Session 5.6
Seasonal Adjustment and Estimation of Trend Cycles

Background

* Quarterly national accounts (QNA) are an important extension of the annual national accounts (ANA)
  * the QNA may not be as comprehensive as the ANA but they follow the conceptual framework provided by the System of National Accounts, 2008 (i.e. the “2008 SNA”) in exactly the same way as the ANA

* One important difference between the QNA and the ANA is that the QNA are usually not as detailed as the ANA
  * the difference could be the amount of detail available within one or more of the accounts or it may relate to not being able to produce a particular account at all because of incomplete data sets
**Some basic principles**

* To the extent possible, the methods used in the QNA should be identical to those used in the ANA
  * if this is not feasible then the aim should be to make them as consistent as possible
* The QNA must be “data driven” and not simply be based on econometric projections of the ANA
  * it may be necessary to fill minor gaps using econometric methods but this should be strictly monitored and steps taken to fill data gaps as soon as practicable
* The QNA must be consistent with the ANA which means that a benchmarking process is required
  * simply pro rating quarterly series to annual series is rarely a satisfactory method

**Some basic principles (continued)**

* It is necessary to establish a process and timetable for revising the QNA and communicate the timetable to users
  * the most common source of revisions will be more up-to-date data becoming available (whether annual or quarterly)
  * rebenchmarking the QNA to the ANA as the annual accounts extend to another year will also result in revisions
* Seasonal adjustment is a critical part of gaining users’ acceptance of the QNA as a useful source of information on the economy
  * publishing both seasonally adjusted and trend data will assist users in analysing the accounts
Some basic principles (continued)

* Producing a consistent time series of national accounts data is critically important for economic analysts
  * discontinuities can be introduced into the accounts if new data are simply substituted for old data in the single reference period relating to the new data
  * it is necessary to adjust the data in other periods to ensure that they are consistent with the new data
* The time series QNA covers quarters and years
  * it is not useful to estimate cumulative (i.e. “year-to-date”) data as a means of removing seasonal influences
* The QNA should be seasonally adjusted using a recognised seasonal adjustment program, such as X-12
  * trend estimates can be useful and are available from X-12

Seasonal adjustment

* A time series is a sequence of data items observed in a number of successive periods (years, quarters, months) through time
  * time series are important because they both measure economic activity over time and identify turning points in that activity
* A time series can be broken down into three basic components
  * seasonal, which is the variation around the trend attributable to factors that occur systematically each year (once or more often)
  * trend, which measures the underlying, long-term behaviour of the original series
  * irregular, which is what remains after the original series has the effects of the trend and seasonal influences removed from it
* The basic additive model is \( O = S + T + I + e \) (\( e \) is the error term)
  * a multiplicative model is commonly used
    \[ \log O = \log S + \log T + \log I + \log e \]
Seasonal adjustment (continued)

* In seasonally adjusting a quarterly time series, several potential influences need to be taken into account:
  * calendar-related seasonal events
  * trading day influences
  * effects of holidays whose timing moves from year to year
  * irregular influences
  * Removing the effects of the calendar-related seasonal events, and the influences of trading days and moveable holidays leaves a combination of the trend and irregular in the time series
  * It is possible to estimate the irregular and also remove it from the time series to provide a measure of the underlying trend

Calendar-related seasonality

* The calendar-related seasonal effect is reasonably stable in terms of annual timing, direction, and magnitude
* Possible causes are weather (such as the effects of summer or winter), administrative (the timing of tax receipts), social customs that have the same timing each year, and other effects that are stable in annual timing (such as public holidays that are always celebrated on the same date)
* Weather conditions that are abnormal, such as snow in the summer, would not be considered to be a seasonal influence
  * snow in summer would be classified as an irregular event and so would remain in the seasonally adjusted series
Trading-day influences

* Trading-day influences are the impact on a time series of having different numbers of working days in a quarter
* The simplest aspect is that the first quarter of a year has 90 days (91 in leap years), the second quarter has 91 days, while the third and fourth quarters both have 92 days
* Trading-day influences can be sufficiently large that they distort the apparent seasonality in a series, which means it is impossible to seasonally adjust the series with any precision
* A “prior adjustment” is made to an original series to remove the effects of different numbers of trading days before a series is analysed for seasonal effects

Effects of moveable holidays

* Moveable holidays and festivals occur each year but their timing can change from one to the next
* Some moveable holidays, such as Chinese New Year, are important when seasonally adjusting monthly time series but do not affect quarterly series because they always fall into the same quarter
* Chinese New Year varies between January and February but is always in the first quarter
* Examples of moveable festivals that affect quarterly series are Easter, Ramadan and Yom Kippur
* The effects of changing from one quarter to another have to be estimated using statistical techniques
* The reliability of such assessments depend on the number of observations that are available for a particular occurrence
Irregular component

* The irregular is obtained by removing the trend and seasonal influences from an original series
* An irregular is random and can be large
  * a very large irregular is referred to as an outlier
  * in some cases it is possible to identify the reason for an outlier, such as a strike or a change in administrative arrangements affecting the timing of receipts or payments by government
  * in other cases, statistical techniques can be used to identify outliers, such as those observations more than 2 standard deviations from the mean

Household final consumption expenditure ($m)
REFERENCES

* Eurostat: Handbook on Quarterly National Accounts
* IMF: Quarterly National Accounts Manual – Concepts, Data Sources, and Compilation
* OECD: Quarterly national accounts: Sources and methods used by OECD member countries
* Statistics Canada: Seasonal Adjustment and Identifying Economic Trends
* United States Bureau of the Census: A large number of papers on seasonal adjustment are available on the website under the heading Seasonal Adjustment Papers Listed by Year