Workshop on the Methodological Review of Benchmarking, Rebasing and Chain-linking of Economic Indicators

Jointly organized by:

United Nations Statistics Division (UNSD)
Lao Department of Statistics (DOS)

24 - 26 August 2011
Vientiane, Lao People's Democratic Republic

An overview of economic indicators and quarterly accounts as short-term indicators

Vu Quang Viet

The paper has four parts, providing an overview of:

- **General introduction to the use of indicators** for the analysis of the performance of an economy, evaluating current as well as future problems;
- **Leading indicators** as very short-term indicators (normally monthly) to track the general strength and weakness of the economy as well as the turning point of the business cycle;
- **Industrial production indexes** as short-term indicators to monitor the performance of a given industry or a composite of industries in an economy.
- **Quarterly accounts** as the most comprehensive and integrated system of short-term indicators in an economy: a description of necessary steps required in the compilation of quarterly accounts.

1. The use of economic performance indicators

Economic performance indicators are mostly drawn from annual or quarterly accounts and therefore are fully consistent with one another and provide useful overview of the economy, its strength as well as weakness. However, they need to be supplemented by other important indicators that are prepared from specialized statistics such as monetary and government budget statistics. All indicators would be more meaningful in the context of changes over time, therefore, time series of statistics are required.

1.1 Indicators based solely on national account aggregates

Familiar indicators are: rate of growth in GDP, final consumption, investment in fixed assets, saving rate (saving/GDP), investment rate, effective individual and corporate tax rates, etc. These indicators can be derived directly from national account data. They show not only the performance of the economy over time but also in comparison to other countries of the same level of development. One of the very useful aggregates in national accounts often ignored is change in inventories. The building up of inventories in relation to sales is a signal for an economic slowdown and vice versa. Unfortunately, many countries have treated it as a residual item or add statistical errors to it, which makes it loose its usefulness.

1.2 Indicators based on the combination of national account data and specialized data

Other indicators are derived by combining national accounts data with other data, for example government budget balance / GDP, current external account balance / GDP, debt payment / export (which includes both interest payment and payment principal). A high ratio of government budget deficit over GDP and a large external account deficit would signal the need for policy adjustment. Large budget deficit may either crowd out private investment, or generate higher inflation if the deficit is not met with government borrowing. Of course the analyst has to take many other factors into account. High foreign debt service ratio coupled with the slowing down of exports would be a clear warning for foreign debt payment crisis. Most of the time, it helps, but it is not necessary to have a sophisticated economic forecasting model to gauge upcoming economic problems. Simple economic indicators provide a good tool for recognizing economic problems when the indicators cross some critical ratios.

1.3 Indicators based on specialized statistics

National accounts are not the only source for economic indicators. Indicators from solely from specialized statistics are as important. Among them are two types of ratios that should be closely monitored. One type is banking system performance indicators such as non-performing loan ratio and liability over asset of the banking system. The second type consists of foreign exchange reserves and the current short-

term liability denominated in foreign currencies. These indicators are extremely important in detecting possible problems in the financial market.

The financial crisis in East Asia and ASEAN countries in 1987 took place without warning since the performance ratios of the banking system and foreign exchange reserve were neither measured properly nor monitored closely. The economy seemed to be rosy before the impending crisis. Indicators on production, government budget, foreign trade balance looked favorable for almost all countries, except for the current external account deficits that went beyond -6% of GDP. The shortfall, which was always expected to be met by capital inflow, turned out to be the reason for the devaluation of national currencies and deepening capital flight.

Non-performing loan ratio is in general defined as loan nonpayment beyond 3 months. In Asia though, before 1997 loan nonpayment over a year was not classified as non-performing. In addition, banks' liability over total asset is normally expected to be less than 1 in developed market (meaning that net equity is zero) but in Asia the ratio of over 4 (meaning a great negative net equity) was commonly seen.

Forward binding contracts to sell foreign currencies (financial derivatives) were also not taken into account in liabilities denominated in foreign currencies in 1997. (See table A2 in the appendix for the operational definition of foreign exchange reserve and total current liabilities denominated in foreign currencies.)

General economic indicators are grouped into 11 groups and listed in table A1 for reference. The definition of the indicators and their possible uses are also indicated.

2. Leading, coincident and lagging indicators

It is important for policy makers and business leaders to track the current performance of the economy and as much as possible to predict future development. Leading, coincident and lagging indicators are the indicators that have proved to be useful in this respect. These statistics may be read as individual series but they are more useful when being aggregated into composite leading, coincident and lagging indexes. No weights are used for aggregation; a composite index is a simple unweighted average. But to be useful these series have to be seasonally adjusted. The seasonal adjustment will be further discussed in the context of quarterly accounts. OECD regularly reports composite leading index on the economy of its member countries.

Types of leading, coincident and lagging indexes that are proved to be useful and commonly used in most countries are listed in table A3. These statistics are mostly in constant prices, except prices of stock, commodities and interest rates which are in nominal terms. Most data are related to manufacturing industries.

The composite index of leading indicators is used in two ways:

- Predict a business cycle, which includes the contraction (recession) and the expansion periods. The initial of a contraction period is commonly defined

as having negative rate of growth of GDP in at least two quarters. The important objective of studying business cycles is the timing of turning points from expansion to contraction and vice versa. Peaks and troughs in leading indicators tend to precede business cycles peaks and troughs. The downward-turning of the composite leading indicators precedes a recession (the two-quarter negative growth of GDP) around 3.8 months in the USA (see table A4).

- Track the growth cycles, that is, to see if the economy is speeding up or slowing down. This is a more appropriate method to track an economy when it grows continuously. In this case the composite index tracks the changes in the indicators. Growth cycle peaks tend to precede business cycle peaks while their troughs tend to be coincident with business cycle troughs.

Coincident peaks and troughs coincide with the business cycles peaks and troughs. Coincident indicators, foremost is GDP, are used to identify the business cycles.

Lagging indicators are used to confirm the performance of the leading indicators.

The composite leading index is not meant to replace quarterly accounts. It may give only signal to the turning point (business cycles), the strength or weakness of the economy (growth cycles). However, it cannot be turned into statistics on level of economic activity such as GDP in the quarterly accounts.

The leading indicator method is developed for developed countries or in countries, which already have an important manufacturing sector and the associated business service sector. The composite leading index performed quite well in developed countries like the U.S.A., Canada, Britain, France, Italy, Japan, South Korea and Taiwan but it is still doubtful whether it is useful to track the economy of low-income developing countries (see table A3). Leading indicators have been tested and currently used in Thailand and Malaysia. They are quite successfully in tracking the economy of Malaysia but not Thailand. Whether they will perform well in other less developing countries with smaller manufacturing sector like Cambodia, Myanmar, Laos and Vietnam cannot be known in advance. Test must be performed to confirm its usefulness in these countries. But it is much easier and faster to compile monthly composite leading index than quarterly accounts.

Whether imports or exports can serve as leading or coincident indicators in a particular country has also to be tested. If export is a driving force for growth, a deterioration of the growth of exports may be a leading indicator. On the other hand, in a country, which relies heavily on imported inputs, the reduction in imports may hinder production. But in this case, prices of imported intermediate goods may serve as a better indicator for business cycle.

3. Industrial production indexes

Industrial production indexes are basic information to be used for the compilation of quarterly accounts. Below is the review of industrial production indexes.

3.1 Production index as a composite index

Normally for annual data, a sample survey is collected and then extrapolated to cover the whole population of production units in a given economic activity.

Monthly and quarterly indexes may have to rely more on quantity statistics like tons, btu, number of students, employment, etc. These quantity indexes are used to extrapolate the volume production indexes. A given class of ISIC may consist of many activities with different quantities including current values; therefore a composite index for a given ISIC has to be developed, which requires a weighting scheme. Value added is commonly used as weights.

$$k = \sum v_i f_i$$

$$\sum v_i = 1$$

$$v_i = V_i / \sum V_i$$

v_i is the share of value added of an activity in a given aggregate ISIC k for example. f_i is the rate of growth of output in activity i. k is then the rate of growth of the class of ISIC under study. Thus a production index is a volume index. Production indexes are then used to extrapolate values of the base period to the current period, be it monthly or quarterly. To get the corresponding value at current prices, a price index has to be applied.

When v_i is from the base-year period, the method used as above is considered a Laspeyes volume index. One can calculate k as a chain index of the Fisher type. In this case, k_{t-1} for the previous period and k_t for the current period must be calculated. k* of the Fisher type is the geometric mean of k_{t-1} and k_t.

$$k^* = (k_{t-1}^{1/2}) \times (k_t^{1/2})$$

Since monthly and quarterly data are the results of not only the trend in production but also seasonally effects and irregular factors. In order to capture the seasonal effects, production index should use t-4 as the previous period of the period t.

3.2 Limitation of production index when used in national account compilation

Production indexes when used in national account compilation assume that output and value added grow at the same rate, i.e. there is neither change in technology nor price substitution effects that affect intermediate consumption and employment to produce a given output. This limitation is applicable also to annual national accounts when the value added/output ratios of the base are used to derive value added of industries and GDP. The limitation may be reduced when the production approach is supplemented by the final expenditure approach to reconcile the difference.

4. Quarterly accounts

Quarterly account is a highly comprehensive system of economic data to measure the performance of an economy in the short run. Unlike leading indicators, it presents the picture of the economy at a moment in time with fully integrated data, that is capable of showing the movement of the economy (if at constant prices) and also the level of aggregates. The leading indicators need quarterly accounts data to serve as coincident indicators for the precise timing of turning points in business cycles. The general approach to quarterly account compilation is similar to annual national accounts. But quarterly accounts have to be produced in a very short period of time, they have the following characteristics:

- They cannot be as comprehensive as annual accounts with full articulation of institutional sectors.
- They have by nature to rely on roughly estimated data and therefore need to be more frequently revised as more reliable data come into streams.
- Quarterly accounts have to be finally revised to benchmark them with final annual accounts. Benchmarking means that data for the whole year has to be equal to the sum of the quarterly values.

In addition

- Quarterly account data needs to be seasonally adjusted to be more usable in tracking the timing of turning points in the trend and in the use of economic modeling either for forecasting or economic impact analysis; However, quarterly account data even without being seasonally adjusted is already very useful in monitoring an economy.

For the compilation of quarterly accounts, the following steps should be taken:

1) Preparation of data, seasonal adjustment,
2) Benchmarking,
3) Rebasing and chaining of quarterly data
4) Policy of revision.

The essential content of each of the topics will be separately discussed and only the details of the methodologies that deem to be important will be presented. Readers can read more about these methodologies in the *Textbook on Quarterly National Account Compilation* that will soon be published by IMF.

4.1 Preparation of data

Quarterly data have been basically covered in table A5 and in the previous discussion of production indexes. However it can be summarized as follows:

1) Analysis of important data that need to be collected or estimated: Important data are the data on an activity that makes up a significant share of GDP (or total value added at basic prices) of an economy in the most current year. More focus should be on the collection of important data through administrative records and surveys. Other data can be roughly estimated on the basis of some rough proxies or the quantifiable relationship with other important activities that drive their production or judgmental trend.

2) Many data for the quarter are extrapolated by using some quantity indicators like wages and salaries (at constant prices), employment, physical quantity of output, inputs used in production.
3) Extrapolation of quarterly data on detailed activities should be based on previously seasonally unadjusted data in order to capture the seasonal effects later and to have both seasonally adjusted and unadjusted data. Quarterly data and quarterly national accounts have uses of both types of data.
4) Extrapolation of the value added of an activity for a quarter t is based on the value added of the quarter t-4 and the rate of growth of a selected proxy index in the same time period.
5) Current value of an activity is obtained by applying the output price index of that activity output to the estimated volume. (This is a very simple approximation for quarterly data. The more accurate estimation of price index for value added may be obtained by applying double deflation method to the calculation of price indexes using the base-year input-output table).
6) Taxes on products at constant prices are estimated by using the tax/value added ratios of the base year.

4.2 Seasonal adjustment

Economic activity may vary by season. High season of production and sale normally take place before Christmas in many countries and before the Chinese new year in others; ice cream is more popular during the summer than winter and grain harvest also takes place in one season. The comparison makes sense only if an activity of a given quarter is compared to that of the same quarter in the previous year. However to do this, it may not be easily understandable to most people who want to have a comparison with the preceding quarter. Thus there is a need for seasonally adjusted data.

Seasonally adjusted data and seasonally unadjusted data have their own usefulness. The unadjusted data provide the actual data that reflect the reality and can be used for marketing or budgeting purposes. The adjusted data provide information for forecasting and trend study purposes. Both of them should be supplied to users. However, without seasonally adjusted data, it is not possible to study the trend as well as to capture correctly the turning point of a business cycle.

Raw data can be decomposed into three components:

1) Trend
2) Seasonal variation
3) Irregular variation

The commonly used method X11, X11-Arima and X-12-Arima, which adopts an iterative procedure based on a series of moving averages, can be used to produce the trend (which is called seasonally adjusted data), the seasonal variation and the irregular variation. It also allows the removal of extreme values from the original data.

To seasonally adjusted data, at least 5 years of data are required. However to be more precise, a long time series is required.

Seasonally adjusted data will not automatically satisfy the accounting identities in national accounts, which must exist in original data. It is not necessary to mechanically manipulate the data to make them obey identity relationships. To avoid the inequality, it is better to sum the adjusted data on components to get the adjusted total.

Among the three statistics: current value, volume measure and price index, only two statistics need to subject to seasonal adjustment, the remaining one can be derived implicitly.

4.3 Benchmarking

Data produced by quarterly production index or quarterly accounts must add up at the end of the year to the totals obtained by annual accounts. Mechanical methods are used to distribute the differences between the total in national account and the sum of the four quarters. I personally have doubt on mechanical methods that either create a step problem or change the quarterly rates of growth. The best way is still to go back to the quarterly data and try to examine which quarter is under or over estimated and try to reconcile to the annual data.

Below is a brief review of some commonly used methods:

- Pro-rata distribution, which creates the step problem
- The Bassie method recommended by OECD
- The proportional method recommended by the IMF

4.3.1 The pro -rata method

This method can be written as follows:

$$X_q = A \times \left(\frac{I_q}{\sum I_q} \right) \quad (1)$$

$$X_q = I_q \times \left(\frac{A}{\sum I_q} \right) \quad (2)$$

$$B_q = \left(\frac{A}{\sum I_q} \right) \quad (3)$$

A is the annual data
I_q is the quarterly index
X_q is the adjusted level data of the quarter.

Formula (1) and (2) are mathematically the same except (1) is ready to use to distribute A and (2) is ready to change the index itself. (3) is the name for a component in (2), which is called the rebasing ratio (B_q).

Pro rata distribution of discrepancy

	Quarter values	Quarter index	Rates of change	Annual value	B_q ratio	Derivation of quarterly values Using formula (1)		Adjusted rates of change
1990								
1991								
Q1	970	98.2				98.2 * 9.95	=977.1	
Q2	995.7	100.8	2.6%			100.8 * 9.95	=1003.0	2.6%
Q3	1009.5	102.2	1.4%			102.2 * 9.95	=1016.9	1.4%
Q4	995.7	100.8	-1.4%			100.8 * 9.95	=1003.0	-1.4%
Sum	**3970.9**	**402**		**4000**	**9.95**		**4000**	
1992								
Q1	977.9	99.0	**-1.8%**			99.0 * 10.28	=1017.7	**1.5%**
Q2	1003.6	101.6	2.6%			101.6 * 10.26	=1044.5	2.6%
Q3	1014.4	102.7	1.1%			102.7 * 10.26	=1055.8	1.1%
Q4	1002.6	101.5	-1.2%			101.5 * 10.26	1043.4	-1.2%
Sum	**3998.5**	**404.8**	**0.7%**	**4164.4**	**10.28**		**4161.4**	**4%**
1993								
Q1	992.7		-1.0%					
Q2	1017.4		2.5%					
Q3	1022.3		0.5%					
Q4	1002.6		-1.9%					
Sum	**4035**			**4000**				
1994 Q1	992.7		-1%					
Q2	1017.4		2.5%					
Q3	1022.3		0.5%					
Q4	1002.6		-1.9%					
Sum	**4035**			**5000**				

In the example above, the pro-rate distribution is used to obtain new quarter values that sum to the total annual value (4164.4). The problem is that all rates of change remain the same except for the first quarter of 1991 where there is a serious step problem. The negative rate of change (-1.8%) is turned into a positive rate of change (1.5%).

4.3. 2 The Bassie method

The Bassie method is the method recommended by OECD in benchmarking. The method is as follows:

1) Select a pair of two years for benchmarking: This means that the differences between the annual data and the sum of the original quarter data are prorated but still keep close to the movement of rates of change in the two years.

2) Apply the simple prorating method to the original quarter data of the first year in the pair. (See section 4.3.1 for the method).

3) Apply the following formula for adjusting the prorated data of the first year and the original data of the second year as follows:

- Find the difference between the annual value of the second year and the sum of quarter data:
  $D_2 = A_2 - \sum X_{q,2}$
- Find the new adjusted value of the quarters for year 1 and year 2
  $Z_{q1} = X_{q,1} + 0.25 \times b_q \times D_2$
  $Z_{q,2} = X_{q,2} + 0.25 \times c_q \times D_2$

Subscript 1,2 refer to the first and second year. The value of b and c are as follows:

To be used for the first year		To be used for the second year	
b1	-0.0981445	c1	0.57373047
b2	-0.1440297	c2	0.90283203
b3	-0.0083008	c3	1.17911122
b4	0.25048828	c4	1.34423822
Sum	0.0		4.0

The example below shows that the Bassie method is simple but works well.

The Bassie method

	Quarter values	Quarter index	Original rates of change	Annual value	B_q ratio	Pro rata distribution of the first of a pair of 2 years	Quarter value by Bassie method	Adjusted rates of change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1991								
Q1	970	98.2				977.1	972.4	
Q2	995.7	100.8	2.6%			1003.0	996.1	2.6%
Q3	1009.5	102.2	1.4%			1016.9	1016.5	2.0%
Q4	995.7	100.8	-1.4%			1003.0	1014.9	-0.2%
Sum	**3970.9**	**402**		**4000**	**9.95**	**4000**	**4000**	
1992								
Q1	977.9	99.0	**-1.8%**				1001.3	**-1.3%**
Q2	1003.6	101.6	2.6%				104.4	3.9%
Q3	1014.4	102.7	1.1%				1062.4	2.1%
Q4	1002.6	101.5	-1.2%				1057.3	-0.5%
Sum	**3998.5**	**404.8**	**0.7%**	**4164.4**	**10.28**		**4164.4**	**4%**
1993								
Q1	992.7		-1.0%			984.1	960.4	-9.2%
Q2	1017.4		2.5%			1008.6	973.8	1.4%
Q3	1022.3		0.5%			1013.4	1011.4	3.9%
Q4	1002.6		-1.9%			993.9	1054.3	4.2%
Sum	**4035**		**0.9%**	**4000**		**4000**	**4000**	**-3.9%**
1994								
Q1	992.7		-1%				1131.1	7.3%
Q2	1017.4		2.5%				1235.2	9.2%
Q3	1022.3		0.5%				13.6.8	5.8%
Q4	1002.6		-1.9%				1326.9	1.5%
Sum	**4035**		**0.0%**	**5000**			**5000**	**25%**

The adjusted rates of change retain the movement of the original rates of change. The annual total of 5000 for the year 1994 is very different from the sum of the quarterly values, which is 4035, but the adjusted rates seem to move at the same direction. The problem like this in fact should not be resolved by mechanical method; it requires national account compilers to reexamine and improve the

original quarterly data first before a mechanical method is applied. Some people have proposed to eliminate the step-problem by including more than two years. But there exists a problem with this recommendation: Do you want to adjust the step problem between the two years the problem occurs or do you want to smooth out every thing mechanically over many years?

4.3.3 The Denton Benchmarking method

The IMF recommends this method, but it does not seem to this writer that this Denton method has clear advantage over the Bassie method. The method is more difficult to calculate than the Bassie method since it relies on the minimization of the difference between the adjusted and the original rates under the condition that the sum of the quarter values is equal to the final annual value. It aims at spreading the difference over a number of years. The method will not be discussed here. Besides there are other methods but they are also mathematically complex to implement and therefore would not be discussed here either.

4.4 Rebasing and chaining of indexes of quarterly volume statistics

The discussion will focus on two special cases: original data and seasonally adjusted data. When original data are used, it is necessary to calculate the index of change between two quarters of two given years separated by 4 quarter (to avoid seasonal variations) but when seasonally adjusted data are used, it is possible to compare any two consecutive quarters in a given year.

There are many variations in the treatment of each type of data:

- Change in base period every quarter;
- Change in base period every year
    - Taking the average index for the previous year as the base
    - Taking the last quarter index of the previous year as the base

The change of the base period every quarter seems to be preferable on a theoretical point of view as it reflects more changes in the economic structure, which are due to changes in relative prices. However, it is not only quite cumbersome to do that but it may create the difficulty in benchmarking quarterly data to annual data as the latter uses the previous year as the base year when the base year is changed annually. For these reasons, the discussion below selects only the treatment of using the average of the previous year as the base. The change of base year every five or ten years is similar in method to the annually changed base year.

4.4.1 Seasonally adjusted data

The chain industrial production index can have the base period changed every month but it would be difficult to link and benchmark it with quarterly accounts and annual accounts. The benchmarking of quarterly data to annual data when the base period is different (quarter versus annual average) poses similar problem.

A simple way is to use the annual average prices of the previous year as the base. In the following example, quarterly quantity index of Laspeyres is shown. Quantity

index is calculated as the value of production at the current quarter in average last year prices divided by the average quarter value of previous year. The average quarter value of the previous year is the annual total divided by 4. Similarly, the average annual price is a simple average of unit price in four quarters. Data for the following year will be prepared in a same manner. Since the indexes of the following year use the annual average index as the base, when chaining indexes to previous year, the new indexes are simply multiplied with the annual average index (see the second part of the last column in the example).

Quarterly index using the average of previous year as the base
Laspeyres-type volume index

	Average price	Quantity	Value at current prices	Value at average prices of 1990	Production Index calculation	Production index (1990=100) and chaining of index
1990 =100	**4**	**200**	**800**	**800**	**100**	**100**
Year 1991						
Q1	4	50	200	200	200/(800/4)*100	**100**
Q2	5	55	275	220	220/(800/4)*100	**110**
Q3	5	55	275	220	220/(800/4)*100	**110**
Q4	4	60	240	240	240/(800/4)*100	**120**
Year 1991	**4.5**	**220**	**990**	**880**	(880/800)*100	**110**
	Average price	Quantity	Value at current prices	Value at average prices of 1991	**1991=100**	
1991 =100	**4.5**	**220**	**990**	**990**	**100**	
Year 1992						
Q1	5	62	310	279	112.7	**124** (=112.7*1.10)
Q2	5.1	60	306	270	109.1	**120** (=109.1*1.10)
Q3	5	65	325	292.5	118.2	**130** (=118.2*1.10)
Q4	5.2	67	348.4	301.5	121.8	**134** (=121.8*1.10)
Year 1992	**5.076**	**254**	**1289.4**	**1143**	(1143/990)*100= 115.4	127 (=115.4*1.10)

4.4.2 Chaining when quarterly data have not been seasonally adjusted

The aim is chain linking to the same quarter in the previous year while the average prices of the previous year still serve as the base year prices. The procedure is as follows:

1) Quarterly data of the two years to be compared are both calculated at the annual average prices of the previous year. The procedure for calculating values at the annual average prices is the same as in 4.4.1.
2) Quarterly indexes to the previous year are calculated by dividing a quarter value of the year to the value of the same quarter in the previous year, which are measured at the same annual average prices.

3) The chaining of indexes to the first year in the series are calculated as before. The indexes obtained above are then chained to the series of the first year (year 1991 in this example): quarter by quarter of the same kind.
4) The procedure is repeated for the following year. First calculate the indexes of changes to the previous year then link it to the chain index.

Chain a quarter t to quarter t-4: Seasonally unadjusted quarterly data.

	Value at average 1991 prices	Change with regard to t-4	Value at average 1992 prices	Change with regard to t-4	Linking chain index
Year 1991					
Q1	225				100
Q2	247.5				110
Q3	247.5				110
Q4	270				120
Year 1992					
Q1	279	124	314.7		124 (=124*1.0)
Q2	270	109.1	304.6		120 (=109.1*1.1)
Q3	292.5	118.2	330.0		130 (118.2*1.1)
Q4	301.5	111.7	340.1		134.0 (=111.7*1.2)
Year 1993					
Q1			320	101.7	126.1 (=101.7*1.24)
Q2			310	101.8	122.1 (=101.8*1.20)
Q3			360	109.1	141.8 (=1.09.1*1.30)
Q4			380	111.7	149.7 (=117.7*1.34)

4.5 Policy of revision

Revision should become a normal activity of a statistical office as quarterly accounts and industrial production indexes have to rely on incomplete or approximate statistics to estimate quarterly data and quarterly annual accounts in order to provide policy makers and analysts timely information on the economy. The quarterly accounts may rely on data on three months only and even less, thus trend extrapolation is the norm. It is therefore utterly important that quarterly data and accounts be revised in order to take into account more reliable information when they become available. Users may mistakenly regard revision and especially large revision as a sign of unreliability of the methods used in statistics in general and in national accounting in particular, or as a sign of mistakes made by compilers. Users are normally not informed about the nature of the basic quarterly data, which could be either incomplete, approximate or guestimates and when collected by sampling, the sample is small and therefore the quarterly data cannot be as comprehensive as annual data. Timely quarterly accounts need timely quarterly data, which is another reason for the deficiency in data quality. The improvement of quarterly accounts requires the improvement of quarterly data collection. But there is a limit to the improvement of data collection, which is affected by financial resources and the speed in data processing. Even with better data collection, data from many sources such as government expenditures come in only after a long

delay. Thus revision is needed when more reliable data become available. Some statistical offices may be disinclined to implement revision for fear of being criticized. It is thus important that a statistical office educates users on its revision policy and the reasons why quarterly and even annual accounts should be revised.

APPENDIXES

TABLE A1
ECONOMIC PERFFORMANCE INDICATORS

Indicators	*Interpretation*
Group 1: General economic level and performance	
▪ GDP per capita	▪ The level of economic development in comparison to other countries
▪ GDP rate of growth	▪ The performance of the economy
Group 2: Labor productivity and labor cost	
▪ Gross value added per worker per work hour (manufacturing)	▪ Labor productivity
▪ Compensation of employees per work hour	▪ Labor cost
Group 3: Income distribution	
▪ Compensation of employees / gross value added	▪ Income share of employees in GDP
▪ Operating surplus / gross value added	▪ Income share of capital in GDP
Group 4: Investment	
▪ Gross fixed capital formation/ GDP	▪ Share of investment in capital goods in GDP
▪ Gross produced fixed assets / GDP (capital – GDP ratio)	▪ Ratio used in estimating produced capital goods requirement for a given rate of growth in GDP.
▪ Gross fixed capital formation / Change in GDP	▪ An approximation of capital/GDP ratio above (applicable only for the years with stable positive growth, commonly called ICOR)
▪ Gross fixed assets/ output by types of industries	▪ Capital – output ratios necessary for industry development planning
Group 5: Saving	
▪ Saving / GDP	▪ Saving rate of the nation
▪ Saving / Gross fixed capital formation	▪ Domestic funding of investment
▪ Saving of an institutional sector / Total saving	▪ Contribution of each sector to total saving
▪ Saving of households / Disposable income of HH	▪ Saving rate of households
Group 6: Performance of government	
▪ Government deficit / GDP	▪ Government deficit rate
▪ Revenue / Expense (excluding payment on principal or incurrence of debt)	▪ If less than 1, government policy on budgeting needs to be seriously reviewed as recurrent revenue does not cover recurrent expense
▪ Fixed capital formation / total expenditure	▪ Share of investment in capital goods over total expenditure
▪ Interest p ayment / total expenditure	▪ Indicator of pressure of debt payment on government expenditure
▪ Taxes / GDP	▪ Government effort or tax burden
▪ Corporate taxes / Corporate primary income balance	▪ Government effort or tax burden on corporations (right, fair, too high)
▪ Individual income taxes / Gross national income of household	▪ Government factor on households (right, fair, too high)

TABLE 1.1 (CONTINUED)
ECONOMIC PERFORMANCE INDICATORS

Indicators	*Interpretation*
Group 7: Banking performance	
▪ Non-performing loan ratio (defined as loan nonpayment beyond 3 months)	▪ Possibility of default
▪ Liabilities / assets	▪ Banks' bill of health (ratio in developed countries is lower than 1)
Group 8: Foreign trade performance	
▪ Imports / GDP, import rate of growth	▪ Import reliance, growth factor
▪ Exports / GDP, export rate of growth	▪ Export effort
▪ (Exports + imports) / GDP	▪ Degree of openness of the economy
▪ (Exports less imports) / GDP	▪ Export / import gap
Group 9: Balance of payment	
▪ Current external account deficit / GDP	▪ Ability to service imports and current rate of economic growth (warning signal if over 3%)
▪ (Exports less imports) / GDP	▪ Same as above
▪ Debt payment (interest + principal) / export	▪ Ability to service foreign debt (expected to be lower than 30%)
Group 10: Foreign exchange reserve	▪ Ability to finance imports and prevent foreign exchange crisis
Group 11: Prices	
▪ Producer price index, consumer price index, import price index and export price index	
▪ Interest rate	
▪ Foreign exchange rates	
▪ Stock exchange price index	
▪ Wage rate index	

TABLE A2
FOREIGN EXCHANGE RESERVE

Foreign exchange reserve (stock):	**Total current liabilities denominated in foreign currencies forecasted for the short term**
Foreign exchange assets (over non-residents) Foreign currency Deposits denominated in foreign currencies Securities issued by non-residents (readily marketable) Monetary gold SDRs Reserve position in the IMF Other claims (liquid current assets only) Financial derivatives (claims in foreign currencies on nonresidents)	Foreign exchange liabilities (to non-residents) National currency held by nonresidents Deposits Securities (readily marketable) Debt payment Net imports Trade credits payable Other payables Financial derivatives Forward instrument (binding contract to sell foreign currencies at specified date for specified price)

- **International reserves** consists of external assets that are readily available and effectively controlled by the central bank or the central government for direct financing of payment imbalances to affect exchange rates and to adjust inflows and outflows of foreign exchange. They include only actual assets. Contingent credit lines and undrawn swap facilities are excluded. They would not include foreign-currency denominated claims on residents. It is normally expected that the international reserves meet at least three months of imports.

- **Total current liabilities denominated in foreign currencies forecasted in the short term**: The forecasted value of this total liability indicates the demand of foreign currencies in a given accounting period, for example a quarter. This information would have to match with the supply of foreign currencies indicated by the international reserve plus other expected receipts of foreign currencies such as current transfers and borrowing from abroad. Demand greater than supply indicates the possibility of foreign exchange crisis, which requires quick and effective policy adjustment.

TABLE A3
CYCLICAL ECONOMIC INDICATORS

	Leading indicators	**Coincident indicators**	**Lagging indicators**
Employment and unemployment	▪ Average workweek in manufacturing or overtime ▪ Initial claims for unemployment insurance inverted* ▪ Job vacancies	▪ Non-farm employment, ▪ Unemployment inverted*	▪ Long-term unemployment, inverted* ▪ Average duration of unemployment
Production and income	▪ Capacity utilization rate	▪ GDP (Q) ▪ Industrial production ▪ Personal income	
Consumption and trade	▪ New orders of consumer goods and materials ▪ Consumer expectation index	▪ Manufacturing and trade sales	▪ Unfilled orders in manufacturing
Fixed capital formation	▪ Formation of business ▪ Contracts and new orders of capital goods ▪ Building starts, building permits ▪ New order of durable consumer goods	▪ Gross private capital formation (Q) ▪ Production of producers' durable equipment (Q)	▪ Machinery and equipment sales ▪ Business construction expenditures
Inventories	▪ Change in business inventories (Q) ▪ Change in manufacturing and trade inventories		▪ Manufacturing and trade inventories to sales
Prices, cost and profits	▪ Industrial materials price index ▪ Stock price index ▪ Corporate profits after taxes (Q) ▪ Ratio of price to unit labour cost, non-farm		▪ Unit labour cost, % change ▪ Consumer price index for services, % change
Money and credit	▪ Change in deflated money M2 ▪ Net changes in business loans ▪ Change in consumer credit ▪ Interest rate spread (long less short	▪ Velocity of money	▪ Commercial and industrial loans outstanding ▪ Ratio consumer credit outstanding to personal income ▪ Average interest rate charged by banks
Exports and imports	▪ ?	▪ ?	▪ ?

*Inverted means that the statistics is divided by 1.

TABLE A4
PERFORMANCE OF LEADING INDICATORS

	BUSINESS CYCLES				GROWTH CYCLES	
	Turning points		Peaks	Troughs	Turning points	
	Covered	Missed	Mean (months)	Mean (months)	Covered	Missed
U.S.	16	0	12.0	3.8	22	4
Canada	12	0	7.0	4.5	24	4
UK	10	2	10.8	13.4	14	8
France	11	3	8.5	1.5	18	2
South Korea	5	0	4.7	5.5	11	8
Taiwan	8	0	9.0	2.0	12	2
Thailand	4	7	4.5	6.5	4	9
Malaysia	4	1	10.0	0.5	8	11

Source: Handbook of National Accounting: Use of Macro Accounts in Policy Analysis, Draft, United Nations Statistics Division, 2000.

TABLE A5
OVERVIEW OF VALUE, VOLUME AND PRICE INDICATORS COMMONLY USED IN QUARTERLY PRODUCTION ACCOUNTS

	Current value	**Quantity indicators for volume**	**Price indexes**	**Other indicators for extrapolation**
Agriculture	Survey	Harvest (yield x areas)	X	
Fishing	Survey	Catch (yield x employment)	X	Fish landing (value and size of catch)
Forestry	Survey	Harvest (yield x exploitable areas)	X	
Mining	Survey	Industrial production index	X	
Manufacturing	Survey	Industrial production index	X	Input indicators like electric power used
Utilities	Administrative record	Industrial production index	X	Physical quantities
Construction	Survey	Sample of approved permits, estimated work done	X	Input indicators like supply of construction materials; number of production workers or work hours; budget data for public work
Wholesale and retail trade	Survey		Cost index	Employment, VAT taxes statistics
Restaurant and hotels	Survey		X	Employment, number of tourists; number of rooms occupied
Financial intermediaries	Administrative records; survey		X	Value of loans and deposits; stock market volume traded; issues of stocks and bonds; employment
Real estate, business services	Survey		X	Employment
Transport and storage Communications	Administrative records Administrative records	Volume of goods and passengers transported Volume of mails sent or phones made	X X	Gasoline used; number of workers
Ownership of dwellings			X	Number of dwelling units by types
Public administration	Administrative records		Cost index	Employment; wages and salaries
Defense	Administrative records		Cost index	Wage and salaries
Education	Administrative records		Cost index	Number of students, full time equivalent enrollment
Law and legal services				Number of clients, employment
Health	Administrative records; survey		X	Number of patients, number of visits
Research	Survey		Cost index	Number of publications, number of patents, employment
Performing arts	Survey		X	Number of attendees
Museums	Survey		X	Number of visitors

	Current value	Quantity indicators for volume	Price indexes	Other indicators for extrapolation
Libraries	Survey		X	Number of visitors, number of volumes
Newspapers	Survey		X	Number of circulation
Books	Survey		X	Number of copies
Sport clubs	Survey		X	Number of members
Community and social services	Survey		X	Employment
Personal services	Survey		Wage index	Employment
Net taxes on products				Apply base year tax ratios (tax/value added) by relevant activities

TABLE A6
VALUE, VOLUME AND PRICE INDEXES FOR HOUSEHOLD FINAL EXPENDITURES

	Current value, volume (survey)	**Price indexes**	**Other indicators for extrapolation**
Final consumption expenditure of households	Retail sale survey; household survey; commodity flow technique	Same as production	Residual to the identity GDP = FC of households + FC consumption of government + gross capital formation + exports - imports
Final consumption expenditure of government	From production account of government		
Fixed capital formation	Business surveys	Same as production	Commodity flow method utilizing value of construction, production of equipments, exports and imports of equipment adjusted for transaction costs
Changes in inventories	Business surveys; Administrative data on government stocks; commodity flow approach for agriculture products and forestry; unsold housing units	Same as production	Trend extrapolation (as a percentage of output)
Exports and imports	Trade statistics		