Quarterly Growth Rates

by
Neo Poh Cheem
Economic Accounts Division
Singapore Department of Statistics

Introduction

Short-term macro-economic indicators, in particular real (or constant price) GDP estimates are crucial to the monitoring and tracking of current economic developments. Quarterly changes or growth rates[1] very often provide the initial basis of any assessment of trends, growth momentum and anticipation of turning points.

The comparison or presentation of quarterly changes are inherently more difficult than that for annual changes for the following two reasons. First, the four quarters within one and the same year have different numbers of working days, and are affected by regular and seasonal effects on production and expenditure. Second, the same quarters in different years may also differ, eg in the number of working days.

Three Methods

Three methods are used by national statistical agencies to calculate and present quarterly growth rates. These are as follows :

(a) measuring the change compared with the corresponding quarter in the previous year;

(b) measuring the change since the previous quarter; and

(c) extrapolating the growth since the previous quarter to an annual growth rate.

---

1 While the focus of this paper is on quarterly growth rates, the discussion and arguments apply equally to other sub-annual growth rates, in particular monthly growth rates.

A   Year-on-Year Growth Rate

This method calculates quarterly growth rates as the percentage change in real GDP from the corresponding quarter in the previous year. It yields the y-o-y (year-on-year) or nsa (non-seasonally adjusted) growth rate and is used in most European and Asian countries, including Singapore.

The merits of this method are its ease of comparison with annual growth rates and its implicit seasonal adjustment. For example, the seasonally higher 4th quarter (which includes the Christmas and year-end festive period) is compared with the 4th quarter of the previous year. Thus, y-o-y growth rates display an underlying trend but remains sensitive to irregular effects and deviations from expected seasonal behaviour.

Y-o-y growth rates do have some disadvantages. First, no correction is made for differences in the number of working days arising from leap year or moving holidays such as Hari Raya. More working days could, for example, result in a higher growth rate even when the underlying trend is declining.

Second, the sensitivity to irregular effects could result in an inappropriate interpretation in a subsequent year. For example, if economic activity declines sharply in a particular quarter because of an unexpected shock, a 'normal' quarter in the subsequent year will show an exceptionally strong growth. This is often referred to as a base effect.

To illustrate the base effect, consider Chart 1 which shows the growth rates in the real value-added of hotels and restaurants from 1990 to 1992. Because of the Gulf War, tourist arrivals declined sharply resulting in a decline of 5.3 per cent in the real value-added of hotels and restaurants in 1Q91. Hotels and restaurants grew strongly by 16.4 per cent in 1Q92 when the underlying trend returned to normal.

Third, y-o-y growth rates are slower in identifying turning points. Chart 2, for example, shows that real GDP contracted sharply by 6.1 per cent in 4Q01 on a y-o-y basis. Growth momentum, however, has already improved, as reflected in the positive q-o-q (quarter-on-quarter) change in the seasonally adjusted real GDP in 4Q01.

B   Quarter-on-Quarter Growth Rate

A second method is to compare the change in real GDP with the preceding quarter. This method provides q-o-q growth rates. Since q-o-q growth rates are meaningful only if the data are seasonally adjusted, this method can be used only for seasonally adjusted data. The q-o-q growth rates are therefore also referred to as sa (seasonally adjusted) growth rates. Most European countries compute and present the q-o-q growth rates as supplementary information to the y-o-y growth rates.

CHART 1   HOTELS AND RESTAURANTS REAL VALUE ADDED
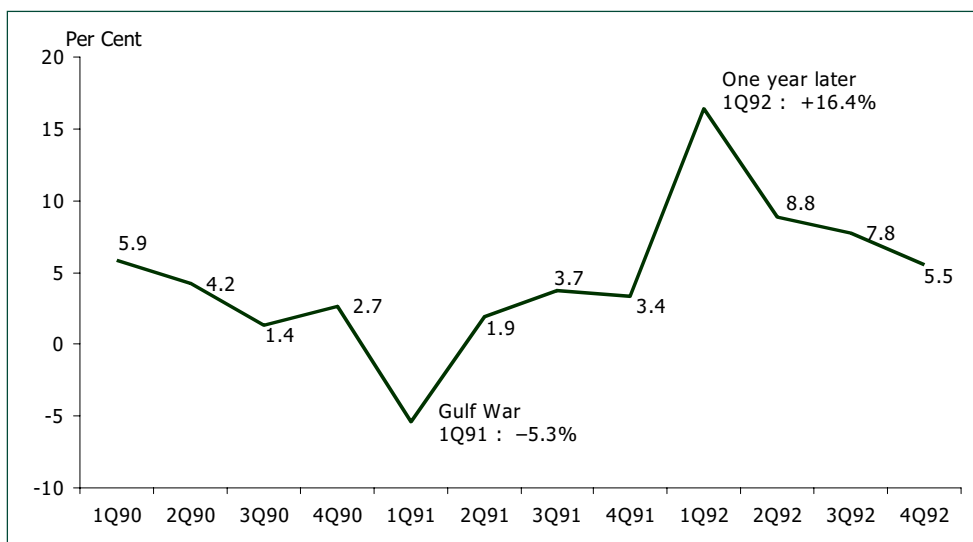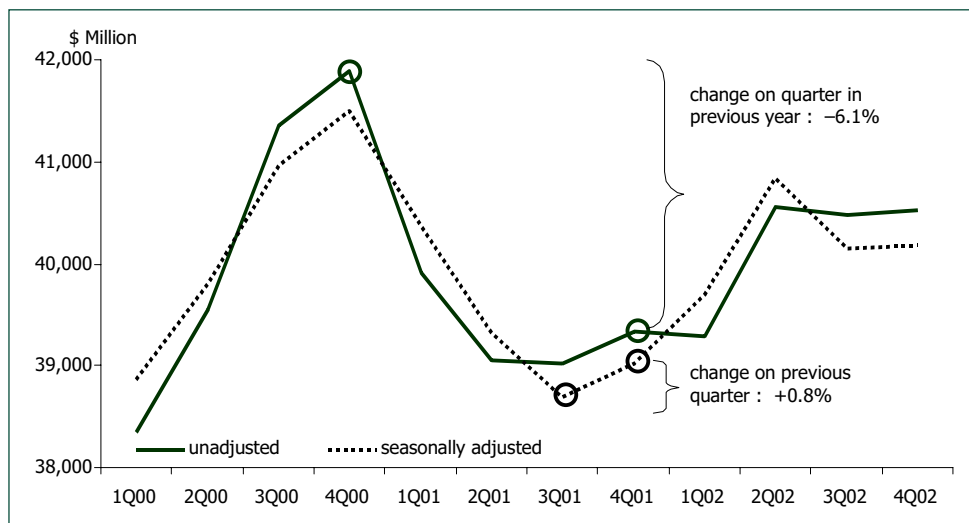(Year-on-Year Growth Rate)

CHART 2   REAL GDP
(At 1995 Market Prices)

The main advantage of this method is that it is relatively quick in the identification of turning points. Chart 2 shows, for example, that real GDP expanded by 0.8 per cent on a q-o-q basis in 4Q01 even though on a y-o-y basis, real GDP growth has remained negative.

C   Annualised Q-o-Q Growth Rate

One major disadvantage of the q-o-q growth rates is that they are of a different order of magnitude from the annual rate. To correct this, the q-o-q growth rates are annualised using the following formula :

$$a = (1 + r)^4 - 1$$

where

a = annualised quarter-on-quarter growth rate

r = original quarter-on-quarter growth rate

The annualised rate, which is referred to as saar (seasonally adjusted annualised rate), basically extrapolates the q-o-q growth rate on the assumption that the economy will grow at that rate over a one-year period. The saar therefore has the same properties as q-o-q or sa growth rate but with the further advantage that it is of the same order of magnitude as an annual growth or y-o-y growth rate.

This method is used by, among others, the US and Japan. Singapore has, since 3Q 1986, compiled and disseminated the saar as supplementary information to the y-o-y growth rate. The q-o-q growth of 0.8 per cent in Singapore's 4Q01 real GDP translates to an expansion of 3.4 per cent on a saar basis.

Which Method?

The decision on which of the three methods to use depends on the purpose for which the quarterly growth rates are intended. The primary measure adopted by different countries is shown in Table 1. Several countries, including Singapore, which adopt the year-on-year growth rate as the primary measure, also compile and disseminate supplementary quarterly growth rates.

TABLE 1   INTERNATIONAL PRACTICE

Primary Measures

Year-on-Year Growth Rates	Supplemented by Quarter-on-Quarter Growth Rates?
Germany	Yes
Hong Kong, China	Yes
Netherlands	Yes
Philippines	Yes
Singapore[1]	Yes
Switzerland	Yes
Thailand	Yes
Indonesia	No
Korea	No
Malaysia	No

Quarter-on-Quarter Growth Rates	Supplemented by Year-on-Year Growth Rates?
Canada	Yes
Japan[2]	Yes
United Kingdom	Yes
Australia[3]	No
United States[1]	No

Source :   Web-sites of national statistical offices and IMF

1   Quarter-on-quarter growth rates are annualised.
2   Both sa growth rate and saar are published.
3   Supplemented by trend component.

The consensus among economic statisticians is that the y-o-y growth rate is most appropriate for international comparison as it is objective and transparent. The need for seasonal adjustment makes the q-o-q growth rate and saar less comparable because the resulting series are dependent on the seasonal adjustment procedures adopted and the extent of seasonal adjustment applied. Without supplementary information, it would be unclear whether the seasonally adjusted data had, for example, adjusted for differences in the number of working days arising from "moving holidays".

A further reason for the preference of the y-o-y growth rate is that it is subject to smaller revisions than q-o-q growth rate and saar. Since estimates of seasonal factors could change significantly with additional data points, the seasonally adjusted series could be revised with the receipt of new data even when the underlying historical data are unchanged.

Generally, when the economy is on a steady growth path, the y-o-y growth rate would suffice and little attention is paid to q-o-q growth rate and saar. Reflecting the vagaries of an uncertain external environment, q-o-q growth rate and saar could be highly volatile, showing large swings which may hinder analysis solely focused on sequential growth rates. Notwithstanding the higher volatility, as q-o-q growth rate and saar identify or anticipate turning points earlier, they become more relevant and should receive greater attention when the economy is at or close to a turning point.

Conclusion

Three methods are available for the computation and presentation of quarterly growth rates or quarterly changes. The year-on-year method is the most widely used and the best for international comparison.

However, as y-o-y growth rates have the disadvantage of being slower in the identification of turning points, seasonally adjusted quarter-on-quarter growth rates (or its annualised equivalent) could be considered to be more appropriate when the economy is at or close to a turning point. Some countries, eg US, Japan and Canada, adopt q-o-q growth rates as their primary measures of quarterly changes.

Singapore, while adopting the y-o-y growth rate as the primary measure, compiles and presents supplementary information on the annualised equivalent of the q-o-q growth rate, ie the saar.

2002 in Brief

Singapore's population
...   reached a total size of 4.16 million in June 2002.

Average life expectancy at birth
...   was 77 years for males and 81 years for females.

Literacy rate
...   was 96.9 per cent among males and 90.6 per cent among females.

Home ownership rate
...   was 93.6 per cent.

Labour force participation rate
...   was 77.2 per cent among males and 53.4 per cent among females.

Per capita Gross National Income
...   was S$36,909.

Official foreign reserves
...   increased to S$143 billion.

Mobile phone subscribers
...   reached 779 per 1,000 population.

Internet dial-up subscribers
...   was 592 per 1,000 population.

Crime rate
...   was 768 per 100,000 population.

Change in 2002
(Year-on-Year)

Unit Labour Cost Index
...   was 4.2 per cent lower.

Consumer Price Index
...   declined by 0.4 per cent.

Domestic Supply Price Index
...   fell by 1.5 per cent.

Retail Sales Index
...   was 2.5 per cent lower.

Catering Trade Index
...   was 5.4 per cent lower.

Domestic Wholesale Trade Index
...   rose by 3.1 per cent.

Foreign Wholesale Trade Index
...   declined by 3.4 per cent.

Business Receipts Index
...   fell by 0.8 per cent.

Industrial Production Index
...   rose by 8.3 per cent.