available for the annual estimates. In general, data sources and methods are readily available for government consumption, exports and imports, while they are more difficult to come by for the other items.

Final consumption expenditure by government is calculated as output less any fees and sales less the value of output for own account capital formation plus the value of goods and services purchased from market producers for the benefit of households (social transfers in kind). Government expenditure and revenue data are normally recorded on a monthly or quarterly basis and, thus, data sources for quarterly estimates should be available. Government salaries at constant prices is mentioned in Section 2.2.2 above. Intermediate consumption by government, sales and social transfers in kind should be deflated by appropriate price indices, the same as the ones used in the annual estimates.

Final consumption expenditure by households includes all net expenditure by resident households on goods and services for consumption. Note that durable goods such as furniture, refrigerators, TV-sets and cars are included. Furthermore, goods produced for own consumption and imputed rentals for owner-occupied dwellings are included.

It is more difficult to compile this item on a quarterly basis. It should then be kept in mind that many African countries estimated annual household consumption as a residual until recently; this method is not recommended. An annual benchmark for household consumption is often calculated on the basis of an intermittent household budget survey. Quarterly estimates have to rely on various indicators; three examples:

- Some countries have embarked on continuous household surveys, which collect quarterly data on major expenditure categories as a core module; another core module collects quarterly data on employment. Such surveys include add-on modules on an intermittent basis, e.g. a detailed household budget survey every five years.
- Indicators for the movement of the supply of consumer goods can be calculated as output of industries that are mainly producing consumer goods and services plus imports minus exports of consumer goods. Foreign trade statistics can be classified by broad economic categories (BEC) which is a classification by end use. Four categories of consumer goods are identified in BEC.
- Sales of retail trade as recorded for VAT can be used as an indicator for household consumption.
- Consumer price indices are generally available and should be used as deflators also in the quarterly estimates.

Final consumption expenditure by NPISH is defined similarly to government consumption. Quarterly consumption should be moved with whatever is estimated on the production side. It should then be noted that data sources for the annual estimates are often scarce.

Gross fixed capital formation includes four main categories: buildings and structures; transport equipment, machinery and other equipment; cultivated assets; and intellectual property products. Comments:

- Buildings and structures: A major part of the output of the construction industry is used as gross fixed capital formation, while a minor part is repair and maintenance, i.e. intermediate consumption. The quarterly estimates of gross fixed capital formation in buildings and structures can therefore be moved with quarterly construction as estimated on the production side.
- Transport equipment, machinery and other equipment are mainly imported in many African countries. The classification of imports by BEC is then useful for the quarterly estimates. Any domestic output and exports must be taken into consideration. Deflators could be derived from the output and imports of such products.

- Cultivated assets and intellectual property products may be difficult in the annual estimates of GDP. While synthetic quarterly values may be acceptable for cultivated assets, specific information will be needed for intellectual property products. Two important categories – mineral exploration and research and development –are often incurred by a few large enterprises, which should be able to provide quarterly data on expenditure.

Changes in inventories. Inventories are defined as goods and some rare services that have been produced or imported but have not yet been used for consumption, fixed capital formation, or exports. They consist of materials and supplies, work-in-progress, finished goods, goods for resale and military inventories. Although changes in inventories may be a small component of GDP, they can swing substantially from strongly positive to strongly negative. Consequently, this small component can be a major factor in GDP movements. In the quarterly data, the average absolute quarterly contribution to growth can be large, often being one of the major quarterly growth factors.

Changes in inventories are difficult to estimate properly also in the annual estimates of GDP and are often only partially estimated in African countries. It must then be noted that they also feature in the estimates of the production side, e.g. changes of inventories of finished goods should be reflected in proper estimates of output. Because of these difficulties, it may only be possible to estimate changes in inventories partially, if at all, in QGDP by expenditure. One possibility is to include them with the discrepancy between QGP by activity and expenditure. That item should then be labelled as being "changes in inventories plus net errors and omissions" to emphasize the limitations.

Acquisitions less disposals of valuables are classified as capital formation and measure goods that are kept as stores of values such as art objects, antiquities and precious metals and stone. This item is normally not included in African national accounts; in countries where it is included, its share of GDP is tiny.

Exports and imports of goods and services. Quarterly data on goods are normally available in detail as recorded in customs procedures. Many countries now compile their balance of payments on a quarterly basis, which then provides data on exports and imports of services and of goods that are not recorded by Customs. The estimates of constant prices may be more problematic as proper export and import price indices may not be available. Producer price indices and implicit output deflators could then be used for exports. For imports, export and producer price indices form trading partners could be used; these induces have to be adjusted for changes in exchange rates.

There will inevitably be a discrepancy between QGDP by activity and expenditure. It can be treated as described under changes in inventories above. If the discrepancy is significant, some estimates have to be revisited, both at the production and expenditure side. Mining is a case in point: Output as recorded by mining companies and exports as recorded in customs data may differ because of margins, taxes on products and measurement errors. It should finally be mentioned that mathematical reconciliation methods are available.

2.4 Benchmarking

The estimates of QGDP must be consistent with the annual estimates of GDP, i.e. the sum of the four quarters must be equal to the annual estimate for all items calculated on the production and expenditure sides. Benchmarking is used to bring the two together; it deals with the problem of combining a series of high-frequency data (e.g., quarterly data) with a series of less frequent data (e.g., annual data) for a certain variable into a consistent time series. Normally, the two series show different levels and movements, and need to be made temporally consistent. Because annual data are usually more comprehensive and accurate than quarterly ones, the quarterly series is benchmarked to the annual data.

Benchmarking serves two purposes in QNA:

- Quarterly distribution of annual data to construct time series of benchmarked QNA estimates ("back series"); and
- Quarterly extrapolation to derive the QNA estimates for quarters for which ANA benchmarks are not yet available ("forward series").

The main objectives of benchmarking in QNA are:

- To estimate quarterly data that are temporally consistent with the ANA data, i.e., to ensure that the sum of the quarterly data is equal to the annual benchmark;
- To preserve the quarterly movements in the indicator as much as possible under the restrictions provided by the ANA data; and
- To ensure, for forward series, that the sum of the four quarters of the current year is as close as possible to the unknown future ANA data.

The relationship between the annual estimate (the benchmark) and the quarterly indicator is called the benchmark-indicator (BI) ratio. A BI-ratio that changes over time signals different patterns between the indicator and the annual data; on the other hand, a constant annual BI ratio means that the two variables present the same rates of change. The indicator should capture the movements as accurately as possible; the level of the indicator is not important.

The pro rata benchmarking method is a simple method of benchmarking that should be avoided. Pro rata means that the discrepancy between the sum of the four quarters and the annual estimate is distributed proportionally to the four quarters. While the quarterly movements within the year will be the same, the pro rata method entails a step problem between the fourth quarter and the first quarter of the following year. Table 2.2 illustrates the step problem in pro rata benchmarking.

Table 2.2: Pro rata distribution and the step problem

	Indicator	Change	Annual data	Annual BI-ratio	Quarterly BI-ratio	Derived QNA	Change
2012-1	982.0				0.995	977.1	
2012-2	1 008.0	2.6%			0.995	1 003.0	2.6%
2012-3	1 022.0	1.4%			0.995	1 016.9	1.4%
2012-4	1 008.0	-1.4%			0.995	1 003.0	-1.4%
Year	4 020.0		4 000.0	0.995		4 000.0	
2013-1	990.0	-1.8%			1.028	1 017.7	1.5%
2013-2	1 016.0	2.6%			1.028	1 044.5	2.6%
2013-3	1 027.0	1.1%			1.028	1 055.8	1.1%
2013-4	1 015.0	-1.2%			1.028	1 043.4	-1.2%
Year	4 048.0		4 161.4	1.028		4 161.4	
2014-1	1 005.0	-1.0%			1.028	1 033.2	-1.0%

The step was caused by suddenly changing from one BI ratio to another. The indicator shows a decrease from 2012-4 to 2013-1 while pro rata distribution shows and increase.

The (implicit) quarterly BI ratios should change smoothly from one quarter to the next while averaging to the annual BI ratios. The proportional Denton benchmarking technique keeps the benchmarked series as proportional to the indicator as possible by minimizing (in a least-squares sense) the difference in relative adjustment to neighbouring quarters subject to the constraints provided by the annual benchmarks. The result of this method is shown in Table 2.3.

Table 2.3: Benchmarking by the proportional Denton method

	Indicator	Change	Annual data	Annual BI-ratio	Quarterly BI-ratio	Derived QNA	Change
2012-1	982.0				0.998	969.8	
2012-2	1 008.0	2.6%			0.991	998.4	2.6%
2012-3	1 022.0	1.4%			0.996	1 018.3	1.4%
2012-4	1 008.0	-1.4%			1.005	1 013.4	-1.4%
Year	**4 020.0**		**4 000.0**	**0.995**		**4 000.0**	
2013-1	990.0	-1.8%			1.017	1 007.2	-0.6%
2013-2	1 016.0	2.6%			1.026	1 042.8	3.5%
2013-3	1 027.0	1.1%			1.033	1 060.4	1.7%
2013-4	1 015.0	-1.2%			1.036	1 051.0	-0.9%
Year	**4 048.0**		**4 161.4**	**1.028**		**4 161.4**	
2014-1	1 005.0	-1.0%			1.036	1 040.7	-1.0%

The table shows that the estimate of the first quarter of the current year (2014) is moved with the BI-ratio for the fourth quarter of 2013. The Denton method also includes enhancements to improve the estimates for the most recent quarters (the forward series) and reduces the size of later revisions by incorporating information on past systematic movements in the annual BI ratio.

The movements of the indicator, the pro rata distributed values and the benchmarking with the Denton method are shown in Figure 2.1 overleaf.

Figure 2.1: Pro rata distribution and Denton benchmarking

The IMF has developed XLPBM, which is an Excel add-in function; it includes benchmarking according to proportional Denton method. In addition, XLPBM includes the option of using another method, the proportional Cholette-Dagum method with autoregressive error.

2.5 Seasonal Adjustment

2.5.1 Principles of seasonal adjustment

Seasonal adjustment facilitates an understanding of the development of the economy over time and facilitates the identification of turning points. It applies analytical techniques to break down a series into components. Four main components are generally assumed for seasonal adjustment purposes:

- The trend/cycle component is the underlying path of the series. It includes both the long-term trend and the business-cycle movements in the data.

- The seasonal component includes those seasonal fluctuations that repeat themselves with similar annual timing, direction and magnitude. Possible causes: administrative or legal measures, traditions and calendar effects that are stable, e.g. Christmas and new year.

- The calendar component comprises calendar effects that changes from period to period. First, moving holidays change date from year to year, e.g. Easter and Ramadan. Second, the trading and working day effects result in different number of trading and working days depending on the number of weekends (Saturday and Sunday) in a quarter. Third, the leap year accounts for the extra day in the first quarter of a leap year.

- The irregular component captures all the other fluctuations that are not part of the trend-cycle, seasonal and calendar components. These effects are characterized by the fact that their timing, impact and duration are unpredictable at the time of their occurrence.

One way of getting around the problem of seasonal patterns would obviously be to look at the rate of change from the same quarter of the previous year. Indeed, change rates in the original series are normally shown that way but there are disadvantages. First, turning points are not immediately detected and, second, calendar effects due to moving holidays can be included.

The purpose of seasonal adjustment is to identify and estimate the different components of a time series, and thus provide a better understanding of the underlying economic movements in the series. The target variable of a seasonal adjustment process is the series adjusted for seasonal and calendar effects. Three observations on the limits of seasonal adjustment are worth noting here:

- A fundamental prerequisite for applying seasonal adjustment procedures is that the processed series should present clear and sufficiently stable seasonal effects. Series with no seasonal effects, or series with seasonal effects that are not easy to identify from the original series, should not be seasonally adjusted.
- Seasonal adjustment is not meant for smoothing series. A seasonally adjusted series is the sum of the trend-cycle component and the irregular component. As a consequence, when the irregular component is strong the seasonally adjusted series may not present a smooth pattern over time.
- Seasonal adjustment and trend-cycle estimation represent an analytical processing of the original data. As such, the seasonally adjusted data and the estimated trend-cycle component complement the original data, but they can never replace them. Besides, there is no unique solution on how to do seasonal adjustment. Thus, the unadjusted data – the original series – are useful in their own right as they show the actual economic events.

Seasonal adjustment requires sufficiently long time series. When a series is too short, it may be difficult to identify a stable seasonal pattern and significant calendar effects from a small number of observations. For QNA, it is recommended that at least five years (20 quarters) of data be used for seasonal adjustment. Seasonal adjustment of shorter time series can still be done but should not be published.

2.5.2 Seasonal adjustment procedure

A seasonal adjustment procedure follows a two-stage approach which is included in available software. Without going into details, the two stages are:

- Pre-adjustment with the objective to adjust the series for deterministic effects and to extend the series with backcasts and forecasts to be used in the time series decomposition process. Calendar effects as defined in component C above are removed. Besides, abnormal values are taken out of the series and then re-introduced in the final components after the decomposition. Examples of abnormal values include a drop in the production of crops due to unseasonable weather conditions and strikes that disrupt production.
- Decomposition of the pre-adjusted series into unobserved components: trend-cycle, seasonal and irregular. There are two alternative methods. The X-11 filter is derived as an iterative process, which consists in applying a sequence of predefined moving average filters. The SEATS filter is based on a so-called ARIMA model.

Statistical agencies and international organizations have developed programs to facilitate the production process of seasonally adjusted and trend-cycle data. There are three widely used programs:

- X-13-ARIMA-SEATS (X-13A-S) is developed and supported by the US Bureau of the Census. The program implements the two most widely used seasonal adjustment methods, the moving average X-11 method and the ARIMA model-based SEATS method. It also offers a module for selecting pre-adjustment effects. X-13A-S produces basic and advanced diagnostics to evaluate the quality of the seasonal adjustment results.
- The TRAMO-SEATS program is promoted and maintained by the Bank of Spain. The program implements the ARIMA model-based seasonal adjustment method.
- Demetra+ is a Windows interface that includes both X-12-ARIMA and TRAMO-SEATS programs. It was developed by the National Bank of Belgium in cooperation with Eurostat.

The X-13 A-S program is most widely used and do not require a detailed knowledge of seasonal adjustment. However, an understanding of the issues involved and an ability to understand the diagnostics provided by the programs is necessary. As a minimum, the presence of seasonality must be checked. A series should not be seasonally adjusted if the diagnostics return “identifiable seasonality not present”.

New observations generally result in changes in the estimated seasonal pattern for the latest part of the series and, therefore, seasonally adjusted data are more frequently revised than the original non-seasonally adjusted series. It is therefore important to establish a transparent revision strategy.

2.5.3 Particular issues

Balancing and reconciliation, e.g. of GDP by the production and expenditure approaches, are better done with the original estimates. It is easier to identify the source for errors and correct errors in the original data.

Direct or indirect seasonal adjustment of aggregates. Seasonally adjusted series of aggregates can be derived directly by adjusting the aggregates or indirectly by aggregating the seasonally adjusted components. Thus, GDP can be seasonally adjusted directly or derived as the sum of seasonally adjusted values added. Conceptually, neither the direct approach nor the indirect approach is optimal. There are arguments in favour of both approaches.

Annual totals based on seasonally adjusted quarters will not automatically be equal to the annual totals in the unadjusted series; it is often the case, conceptually, that they should not be equal. From a user's point of view, however, consistent quarterly and annual estimates are generally preferred. Therefore, the programs mentioned above offers the option to force the seasonally adjusted series to be equal to the annual total in the original series.

Seasonally adjusting indicators or QNA series. Seasonal adjustment can be applied either to monthly or quarterly indicators, or to unadjusted QNA series. When seasonal adjustment is applied to indicators, the seasonally adjusted indicator is used to derive QNA data in seasonally adjusted form. When seasonal adjustment is applied to unadjusted QNA series, the seasonally adjusted QNA series is obtained as a result from the chosen seasonal adjustment method. Both approaches are equally acceptable.

Status and presentation of seasonally adjusted QNA vary from country to country. Some countries publish seasonally adjusted estimates for only a few main aggregates while the emphasis of the analysis is on the original estimates. Others focus on the seasonally adjusted estimates. Data adjusted for calendar effects may also be published separately, which makes the impact of calendar effects visible to the users.

Annualised growth rates are sometimes used to present quarterly growth rates, i.e. the growth from one quarter to the following quarter. This is done to make the results more understandable. Many people have a feel for annual growth rates but not for the quarterly ones; a growth of 1 per cent seems modest while an annualised growth of 4.1 per cent looks more respectable. In small economies, single events can have a big impact on quarterly growth rates and result in huge annualised rates and should therefore be avoided.

2.6 Flash Estimates

The term "flash estimates" is often used for a first release of QNA data fairly shortly after the reference period, say 45-60 days. The term "flash" is meant to emphasise that shortcuts regarding data sources have been taken and that the estimates are particularly subject to revisions. Otherwise, flash estimates do not raise additional conceptual issues. The following are common types of short-cuts:

- The use of data for only one or two months for some components with the missing month (s) estimated by extrapolation using mechanical methods.
- Use of survey data with less complete response rates than the data used for subsequent estimates of QGDP.
- Extrapolation of the latest quarter using mechanical methods.

Because the use of shortcut sources and methods is a general feature of QNA compilation, flash estimates only differ from subsequent QNA estimates in that they use a higher proportion of such methods.

National statistical offices in Africa are often subject to resource constraints and may not have the capacity to compile flash estimates. Therefore, institutions such as the central bank could compile flash estimates for their own analysis; it will require a close cooperation with the national statistical office. Ultimately, the NSO should be provided with appropriate resources for the compilation of QGDP including flash estimates if required by major users.

2.7 Economic Activity Indicator

If estimates of QGDP are not available, it could be an option for the central bank to develop a proxy, let us call it Economic Activity Indicator (EAI). This section is a case study of an EAI developed by the Central Bank in Lesotho, supported by MEFMI.

The Bureau of Statistics (BOS) in Lesotho compiles annual estimates of GDP but so far no estimates of QGDP. Assessments indicate that it would be possible to develop quarterly estimates and there are plans aiming at estimates of QGDP within one or two years. Therefore, the CBL needed to improve and expand its indicators for assessment of the real sector and requested MEFMI to organise a consultancy to develop an EAI. The EAI is now published in the Quarterly Review of the CBL.

The approach in deriving the EAI is to move the values added - the contribution to GDP - by the economic activities (industries) included in the EAI by indicators that approximate the volume movements of the output of the industries. This is similar to methods used in the compilation of QGDP by activity at constant prices. Eleven economic activities are specified in the EAI as shown in Table 3.1 as well as the indicators used.

Table 3.1: Indicator data for the compilation of the EAI

Industry	Volume indicators
Mining and quarrying	Diamond production (carats) and average prices data from the mines; the prices are used to derive values for the base year and, thus, weights for each mine. Quarrying: VAT sales* deflated by South African PPI.
Manufacture of food products and beverages	VAT-sales deflated by CPI and South African PPI.
Manufacture of clothing and textiles	US-data on import volumes of clothing and textiles from Lesotho Exports excluding to the US deflated by South African PPI.
Other manufacturing	VAT-sales deflated by South African PPI.
Electricity supply	Sales data (quantities and values) from LEC and LHDA; the base year values are used as weights for different categories of sales.
Water supply	Sales data (quantities and values) from WASCO and LHDA; the base year values are used as weights for different categories of sales.
Construction	VAT-sales by quarrying, brick manufacturing and wholesale of building materials; and government construction expenditure all deflated by South African PPI.
Wholesale and retail trade	VAT-sales deflated by CPI.
Telecommunications	VAT-sales deflated by CPI.
Commercial banks	Stocks of loans and deposits deflated by CPI.
Other private services**	VAT-sales deflated by CPI.
Government activities	Employment in government.

* Sales as reported to the revenue authority by enterprises registered for VAT.

** Hotels, restaurants, business services, real estate (except dwellings), and various personal services.

It must be emphasised that the EAI is not GDP and that the results will differ from GDP; however, its correlation with the growth in annual GDP should be monitored. There are a number of reasons why the EAI and GDP differ:

- The EAI uses 2010 as the base year meaning that the weights for that year in the annual GDP-estimates are used. The base year in the annual estimates is different.
- The EAI does not include all economic activities. Three important ones are not included: agriculture, transport and dwelling services.
- The quarterly values added are not benchmarked to the annual totals.

The EAI has to be reviewed as and when the BOS develop estimates of QGDP. One option for the Central Bank could be to discontinue the EAI and instead develop flash estimates of the latest quarter.

3. Composite Indicators of Economic Activity

3.1 Introduction

Section 2.6 and 2.7 of Chapter 2 discuss how accounting methods can be used in conjunction with monthly data to produce 'nowcasts' of economic activity based on the framework provided by the SNA. This chapter presents an alternative approach to anticipating the official estimates of GDP based on Composite Indicators of Economic Activity (CIEA). Composite indicators are based on sub-indicators that have no common meaningful unit of measurement, and there is no obvious way of weighting these sub-indicators for aggregation. A CIEA uses purely empirical relationships between available high frequency data and GDP to identify the optimal "basket" of indicators. At the outset, the limitations of CIEA should be pointed out:

- They may send misleading, non-robust policy messages if they are poorly constructed or misinterpreted.
- The summarized picture provided by composite indicators may invite users to draw simplistic policy conclusions.
- Their construction involves stages where judgment has to be made: the selection of sub-indicators, choices of methods or models, the weighting of sub indicators and the treatment of missing values and outliers.

Nevertheless, CIEAs can provide experts and decision-makers with a valuable tool that allows them to assess the trends in GDP in relation to goals and targets; to monitor the turning points in economic activity; and to provide timely information about to deviations from projections and adjust projections to changes in circumstances.

This chapter contains three sections after the introduction. First, Section 3.2 presents the concepts of leading, coincident and lagging indicators. Section 3.3 then describes the mathematics of the US Conference Board Method by constructing a CIEA for a simplified example. CIEAs have recently been constructed in African countries using a toolbox that has been designed by the IMF. This is discussed in Section 3.4.

3.2 Leading, lagging and coincident indicators

Leading indicators tend to change before the economy as a whole changes. Thus, they can be used as short-term predictors of the economy. The best example of a leading indicator might be the Purchasing Managers' Indices (PMI). It is normally made of a set of components.

- An important component is a measure for new orders in the business sector. Clearly, when orders increase, production is also likely to increase in the near future, and, conversely, when orders decline, production is likely to slow down.

- Another component is inventory of finished goods. When inventory of finished goods decline, production is likely to increase in the future. On the contrary, a build-up of inventory of finished goods tends to be a precursor to a slow-down in production.
- The stock market is sometimes used as a leading indicator, as it often begins to decline before the economy as a whole declines, and starts to increase before production recovers from a slump.
- Other leading indicators include: index of consumer expectations; building permits; selected components of gross fixed capital formation and the money supply.

Lagging indicators are those that occur after major economic events such as production and growth have taken place. Lagging indicators can be used to check data on economic developments. Significant deviations between the calculated growth rate of the economy and the evolution of selected lagging indicators must be explained or the calculated growth rate must be re-calculated. Examples of lagging indicators include the unemployment rate and the VAT collected by government.

Coincident indicators tend to occur more or less simultaneously with major economic developments. As such they are less useful to predict future economic events, but they can still be used in quarterly national accounting. Examples of coincident indicators are: personal income; number of people employed and retail sales.

3.3 The US Conference Board Method

The introduction mentioned that there are no obvious ways of weighting indicators that are combined into a CIEA. The US Conference Board Method (UCBM) assigns 'weights' depending on the volatility of the indicator. The mathematics of the method is illustrated here with a simplified example of combining two indicators, A and B, into a CIEA. The CIEA is calculated for twelve months in the example.

Step 1: Symmetric average changes are calculated for each indicator:

$$r(t) = \sum w_i r_i(t) \tag{3.1}$$

If the component y is in per cent change form or an interest rate, simple arithmetic differences are calculated:

$$r_i(t) = y_i(t) - y_i(t-1) \tag{3.2}$$

The reason for calculating the symmetric changes is to allow these to be weighted together (steps 2-3) in such a way that the positive and negative growth are treated equally. The symmetric growth is best thought of as using the average of the start and end periods over which the growth is being measured.

Step 2: Calculate a 'weight' for each indicator based on the inverse of the standard deviation of the symmetric changes of each series, i.e.:

$$w_i(t) = \frac{\frac{1}{STDEV(r_i(t)}}{\frac{1}{\sum STDEV(r_i(t)}} \tag{3.3}$$

This choice of weights gives less volatile series greater weight and more volatile series less weight. In this way, the contributions from each series to the change in the aggregate index are 'equivalent' in the sense that the weight multiplied by the (symmetric) change from each series are equal on average over the time period for which the CIEA is calculated. The weights can be 'normalised' so that they sum up to 1.

Step 3: Weight the symmetric percent changes together:

$$r(t) = \sum w_i r_i(t) \tag{3.4}$$

Step 4: Invert the weighted symmetric changes to calculate the CIEA:

$$y(t) = y(t-1) \times \frac{200+r(t)}{200-r(t)} \tag{3.5}$$

The starting point of the series can be set equal to 100 so that the inverted symmetric changes are expressed as index numbers. This step is required to move back into 'index level space', rather than (symmetric) percentage change space. Note that once back in index level space it is correct to calculate percentage changes from the index in the usual way. In other words, the percentage changes should not be calculated using the symmetric formula, which was simply a device to the weighting together of the changes of each indicator into a composite index. The four steps are illustrated in Table 3.1.

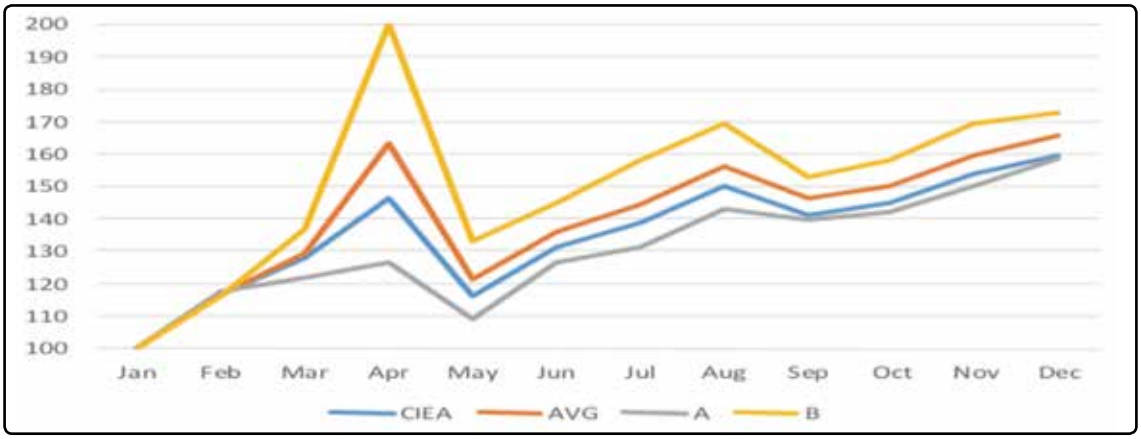
Table 3.1: Four steps in constructing a CIEA

	Indicators		Step 1		Step 2: StDev		Step 2: Weights		Step 3	Step 4	Indices		
	A	B	A	B	A	B	A	B	% Chg	CIEA	AVG	A	B
Jan	667	879								100.0	100.0	100.0	100.0
Feb	783	1 021	16.00	14.95	0.012	0.010	0.500	0.500	15.47	116.8	116.8	117.4	116.2
Mar	811	1 202	3.51	16.28	0.013	0.006	0.575	0.425	8.94	127.7	129.2	121.6	136.7
Apr	843	1 759	3.87	37.62	0.013	0.003	0.711	0.289	13.63	146.4	163.3	126.4	200.1
May	728	1 169	-14.64	-40.30	0.014	0.003	0.664	0.336	-23.26	115.9	121.1	109.1	133.0
Jun	844	1 275	14.76	8.67	0.014	0.003	0.616	0.384	12.42	131.2	135.8	126.5	145.1
Jul	874	1 389	3.49	8.56	0.014	0.004	0.577	0.423	5.63	138.8	144.5	131.0	158.0
Aug	954	1 489	8.75	6.95	0.011	0.004	0.522	0.478	7.89	150.2	156.2	143.0	169.4
Sep	931	1 342	-2.44	-10.39	0.011	0.004	0.497	0.503	-6.43	140.9	146.1	139.6	152.7
Oct	947	1 390	1.70	3.51	0.011	0.004	0.480	0.520	2.65	144.7	150.1	142.0	158.1
Nov	1 000	1 489	5.44	6.88	0.010	0.004	0.459	0.541	6.22	153.9	159.7	149.9	169.4
Dec	1 059	1 520	5.73	2.06	0.009	0.004	0.434	0.566	3.65	159.7	165.8	158.8	172.9

Step 2 is shown in four columns: The first two show the inverted standard deviations, while the last two show the weights calculated according to formula (3.3); the weights have been 'normalised' so that they add up to 1.

The final three columns show the indicators expressed as index numbers and a straight average of them (column AVG). Figure 3.1 shows the four index series.

Figure 3.1: The CIEA compared to the indicators



This section has shown how to calculate a 'weighted' average of indicators that have no apparent weight. The actual derivation of a CIEA may use seasonally adjusted or trend/cycle adjusted indicators. This is discussed in the following section.

3.4 Toolbox for constructing composite indicators

CIEAs have been constructed in Rwanda, Tanzania, Uganda, Kenya and Mozambique. The methodology was developed in Mozambique and can be summarised in five steps.

Step 1: Identification of suitable indicators for inclusion in the model; these should have the following characteristics:

- Timeliness/punctuality: the series must be published on a reasonably prompt schedule, preferably every month, and should not be significantly revised.
- Logical coherence with the target variable: the indicators should have some economic relevance to the target variable and should also be correlated with the target variable.
- The indicators must exhibit a consistent timing pattern as a leading, coincident or lagging indicator; besides, their month-to-month movements must not be too erratic.
- The data must be collected and processed in a statistically reliable way.

Step 2: Testing the suitability of the indicators to be included in the final model; this includes looking at:

- The correlation of the indicators with the 'target variable', in this case (real or nominal) trend-cycle GDP.
- How much of the variation in GDP is explained by the CIEA?

Step 3: Replacement of outliers; this is relevant only when the CIEA is targeted at the original or seasonally adjusted series, and is used as a means of further smoothing the indicators before they are considered for inclusion in the CIEA.

Step 4: Calculation of the trend-cycle for the indicators included in the model to ensure that all indicators have estimates for all quarters for which the CIEA is to be estimated. The US Census Bureau's X12 ARIMA program is used with automatic selection of the most suitable model for each indicator. Forecasts (12 periods ahead) are also calculated.

Step 5: Calculate the CIEA of the trend-cycle estimates of the indicators using the US Conference Board methodology described in Section 3.3.

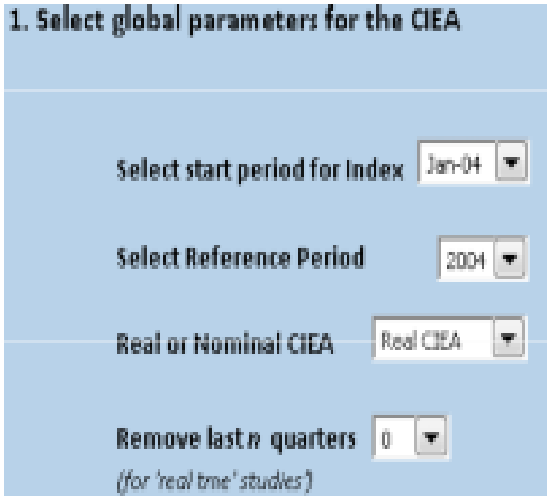
Step 6: Calculate the mean/variance adjusted CIEA. Once the basic CIEA has been created, the mean and variance of it is normalized to equal that of the trend-cycle GDP over the period for which GDP data are available. This reduces the inherent volatility of the CIEA and effectively 'maps' it onto GDP. The stability of the variance of trend-cycle GDP ensures that this normalization can be applied across the entire CIEA time-series.

The IMF has designed a toolbox for the construction of CIEAs along the above lines. The toolbox is based on Microsoft Excel and its programming language VBA and on the X12-ARIMA programme

developed by the US Bureau of the Census. What follows is a summary of the five panels in the toolbox. The reader is referred to the IMF Statistics Department to acquire the toolbox

Panel 1 allows the user to:

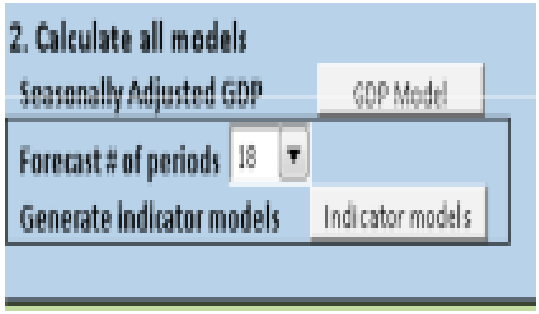
- Select the start period.
- Select the reference period.
- Select whether to run nominal or real GDP.
- To run an 'out of sample' test which removes quarters of data.



Panel 2 shows two buttons:

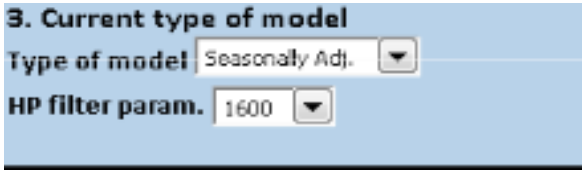
- The button 'GDP Model' calls the US Census Bureau's X12ARIMA program to create an ARIMA model of the series which is used to produce a seasonally adjusted, and trend-cycle version of the GDP series.

- The button 'Indicators models' also calls X12-ARIMA and creates the following series, as well as an n-period ahead forecast: original, seasonally adjusted and trend/cycle.

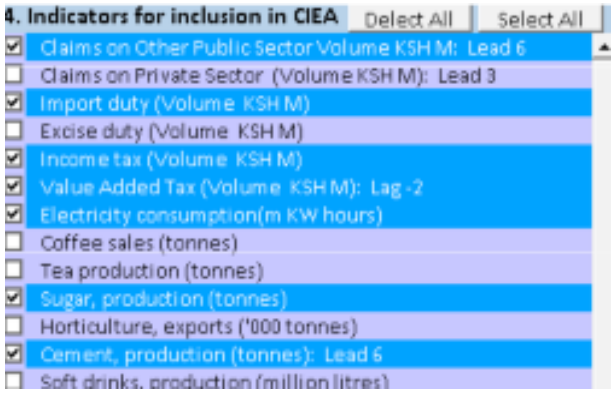


Panel 3 allows the user to select CIEA models for the:

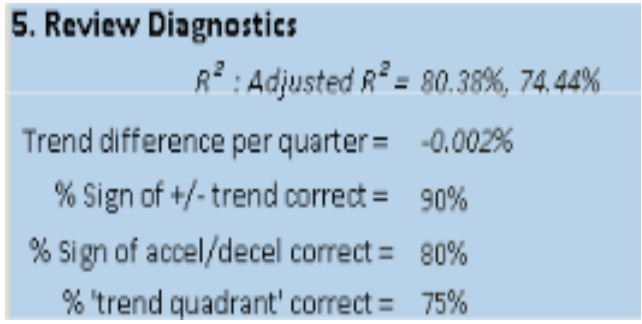
- Original series
- Seasonally adjusted series
- Trend/cycle series
- Hodrick-Prescott trend filter



Panel 4 allows the user to select different combinations of indicators to include in the combinations of indicators to include in the CIEA. Once a set of indictors has been chosen, the results are displayed immediately for this CIEA combination.



Panel 5 provides some basic diagnostics relating to the selected CIEA.



4. Forecasting GDP for Year-In-Progress

4.1 Overview

Forecasting can be done in many different ways. Many policy institutions, central banks and departments of finance use sophisticated mathematical models for forecasting relevant economic variables. Forecasting can also be done within the statistical accounting framework either for a single account or for the whole set of macroeconomic accounts. In this chapter, we describe the latter approach in the context of the GDP for the year-in-progress.

The first section discusses the steps involved in the forecasting exercise including a sub-section on forecasting techniques. The second section outlines practical advice for the implementation of a forecasting scenario for the GDP. There are also two appendices: the first shows how the government account should be forecasted, and the second how forecasting of the goods and services account in the balance of payments should be done. This is relevant, because some items in the government account and the balance of payments are part of the GDP equation. There is also a third appendix on forecast performance.

4.2 Forecasting exercise: a step-by-step approach

4.2.1 Principles underpinning the forecasts

The main principles underpinning the year-in-progress forecasts discussed in this chapter are as follows:

- All available prior information is included, for example information on the known future path of government debt repayments has been entered.
- All behavioural relations are taken into account.
- The accounting identity that supply of goods and services equals use of the same is respected. The rule that all accounts add up to zero is respected. This means that one item must be forecasted residually.
- Common sense is allowed to play a significant role.

The forecasting techniques described here follow the principles of a baseline scenario. The baseline is the most likely outcome given what is known about the economy and current policies.

Box 4.1: The baseline scenario

A **baseline scenario** is constructed under the assumptions that macroeconomic trends will continue, and economic policies will not change from those implemented in the recent past.

The baseline is essentially a continuation of the status quo. It is used to understand the direction of the economy: to establish whether there are problems in the real sector or if the situation is fairly satisfactory.

4.2.2 Principal steps in the construction of year-in-progress forecasts

The following main steps are recommended:

- Forecast GDP growth at current and constant prices from the production side by projecting values for the individual activities. Most individual activities should be projected at constant prices. However, the government activities – public administration, health and education – should also be forecasted at current price valuation. Optimally, the domestic trade activity – retail and wholesale trade – should be forecasted at current prices only.
- Forecast the deflator, either at individual activity level or for the whole GDP.
- Combine projected deflator with the projected activity values to get forecasts for GDP at current and constant prices from the production side.
- Determine the residual. Normally, imports or final consumption by households is the residual. This is discussed in more detail in the next sub-section.
- Project remaining variables. This is discussed in more detail below.
- Check the evolution of the residual to ensure it makes economic sense and is in line with expectations.

4.2.3 Determining residuals

As mentioned above, one of the items in each account must not be forecasted individually, but must be a residual.

Box 4.2: The residual forecast

A ***residual forecast*** is a forecast that is derived as the sum of all the other main items in the account so that the account adds up to zero. If there is no residual, the account is over-determined.

A residual should have the following characteristics:

- It must be big and analytically relevant.
- No prior information should be available.
- The choice of residual should reflect the actual economic flows.
- It is beneficial – but not absolutely necessary – if it is possible to form prior expectations of the expected path of the residual. In practice, this normally means that the item tends to evolve in a smooth way and/ or normally follows the evolution of another item.

Below, we discuss these characteristics.

Big and analytically relevant: The setting of residuals is an important part of the forecasting exercise. A residual should yield a result in the forecasting exercise. Thus, a residual should be a variable of significant magnitude and of considerable analytical importance.

It is important that the residual is a number of considerable magnitude, because then the relative impact of the accumulated forecasting errors of the other variables in the same account will be small. If not, the relative effect of the accumulated forecasted errors in the other variables of the account will be large.

A numerical example illustrating this point might be useful. In the example below, the GDP identity in a closed economy is used:

$$GDP = FC + GFCF + \Delta Inv \tag{4.1}$$

Where FC is final consumption, GFCF is gross capital formation and ΔInv is changes in inventories. The following table shows the year-in-progress forecasts for Year II, as well as the actuals for Years I and II. The residual is changes in inventories, which is a small item relative to the other variables.

Table 4.1: Relative impact of forecast errors on a small residual

	Year I, Actuals	Year II, Forecasts	Year II, Actuals	Forecast Error
GDP	100	111	112	–0.9%
FC	65	72	71	1.4%
GFCF	25	28	27	3.7%
ΔInv	10	11	14	–21.4%

For Year II, the total GDP value from the production side is forecasted as 111, final consumption as 72 and GFCF as 28. Given that changes in inventories is selected as residual, the value is 11 – otherwise GDP from the production side would not equal GDP from the expenditure side.

When the actual values for Year II become known, the veracity of the forecasts can be evaluated. It turns out that the forecasts are fairly good: the forecast error in total GDP is less than 1 per cent; the final consumption error is just above 1 per cent; and the forecast error in gross fixed capital formation is also quite small. In absolute terms the resulting forecast error in changes in inventories is a mere 3, but in relative terms it is huge: in excess of 21 per cent. The reason is obviously that the relative magnitude of changes in inventories – relative to the other three variables in the account – is very small. This often leads to a large relative forecast error, as all the accumulated errors in the other items are reflected in the residual.

In the next example the residual – final consumption – is large relative to the other variables. The example is shown in table 4.2.

Table 4.2: Relative impact of forecast errors on a large residual

	Year I, Actuals	Year II, Forecasts	Year II, Actuals	Forecast Error
GDP	100	113	112	0.9%
FC	65	74	71	4.2%
GFCF	25	26	27	-3.7%
ΔInv	10	13	14	-7.1%

The total GDP value from the production side is forecasted as 113, GFCF as 26 and changes in inventories as 13. Given that final consumption is selected as residual, the value is then 74.

When the actuals become known, veracity of the forecasts can be evaluated. Also in this case, the forecast error in total GDP is less than 1 per cent, and the forecast error in gross fixed capital formation is also quite small. In relative terms, the error in forecasted changes in inventories is somewhat larger, 7.1 per cent. But this does not lead to a large accumulate forecast error in the residual, i.e. in final consumption. Again, in absolute terms, the error is 3, but this translates to a mere 4.2 per cent forecast error in relative terms. In conclusion, it is very helpful to choose a residual that is large relative to the other items in the account.

No prior information: Items, which are forecasted using the prior information method, should not be chosen as residuals, because in that case the prior information should be used in the forecast. Reflection of actual economic flows: A residual must also be economically meaningful and reflect the actual flows in the economy. This means that the residual should not be exogenously determined, but should be chosen as the variable that adjusts so that supply and use of goods and services balances. An example with an item that is not a suitable residual illustrates this point well. Exports is such an item, because exports do not fill the gap between supply and use of goods and services. Instead exports are exogenously determined by two factors: a) the ability of certain exporters to supply certain products; and b) foreign demand. Thus, exports would not be an appropriate residual. Imports would be a better residual, as it does fill the gap between domestic production and aggregate domestic demand.

Prior expectations: If it is possible to formulate a priori expectations of the projected path of a residual item, the residual becomes more meaningful. Thus, a residual item is preferably not a variable that normally exhibits erratic behaviour, because then, it is very difficult to check the projected value with the expected value. For example, the evolution of gross fixed capital formation in the national accounts is often not smooth, but can fluctuate quite substantially from one time period to the next. It is not optimal to select such a variable as a residual, because it will be difficult to check the forecasted path with the expected path. However, it is possible to check the forecasted paths of household final consumption and of imports with their expected paths, because both tend to evolve in line with GDP.

In conclusion, the best residuals are either imports or final consumption of households. Both are big and analytically important. There is no prior information on either item, and it is possible to form prior expectations on both. An additional argument in favour of imports is that it reflects the actual flows in the economy when it is selected as a residual.

4.2.4 Types of projections of individual items

All items that are not linked to items in other accounts and are not derived as residuals must be forecasted separately for each item. There are three types of projections of individual items. These types are:

- Prior information;
- Proxies; and
- Mechanical forecasting.

Box 4.3: Prior information

The future path of certain variables is known with a fairly strong degree of certainty; we refer to this as prior information. This is the case, for example, with government debt repayments and electricity output. When prior information is available, it should always be used. If the information is perfect or nearly perfect, the prior information value should be plugged in without any adjustment. If the prior information is merely indicative, the forecast should be based on the prior information, but with some adjustments.

Forecasting within a statistical accounting framework entails identifying and using as much prior information as possible. In most countries, there is prior information for the following items:

- International raw material prices, such as prices of coffee, tea, nuts, timber, oil and minerals (relevant for countries engaged in producing such commodities);
- Agricultural output at constant prices;
- Mining output at constant prices (relevant for resource-rich countries including oil and mineral producers);
- Output in some components of manufacturing, especially those components that are dominated by a few large enterprises;
- Accommodation and food service activities, especially if the activity is dominated by a few large enterprises;
- Electricity and water - output and prices; and
- Wage movements in the government sector.

Most available prior information is in the context of the national accounts and the statement of government operations. Expected changes in raw material prices can normally be found in the World Economic Outlook (WEO), which is published twice yearly by the International Monetary Fund. A search on the internet can yield supplementary information. Regarding production trends in agriculture, there is normally information available at the department of agriculture. The main mining companies and/or the department of mines know the expected mining output in the near future, especially the year-in-progress; of course, this is relevant for resource-rich countries only. All these agencies – departments of agriculture and mines as well as mining companies – should also have a good idea about expected price changes in the relevant commodities.

The electricity and water utilities should be contacted for information on expected developments in output and prices in those activities. Chambers of commerce, tourism federations, hotel association as well as ministries of industries and trade normally are well positioned to report on the status of manufacturing, hotels and restaurants and other industries.

For the year-in-progress, there is also prior information on all items for which there is high-frequency data. For example, estimates of three quarters of the GDP can be used to extrapolate

values for the fourth quarter. Naturally, the more the year has progressed, the more reliable is such data. As soon as data on the first six months are available, it can be used as a supplementary or main source of forecasting values for the year-in-progress.

Adjustments to prior information. In some cases, information collected from various agencies can be used as such, without any adjustment. However, prior information is not always perfect; if that is the case, it is necessary to make adjustments before using it. For example, prior information on expected electricity output should, in some instances, be adjusted. In most countries, the main utility company provides information on whether it is likely to increase or decrease the volume of output in the near future, and also by how much. It also knows if the prices are expected to change or remain constant. The information thus provided is often good, but the quality varies. For example, the utility company may consistently be overly optimistic regarding its expected output. To verify the quality of the numbers, the following simple test is proposed.

Table 4.3: Bias in prior information on electricity output

	Year I			Year II			Year III			Average diff
	Rprtd	Actual	Diff	Rprtd	Actual	Diff	Rprtd	Actual	Diff	
Electricity output	100	90	-10%	100	85	-15%	100	92	-8%	-11%

Where rptd means expected value reported by utility company for the year-in-progress; actual refers to realised output; diff is the percentage difference between the reported and the realised values; and average diff is the average difference in the three years.

It is immediately clear that the utility company in this example tends to be overly optimistic in the values it reports on output in the year-in-progress. As shown in the last column, on average, the upward bias in the three years is 11 per cent. In year IV, one way to adjust the value for the year-in-progress as reported by the utility company would then be to reduce the reported value by 11 per cent. A more refined way would be to examine the yearly variations, which are fairly substantial, ranging from -8 to -15 per cent. It might be that there are special circumstances that prompted the electricity utility to be very optimistic in the second year. If that is the case, that difference should probably be omitted from the average value. Then, the upward bias would be -9 per cent. The best way to use this information might then to be adjust the reported forecasted value downward by 9 per cent.

Collecting prior information. There is a whole range of other institutions where information about future trends and developments are collected and stored. If a reliable and meaningful forecasting scenario is to be constructed, it is vitally important to collect as much information as possible and incorporate it within the forecasted scenarios in a systematic way. To this end, it is normally necessary to visit the relevant institutions and conduct interviews with knowledgeable staff. There are many ways to conduct such interviews, but some advice is provided here:

- Prior to meeting: identify a suitable volume indicator that represents the activity. Examples are expected harvest for the crop component of the agricultural activity and expected mining output of diamonds and other minerals for the mining activity.

- Prior to meeting: also identify suitable proxies if information on main volume indicator is not available. An example is expected changes in area planted if there is no information on expected harvest.
- During meeting: discuss the volume indicator and proxies with the agency representatives to obtain information on likely future path. Also, identify other volume indicators and proxies if appropriate.
- During meeting: obtain other relevant information pertaining to the activity that might be used in combination with volume indicators. For example, for the agricultural activity, changes to the irrigation system in your country, access to credit for farmers, and changes to distribution system for fertilizers.

Proxies

Box 4.4: Proxies

The historic path of some variables is correlated with that of other variables; i.e., there is a behavioural relationship between the variables. When no prior information is available, such correlations should always be used for forecasts. A proxy relationship is then established and the dependent variable should be forecasted as a proxy to the independent variable.

Some items tend to have a behavioural relationship with other items. For example, normally import taxes are dependent on imports. Similarly, household final consumption tends to be strongly correlated with disposable income of households (sometimes approximated with GDP). When the marginal propensity to consume is constant, the correlation between them is one; i.e. a 5 per cent increase in income leads to a 5 per cent increase in household final consumption. But even a slightly less strong correlation can be used to establish a proxy relationship. A very important component of the forecasting exercise is to identify all proxy relationships and make proxy forecasts.

This type of projection – through proxies – is normally the second best method. If prior information is available, it should be used instead.

The first step is to identify proxy relationships. For example, according to economic theory and plain common sense, the activity retail and wholesale trade should be strongly correlated with VAT collections. In most countries and in most time periods, investigation of actual data bears out a strong positive correlation between these variables. Nevertheless, even though some proxy relationships may seem obvious, it is important to verify all proxy relationships within the actual dataset. This is done by investigating the correlation between the two variables in the recent past, for example in the four or five years leading up to the latest year included in the database. If the correlation is as expected – strong and positive – the proxy should be implemented in the baseline forecast. If not, an alternative method – mechanical forecasting – must be selected.

The best way to investigate the similarity of the growth rate of two variables is through econometric techniques. However, discussion of such techniques is beyond the scope of this document.

A second-best option is to check the correlation between the two variables in the recent past, say four or five time periods. If the correlation is high and there is a good theoretical justification for a high correlation due to common sense and/ or economic theory, a proxy relationship can be established. The easiest way to check the correlation in Excel is to use the correlation function:

$$=CORREL(first\ timeseries,\ second\ timeseries) \tag{4.2}$$

If the correlation is high, say at least 80 or 85 per cent, a proxy relationship can be established; i.e. one variable can be forecasted using the growth rate of the other variable. Using the example above, the growth rate of final consumption by households can be forecasted by correlating it to the projected growth rate of disposable income by households.

The second step in proxy forecasting is to project the dependent variable as a function of the expected evolution of the proxy. If an Excel spreadsheet is used, the easiest way to do proxy forecasting is to apply the percentage growth rate of the independent variable in the proxy relationship. For example, if imports grow by 8.2 per cent, import taxes would grow at the same rate. A slightly more refined method would be to apply the same average percentage growth rate in the last three or four years.

Mechanical forecasting

Box 4.5: Mechanical forecasting

In the absence of prior information and proxy relationships, the future path of a certain variable should be forecasted as an extrapolation of recent trends. Such extrapolations are made by applying a *mechanical forecas*ting method to an individual item.

If no prior information is available and no proxy can be identified, projections must be done using a mechanical forecasting method. Mechanical forecasting is normally the least preferred forecasting method. It should not be used unless there is no prior information and no proxy has been identified.

When a mechanical forecasting technique is being used, the recent trend is extrapolated into the future. The extrapolated future path reflects the main assumption underpinning a baseline scenario; namely that recent trends are continued in the future. For example, the average growth rate of communication is likely to continue also in the year-in-progress.

To gain a deeper understanding of the trend, the best way to proceed is normally to insert a chart exhibiting the trend of a given item observed in the recent past. This should be done such that a suitable extrapolation method can be identified; a suitable extrapolation method being a method that yields a forecasted path that is a continuation of the recent trend. Depending on the past behaviour of a given variable, one of four extrapolation methods should normally be used. Over time, a given variable exhibits a path that can be described as follows:

- Exponential increase or decrease - the trend is increasing or decreasing at an increasing rate.
- Linear increase or decrease - the trend is increasing or decreasing at a constant or nearly constant rate
- No discernible trend - the trend is erratic.

Exponential increase or decrease: If the chart shows that the trend is exponential, there are several options. The forecaster can use either:

- one of two formulae for the average growth rate; or
- A function in Excel.

The two formulae are illustrated below. The forecasts are based on n past observations, which range from periods t to t-(n-1). The purpose is to derive a forecast for period t+1. The formula is either:

$$= AVERAGE\left(\frac{OBS_t}{OBS_{t-1}}, \frac{OBS_{t-1}}{OBS_{t-2}}, \frac{OBS_{t-2}}{OBS_{t-3}}, \ldots, \frac{OBS_{t-n}}{OBS_{t-(n-1)}}\right) \quad (4.3)$$

or :

$$= \left(\frac{OBS_{t-n}}{OBS_{t-(n-1)}}\right) \wedge \left(\frac{1}{t-(n-2)}\right) \quad (4.4)$$

The first formula normally yields a more pronounced growth path and the second a more moderate growth path. Usually, by examining the chart, it is clear which one yields a better continuation of the recent trend.

Alternatively, the forecaster can use a function in Excel, namely:

$$=GROWTH(\text{series of past OBS, series of past reference periods,new reference period}) \quad (4.5)$$

Linear increase or decrease: If the chart shows that the trend formed by past observations was linear or that past observations hovered around a linear upward or downward path, the trend function in Excel normally yields the best result. The trend function is constructed as:

$$=TREND(\text{series of past OBS, series of past reference periods, new reference period}) \quad (4.6)$$

The trend function projects values that follow the same linear path that was observed in the recent past.

No discernible trend: If the chart shows that past observations do not form a discernible trend, the best way to proceed is normally to apply the average function in Excel. This is the case when past observations increased in some years and decreased in others. In Excel, the average function is constructed as:

$$= AVERAGE(past\ OBS) \tag{4.7}$$

The average function projects values that are the average of values that were observed in the recent past.

4.2.5 Level of disaggregation for projected data

The appropriate level of disaggregation must be determined. This is not always straightforward. The GDP by activity is a case in point. At the highest level of aggregation, the GDP is broken down into the highest tabulation categories of ISIC[1], but each tabulation category can also be disaggregated into a number of sub-items at different levels. For example, the agricultural activity can be forecasted as a single item or it can be broken down into at least three main components: crops, fruit/ vegetables and livestock. Given that the future evolution of crops may not depend on the same factors as livestock or as fruits/ vegetables, it is often better to forecast these sub-components of agriculture separately.

In a country where agriculture accounts for a large share of the GDP, it might also be pertinent to disaggregate some of these components further; for example, crops could be divided into maize and other crops. However, if agriculture accounts for a very small share of the GDP, it may not be beneficial to divide it into its components. The general rule is twofold:

- When a certain item or sub-item is very small, there is no need to disaggregate it. For example, if fruits/vegetables are very small in comparison to crops, there is no need to forecast it separately.
- When the future path of a certain item or sub-item is likely to be similar to other items, there is no need to forecast it separately.

The "correct" level of aggregation is mainly a matter of judgement and depends on these two factors as well as familiarity and reliability of the data. The more familiar the compiler is with the data and the higher the degree of reliability, the more detail can be used in the forecasting exercise. Otherwise, it may be more meaningful to focus on a few selected items at a fairly high level of aggregation.

4.3 Forecasting the GDP

4.3.1 Forecasting the production side of the GDP

Activity forecasting

The starting point is the GDP by activity. Value added of the various economic activities should be forecasted separately. Most activities should be forecasted at constant prices; the only exceptions being:

- The government sector activities, which preferably should be forecasted both at constant and current prices; and

[1] The International Standard Industrial Classification of All Economic Activities disaggregates the GDP into economic activities: agriculture, fishing, mining, manufacturing, etc.

- The domestic trade activity, normally referred to as wholesale and retail trade, which sometimes is forecasted at current prices.

The relevant valuation is basic prices; i.e. taxes less subsides on products - mainly VAT, excises and import taxes - should not be included. The latter should be forecasted separately, in the context of the government account. Forecasts within the context of the government account should also be used to obtain the value added of the government sector activities.

If these forecasts are not available in the context of the government account or if they are deemed unreliable, they must instead be forecasted by those who forecast the GDP. How this is done is discussed in the first appendix to this chapter.
Forecasts for each activity must take into account all available prior information with respect to:

- Policies that are currently in place;
- Expected changes in policies;
- Expected activity-specific developments; and
- Expected economic developments in general.

Relevant prior information is collected by visiting ministries, companies and other agencies to conduct interviews. For example, in most countries officials at the Department of Agriculture for the agricultural activity and staff at the electricity utility for the electricity activity are in a position to provide relevant prior information; see the discussion above about prior information for more detail.

As discussed in the same section, in most countries prior information is available for expected output of the following activities:

- Agriculture crops - for example, expected harvest, yield per acre and/ or acreage under cultivation, rainfall;
- Agriculture livestock - for example, expected stock of livestock, rainfall;
- Mining - for example, expected extraction, labour conditions in mining sector, external demand;
- Some components of manufacturing, especially those components that are dominated by a few large enterprises;
- Electricity and water, especially when there is one or very few electricity and water providers;
- Accommodation and food service activities, especially if the activity is dominated by a few large enterprises; and
- Changes in employment in government sector - used for growth rate of public administration and the government components of education and health at constant prices.

Normally, there is no prior information on the other activities. In that case, either a proxy or a mechanical forecasting method must be used. In most cases, the following activities can be forecasted with a proxy method:

Table 4.5: Proxy Forecasting for Relevant GDP Activities

Relevant activities	Suggested proxy by activity	Theoretical justification
Construction	• Approved building permits as proxies for values at constant prices; and • Government construction as proxies for values at current prices	Private residential construction and government construction are the main drivers of construction
Wholesale and retail trade (at current prices)	VAT collections	VAT collections tend to be proportional to sales
Transportation and storage	• Activities involved in producing goods (but excluding agriculture if farmers mainly engaged in subsistence farming) as proxies for constant or current prices and/ or • Imports of goods as proxies for current prices	Imported and locally produced goods are transported and stored.
Real estate activities	Population growth as proxies for constant prices	Normally, the most important component of real estate activities is imputed rental. The latter is mainly determined by population growth.
FISIM (if estimated as a separate item)	Financial services as proxies for constant or current price	FISIM is part of financial services

Proxy forecasting of the aforementioned activities normally yields good results, but, as discussed above in the sub-section called proxies, a mechanical forecasting method must nevertheless be chosen unless a strong empirical correlation has been established.

Remaining activities must be forecasted with a mechanical forecasting method along the lines discussed above in the section called mechanical forecasting. This is normally the case for, inter alia, community and personal services.

Deflator forecasting

The next step for the national accounts is to make assumptions pertaining to the deflators. The simplest way to do this is to assume a projection for the whole deflator, for example in line with forecasted CPI inflation.

A slightly more sophisticated way is to do independent deflator forecasts by activity. Except for the activities for which prior price information is available, this is usually done using mechanical forecasting techniques. As discussed above, there is normally prior information on expected future movements in:

- Prices of selected agricultural commodities;
- Prices of raw material;
- Prices of electricity and water; and
- Government sector wages.

Prior information of these prices should be used to construct deflators for agriculture, mining, electricity, water and government sector activities - public administration, health and education. The deflators are used to convert forecasted GDP components at constant price into forecasted GDP components at current prices and vice versa.

Use of forecasts from government account

As mentioned above, certain items should be forecasted in the context of the government account, and linked to the national accounts. This is the case for:

- Value added of all the government activities at current prices: Compensation of employees in the government account is the main source for the computation of this item. It is also important to adjust upwards for consumption of fixed capital of government, given that the latter is normally not included in the government account, which is compiled on cash basis.
- Taxes less subsides on products: The relevant tax and subsidy items in the government account are normally the sole source.

4.3.2 Forecasting the expenditure components

On the expenditure side, the following items must be forecasted, namely:

- Government account items:
  - Final consumption of government
  - Gross fixed capital formation of government
- Balance of payments items:
  - Exports of goods and services
  - Imports of goods and services

- Items appearing in the national accounts only:
    - Final consumption of households
    - Gross fixed capital formation of other (non-government) sectors
    - Changes in inventories

Projections should be made at current prices. The starting point is to select one of these items as residual; normally the choice is either final consumption of households, imports of goods or imports of goods and services. It is at the discretion of each country to choose the most suitable residual, given its own particular circumstances.

Forecasts of the government items should use the projected values in the government budget; this is a prior information type of forecast. In line with the definition in the SNA, the forecast for government final consumption should be derived from the government budget as:

+ Compensation of employees
+ Use of goods and service
– Sales of goods and services
+ An adjustment variable for consumption of fixed capital[2]

Regarding the forecast for government gross capital formation, the best way to proceed is to use the same value as in the government budget.

Naturally, the same caveats as discussed under the sub-section prior information apply. If data consistency for historical series is inadequate, it is necessary to make corrections for the biases in the data as shown in the prior information sub-section.

Regarding exports and imports, if available, balance of payments forecasts should be used if historical data are consistent across the two accounts. If historical data are inconsistent or if forecasts are not available, projections should be made in the context of the national accounts. The second appendix to this chapter discusses how this should be done.

For two of the remaining items, proxies should be identified as shown in the table below.

[2]As mentioned above, consumption of fixed capital does not appear in most statement of government operations. Therefore, the number obtained from these links must be adjusted upwards to take into account an estimated value for forecasted consumption of fixed capital.

Table 4.6: Proxy forecasting for relevant expenditure items

Expenditure item	Suggested proxy by item	Theoretical justification
Final consumption of households	• Disposable income of households • or (if disposable income not available) either: • Disposable income or • GDP	In many developed countries, the marginal propensity to consume is constant or near constant; i.e. the correlation between disposable income and household final consumption is very high
Gross fixed capital formation of non-government sectors	• Construction activity (indicated by building permits) and • Imports of capital goods	Gross fixed capital formation is strongly correlated with the construction activity (mainly for housing) and imports of capital goods (for machinery and equipment)

Changes in inventories, on the other hand, can normally not be correlated with any other variable, and must therefore be forecasted mechanically. Frequently, it exhibits an erratic path, and is therefore often forecasted using the average function in Excel.

Appendix 1: Forecasting relevant items in the government account

The first step is to identify the relevant variables in the government account. To forecast taxes less subsidies on products, the following items are relevant:

- VAT;
- Excise and import taxes;
- Any other tax on products; and
- Any subsidy on products.

To forecast value added of the government sector activities - public administration, health and education - and the final consumption of government, the following items are relevant:

- Compensation of employees;
- Use of goods and services; and
- Sales of goods and services that have been produced of government.

The second step is to use the projections made in the government budget, and assess whether they are realistic. Normally, the expenditure projections – compensation of employees and use of goods and services – tend to be more realistic than the revenue projections, simply because the government knows better and has more control over expenditure than revenue. Especially, the projections for compensation of employees could be quite reliable. This is because the government is able to exercise strong control over compensation of employees. However, due to errors or other factors, budget numbers on the expenditure side are not always reliable. As discussed above in the sub-section prior information, if budget data are not reliable, adjustments must be made. For example, if previous budget figures did not materialise and the downward bias normally hovered around ten per cent, it would be pertinent to make the same adjustment to budget numbers for the forecasted period.

The second step is to make independent forecasts for taxes from those in the budget. Government officials do not have perfect information on the items on the revenue side nor are they able to exercise perfect control over the said items. Like everyone else, they must rely on forecasts, assumptions and judgement when they make estimates for budgeted revenue. Projections on the revenue side in the government account are often primarily related to various components of the national accounts projections. Tax revenue is a good example. Tax revenue depends on:

- The tariff;
- The efficiency of the tax collection effort; and
- The taxable base.

Tariffs do not change very often, and any future change should be known. It is therefore realistic to assume they will remain constant unless the government has provided information on tariff changes during the forecasted period. Regarding efficiency of tax collection, unless there are some clearly specified projects in this regard, it is difficult to forecast changes in a meaningful way. That leaves the taxable base. For each tax component, the taxable base should be identified so that each given tax component can be forecasted as a proxy of the taxable base. For example, the forecast for import taxes should be moved with projected imports, VAT with forecasted final consumption of households, etc.

Appendix 2: Forecasting relevant items in the balance of payments

Exports of goods should be broken down by main product category. Agricultural exports should be separated from exported mining products, exported manufactured products and other exported product groups. It might also be relevant to break down the various mining products and do separate forecasts for each. For some products, prior information might be available, mainly for agricultural and mining commodities. If no prior information is available, the best way to proceed is to identify a proxy. For example, exports of agricultural goods could be moved with the agricultural activity or a relevant sub-component thereof, using the assumption that the export component of a given activity is constant in the forecasted period.

Given that the domestic price of the relevant products may differ from export prices, exports should also be broken down by volume and price. The forecast for each exported product should therefore be done using constant price data. For the price component, forecasts of world commodity prices should be used. The World Economic Outlook or any other serious publication with forecasted commodity prices should be used.

Projections of service receipts and payments should be linked to the performance of relevant activities like trade, as well as other foreseeable policies and developments. For instance, imports of freight transport services should be correlated with imports of goods through a proxy relationship whereby a given percentage increase in imports of goods should lead to the same percentage increase in imports of freight transport services. The correlation must hold, because a very important segment of imported freight transport services represents the cost of transporting imported goods to the border of the country. Given that imported goods also carry an insurance charge, imported insurance services could also be correlated with imports of goods through a proxy relationship.

Regarding travel, an increase in hotel facilities should be taken into account in the forecast of this item on the credit side. The forecast should also include specific assumptions about the future hotel occupancy rate. In addition, if there are effective campaigns about the country as a tourist destination and they are likely to increase the future volume of tourists, they should be considered in the forecast of travel on the credit side.

If the propensity to export out of total value added is constant, exports of construction services, financial services and insurance services could be correlated with the corresponding activities through a proxy relationship. However, before this is done, a correlation between the activity and the export must first be established for the recent past.

Remaining service items can either be forecasted through proxy or mechanical methods.
Imports of goods and services could be moved with the GDP or derived residually.

Appendix 3: Forecast performance

Once the GDP has been forecasted, it is important to assess how well it performs. This involves the following steps:

- Measuring the performance of a baseline by comparing the projection to the actual values. This can be done, for example, by looking at a plot of the two series. An effort should be made to explain differences, especially 'big' differences in a specific period. This is essential since in this way the projections can be improved.
- Computing a standard statistic that is used for measuring the forecast performance such as the Root Mean Square Error (RMSE). The RMSE is the root of the sum of the squared differences between projected and actual values divided by the number of observations. This statistic is important to compare the performance of different projections to identify the projection that performed best in forecasting a given series.

In the beginning, the visual analysis of the difference between projected and actual values is probably the most important performance measurement. In the long run, it is also useful to introduce the notion of the RMSE.

Once the forecast scenarios have been established and the performance measured, meaningful and useful forecasts can be made about the likely future development of the economy.

5. The Non-Observed Economy

5.1 Overview

All economic production should be included in the GDP estimate. Economic production comprises a wide array of activities, ranging from agriculture and manufacturing to transportation and public administration. A substantial part of the economic production is sold or otherwise transferred to other economic units, but some is used by the same unit that has produced it. Most economic production is legal, but can also be undertaken in contravention of the law. When economic statistics are compiled correctly, all economic production should be included in the GDP, irrespective of type and legality of activity. Coverage of economic activities is then exhaustive.

It is well known that data collection of some economic production is problematic. In particular, it is difficult to obtain reliable information on illegal, underground, and informal activities as well as activities undertaken by the household sector for their own final use. Examples of illegal activities are smuggling and sale of illegal drugs. Activities undertaken by units trying to avoid taxation are referred as underground. Small-scale household production for sale on local markets is an example of an informal activity, and subsistence farming for own consumption is an activity undertaken by the household sector for their own final use.

The aforementioned activities tend not to be covered by any specific data source or be covered inadequately. Together, they comprise the non-observed economy (NOE). The NOE also includes economic production that is missing from the statistical framework due to deficiencies in the data collection system.

The purpose of this chapter is to outline the main features of the NOE and discuss how it can be measured. This first section discusses the types of transactions involved in the NOE, and the second section, the types of activities. The third section explores how the NOE can be measured, often through indirect sources. The fourth section is a case study, describing how the NOE is measured in South Africa. There are also two appendices: the first discusses the production boundary and the second explores the difference between enterprises and establishments.

5.2 Introduction

The NOE consists of activities that are either excluded from the macroeconomic statistical framework even though they should have been included or included incorrectly.

Box 5.1: The non-observed economy

The ***non-observed economy*** comprises the following types of activities:

- Economic activities that are not covered by any data source.
- Economic activities that are reported incorrectly either because the respondents misreported inadvertently or deliberately or because of deficiencies in the data collection system.

There is a NOE in all countries, but its size varies considerably both in absolute and relative terms. As a percentage of the total economy, it tends to be larger in developing countries.

There are many reasons why it is important to include the NOE in the national accounts estimates, in particular the GDP and compensation of employees:

- First, the omission of data on the NOE is likely to result in erroneous growth rates. This is particularly problematic when the activities that make up the GDP grow at different rates from those that are not included. Many economists are of the opinion that the NOE tends to grow at different rates from the rest of the economy, as the informal sector is thought to provide a buffer when the official economy fails.
- Second, if the NOE is not included in the GDP, the latter will exhibit a bias. Given that the unobserved economy to a large extent refers to missing data, the bias tends to be downward. However, the unobserved economy also refers to incorrectly reported activities; thus, the NOE could hypothetically lead to over-estimation of the GDP.
- Third, even though the NOE share of GDP is probably fairly small, it may be significant for individual industries, especially those characterised by a large share of underground and informal activities, mainly those industries where small enterprises are prevalent. Thus, inadequate coverage of the NOE yields a skewed picture of the structure of the economy.
- Fourth, production in the NOE tends to be labour intensive. Thus, non-observed activities often play a role in employment creation, income generation and poverty alleviation. It is important to have accurate information on these vital social issues.
- Fifth, given that a significant portion of the labour force will be engaged in the NOE in many countries, compensation of employees tends to be underestimated when not included in the GDP estimate. Even when it is included in the GDP, it is important that the national accounts compilers make an explicit calculation for the compensation of employees and mixed income; otherwise the gross operating surplus, being the residual in the generation of income account, will exhibit an upward bias.
- Sixth, correct measurement of the consumption related to the NOE is important. While consumption of underground and informal sector products might be captured even when the corresponding supply side is not, consumption of products produced on own account is not. Its exclusion would lead to underestimation of per capita consumption and errors in welfare indices.
- Seventh, inclusion of the NOE provides information about an unexploited taxable base. In this context, underground activities tend to be the most important component of the NOE.

When information on the NOE is missing or incorrect, the foundation for sound economic policy is inadequate. Data on the size and characteristics of the NOE and its contribution to the GDP and compensation of employees are necessary, so that policy makers can take informed decisions with respect to employment creation, poverty alleviation and other issues.

When the NOE is not taken into account, coverage of economic activity is always incomplete and/or erroneous. The macroeconomic accounts are then said not to be exhaustive.

Box 5.2: Exhaustiveness

Exhaustiveness of the macroeconomic accounts is achieved when all activities within the production boundary[1] are covered adequately.

Exhaustiveness is achieved when all activities are included in the GDP. The preferred method is to include them through direct observation, for example through surveys and administrative records. However, given the nature of some components of the NOE - especially illegal and underground activities - direct observation is not always a viable option. In that case, the statistician must resort to indirect measuring methods. We discuss the latter in some detail below.

Detailed, internationally accepted recommendations pertaining to the NOE appear in Measuring the Non-Observed Economy: A Handbook[3].

We refer to this document as the Handbook. Most of the discussion in this chapter is based on it. In addition, we use paragraphs 6.39 through 6.48 as well as the twenty-fifth chapter of the 2008 version of the System of National Accounts (SNA), which also provides interesting observations on the NOE.

5.3 Types of transactions in the non-observed economy

The NOE refers mainly to output, intermediate consumption, value added, compensation of employees and mixed income. In addition, it affects the capital formation of the activities that are not covered in the data collection system. The use of goods and services produced by activities in the NOE is another important transaction in this context, mainly in the form of final consumption of households.

The so-called production boundary is applicable to the NOE. Household production on own-account of goods is within the production boundary and is, therefore, part of the NOE if it is not covered through direct statistical measurement. However, household production on own-account of services is normally outside the production boundary. Given that the SNA recommends that production of virtually all own-account services should not contribute to the GDP, such production is also not part of the NOE.

[3]Organisation of Economic Co-operation and Development, International Monetary Fund, International Labour Organisation, Paris, 2002.

The sole exception to the rule that services produced on own account is outside the production boundary is imputed rentals[4].[5] When households own their dwelling, a value is imputed for the rental cost. This value is part of output. It is own-account production, because the household produces the rental service to itself. The value of the imputed rental should be in line with the rental that would have been paid if the owner had rented the house instead of owning it.

5.4 Types of activities in the non-observed economy

A very substantial part of the NOE pertains to one of these four spheres:

- Illegal activities;
- Underground activities;
- Informal sector activities; and
- Production of goods and services for own final use.

Naturally, any other activity that is not covered or not covered well by any data source is also part of the NOE. For example, flaws in the data collection system give rise to a NOE. Large enterprises that deliberately or inadvertently misreport their activities are also part of the NOE.

5.4.1 Illegal activities

Definition

Box 5.3: Illegal activities

Illegal activities consist of all activities that have the following two characteristics:

- They are unlawful with respect to production, consumption or trading.
- They have been mutually agreed upon by the purchaser and the seller.

Theft, robbery, extortion and similar acts have not been mutually agreed upon, and are therefore not considered illegal activities in the context of the NOE.

Illegal activities also do not include activities that inherently are legal but concealed from public authorities to avoid taxation. (In the parlance of the NOE, such activities are considered underground.)

[4]See Appendix I for a brief discussion of imputed rentals.

[5]Services produced by paid domestic staff are included within the production boundary. We mention this activity explicitly, as it sometimes is deemed to be part of household production for own final use.

In the context of the NOE, illegal activities cover the production of, consumption of and trade in unlawful products. They also include production of some legal products under unlawful circumstances. The Handbook further specifies that illegal activities normally entail an infringement of a criminal code of conduct.

All illegal activities are considered to be part of the NOE. In some countries, the share of illegal activities in GDP is highly significant, but in most countries it is relatively small.

There is a large literature on the reasons why illegal activities occur. It is beyond the scope of this chapter to discuss this issue in detail. It suffices to state here that illegal activities tend to occur more frequently in countries where law enforcement is not effective.

Types of illegal activities

Illegal activities can be broken down into a number of sub-categories:

- Production of, consumption of and trade in illegal products, for example marijuana and amphetamines.
- Production and consumption of illegal services, for example prostitution.
- Illegal production of legal goods, such as:
    - Production processes that are illegal when performed by unauthorized producers, for example unlicensed gambling and unlicensed medical practice;
    - Counterfeit production, i.e., production of goods that are legal per se but infringe the rights of trade mark holders.
- Illegal trade in legal products, for example smuggling of cars, trade in stolen and counterfeit goods, as well as unlawful trade in weapons.

Data capture of illegal activity

Illegal activities are not reported either on the supply or the use side. Therefore, it is necessary to capture them through indirect methods, and infer values both for supply and use. Given that neither the supply nor the use of illegal activities is captured in the database, they do not give rise to an imbalance between supply and use. However, unless included through indirect methods, they result in a downward bias in the GDP and other numbers.

An example would illustrate these points further. Let us assume the following situation whereby illegal production of marijuana is 100. The same data source provides information that residents consume 95% and non-residents 5% of the total output of marijuana. If all these pieces of information are taken into account, the following transactions must then be recorded in the supply and use table:

Table 5.1: Supply and use table with correct recording of an illegal product

Product	Supply	Use	
	Output	Final Consumption	Exports
Marijuana	100	95	5

Given that the whole set of information on supply and use of marijuana comes from the same indirect source, the illegal activity will not give rise to any imbalances between supply and use. This statement is true irrespective of whether or not the illegal activity is included in the macroeconomic statistical framework. If it is included, both supply and use of marijuana will be recorded, with supply of marijuana balancing use of the same product. If it is not included, neither the supply nor the use will be recorded. However, if it is not included, the values on both sides will be zero, meaning that the GDP will be underestimated and there will be a general downward bias to the overall numbers.

5.4.2 Underground activities

Definition

Underground activities are legal per se, but nevertheless entail breaking laws or rules.

Box 5.4: Underground activities

Underground activities are inherently legal, but are deliberately concealed from the public authorities to avoid payment of taxes and social security contributions or compliance with regulations.

All underground activities are considered to be part of the NOE. Underground activities are more prevalent in countries where tax and regulatory authorities are not enforcing laws effectively. They also tend to be more common when there is a multitude of small enterprises.

Characteristics of units engaged in underground activities

Units engage in underground activities for a variety of reasons:

- To avoid paying social security contributions and taxes - affecting mainly value added and income taxes;
- To avoid complying with prescribed standards, such as environmental, safety and health standards as well as minimum wages and maximum work hours; and
- To avoid administrative burdens, for example completion of administrative forms and statistical reporting requirements.

The most important characteristics of units engaging in underground activities are listed below:

- They belong mainly to the household and the non-financial corporation sectors. Occasionally, they may also belong to the financial corporation sector and the non-profit institution serving household sector.

- They engage in in all types of activities except provision of government services. Underground activities in financial services is also limited, but may occur, for example FISIM may be underground.
- Their transactions are often on cash basis.
- They tend to be fairly small. This is because the reporting requirements for small-size enterprises are normally less compelling than for large enterprises, and it is easier for them to dodge such requirements. Some medium-sized and large enterprises may nevertheless engage in underground activities, especially when the buyer uses cash as means of payment.

The same unit may engage in both regular and underground activities. Small enterprises that conceal most of their revenue for the tax authorities may choose to declare some revenue. Conversely, large enterprises that normally report their revenue to the relevant authorities sometimes opt to hide some revenue, especially when the payment is on cash basis. Thus, underground activities are not necessarily confined to a given set of enterprises.

Data capture of underground activity

Given that underground activities are deliberately concealed from the public authorities, it is not possible to capture underground activities through direct statistical queries. In particular, units are unwilling to report underground activities on the supply side. Instead, it is necessary to measure such activities through indirect methods, and infer values for supply and sometimes also for use. On the use side, values can sometimes be derived from standard data sources, such as a household income and expenditure survey. This would be the case, for example, when a small household enterprise provides construction services that it fails to report, but the user of said construction services provides the required information. Unless corrected, this leads to an imbalance between supply and use in the database. Given that some underground activity is unreported both on the supply and use side, underground activities also tend to result in a downward bias to the GDP and other numbers.

An example would illustrate these points. A medium-sized construction company builds residential houses worth 100, and sells them to various households. It reports the revenue both to the tax authorities and the statistical office. The same construction company also maintains other buildings, which are owned by the occupier, part of the household sector. The company earns 10 for the maintenance. It is paid in cash for the maintenance. The company does not report the revenue from the maintenance either to the tax authorities or the statistical office. Meanwhile, a household income and expenditure survey accurately shows that households have spent 100 on new buildings and 10 on maintenance of buildings. If all these pieces of information are taken into account, the following transactions should be recorded in a supply and use table:

Table 5.2: Supply & use table with correct recording of an underground activity

Product	Supply	Use	
	Output	Intermediate consumption[2]	Gross fixed capital formation
Construction	110	10	100

When all information is entered correctly, supply equals use.
However, if the reported data are entered without any adjustments, the following entries are made:

Table 5.3: Supply & use table with incorrect recording of an underground activity

Product	Supply	Use	
	Output	Intermediate consumption	Gross fixed capital formation
Construction	100	10	100

According to the reported data, the output amounts to 100 only, whereas intermediate consumption (corresponding to the maintenance) equals 10 and gross fixed capital formation (corresponding to the new residential buildings) equals 100. If uncorrected, this leads, on the one hand, to an imbalance between supply and use, and, on the other, to a downward bias in output. Of course, it would have been perfectly possible that the maintenance was not covered either on the supply or on the use side. In that case, supply would have balanced use, but there would have been a downward bias to the GDP and other figures pertaining to the macroeconomic statistical framework.

5.4.3 Borderline between illegal and underground activities

The Handbook points out that the borderline between underground and illegal production is not always straightforward. For example, production of a legal substance, such as a certain manufactured food product, is normally unlawful if it is done in violation of regulatory or administrative standards. Therefore, the uninitiated in the definitions associated with the NOE might very well consider this action an 'illegal activity'. The reason why, in the context of the NOE, it is considered an underground activity rather than an illegal activity is that the underlying action - food manufacturing - is legal; it is the non-compliance with the standards that renders this action unlawful. Thus, one should take into account the nature of the underlying action when determining whether it is illegal or underground.

Similarly, tax evasion is illegal, so the uninitiated might think that production in violation with tax laws is illegal rather than underground. However, frequently, the underlying action, for example small-scale construction, is perfectly legal even though it may be hidden from public authorities to evade taxes. Thus, this type of activity is normally thought of as underground rather than illegal.
The Handbook specifies further that "two observations help to clarify the boundary. First, the lack of administrative authorisation alone is not sufficient to define an activity as illegal. Second, a distinction can be made between the various kinds of activities that break the law. (…) The rule of thumb is that underground activities (…) are those not complying with administrative rules, whereas illegal activities are associated with criminal behaviour. (…) Also, as noted in the SNA of 1993 (Paragraph 6.35) 'it is not necessary for the purposes of the System to try and fix the precise borderline between underground and illegal production as both are included within the production boundary'."

5.4.4 Informal activities

Definition

Box 5.5: Informal sector activities

Informal sector activities are defined as certain household activities having both of the following characteristics:

- The household activity results in the production of goods and services, which, at least to some extent, are sold or bartered.
- The household activity is not registered and/or its turnover or number of employees is below a certain threshold.

The informal sector consists of unincorporated enterprises, which, due to their small size or other reasons, are not registered with any authority, and therefore frequently not reported or reported inaccurately. Unlike units in the underground economy, informal sector units do not deliberately conceal their activities from various authorities. Many, but not all, informal sector activities are considered to be part of the NOE. The informal sector tends to be larger in countries where there is a multitude of small enterprises that do no maintain separate accounts for the owner and the productive activity.

Characteristics of informal sector units

Informal sector units come in many shapes and forms. In many cases, the owner is the sole worker in the enterprise. In other instances, the enterprise employs several people, frequently in the form of unpaid family members and other relatives. The size of informal sector units varies, but frequently they are very small. It follows that the informal sector tends to be larger in countries where there is a multitude of very small, unincorporated enterprises.

Informal sector units may engage in most kinds of production activities ranging from agriculture to taxi driving, street vending and shoe shining. Most informal sector activities require little or no capital and skills, but there are exceptions, as units engaged in car repair, construction and tailoring may also belong to the informal sector. The location also varies. Some informal sector units operate without a fixed location – for example streets and street pavements – whereas others are runt in the owners' homes or in separate workshops.

The most important characteristics of the informal sector are listed below:

- Units engaged in production of informal activities are always members of the household sector. However, even though many household sector activities are informal, there are also household sector activities that do not belong to the informal sector, for example household enterprises that are listed on a business register and whose activities are captured through a survey.
- The size of the units engaged in production of informal activities tends to be small and fall below a value threshold for reporting for statistical or taxation purposes. However, there are also informal sector activities that are fairly large.

- Some informal activities are non-monetary; i.e., involve barter. However, many informal activities are monetary, and there are also non-monetary activities that do not belong to the informal sector. For example, household production exclusively for own final use is non-monetary, but, by virtue of having no market element, is still not considered an informal activity.

Data capture of informal sector activity

Unlike underground activities, informal sector activities are not deliberately concealed from the public authorities, but, given that the enterprise is not registered, they are frequently not reported in full or reported incorrectly.

Some informal sector activities are captured quite accurately through standard statistical methods, for example labour force surveys, tourism surveys and household income and expenditure surveys. Let us consider the example of a household that rents rooms to visitors without maintaining separate accounts of the costs arising from regular household activities and the costs associated with the rental activity. The activity is not registered with the tax authorities, and, given its small size, also exempt from taxation. Thus, the activity is definitely part of the informal sector. The issue is then: is it also part of the NOE? The answer is not straightforward. If the revenue is captured accurately by a household income and expenditure survey and/ or with a tourism survey, it will not be part of the NOE.

However, given that many informal sector activities are not captured well, supplementary data collection efforts are often required to ensure a reasonably exhaustive coverage.

Informal sector activities are often missing or reported incorrectly on both the supply and use side, but not necessarily to the same extent. Unless corrected, this leads to an imbalance between supply and use in the database as well as to a downward bias to the GDP and other numbers.

An example would illustrate these points further. A small farming unit does not distinguish between costs associated with the household and costs arising from the farming activity. It produces 100 worth of maize and wheat. It sells 80 on the market and it barters 15 for cattle. The rest it stores for the next year. None of the activities of the small farming unit is reported to the tax authorities or the statistical office. Meanwhile, a household income and expenditure survey accurately conveys the information that households (other households than the producer) have spent 80 on maize and wheat. However, the household income and expenditure survey fails to capture the barter transaction and the inventory entry. If all these pieces of information are taken into account, the following transactions must then be recorded in the supply and use table:

Table 5.4: Supply & use table with correct recording of an informal sector activity

Product	Supply	Use	
	Output	Final consumption	Changes in inventories
Crops	100	95	5

However, if the reported data are entered without any adjustments, the following entries are made:

Table 5.5: Supply & use table with incorrect recording of an informal sector activity

Product	Supply	Use	
	Output	Final consumption	Changes in inventories
Crops		80	

According to the data sources, there is no entry on the supply side. The only entry is made on the use side in the form of final consumption associated with monetary transactions (corresponding to the monetary purchases of maize and wheat) equalling 80. If uncorrected, this leads, on the one hand, to an imbalance between supply and use, and, on the other, to a downward bias both in output, final consumption and changes in inventories.

5.4.5 Household production for own final use

Definition

Households production for own final use covers a range of activities where the producer and user of a good or a service is the same unit. It is part of the NOE if it is not covered through direct statistical measurement, for example a household budget survey.

Box 5.6: Household production for own final use

Household production for own final use is defined as those activities yielding output of goods or services, which are consumed or capitalised by the households that produced them.

Some, but not all, household production for own final use is part of the NOE. More precisely, household own-account production that is inside the production boundary is included in the NOE if it is not covered through direct statistical measurement. Thus, all production of goods is included, but most production of services is excluded. The only service that falls inside the production boundary is imputed rental. Given that household production of other services does not contribute to the GDP, it cannot be part of the NOE.

For practical reasons, the range of goods included in own-account production is normally confined to food, fire wood, as well as water collected from streams and wells. Other products, such as textiles, clothing and construction, are but rarely included. Practices vary considerably across countries. For example, the Kenyan GDP includes food, fire wood and water produced on own account, whereas in Lesotho food and fire wood are included, but water is not.

Characteristics of units engaged in production for own final use

The same unit may engage in both informal sector activities and production for own final use. Many but not all informal sector units engage in production for own final use. Conversely, there are units outside the informal sector that produce products that they consume on themselves.
There are many examples of informal sector units that engage in production for own final use, for instance small-scale farmers that sell some of their produce on the market and consume the rest on own account. Similarly, many households producing for own final use are part of the informal sector, for instance subsistence farmers who sell some of their produce on the market. Thus, units engaged in production for own final use are not necessarily confined to a given set of enterprises.

There are also many examples of units outside the informal sector that engage in production for own final use. An example would be a government employee who, upon coming home from work manages a small vegetable garden for own use.

Given that, according to the definition, informal sector units must have some market production, those households that produce exclusively for own final use are not part of the informal sector. This is because production of the latter is strictly of a non-market nature.

Similar to informal sector units, households engaging in production for own final use come in many shapes and forms. On the whole, the discussion above about the characteristics of informal sector units is applicable also to the units producing for own final use with two exceptions:

- All household production for own final use is always non-monetary.
- The range of activities is somewhat more limited. For example, household production for own final use does not occur in street vending.

Data capture of production for own final use

Regarding data capture, many of the comments pertaining to the informal sector activities are applicable also for household production for own final use. Similar to informal sector activities, household production for own final use is sometimes captured through standard statistical methods, mainly household income and expenditure surveys. If the latter is conducted appropriately and the population register is well maintained and updated, it is possible to get reasonably good information on these activities. Let us consider the example of a household that produces its own maize. The issue is then: is it also part of the NOE? The answer is not straightforward. If the output is captured accurately by a household income and expenditure survey, it will not be part of the NOE.

However, household production for own final use is not always captured well. Thus, supplementary data collection efforts are often required to ensure a reasonably exhaustive coverage.

Unlike informal sector activities, there is only one data source for household production for own final use. That same data source must be used to infer values both on the supply and use side. Thus, such production does not lead to imbalances between supply and use, irrespective of whether or not it is included. However, unless included, household production for own final use lead to a downward bias to the GDP and other numbers.

An example would illustrate these points further. A subsistence farmer produces 100 worth of maize, all of which it consumes in the same time period. If all these pieces of information are taken into account, the following transactions must then be recorded in the supply and use table:

Table 5.6: Supply & use table with correct recording of output for own final use

Product	Supply	Use
	Output	Final consumption
Maize	100	100

Given that the whole set of information on supply and use of maize comes from the same source, the activity will not give rise to any imbalances between supply and use. This statement is true irrespective of whether or not the household production is included in the macroeconomic statistical framework. If it is included, both supply and use of maize will be recorded, with supply of maize balancing use of the same product. If it is not included, neither the supply nor the use will be recorded. However, if it is not included, the values on both sides will be zero, meaning that the GDP will be underestimated and there will be a general downward bias to the overall numbers.

5.4.6 Other activities that are part of the non-observed economy

Other activities that form part of the NOE take place for two main reasons:

- Flaws in the data collection and data compilation systems; and
- Misreporting and non-response by statistical units.

Flaws in the data collection and data compilation systems: Systems for data collection and compilation are never perfect. It is impossible for any statistical agency to capture the whole range of productive activities even outside the four main problem areas discussed above. It is also impossible to do all computations, imputations and aggregations impeccably. Flaws range from problems with the sample frame to inadequate survey methods and also include inappropriate aggregation methods.

For the productive activities, the most important sample frame is the business register. A whole variety of problems are possible, mainly in the form of under-coverage and inadequate updating; both give rise to NOE. Given that the sample frame plays a crucial role when survey results are blown up to represent the entire population, it is self-evident that even small errors in the business register and other sample frames can lead to significant bias to the GDP estimate.

In addition, survey methods may be inadequate. The potential for errors is wide. For example, the sample may be too small or inappropriately selected. Finally, aggregation methods can be wrong or correct methods may be incorrectly applied to collected data. A case in point is when non-response is handled incorrectly by not imputing values for missing observations or doing so erroneously. Another fairly common aggregation error relates to weighting procedures.

Misreporting and non-response: Enterprises and other statistical units may misreport. Their misreporting is either deliberate or inadvertent. The main reasons they misreport deliberately is to reduce their tax or social security burden. Such misreporting normally results in a downward bias to output and upward bias to expenditure, especially intermediate consumption. It should also be remembered that enterprises sometimes maintain flawed bookkeeping systems, resulting in inadvertent reporting errors. The errors can take any form, and lead to upward or downward biases.

In every survey, there is always a certain degree of non-response. If correctly handled by the statistical agency - notably by imputing values for non-response - this is not a problem. However, if the degree of non-response exceeds a certain threshold, it does negatively affect the quality

and reliability of the statistical results even when the statistical agency handles the non-response correctly.

5.5 Inferring values for the non-observed economy

5.5.1 Introduction

Unfortunately, data collection for the NOE is notoriously difficult. Different types of direct data sources can be used and indirect methods are also admissible. The main types of direct data sources are surveys, tax registers and police records. There are several indirect methods; here we focus on two, namely a supply and use table and a flow of funds.

For illegal and underground activities, surveys can be used, but do not always yield accurate results, because respondents are not always willing or able to provide accurate information. Alternative sources are tax registers, tax audits, police records and, if available, information made available by non-profit organisations and activists groups. Data made available by the South African Sex Worker Advocacy and Task Force (SWEAT) is an example of an activist group that produces material that can be used to infer values on some illegal activities. Information from research projects and from other countries can be used as supplementary sources. Indirect methods can also be useful to estimate the magnitude of illegal and underground activities.

Regarding the informal sector and household production for own final use, the best way to proceed is to ensure that household-related surveys adequately cover as much as possible of the NOE, and, if necessary, add additional modules to existing surveys and/or design supplementary surveys. The two most important surveys in this respect are the Household Budget Survey[6] (HBS) and the Labour Force Survey (LFS). Indirect methods can also be useful.

The approach required to estimate values for the other activities that are part of the non-observed activity is very different. To minimise flaws in the data collection and data compilation systems; the sole remedy is to examine and re-examine the data collection cum compilation system; identify errors; and correct them. Regarding the misreporting and non-response by statistical units that give rise to a NOE, the best approach is to infer values indirectly by using a supply and use table or a flow of funds.

To summarise, inferring values for the NOE is done in four main ways:

- The identification and implementation of additional data sources, such as surveys and tax registers;
- Improved/ extended use of existing data sources;
- Use of indirect methods, mainly supply and use table and flow of funds; and
- Corrections to the data collection and compilation system.

[6]Household budget surveys are also referred to as income-expenditure, budget-consumption, living conditions, or living standards surveys.

5.5.2 Direct data sources

Collecting data on illegal and underground activity

The best data sources are tax registers, police records, material made available by non-profit organisations and activists groups as well as information from other countries.

Surveys

A possible data source for illegal and underground activity is opinion surveys, where the respondents are either enterprises or households. The best results are normally obtained when the surveys have the following features:

- They ask the respondent to provide general practices in an industry with which the latter is familiar.
- They do not ask any direct questions about the activities of the respondent.
- They are designed to take very little time to complete.
- They are addressed to respondents who are likely to be well informed, for example senior managers in the industry covered by the survey. A case in point would be senior retail managers if the industry covered is retailing.
- Respondents are asked to provide qualitative and range information rather than precise quantitative data. For example, they might be asked if underground activity in the industry they know has increased, stayed flat or decreased. They might also be asked to provide range information, for instance in the sense of indicating the percentage range of underground activity out of total activity in their industry. If the selected industry is construction, managers of construction companies could be asked to indicate whether they believe that underground construction accounts for a certain percentage range, for example 5%-15% or 15%-25%, of total construction.

Naturally, results from this type of surveys must be used very cautiously. Given the nature of information provided - qualitative data and ranges - the results cannot be inserted very easily within the quantitative framework of the national accounts. Rather the results can be used to corroborate or adjust information from other sources.

Surveys where the respondent is knowledgeable about underground activity can be useful. Such surveys should focus on the use side, as surveys on underground production are not reliable even if the statistical agency assures respondents that the results are confidential. In most countries, it is not unlawful to make a payment without asking for a receipt. Therefore, expenditure reported in household budget surveys normally includes underground expenditures. The crux of the matter is to distinguish underground expenditure from other expenditure. In some countries, respondents are asked to indicate whether certain expenditure may have an underground character. An alternative method is to ask respondents to select the type of outlet or seller from among a list that includes those types most likely to be operating underground, including street-traders, independent artisans (plumbers, gardeners, electricians, etc.) and farm shops.

Again, results must be used with care. Respondents may not know that the expenditure has an underground dimension. Even if they know, they may be unwilling to provide accurate information.

Tax audits

A readily available source of data on underground production is tax audits, as the tax authorities regularly conduct such audits on selected enterprises irrespective of any statistical requirements. However, they must be used with extreme caution. This is because the revenue service conducts tax audits for enterprises where they suspect tax evasion or other irregularities. They are not conducted for statistical purposes and thus are not done on a random basis, meaning that they cannot be used to generalise the results to the total population. However, similarly to opinion surveys they can be used to corroborate and adjust other information. They might also give some indication of the magnitude of and trends in underground activity.

Collecting data on informal sector activity and household production for own final use

The purpose of this sub-section is to outline the necessary steps to capture information on:

- Market-oriented activities by households that are not included in the business register; i.e. the informal sector; and
- Household production for own final use.

All enterprises with a visible fixed outlet are normally included in a business register. However, it is highly likely that very small outlets are excluded. Especially subsistence farmers, small enterprises in construction, transport and retail sales tend to be excluded. One would cover these activities by special data collection systems.

Collecting data consists of three steps:

- Identifying households conducting market-related transactions and production for own, final use;
- Conducting surveys on these households; and
- Implementation.

However, before exploring these three areas, we discuss briefly two standard surveys on the household sector, namely:

- The household budget survey;
- The labour force survey.

Household budget survey

The primary aim of an HBS is to obtain information pertaining to consumption of households. Questions normally relate to the time period the consumption actually occurs or to activity undertaken in the previous month. This is because many households are unable to remember activities further back than one month; sometimes even the previous month might be challenging. Unless specific questions are included on household production, an HBS will not provide any information neither on the informal sector or own-account production.

Labour force survey

The primary aim of an LFS is to determine employment levels and patterns in a given economy. Normally it does not provide precise, quantitative data on the values of production in the informal sector or household production for own final use. Still, it can be useful as data source in this regard, especially for the informal sector, because it allows the compilers of the national accounts to assess the number of the informal sector employees by broad industry tabulation category, both in absolute terms and as a portion of total employment. Naturally, an LFS can also be used to calculate employment trends and changes in the number of the employees over time. Thus, it can be used to establish trends, and to verify trends that have been calculated from other sources. The LFS can also yield information on some characteristics of the people employed in the informal sector as well as the conditions of employment.

More importantly, an LFS can serve to produce high-frequency indicators - for example quarterly indicators - used to calculate high-frequency benchmarks for the informal sector and household production for own final use. This is because LFSs are normally conducted more often than household budget surveys. Thus, the data obtained from the former concerning the evolution of labour inputs in the informal sector can be used to infer data from the latter concerning other characteristics, e.g. value added, of the household component of the NOE.

In many developing countries, it is quite common that people, who are employed in the formal sector, have a secondary job in the informal sector. Therefore, it is important that the questions for identification of the informal sector be asked not only in respect of the respondents' main jobs but also in respect of their secondary jobs. Similarly, many informal sector employees are part of a family enterprise and do not get paid for their work. For the LFS to be useful for the NOE, such people should also be included in the definition of employment in the LFS and the results should be shown separately from other results.

Regarding estimates for production for own final use, before using the LFS, the compiler must first verify that people engaged in such activities really are classified as employees when the LFS is carried out; otherwise they will not be covered. Stated differently, the national accountant must verify whether or not people engaged in subsistence farming and other production for own final use are considered to be employed in the LFS.[7] This is very important in many developing countries, where a significant amount of households are engaged in subsistence farming.

More precise information on production in the informal sector and for own final use is normally obtained by including a special module in an existing LFS.

Identifying households conducting market-related transactions

The best way to capture household production is probably through an extension to an existing household survey, probably an HBS or an LFS. The main drawback is that the sample size of household surveys is often too small.[8] This is not surprising given that all households engage in consumption and the great majority in labour, but only some are involved in productive activity.

[7]They should be, as the production boundary in the SNA and LFS is exactly the same.

[8]This is not unexpected in view of the fact that the sampling of HBSs or LFSs is normally not designed to capture productive activity.

Another problem is that some households are reluctant or unable to provide truthful answers on productive activity.

Therefore, the estimates may exhibit significant random errors and could only give a rough hint about those activities. They could not be used to make reliable estimates on changes from year to year.

If the decision nevertheless is taken to use a household survey, the best way is to use a two-stage approach:

- Screening many households with a few questions in the first stage; and
- Interviewing the business-oriented households in the second stage.

A given number of enumeration areas must be sampled by random and a given number of households must be chosen at random within each enumeration area. To establish a sample frame for productive households, the best way to proceed would be to instruct the enumerators to ask all the households residing in a given enumeration areas whether they have any small business activity - stage one. It is important that very few and straightforward questions be used at this stage - otherwise it would defeat the purpose, namely the identification of the relevant households.

This approach has many advantages. It would not be very demanding to identify the productive households in each enumeration area. It would also save cost, because all transport costs are already covered by the standard survey - be it an HBS or a labour force survey - if the screening and interviewing is done during any of the regular visits. The additional costs would mainly be:

- To compensate the enumerators for the extra time they must spend with the households to ask the additional questions to identify those with productive activities.
- To design a new questionnaire allowing the collection of information on household productive activities.

Conducting survey on market-related transactions of households

Once the screening has been done and the questionnaire designed, an extension to an existing survey should be designed - stage two. The extension would aim to obtain information on productive activities undertaken by households within the selected enumeration areas. Naturally, the selected enumeration areas would be the same as those selected for the HBS/LFS in that period, but the interviewed households would not be the same. For the extension, only those households that have any market-oriented, productive activity would be covered, while for the standard household survey normal random-selection techniques would be applied to select the relevant households. To minimise cost, the same interviewers would probably be able to conduct also those interviews during the regular visits to the enumeration areas, preferably as soon as the relevant households have been identified through the screening procedure outlined above.

The extensions would include the following modules:

- A module to capture data on revenue and operating costs in household related market-oriented productive activities, such as farming, fishing, manufacturing, construction, retailing, etc.
- A module to capture production of goods for own final consumption (including subsistence farming) by product category usually including the following:
  - Food including products such as crops, vegetables, fruit, meat, and milk;
  - Fuel wood; and
  - Collection of water from streams, wells, etc.
- A module to capture data on inputs for own-account construction of buildings, structures, irrigation and land improvements in terms of:
  - Contracted labour;
  - Own work; and
  - Purchased material.
- A module to capture data for the estimates of imputed rentals, e.g. size and type of dwelling and, most importantly, an estimated rental value. The aim would be to determine how much owners of dwellings would charge if they were renting their dwellings and balance that with much they would pay if they were renting it.[9] However, in areas where dwellings are rarely or never rented - common in remote, rural areas -, this approach is not meaningful. Many respondents in such situations have never considered renting their dwellings and may not be able to provide a meaningful estimate. A strategy should also be developed to impute values for the imputed rentals of such houses.

Implementation

In order to carry through the survey, the following tasks should be completed:

- Design the screening procedures. This task would include drawing up a short list of questions to be posed by the enumerators who visit all households within the selected enumeration area. It would also include instructing the enumerators in how the work should proceed.
- Design questionnaire to obtain data on productive activities of household.
- Draw up guidelines for enumerators conducting the survey.
- Process the data.

This concludes our discussion on ways of estimating the NOE through direct data sources. Next, we shall discuss indirect methods to measure certain components of the NOE.

[9]It is necessary to include both aspects, because people tend to overestimate how much they would charge and underestimate how much they would pay.

5.5.3 Indirect methods

Overview

Above, we have discussed ways to estimate parts of the NOE through direct data source material. In this sub-section, we'll discuss alternative ways to do so, namely indirect methods. Two tools are particularly useful:

- The supply and use table (SUT); and
- The flow of funds.

Both tools are useful in two ways:

- To identify and correct missing or misclassified information; and
- To identify and correct downward biases to reported data.

A SUT is a useful tool for estimating activities in the NOE when they lead to discrepancies between supply and use. Consider the case when there is underground activity in construction, as illustrated in Table 2 above. To evade taxation, the producers of certain construction activities are unwilling to report output, but the users, who face no similar disincentive in reporting, have informed the statistical office that they have undertaken a certain amount of construction. In this case, it would be appropriate to use the information on the use side and adjust output accordingly. However, when supply and use are equally distorted as a result of activity in the NOE, a SUT is not useful. This is illustrated, for example, in Table 1, where non-reporting of illegal activities leads to downward biases both in supply and use. We discuss such issues in more detail in the next sub-section.

A flow of funds may also be useful to estimate the NOE. This is because for each sector net lending should equal the net change in financial assets and liabilities (in absolute terms). If, however, the net change in financial assets and liabilities (in absolute terms) is different from net lending, it might be possible to infer values for the NOE. For example, if the net change in financial assets and liabilities (in absolute terms) exceeds that of net lending, it might be realistic to conclude that there is unreported production in that sector. The extent of the unreported production would be equal to the NOE. We explore this issue in more detail below.

Supply and use table

A SUT is an alternative tool that can be used to estimate certain components of the NOE. It is a very different type of tool from survey data, police records and other supplementary data sources discussed above in the sense that it does not provide direct data, but rather serves as an instrument to extrapolate data. It can serve as an instrument to make adjustments to data in the following five main situations:

- Respondents deliberately provide inaccurate information or refuse to provide information;
- Respondents inadvertently provide inaccurate information;

- Respondents are not found or the sampling frame is inaccurate;
- The statistical office makes mistakes in aggregating, collecting or treating obtained data; and
- Certain data cannot be obtained from respondents but must be estimated.

The first four of these five cases are directly relevant for the NOE. Units engaged in underground activity deliberately provide inaccurate information or refuse to provide information. Many of the respondents who inadvertently provide inaccurate information are part of the informal sector. The existence of an informal sector is also a reason why the sampling frame is inaccurate. The statistical office making mistakes in aggregating, collecting or treating data is another aspect of the NOE.
A SUT is useful in two main areas:

- To identify and correct data gaps; and
- To identify and provide appropriate raising factors to correct under-estimated data.

Given that the NOE leads to both data gaps and under-estimated data, a SUT can be useful as a tool to make economic statistics more exhaustive.

For example, it may be known that data on bakeries – both input and output – are very good. It may also be the case that millers mainly belong to the informal sector and that reliability of data on milled flour is quite poor. It may also be the case that import data are reliable. The SUT can then be used to infer data on domestically produced flour. The best way to proceed in this case is to use known input/output ratios for flour input in bakeries to bakery output. The results are then used to infer data on output of flour.

The SUT is particularly useful for non-observed activities that give rise to differences between supply and use. This is frequently the case for the following components of the NOE:

- Underground activities;
- Informal sector; and
- Flaws in the data collection and data compilation systems.

For some activities in the NOE, however, a SUT cannot be used to make extrapolation. For example, as pointed out above, it is highly unlikely that producers and users of illegal products - for example producers and consumers of narcotics and other illegal substances - will report such activities in a statistical survey. Given that values are missing both on the supply and use sides, a SUT cannot be used to infer values for illegal production. As explained above, it is not useful for the estimation of production for own final use either.

Flow of funds

Similar to the SUT, the flow of funds can be used as an indirect tool to estimate the size of some activities in the NOE, because it shows a meaningful range of transactions for each group of economic units. Normally, the economic units are organised to institutional sectors, but other groupings are also possible.

An example of a flow of funds with a highly aggregated set of transactions is shown in Table 5.7:

Table 5.7: Broad structure of a flow of funds

Sectors → / Transaction categories ↓	Total resident	Government	Banks	Households	Remaining domestic sectors	Total non-resident
Disposable income						
Final consumption						
Saving						
Acquisition of capital assets (net)						
Net lending/ borrowing						
Financial transactions (financing)						
By residents						
By non-residents						

The starting point is the disposable income. We have already seen that the disposable income less final consumption equals saving, and that saving less net acquisition of capital assets equal net lending. We also know that an increase in value added of a given sector or the whole economy always affect the disposable income in the same direction.

The main identity in the flow of funds is that the change in net lending should equal the change in financial assets and liabilities, but with the opposite sign. This identity should hold for each sector and for the whole economy[10]. When this identity does not hold, it is due to one of the following problems:

- Respondents deliberately provide inaccurate information or refuse to provide information;
- Respondents inadvertently provide inaccurate information;
- Respondents are not found or the sampling frame is inaccurate; and
- The statistical office makes mistakes in aggregating, collecting or treating obtained data.

[10]Net lending is the balance between total income earned and total spending. This balance must be used for net acquisition of financial assets and liabilities. Thus, net lending must equal net acquisition of financial assets and liabilities.

For the whole economy, spending cannot exceed income unless external funding is available. This is because what one resident unit or sector lends to another unit or sector is exactly equal to what the second unit or sector borrows from the first. For the whole domestic economy, the financial transactions always cancel out; i.e. the total value of financial transactions between residents is zero. Thus, from the whole country's perspective, in a closed economy net lending/borrowing is always equal to zero.

These are exactly the same problems that give rise to imbalances in the SUT. As we have just seen in the previous sub-section, they are strongly linked with certain aspects of the NOE, namely:

- Underground activities;
- Informal sector; and
- Flaws in the data collection and data compilation systems.

Thus, the flow of funds can be used to correct the same types of broad mistakes and errors that cause discrepancies between supply and use in a SUT. What is then the point to use both a SUT and a flow of funds to rectify essentially the same type of problems? The answer has to do with the fact that the two accounts focus on very different areas of the economy. A SUT is confined to transactions in goods and services[11]. It allows the compiler to break down the productive transactions over activities and products, and provides an instrument to balance individual activities and products. This is a great strength and allows the compiler to make sensible adjustments at a highly disaggregated level for transactions in goods and services. The adjustments at detailed level are then fed upwards through the system to give more sensible values for the main aggregates, such as the GDP.

However, a SUT does not contain any financial transactions and the range of income transactions is confined to compensation of employees and the operating surplus. Moreover, the disaggregation according to institutional sector is less obvious than in a flow of funds. This is where the strengths of a flow of funds are notable. The focus of the flow of funds is to break down the economy according to income and financial transactions by individual institutional sector or sub-sector. Thus, the best way to proceed is to make the adjustments sequentially. First, the unadjusted data should be run through a SUT. Second, the SUT-adjusted data should be balanced in a flow of funds to eliminate data discrepancies by institutional sector including the whole range of income and financial transactions.

We use the same examples as in Tables 5.2 and 5.3 above. For simplicity, we repeat the background here: A medium-sized construction company builds residential houses worth 100, and sells them to various households. It reports the revenue both to the tax authorities and the statistical office. The same construction company also maintains other buildings, which are owned by households. It earns 10 for the maintenance. It is paid in cash for the maintenance. The company does not report the revenue from the maintenance either to the tax authorities or the statistical office. Meanwhile, a household income and expenditure survey accurately shows that households have spent 100 on new buildings and 10 on maintenance of buildings. It is also known that all payments are done cash or through bank deposit.

If all these pieces of information are taken into account, the following transactions must then be recorded in a supply and use table:

[11] The main transaction categories included in a SUT are output, intermediate consumption, value added, final consumption, exports, imports gross capital formation compensation of employees and operating surplus. Contrary to a flow of funds, it does not include any income or any financial transactions.

Table 5.8: Flow of funds with correct recording of supply and use of an underground activity

Sectors → / Transaction categories ↓	Total resident	Government	Banks	Households	Remaining domestic sectors	Total non-resident
Disposable income	110	0	0	0	110	0
Final consumption	-10	0	0	-10	0	0
Saving	100	0	0	-10	110	0
Acquisition of capital assets (net)	-100	0	0	-100	0	0
Net lending/ borrowing	0	0	0	-110	110	0
Financial transactions (financing)	0	0	0	110	-110	0
By residents	0	0	0	110	-110	0
By non-residents	0	0	0	0	0	0

If all these pieces of information are taken into account, the disposable income of the remaining domestic sector, which consists inter alia of small construction companies, will amount to 110, being the sum of the output in construction of buildings and output of maintenance. The savings and net lending of the same sector will also amount to 110. Its cash holdings and bank deposits will increase by 110, leading to a recorded value of -110 in financial transactions. As for the households, their final consumption will be recorded as -10 and their acquisitions of capital assets as -100.

However, if the reported data are used without any adjustments, the entries shown in Table 5.9 are relevant:

Table 5.9: Flow of funds with incorrect recording of supply and use of an underground activity

Sectors → / Transaction categories ↓	Total resident	Government	Banks	House-holds	Remaining domestic sectors	Total non-resident
Disposable income	100	0	0	0	100	0
Final consumption	-10	0	0	-10	0	0
Saving	90	0	0	-10	100	0
Acquisition of capital assets (net)	-100	0	0	-100	0	0
Net lending/ borrowing	-10	0	0	-110	100	0
Financial transactions (financing)	0	0	0	110	-110	0
By residents	0	0	0	110	-110	0
By non-residents	0	0	0	0	0	0

Table 5.9 shows that there is a discrepancy in the column reflecting the transactions of the remaining domestic sectors. Net lending is 100 and financing is -110. When financing is negative, the assets of the sector have increased. A higher negative value in financing (in absolute terms) than the positive value recorded under net lending means that the sector has recorded a larger accumulation of net assets than the recorded value of income. In general, the following options are then possible:

- Disposable income is under-recorded;
- Acquisitions of capital assets are over-estimated; and
- Financing is over-recorded.

However, in this example, it is not possible for acquisition of capital assets to be over-estimated, because this item is zero. Thus, either disposable income is under-recorded and/ or financing is over-recorded. At this stage, the compiler must examine which item seems most likely to be incorrect - the disposable income or the financing or a combination of the two. Given that, in this example, the total value of financing for the whole economy equals zero (which, in the absence of transactions with non-residents, must be correct), it seems safe to conclude that the value of financing is correct, especially as the reliability of transactions in financial assets and liabilities tends to be fairly high. This conclusion is strengthened by the fact that underground activities tend to lead to a downward bias in recorded output and therefore also in disposable income. Thus, the best way to proceed to balance the flow of funds would be to make an upward adjustment to disposable income of the remaining domestic sectors as shown in Table 5.8.

Of course, it would have been perfectly possible that the maintenance was not covered either on the supply or on the use side. In that case, supply would have balanced use in the SUT, and, as discussed above, there would have been a downward bias to the GDP. It would not have been possible to spot this downward bias using a SUT. A flow of funds would have been more useful. This concludes our discussion about how indirect methods can be used to estimate certain components of the NOE.

5.6 Case study: South African treatment of transactions in the non-observed economy

Since 1999, Statistics South Africa has been making a very serious effort to include many of the activities in the NOE in the national accounts estimates for South Africa. More specifically, in that year Statistics South Africa endeavoured to make estimates for part of the informal sector, production for own final use and the statistical undercount. Ten years later, it added some illegal and underground activities to the GDP estimate.

5.6.1 Illegal and underground production

In South Africa, illegal and underground production is mainly relevant for the following five industries:

- Agriculture and fishing;

- Mining and quarrying;
- Manufacturing;
- Domestic trade; and
- Personal services.

A variety of data sources are used to calculate illegal and underground activity. The most important sources are administrative and enforcement records, mainly:

- Tax registers obtained from the South African Revenue Services (SARS);
- Documents provided by the South African Police Services (SAPS); and
- Documents provided by the Sex Worker Advocacy and Task Force (SWEAT) for prostitution.

Two main additional sources have been used:

- Surveys on domestic trade; and
- Information from other countries.

The most important pieces of information from other countries are in the form of ratios. The main ratio used within the South African national accounts is:

- Ten per cent of the total volume of illegal products is seized by public authorities, mainly customs and police authorities. The rest is not seized.

This ratio has been used to calculate the total volume of illegal and underground production in agriculture and industry, mining, manufacturing and domestic trade. For example, if police records show that the total volume of confiscated cannabis amounts to 10 tonnes in a given year, the total volume would be 100 tonnes (10/10% = 100). The estimated value of total output at current prices of each product is then obtained by multiplying the total volume with the price of the relevant product. That output is set to equate the output of the corresponding illegal/ underground industry for each product.

Information from other countries is also used to infer values for intermediate consumption. More specifically, such ratios provide information on the value of intermediate consumption relative to output. The ratios are industry specific, and described below.

In South Africa, the information on illegal and underground activities is organised into five main industry groups.

Agriculture and fishing: The illegal and underground activity in agriculture consists mainly of production of cannabis and abalone. The total volume of output is obtained by applying the ten-per cent ratio to products seized by public authorities. As for prices, information is obtained from police records. Using data from other countries, intermediate consumption associated with such output is estimated at five per cent of the output.

The inclusion of such illegal and underground production in the agriculture and fishing industry has resulted in an increase of 0.1% in the output levels and 0.2% in the value added levels.

Mining and quarrying: Unlawful extraction and smuggling of gold, platinum and diamonds account for the bulk of illegal and underground mining and quarrying in South Africa. The total volume of output is obtained by applying the ten-per cent ratio to products seized by public authorities. The prices of these products are well known and readily available at Statistics South Africa. Based on studies from other countries, an assumption has been made that intermediate consumption in this group is ten percent of output.

The inclusion of the underground and illegal activities to the mining and quarrying industry group has resulted in an increase of 0.04% in the value of output and 0.03% in the value added levels.

Manufacturing: Most illegal and underground manufacturing in South Africa consists of unlawful or hidden production of alcoholic and pharmaceutical products as well as reproduction of recorded media on CDs and DVDs. The total volume of output is obtained by applying the ten-per cent ratio to products seized by public authorities. The prices of these products are well known and readily available at Statistics South Africa.

The main rationale for underground manufacturing of alcoholic beverages is to avoid taxes. Production of the remaining products – pharmaceuticals and reproduction of recorded media – is counterfeit.

Information obtained from international sources indicates that intermediate consumption in manufacturing amounts to twenty per cent of output.

The inclusion of underground and illegal activities in the manufacturing industry has led to an increase of 0.01% in output and 0.03% in value added.

Domestic trade: In South Africa illegal and underground domestic trade pertains to the following products:

- Narcotics, mainly cannabis, heroin, cocaine, mandrax and ecstasy;
- Cigarettes and alcohol;
- Clothing;
- Footwear;
- Firearms, ammunition and explosives; and
- Motor vehicles.

The total volume of illegal and underground sales is obtained by applying the ten-per cent ratio to products seized by public authorities. Regarding prices, police records provide information on prices of narcotics. Prices of remaining products are readily available at Statistics South Africa. As

for the output component of sales of traded goods[12], analysis of Statistics South Africa's annual surveys of the trade industry has shown that a reasonable assumption for trade in these products is that output amounts to 30 per cent of sales.

Statistics South Africa considers that all of these products have been produced abroad and smuggled into South Africa for sale, the sole exception being cannabis, which is produced in South Africa.

Unauthorised trade in narcotics, firearms, ammunition and explosives belongs to the sphere of illegal activities. Domestic trade in remaining products is legal. The reason why they are smuggled into South Africa and sold unlawfully is to avoid taxation, mainly customs duties and value added taxes.

The inclusion of illegal and underground activities in the trade industry has led to an increase of 0.3% in the value of output of the trade industry.

Personal services: In South Africa, the biggest illegal activity in this industry group is prostitution. Information from an association called Sex Worker Advocacy and Task Force (SWEAT) combined with studies on prostitution from other countries is the main source of information on output volumes. More precisely, Statistics South Africa uses data on the number of prostitutes, average number of working days and average daily income to infer output volumes. Prices are obtained through examination of relevant advertisement in newspapers. Prices depend on the type of prostitution, indoor or street. The value calculations have been accordingly; i.e., by differentiating between these two categories of prostitution.

The inclusion of this illegal activity to the personal services industry group has resulted in an increase of 0.7% in output and 1.1% in value added.

5.6.2 Informal sector activity

Statistics South Africa is including estimates for informal sector activity in the GDP. In South Africa, the informal sector is relevant for the following industries:

- Agriculture, forestry and fishing;
- Mining and quarrying;
- Manufacturing;
- Construction;
- Trade, hotels and restaurants;
- Transport, storage and communication;
- Finance and business services; and
- Personal services.

[12]Output of domestic trade services is defined as the difference between the sales price and the current value of the cost of acquiring the product. Thus, the output of domestic trade services is equal to the retail/wholesale margin.

Several data sources have been used to infer values pertaining to the informal sector. The most important are household based surveys - mainly the household budget survey and the labour survey - , which provide information on informal sector activities at current prices. Information obtained from the survey of employers and self-employed is also relevant as data source.

5.6.3 Household production for own final use

In South Africa, household production for own final use is quite important. It pertains to the following industries:

- Agriculture, forestry and fishing, for example small-scale animal and crop farming, wood-cutting and the collection of firewood.
- Mining and quarrying, for example mining salt and cutting peat.
- Manufacturing, for example:
    - The processing of agricultural products such as the production of grain by threshing, the production of flour by milling, the preservation of meat and fish products, the production of dairy products such as butter or cheese, and the production of beer, wine or spirits.
    - The processing of leather, for example the curing of skins and the production of leather footwear.
    - The production of baskets and mats.
    - The production of textiles and clothing, such as weaving cloth, and making clothes.
- Construction, mainly building of and improvement to own houses
- Real estate services, i.e. production of imputed rentals
- Personal services, i.e. paid domestic services.

An important component of household production for own final use is subsistence farming, but the latter also includes a whole range of activities that are performed by many South African households. Similar to several other African countries, it is quite common that employees both in the public and private sectors have a small plot of land where they have, for example, some chicken or hens and/or where they grow maize, bananas, vegetables or similar products. Many households also process some of their own agricultural produce, and some use the hides to produce basic leather products. Production of baskets, mats, textiles and clothing is also done on own account.

The production of services for own final use consists of estimates for the owner-occupied dwelling services and paid domestic services.

The household budget survey is the source for most of the information pertaining to household production for own final use. As for imputed rentals, type of dwelling and rental information per type of dwelling serve as data sources. Type of dwelling is sourced from the population census and general household surveys. The services of domestic workers are calculated from the income and expenditure survey of households, the labour force survey as well as the relevant component of the consumer price index.

5.6.4 Other activities that are part of the non-observed economy

As mentioned above, other activities that are part of the NOE are due to flaws in the data collection system and/ or misreporting/non-response by certain statistical units. In, the Measurement of the NOE in South Africa, Statistics South Africa identifies the most problematic area in the South African data collection system as the enterprise sample frame; i.e., the business register. The problem arises because the basic statistical unit is not defined according to international standards. The latter prescribes that the basic statistical unit should be presented in terms of establishments. However, in South Africa the basic unit is instead an enterprise[13]. All this gives rise to the NOE.
The Measurement of the NOE in South Africa does not point out any other glaring problems in the South African data collection/compilation system. It does note that "adjustments for statistical deficiencies are made as a matter of course. This includes the non-response by enterprises as well as the imperfection in reporting by enterprises (e.g. giving combination of business units instead of separating business activities)"[14].

[13]See appendix 2 for the distinction between an establishment and an enterprise.

[14]The Measurement of the Non-Observed Economy in South Africa, p. 13.

Appendix 1: The production boundary

This appendix explores what type of production is included in the measurement of output; i.e. what type of production is included within the production boundary. If all the activities falling within the production boundary - also the NOE activities - are included in the GDP estimate, the GDP is exhaustive.

It must be understood that there are many productive interactions between economic agents that should not be recorded in the national accounts. When a household member makes cheese out of milk, washes the dishes or fetches water from a well, a productive action has taken place; yet not all of these activities should be in the GDP estimate. In order to delineate exactly between what should and should not be included in output, a set of rules have been established, and a production boundary formulated. All transactions within this production boundary should be recorded as output and all transactions outside should not be included even though they may be economically meaningful and contribute significantly to the economic development of a country.

Inside the production boundary

Sales and other disposals to other statistical units

All output produced for purposes of sales or any other disposal - such as gifts or barter - to a separate statistical unit is included within the production boundary. There are no exceptions to this rule. When a producer - say a car manufacturer - is not able to sell the product at the end of the accounting period, the value of the car is nevertheless included within the production boundary; i.e. it should be recorded as output (in this case, the counter-entry is changes in inventories).

Households sometimes sell services to other households. This is the case with maids, gardeners, drivers, chefs, nannies and other domestic staff who provide domestic services to other households. Such services are included within the production boundary. When households provide domestic services to other households, the wages and salaries as well as any payment to a social insurance scheme are considered sales of the provider and included in output.

Indeed, all production of goods and services intended for sale or any other disposal to another unit is included. The type of statistical unit that produces the good or service is irrelevant. For example, the statistical unit may belong to the household sector or any other sector. Thus, households producing apples and maize in their backyard and selling them on the local market or giving them away to a neighbour should be classified as output. This type of activity is particularly important for many developing countries. Even though the total value of output of each household is small, the large number of such transactions implies that household output probably accounts for a fairly significant share of total output in these countries.

Output of capital assets to be used on own account

All production of capital assets is included within the production boundary, irrespective of type of producer. For example, if a mining company produces certain machinery used in mining, this production is always classified as output even when the assets never change ownership, but are used by the same mining company. Similarly, if a household builds a new house, which is intended for own use, it is also included in the production boundary.

Households' output of goods to be used on own account

All household production of goods on own account is included within the production boundary. Thus, goods produced by households for own consumption fall inside the production boundary. For example, when households produce their own food, it is considered output, and the value of food produced does contribute to GDP.

Households' output of one service to be used on own account

Normally, household own-account production of services is not included within the production boundary. However, there is one exception to this rule, namely imputed rental services. When households own their own dwelling, a value is imputed for the rental cost, and this value is included in output. It is own-account production, because the household produces the rental service to itself. This type of rental is often referred to as imputed rental. The value of the imputed rental should be in line with the rental that would have been paid if the owner had rented the house instead of owning it.

Outside the production boundary

Output of services for own consumption of households

In general, services produced by households on own account are not included in the production boundary; the sole exception being imputed rental. The following are examples of activities that are excluded:

- Preparation of meals;
- Cleaning, repair and maintenance of own dwelling and durable goods;
- Care of children and elderly people who are part of the household; and
- Transportation of members of the household or their goods.

These activities are economically meaningful. The main reason why these activities nevertheless are not included in output is that, at a practical level, it is virtually impossible to estimate them in a meaningful way.

Appendix 2: Establishments versus enterprises

Enterprises

A key institutional unit is an enterprise. An enterprise is defined as an institutional unit that engages in production of goods and/or services. Thus, enterprises can be found in all institutional sectors. For example, corporations and households engaged in unincorporated farming activities are enterprises.

An enterprise may be very large, and could simultaneously be involved in many different production processes. But it may also be small. Many small enterprises engage in one activity only, for example, it may engage in the production of retail services only. If that is the case, it is said to have one principal activity only. However, many enterprises have a broad range of production processes, and engage in many activities, for example an enterprise may simultaneously engage in the production of shoes, belts, bags and a whole host of other leather products, as well as in tanning and preparation of leather. The same enterprise may even be engaged in retailing of leather products. If that is the case, the enterprise also has secondary activities. The activity accounting for the biggest share of its value added is its principal activity. Thus, if value added of shoe manufacturing exceeds that of any other activity, it is the enterprise' principal activity. The value added of secondary activities is smaller than the value added of the principle activity.

In addition, an enterprise may be spread out over several locations. For example, the same enterprise may have a retail outlets in South Africa and production facilities in Mozambique.

This lack of homogeneity is not ideal for measurement purposes of production. Therefore, economic statisticians have divided enterprises in smaller units, called establishments.

Establishments

An establishment is an enterprise, or part of an enterprise. An establishment conforms to the following characteristics:

- It is situated in a single location.
- It carries out just a single productive activity or its principal productive activity accounts for most of its value added.

It is important to note that both these conditions must hold for an establishment to be identified. In many developed economies, a significant share of the production of goods and services is carried out by a set of enterprises that are engaged in more than one sort of production. General Electric is a prime example. It is engaged in the production of all sorts of machinery, ranging from domestic appliances to industrial machines. It also produces electric motors, health care products and financial services, as well as a host of other products. If General Electric and similar enterprises were grouped together as single units, they would be very heterogeneous with respect to the type of production processes carried out as well as the goods and services produced. The results would not constitute a meaningful basis for analyses of production. Instead, it is necessary to work with groups of producers that are engaged in essentially the same kind of production. This

is where the establishment enters the scene. Establishments are smaller and more homogeneous units than enterprises and can be used in a meaningful way for analyses of production.

Even though enterprises in developing countries tend to be less diversified than General Electric, the notion of establishment is still highly relevant. For example, a hotel that is also engaged in provision of food and beverage services as well as retail services is an enterprise that is made up of several establishments.

The SNA recommends that production data should be collected at establishment level rather than at enterprise level.

MEFMI

Macroeconomic and Financial Management Institute of Eastern and Southern Africa

9 Earls Road, Alexandra Park,
P. O. Box A1419, Avondale, Harare, Zimbabwe

+263 4 745 988/9/91-94

+263 4 745 547-8

capacity@mefmi.org

www.mefmi.org

@mefmiorg