Compilation technique

1. Introduction

1.1 Basic Concepts

National accounts or national income accounts show economic flows among economic units at the macro level. These flows include production of goods and services which in turn leads to income payable to factors of that production, disposition of that income, saving and investment of economic institutions. This also includes economic activities dealing with the rest of the world, especially exports and imports of goods and services.

Moreover, the national accounts as the whole system will also include investment in financial and intangible assets and capital stocks, including changes in stocks caused by various factors.

1.2 National Accounts System

The international system of national accounts is the United Nations System of National Accounts (UNSNA). The system of national accounts consists of production, income and expenditure, capital formation and rest of the world accounts. In the SNA, the accounts can be compiled by three approaches: production, expenditure and income approaches. The results obtained by the three approaches are equal or equivalent. Choosing one out of the three approaches in generally is based on the level of accuracy, or in other words, the perfection of data system in each country.

In the case of Thailand, the production approach is the core method. This is because reliabilityon the production prices is higher than on the expenditure. Particularly, on the expenditure side, export and import prices are of low quality. Not to mention the lack of information on the items of change in inventories used in the value estimation.

However, at the international level it is agreed that compilation on the expenditure approach is better than the other two in terms of convenience, speed, and reliability. Generally, production process takes many stages before reaching final goods and services which easily lead to double counting and underestimation. On the other hand, the expenditure approach measures only the final goods and services, so chances of making error is less than the production approach.

1.3 National Accounts Estimation

National accounts statistics compilation or national account estimation can be carried out by three approaches. First, by the production approach, value added or production value net of its intermediate consumption during an accounting period is estimated. Second, by the expenditure approach, the total value of final consumption during an accounting period is estimated from expenditure and investment made by each economic unit. Third, by the income approach, all returns to factors of production are estimated both directly and indirectly by basing on the outcome of the previous two approaches.

1.4 Fundamental Concepts of Quarterly National Accounts (QNA) Compilation

There are two main aims of QNA estimation. First, QNA must accurately indicate the direction of economic movements. And, it must be timeliness; if possible the most recent estimated QNA has to be of

the current quarter or of the previous quarter as the latest. QNA estimation in most countries is not carried out for all of the accounts in the system due to the facts that not all quarterly data are obtainable whereas annual data are. Therefore, only main accounts that can address short-term movements of the economy are compiled.

Normally, Gross Domestic Product or Gross National Product is quarterly estimated by the production or/and expenditure approaches. However, some countries follow the income approach as they have better data for this approach.

Difference is not only on parts of the system but also on the estimation or compilation techniques. Generally, QNA estimation has less details and narrower coverage than annual national accounts. For instance, annual accounts have all sub items, while QNA may group some items together before estimating. Sometimes, value added estimation for QNA may not have details on intermediate consumption, annual intermediate consumption is applied instead. In terms of coverage, QNA may cover less items than annual national accounts. This happens to the items that have small value compared to the total value but they are difficult and take time to compile.

1.5 Quarterly National Accounts Estimation/Compilation

As national accounts are actually data and statistics on the value of economic activities, thus they must be compiled directly from statistical bases. They cannot be estimated by any other short-cut techniques, like modeling.

QNA roughly can be compiled intwo ways, i.e. direct and indirect estimation. The direct estimation is applied when basic data are quarterly available. The indirect estimation, such as using indicators, is applied when quarterly data are not available.

There are two forms of quarterly gross domestic product (QGDP) estimation. First is the distribution of annual data into four quarters by related quarterly indicators. In other words, it is a method of breaking low-frequency data (annual) into high frequency ones (quarter). However, annual data must be available first. QGDP derived by this form of estimation cannot provide needed indicators for the current quarter but the pattern of movements in the past that can be used in analysis. Annual data can be broken into four quarters by ways of mathematics, statistics and the mixed. The second form of estimation is based on indicators. Related indicators and the existing benchmark are used to extrapolate the statistics of the current quarter. In other words, it is an extrapolation based on indicators to derive the current quarter without annual data. However, sum of any four quarters may not be equal to its annual figure. If equality is needed, quarterly value needs to be adjusted again by applying the first form of estimation.

2. Quarterly Gross Domestic Product Estimation

2.1 QGDP estimation based on annual data

1. **Direct estimation.**As it is mentioned before that the direct estimation is based on the data that are quarterly collected both of production and prices. The direct estimation is claimed to be the best in terms of correctness and results. The sum of the four quarters will be equal or nearly equal to the annual value subject to the data and prices. Annual prices are normally obtained by the simple average method by which quarterly or monthly data are not weighted by the quantity of the referred quarterly or month. This leads to an inaccurate result. Thus, summing up of QGDP from four quarters tends to give a better result..
2. **Breaking annual data into quarters: Indirect estimation.**Selecting a technique must be carefully carried out since (a) indirect methods are the main technique used in QNA estimation.

This is because very few quarterly data are available. Direct estimation is limited to only a few items. Thus, accuracy of estimation is very dependent on the indirect techniques, and (b) simplicity and convenience are an important character of indirect methods. Many methods are possible; however selecting an appropriate method requires experience and regular tests in order to maintain the standard or raise quality to higher levels.

Any technique used in breaking down annual national income into quarters by utilizing related quarterly indicators is called "quarterization". Quarterization can also be applied to any low-frequency data to get high-frequency ones. Quarterization in national accounts can be carried out at two levels, i.e. group and detail levels. For example, quarterization of private consumption expenditures (PCE) can be carried out at the level of total PCE,or at the detailed items, e.g. beverage, food and others then add them up to get total PCE. The latter is likely to be more beneficial and reliable, as it is worked out from the details.

Three methods used in quarterization of annual data are:

a. **Purely mathematical method.** This will be used in the case that there is not any quarterly data at all. So it is just a method of increasing the frequency of data by a smoothing technique without any economic reasons backing up. This method is simple, plausible, practical but arbitrary. An important mathematical method is Lisman and Sandee's by which coefficients used in increasing the frequency are constant. Another method is Boot, Feibes and Lisman's by which coefficients used in quarterizationminimize the sum of the power two of the difference between quarters (ordinary least square method).
b. **Statistical method.**A linear regression is built up from related variables. These variables have to be both quarterly and annual. An important method is Chow and Lin's by which two steps are needed. The first step is an estimation of y from xB (where y is national income, x related variable and B coefficients derived from the linear regression.)

   The second step is the step of adjusting quarterly y value of 4 quarters to make it equal to annual value.

   If there is no serial correlation, the adjustment is by simplydistributing the differences between the actual and estimated annual value of each year among the four quarters. Another method is Rossi's which is adapted from Chow and Lin's so that estimating quarterly value are estimated from many variables at one time and the sum of quarterly obtained from the estimation is equal to the annual one.

c. **Mixed mathematical and statistical method**This method is applied when variations of data are known from related indicators. There are two steps. The first step is to estimate preliminary quarterly values by the mathematical method. The second step will adjust the preliminary valuesmove in the same direction as indicators. Important mixed methods are Vangrevelinghe's and Ginsburgh's. Both methods are similar. The difference is at the first step at which Vangrevelinghe follows Lisman and Sandee's, whereas Ginsburghfollows Boot and associates.

Dumkerng and associates did a comparative study using all three methods, i.e. Boot and associated, Chow and Lin and Ginsburgh to estimate QGDP and QPCE. The results are as follows..

The estimation reveals that the results obtained from the three methods tend to go in the same direction. However, the result obtained by the Boot and associates method, pure mathematics, has the smoothest movements.

"The results derived by the Ginsburgh's and Chow and Lin's methods fluctuate more than the Boot and associates' results. However, directions of the movements are similar between Ginburgh's and Chow and Lin's results. Thus, either results from Ginsburgh's or Chow and Lin's method give no difference. After comparing to the real value (National Accounts Division used to estimate QNA in details for the 1982-1984 series), it clearly shows that (a) estimation on the government consumption, export and import of goods and services reveals the same direction of movements for the whole 1982-1984 series, (b) estimation on private consumption shows that only results for the fourth quarter of 1982 up to the second quarter of 1983 are inconsistent, and (c) for the final factor, gross capital formation, there are many periods showing inconsistent movements". However, there is no supporting reason why there is no difference or advantages on the results obtained from the statistical method compared to the mixed statistical and mathematical ones even though the mathematical method is used without any economic indicators. Furthermore, it did not clearly point out which method is the best in terms of accuracy to be used.

In order to find out which method is the best indirect estimation for QNA estimation, National Accounts Division has made a further study. It has estimated QGDP of the electricity and water supply sector by methods suggested by Ginsburgh (Mathematical method) and Chow and Lin (mixed methods). After comparing the results to the direct estimation, it indicates that movements of both methods are not different from the direct estimation. However, in terms of value the Ginsburgh's method is a little bit better than the Chow and Lind's.

In practice, the NAOstaffs are familiar with Excel program which give the Ginburgh's method advantages. Therefore, the Ginsburgh's method is used as the core method in quarterization.

2.2 Methodology used in compilation of the current quarter

There are 6 methods used in compilation of QGDP in the current quarter (without annual data) as follows.

1. **Direct method**

   This method is similar to the direct method used to compute annual GDP. It can be used in the case that quarterly are reported of the same details as annual data, e.g. quantities, prices, intermediate costs are reported quarterly. The summation of four quarters should equal to the annual figure. In other words, the annual GDP can be directly obtained by summing up the four quarters of QGDP.

2. **Extrapolation method**

   The extrapolation method is a standard method and the most popular one. Each item of Quarterly Gross Domestic Product is extrapolated with its relevant indicator (see appendix 1: compilation of QGDP by basing on indicators).

3. **Commodity flow method**

   The commodity flow method is used in estimating expenditure by balancing total demand and total supply. Supply is the production value of goods and services (derived from compilation of production value in the country) plus trade margin, transport cost (derived from input-output tables) and import value. Demand can be derived from input-output tables and it consists of private consumption expenditure, government consumption expenditure, investment and

intermediate consumption plus export value. Total supply must be equal to total demand and the difference is the value of change in inventories.

4. **Sampling survey or primary data collection**

   This applies only to the estimation of change in inventories. During the project (1997-1998), the Bank of Thailand (BOT) has taken responsibility to estimate the change in inventories. After the project, NAO is in charge of tracking change in inventories. NAOnow uses the commodity flow method together with indicators from the office of Industrial Economics to estimate the change in inventories.

5. **Compilation of QGDP of the agricultural sector**

   Because a crop year is usually longer than one quarter (3 months), 1993 SNA suggests that QGDP of the agricultural sector should include work in progress, recording according to accrual basis, which is actually gross output of the agricultural sector (see appendix 2: Estimation of Agricultural Output by Quarter).

6. **Past trend adjustment method**

   This method is used for small items. Examples of past trend adjustment are using the average rate of annual growth and quarterly growth. Sometimes, quarterly value has to be obtained by dividing the annual value by 4. However, this method can lead to a problem of step change between the last quarter of one year and the first quarter of the following year. Therefore, it is not recommended unless for small items.

2.3 Professional Judgment (PJ) method

In some cases, the results of the estimation do not reflect real economic activities even with the best available indicators. Such indicators may be inappropriate or inconsistent because most indicators, in particular used in Thailand, are the administrative record which was not designed for being used as economic indicators. As a result, compilers may need to make some professional judgments before releasing the figures to the public. There are two stages of professional judgment: compiler or staff judgment, and expert judgment. Compilers need to take into account (1) current economic situations and (2) understanding of indicators. Application of this method should be considered from:

1. Whether trends from the result are consistent with the current situation. If not, compilers should adjust the result.
2. If the trend is consistent but the level is not, then thee adjustment can be applied by considering the past trend of that particular item.
3. In the case that it cannot be considered or decided whether it should be adjusted or not, better data are needed for the decision.

3. Revision of QGDP

There are 3 stages of QGDP presentation, including revision.

3.1 First presentation

The first presentation is to illustrate the result of QGDP compilation based on indicators and professional judgments. The first presentation is quite important because it reveals economic situations in the previous quarter in a timely manner. The first presentation not only timely presents the result but it should also provide the right direction of change in the economy.

3.2 Ssecond presentation or first revision

This is a backward adjustment from the current quarter. This adjustment needs to take the following issues into account:

Aiming at improving the results, the first revision will be carried out when (1) there is any data adjustment made by thedata source and (2) there are new and better indicators.

1. Better results can lead to a better benchmark for the following quarterly compilation.
2. Revision should be only on the core items.
3. Number of quarters that need to do backward revision depends on (1) how significant the primary data have been changed.If the change is significant then a revision is necessary. And (2) how important such items are in national accounts: important items need to be revised in order to reflect the right direction and real economic movement.

3.3 Second revision

QGDP estimated by the indirect method is usually different from the annual figure even with good indicators. When the annual figures, which are estimated by the direct method, hence more accurate, have been released, the quarterly figures are adjusted so the sum of QGDP from four quarters is equal to the annual value. This technique is the second revision. QGDP which have been adjusted after the second revision can be used as the benchmark for estimating following quarters. The second revision can be utilized as many times as the backward change happened to the annual figures.

There are simple ways toequalize the sum of four QGDP to its annual figure. Quarterization uses the quarterly proportion of the preliminary QGDP to break down its annual GDP. Another way is by dividing the difference between the sum of four quarters and its annual figure by 4, and then add the average difference back to the preliminary QGDP. However, this can cause a step change between the fourth quarter of one year and the first quarter of the following year. This method is not recommended other on small items that do not affect their total values.

The most correct method is Denton least square technique. This technique based on several assumptions such as D4. The method is to solve for the benched values given indicator values and benchmarked values of previous year quarterly data and indicators. The benched valuesminimize the ordinary sum square of the differences between the ratios of the benched values to indicators of the current year to the benchmarked ratio of the previous year, given annual values as the constraint. Moreover, it requires that the compilation of annual value is done separately from the quarterly compilation. In practice, the Canadian Bench program and Extrapolation (Bench Program) can calculate the values satisfying Denton least square conveniently.

4. Seasonal adjustment

QGDP is presented not only in the original preliminary series but also in the seasonally adjusted series. The seasonally adjusted figure reflect the real changes in production and expenditure in each quarter asthe seasonal effects are got rid of.After seasonal adjustment, the real changes in the fundamental of the economy can be examined. The original figure that contains the seasonal effects may show the

direction of the economy that is influenced by the seasonal effects, while the fundamental may not increase or decrease at all. Even though the seasonally adjusted value can better reflect the real changes, the negative value of some items such as change in inventories cannot be seasonally adjusted.

Appendix 1
Compilation of Quarterly Gross Domestic Product by Basing on Indicators

1. Basic concepts

1.1 The compilation of Quarterly Gross Domestic Product with indicators is a standard practice for the estimation of the current quarter data.

1.2 It can be applied to both the production and expenditure approaches.

1.3 Indicators are at the current market prices and constant prices. The current market price indicators are quarterly data, for example, the total revenue declared for value added tax estimation. The indicators at constant prices are that total revenue deflated by a suitable index or sometimes using volumes such as the number of Watt or Kilowatt of electricity used.

1.4 The QGDP estimation for each item at current prices is extrapolated using indicatorsvalued at current prices. Similarly, the constant price item is extrapolated by indicators valued at constant prices--unlike the annual estimation that the value at current price is deflated to obtain the value at constant prices. The reasons for using indicators at constant prices are (a) it is easy to choose a proper indicator and (b) it is convenient in practice.

1.5 The important criteria for selecting appropriate indicators for each item are:

1.5.1 Such indicators can reflect the changes of that item in national accounts in each quarter.

1.5.2 Such indicators have to be current and can be used in the current quarter.

1.5.3 Good indicators should lead to estimation such that the sum of four quarterly values equal or nearly equal to its annual figure because the annual figure is comprehensively estimated. The difference between the two should not be higher than 10 percent of the annual figure. Compilers could use an indicator even though it can lead to more than 10 percent difference, but the results from the estimation must reflect the real economic situations and reasons for using such an indicator must be substantiated.

1.6 Indicators used for the current quarter estimation of any item in national accounts can be different from the previous quarter. The current quarter indicators focus on "data availability" whereas the previous quarter indicators concentrate on the accuracy. Therefore, the value from previous quarters can be used as a benchmark for current quarter estimation.

1.7 The current quarter indicators may be changed if they do not reflect the real economic movement or they fluctuate irregularly. The change can be permanent and temporary. It depends on the compiler's judgment. Thus, the compiler should

1.7.1 monitor the indicators regularly

1.7.2 follow economic situations continuously

1.7.3 develop new indicators in order to (a) get an up-to-date version and (b) be able to better reflect the situation. However, the indicator development needs cooperation from other relevant agencies.

1.8 When extrapolating, the benchmark figure needs to be adjusted according to its annual figure. Then, the benchmark figure will be a good basis for the current quarter estimation.

2. Indicators and primary data used in the compilation of quarterly gross domestic products.

2.1 Entrepreneur revenue declared for value added tax estimation, classified by ISIC, Department of Revenue.

2.2 Electricity consumed by business classified by TSIC, Metropolitan Electricity Authority and Provincial Electricity Authority.

2.3 Import and export statistics, Bank of Thailand.

2.4 Price indices (consumer prices, wholesale prices and producer prices), the Ministry of Commerce.

2.5 Permitted construction area, National Statistics Office and Bangkok Metropolitan Administration.

2.6 General government expenditure, Comptroller General Department.

2.7 Quarterly household socio-economic survey, National Statistics Office.

2.8 Labor force survey, National Statistics Office.

2.9 Production and sale of manufacturing goods statistics, Office of Industrial Economics.

2.10 Production and sale of excise goods, Excise Department.

2.11 Crops forecast (production and price), Office of Agricultural Economics.

2.12 Other production statistics:

- Mineral products statistics
- Electricity, water supply and gas production statistics
- Selling, buying and transferring real estate statistics.

Appendix 2
Quarterly Gross Domestic Product Estimation by Production Approach

National Accounts Office(NAO) has subscribed to the IMF's Special Data Dissemination Standard (SDDS) program since 1996. Under this program, the members have to report the current quarter estimates of quarterly gross domestic product (QGDP) within three months after the reference quarter.

At present, NAO compiles the QGDP by two major methods, direct and indirect. The direct method will be used for the items which the quarterly data are available in time. For items that quarterly data are not complete or not available, the indirect method will be used, i.e. related indicators are employed. Value added is estimated by using the annual proportion of value added to its gross output of the respective

year in the case that there is no information on quarterly cost structure. For the current period, the structure of previous quarter may be usable. The classification is based on the ISIC Rev. 3. A brief on the methodology and indicators used in an estimation of each category is as follows.

A. Agriculture, hunting and forestry

1. Crops. QGDP of the major crops are directly estimated by multiplying the actual output in each quarter by the relative average prices. Variation of minor crops is dominated by the major crops' change. The SNA recommended accounting on accrual basis, meaning that the work in progress in agricultural needs to be recorded as the production takes place. However, though work in progress of major crops has been compiled, it is not implemented due to the suggestion made by public consultation and data users.
2. Farming of animals. Mixed methods are used in this division. First, the direct method is applied to the items that data are available, such as dairy products. Second, the indirect method using related indicators are used for the estimation. Indicators are such as monthly data on the number of slaughtered swine, buffalo and cattle, and export of chicken, etc.
3. Forestry, logging and related services. Charcoal is the main product of this division. The quarterly information on charcoal and logging is available , however, with a one year lag.

B. Fishing

The quantity of caught marine fish, the main product in this sector, in each quarter is an indicator for the total output of this division.

C. Mining and quarrying

Monthly data on the quantity and value are available.

D. Manufacturing

The quarterly production indices in most divisions estimated by the office of Industrial Economics, the Ministry of Industry, and are available and used as indicators for manufacturing. The value added tax (VAT) statistics and other related indicators areused for the remaining items in this category.

E. Electricity, gas and water supply

Monthly data on the output and cost structure are available. The direct estimation on each commodity is applied. The VAT statistics are used for the remaining small items.

F. Construction

The indirect method is used in this category. Monthly data on construction permitted area is available. The figure adjusted by its time lag is used for the estimation.

G. Wholesale and retail trade, repair of motor vehicles and motorcycles

The value added tax statistics as well as imports of goods are used as an indicator for each item.

H. Hotels and restaurants

The value added tax statistics of this category is used.

I. Transport, storage and communication

1. Transportation. Most of the producers in this sector are government enterprises whose quarterly data are available. They are used as the indicators for other similar activities. The value added tax statistics are also used as indicators for the remaining items.
2. Post and telecommunication. The quarterly data on telecommunication and postal activities are mostly available.

J. Financial intermediation

1. Financial intermediation, excluding insurance and pension funds. Half yearly report from all commercial banks is available and used as the main source of indicators for the total division. Reported data are disaggregated into quarters by using quarterly indicators from some major commercial banks.
2. Insurance and other financial businesses. Related VAT statistics are used as indicators.

K. Real estate, renting and business activities

1. Real estate. The quarterly data on land purchasing fees are available.
2. Rent. Comprises two components, actual and imputed rents. SES is used as a major source of data.
3. Other business activities. Related VAT statistics are the main indicators used.

L. Public administration and defense

The quarterly data on government expenditure are available but there is usually a lag of one quarter after the reference quarter for the central government and about two to three quarters for the local governments.

M. Education

Public education is the major component in this category with quarterly data available from government expenditure. Quarterly data availability is the same as category L. For private education, indicators are the number of students in each quarter.

N. Health and services

More than a half of the value added in this category is of the public health. Therefore, public health data is used as the indicator for this category. Quarterly data availability is the same as category L. For private sector, the indicators are revenues of private hospital that are made publicly available.

O. Other community, social and personal services activities

Only annual data are available.Due to the lack of quarterly information in this category,related VAT statistics are used.

P. Private households with employed persons.

Only domestic services are included in this category. Indicators are used from data from National Statistics Office.

Q. Extra-territorial organizations and bodies

At present, there is no estimation on this category.

Appendix 3
Quarterly Gross Domestic Product Estimation by Expenditure Approach

1. Introduction

Quarterly Gross Domestic Product on the expenditure side (QGDE) is compiled by using the concept and methodology recommended in the United National System of National Accounts, UNSNA. Calculation on the expenditure side measures only the expenses on the final goods and services. The total expenditure on gross domestic product is the sum of private consumption expenditure, government consumption expenditure, gross fixed capital formation, change in inventories and exports minus imports of goods and services. The formula is

QGDE = C + I + G + (X-M) + D Stock

Where C = Private Consumption Expenditure
I = Gross Fixed Capital Formation
G = Government Consumption Expenditure
X-M = Net Export of Goods and Services when
X = Export of Goods and Services, M = Import of Goods and Services.

2. Classification

Quarterly Gross Domestic Product by the expenditure side has been estimated from the first quarter of 1993 to the second quarter of 1998 and will be carried out further to the current quarter. Previously, the classification of Quarterly Gross Domestic Product using fixed weighted volume measures by the expenditure side follows the Central Product Classification (CPC). After updating the compilation to Chain Volume Measures, the classification on the expenditure side is updated to Classification of Individual Consumption According to Purpose (COICOP). COICOP can be compared and linked to CPC andthe CPC can be compared and linked to the International Standard Industrial Classification (ISIC) used in QGDP estimated by the production side and also to the Harmonized System used in imports and exports classification.

The estimation of QGDE is carried out at the three-digit level of the COICOP. The published figures are, however, shown at the one-digit level with some exceptions showing at three-digit level in some categories.

2.1 Classification of consumption expenditure according to COICOP14 divisions as follows:

0-12 INDIVIDUAL CONSUMPTION EXPENDITURE OF HOUSEHOLDS

01 Food and non-alcoholic beverages

02 Alcoholic beverages, tobacco and narcotics

03 Clothing and footwear

04 Housing, water, electricity, gas and other fuels

05 Furnishings, household equipment and routine household maintenance

06 Health

07 Transport

08 Communication

09 Recreation and culture

10 Education

11 Restaurants and hotels

12 Miscellaneous goods and services

13 INDIVIDUAL CONSUMPTION EXPENDITURE OF NON-PROFIT INSTITUTIONS SERVING HOUSEHOLDS (NPISHs)

14 INDIVIDUAL CONSUMPTION EXPENDITURE OF GENERAL GOVERNMENT

2.2 Government Consumption Expenditure: this item is classified in division 14 of COICOP, individual consumption expenditure of general government. It is also sub-classified into compensation of employees, consumption of fixed capital, purchase from enterprises and abroad, less purchases by household (HH) and enterprises, and social benefit in kind.

2.3 Gross Fixed Capital Formation is classified by the CPC into 6 categories as follows:

- Food Products, Beverages and Tobacco, Textiles, Wearing Apparel and Leather Products, including carpet and textiles
- Other Transportable Goods, Except Metal. This item consists of wood products, furniture, sport and music equipment.
- Metal Products, Machinery and Equipment, including agricultural machinery, office appliance and transport equipment.
- Construction Works and Constructions and Land Construction, private and government construction included.
- Business Services, Agricultural, Mining and Manufacturing Services, including real estate services.

3. Sources of data

1. Manufacturing production and Sale data from the office of Industrial Economics.
2. Quarterly Socio-Economic Survey data (SES) from National Statistical Office

3. Actual Government Expenditure of Ministries, Departments, Central Governments, Local Governments and Non-Profit Institutions from the Comptroller-General's Department, Bangkok Metropolitan Administration and Others.
4. Value Added Tax data from Revenue Department
5. Economic situations from various organizations

4. Estimation Methods of QGDE at current prices

4.1 Quarterly Private Consumption Expenditure

a. Direct method. The direct method will be used in the case that total sale of goods and services data are available. Data include, for example, total sale of electricity, water supply, beverages and tobacco.
b. Indirect method. This method is used in the case that the quarterly data are not complete or not available. It uses related indicators such as consumption rate per head of food, medicines and other services, and revenue declared for value added tax estimation on items like furniture.

4.2 Quarterly Government Consumption Expenditure is estimated by the direct method using the actual quarterly government expenditure which consists of compensation of employees and purchases of goods and services from enterprises and abroad.

4.3 Quarterly Gross Fixed Capital Formation

a. Direct method. It is used in the case that total sale of goods and services data are available. Data includes, for example, total sale of cars, vehicles, and transport equipment, and construction area and quarterly price per area unit.
b. Indirect Method. This method uses related indicators such as revenue declared for value added tax estimation on the items of machinery and office equipment.

4.4 Quarterly exports and imports are estimated by the direct method using quarterly data from the Bank of Thailand.

4.5 Calculation of Change in Inventories. Both methods are applied to this division. The direct method uses the results of the survey on changes in inventories from the Bank of Thailand. The indirect method utilized the commodity flow method.

5. Estimation of QGDE in real terms

- The quarterly Private Consumption Expenditure is deflated by related Consumer Price Index: CPI.
- The quarterly Government Consumption Expenditure is deflated by related Consumer Price Index and Salary index.
- Quarterly Gross Fixed Capital Formation is deflated by related Wholesale Price Index (WPI).