Data and metadata requirements for building a real-time database to perform revisions analysis

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Contribution to the OECD/Eurostat Task Force on
"Performing Revisions Analysis for Sub-Annual Economic Statistics"

1 Introduction

Many macroeconomic variables published at sub-annual frequency are revised back in time whenever new data are released or when substantial increases of the information set on which they are built up become available. Undertaking revisions analysis[2] allows both users and producers of these statistics the opportunity to study the magnitude and direction of revisions. This is an important element for understanding the quality of the published statistics and for interpreting the figures when analysing the current state of the economy.

The purpose of this document is to present guidelines on the data and metadata requirements for building a real-time database for the purpose of performing revisions analysis, which is seen as a key requirement for National Statistical Offices as part of a comprehensive revisions policy[3].

2 Defining revisions, vintage, and a real-time database[4]

Revisions

Revisions can be broadly defined as a change in value for any reference point of the time series for a statistic when released to the public by an official national or supranational statistical agency. Revisions can occur either when new observations (e.g. one additional month or quarter) become available and some past values are modified, or when the current and (possibly) some past values are modified in an updated release of the current time series.

Vintage

For a given time series we define vintage as the set of data (sequence of values) that represented the latest estimate for each reference point in the time series at a particular moment in time.

[1] Co-authored by Richard McKenzie and Michela Gamba of the OECD.
[2] For a more detailed discussion on the topic of revision analysis see DiFonzo (2005).
[3] For guidelines on good practice for establishing a revisions policy, see Mazzi & Ruggeri-Cannata (2008)
[4] The following definitions are consistent with those defined in Mazzi & Ruggeri-Cannata (2008)

Real time database

A real-time database is a collection of historical vintages of the same time series, catalogued and indexed by the date on which each vintage became available to the public. As such, the revision to a given reference point for a time series can be identified in a real-time database as the change in value from an earlier vintage of estimates to a later vintage.

Form of a real-time database

A real-time database is defined as a two dimensional array, with vintage identified in the rows and reference points for the time series as the columns. If the publication schedule of the producer has the same frequency as the periodicity of the indicator (e.g. monthly), then the real-time database will have the appearance of a symmetric triangle as shown in Figure 1 below. However, the symmetric triangle form is only one special case for the appearance of a real-time database, as successive vintages of a time series may be released in between additional points being added. For example, this is often the case for many countries in the release of Gross Domestic Product. In such cases, the real-time database will have the appearance of a stepped triangle[5], as illustrated in Figure 2.

Figure 1: Extract of real-time database for United Kingdom Retail Trade Volume

Ref. points	Mar-2007	Apr-2007	May-2007	Jun-2007	Jul-2007	Aug-2007	Sep-2007	Oct-2007	Nov-2007	Dec-2007
Vintage										
May 2007	134	..	..	..	..	..	..	..	..	..
June 2007	134.3	134.2	..	..	..	..	..	..	..	..
July 2007	134.3	134.2	134.8	..	..	..	..	..	..	..
August 2007	134.3	134.2	134.8	135	..	..	..	..	..	..
September 2007	134.3	134.3	134.9	135.4	136.4	..	..	..	..	..
October 2007	134.3	134.3	135	135.5	136.4	137.3	..	..	..	..
November 2007	134.2	134.1	134.8	135.3	136.2	137.1	137.9	..	..	..
December 2007	134.2	134.1	134.8	135.3	136.2	137.1	137.5	137.4	..	..
January 2008	133.9	134	134.4	135.1	135.9	136.6	137.1	137.1	137.7	..
February 2008	134	134.1	134.5	135.2	135.8	136.5	137.1	136.9	137.5	136.9

[5] A real-time database may also contain steps for other reasons, for example if the publication of an indicator is suspended pending methodological changes or the regular publication pattern is interrupted for some other reason.

Figure 2: Extract of real-time database for United States Gross Domestic Product

Ref. points	Q1-2006	Q2-2006	Q3-2006	Q4-2006	Q1-2007	Q2-2007	Q3-2007	Q4-2007
Vintage								
October 2006	1.13164E+13	1.1388E+13	..	..	..	..	..	..
November 2006	1.13164E+13	1.1388E+13	1.1433E+13	..	..	..	..	..
December 2006	1.13164E+13	1.1388E+13	1.1451E+13	..	..	..	..	..
January 2007	1.13164E+13	1.1388E+13	1.1444E+13	..	..	..	..	..
February 2007	1.13164E+13	1.1388E+13	1.1444E+13	1.1542E+13	..	..	..	..
March 2007	1.13164E+13	1.1388E+13	1.1444E+13	1.1507E+13	..	..	..	..
April 2007	1.13164E+13	1.1388E+13	1.1444E+13	1.1513E+13	..	..	..	..
May 2007	1.13164E+13	1.1388E+13	1.1444E+13	1.1513E+13	1.1549E+13	..	..	..
June 2007	1.13164E+13	1.1388E+13	1.1444E+13	1.1513E+13	1.1532E+13	..	..	..
July 2007	1.13164E+13	1.1388E+13	1.1444E+13	1.1513E+13	1.1533E+13	..	..	..
August 2007	1.12387E+13	1.1307E+13	1.1337E+13	1.1396E+13	1.1413E+13	1.1508E+13	..	..
September 2007	1.12387E+13	1.1307E+13	1.1337E+13	1.1396E+13	1.1413E+13	1.1524E+13	..	..
October 2007	1.12387E+13	1.1307E+13	1.1337E+13	1.1396E+13	1.1413E+13	1.152E+13	..	..
November 2007	1.12387E+13	1.1307E+13	1.1337E+13	1.1396E+13	1.1413E+13	1.152E+13	1.1631E+13	..
December 2007	1.12387E+13	1.1307E+13	1.1337E+13	1.1396E+13	1.1413E+13	1.152E+13	1.1659E+13	..
January 2008	1.12387E+13	1.1307E+13	1.1337E+13	1.1396E+13	1.1413E+13	1.152E+13	1.1659E+13	..
February 2008	1.12387E+13	1.1307E+13	1.1337E+13	1.1396E+13	1.1413E+13	1.152E+13	1.1659E+13	1.168E+13

3 Key elements for constructing a real-time database for the purpose of performing revisions analysis

The following eight categories have been identified in order to describe the basic data and metadata requirements for building a real-time database for the purpose of performing revisions analysis. The guidelines attempt to present the ideal requirements for building such a database, and in some cases list a minimum requirement recognising the fact that not all relevant information may exist from the past releases of official statistics in order to construct the database. The Annex then gives some examples of existing real-time databases, outlining which variables they include and how they meet the listed requirements, which serves to give the reader a practical dimension to the guidelines.

A- Country / region description

It should be clearly identified in the database the countries or regions within countries to which the variables relate, or the geographical coverage in the case of zone aggregates which may change over time (e.g. Euro area).

B- Variable description (and its evolution over time)

A full description of each variable included in the revisions database should be given, ideally with a link to the current revision policy associated with the regular official releases of time series for the variable. Of particular importance is the availability of metadata associated with each vintage of the time series, especially to signify where

changes to the compilation of the variable have occurred which may affect the revision pattern for the variable over time[6]. This information should be readily identifiable with the vintage when data for the variable is downloaded for the range of vintages required for analysis. Examples of the type of information required in metadata attached to vintages include:

- Notification of changes to the base year
- Scope changes (e.g. if small business were now included in the underlying survey)
- Definitional changes (e.g. such as those associated with the introduction of SNA93 or changes in industrial classification)
- Major methodological changes (e.g. introduction of annual chain linking, changes in imputation methodologies for missing respondents, changes in benchmarking variables)
- Major operational changes (e.g. improvements in timeliness achieved through improved survey operations).
- Changes to the revision policy (e.g. which may affect the timing and frequency of revision)

Having such metadata may allow users to abstract from such major changes, or to study revisions before and after the change which can be an important objective of revisions analysis. Having access to the revision policy for the variable may also assist the user in deciding the focus of the revision analysis study.

C- Variable measures

Defining variable measures can be sub-divided into two categories:

1. defining the unit of a variable, such as current or constant prices in level, index or growth rate form. For constant price (i.e. volume) series the base[7] year should be clearly identifiable.
2. defining the treatment of the variable, i.e. raw, seasonally adjusted or trend.

In principle, all forms of measurement for a variable[8] should be included as separate series, that is, series for raw data together with seasonally adjusted and trend series (if these are also published) for each unit of measurement.

[6] For more detail on the importance of the role of metadata when performing revisions analysis and practical application to German industrial production, see Lorenz (2008).

[7] Base year should be defined as the year for which the latest weights of the constant price series relate. If this differs from the reference year (i.e. the year where the index value has been aligned with 100 or constant price levels are equivalent to current price levels) this should also be clearly specified, otherwise it is implied to be the same as the base year.

[8] In concept, any variable can be included in a real-time database provided the required information as listed in the guidelines is available. In practice, as establishing and maintaining a real-time database can be a resource intensive exercise, focus should be given to key economic variables as assessed from a user perspective.

For constant price series, a minimum requirement can be to provide only vintages of growth rate series. This can be a compromise when metadata on historical changes to the variable such as those listed in item B above are not available, as revisions to growth rate series may be less affected by such changes. Nonetheless, it is important to have level series available where possible, as major level shifts can be an indication of changes to the variable which a researcher may wish to abstract from even where precise metadata on the cause of the change is not available.

D- Identification of vintage

Ideally, a real-time database will contain a vintage for every official release of the time series as defined in Section 2 for each variable, with metadata for the variable relating to the vintage also being available as outlined in item B. The easiest form of identification for vintage is a field providing the date of release that the vintage relates to. In the absence of perfect information on vintages, a minimum requirement could be that the real-time database contains a vintage for each update of the time series where one new data point is released. It is undesirable for successive vintages in a real-time database to contain two or more new data points as this can severely restrict the ability to perform a comprehensive revisions analysis.

E- Length of vintages

Ideally a revisions database will have vintages as far back as possible, but of course this depends on the extent to which historically released time series are still available in archives etc.

F- Length of time series (within vintages)

The full time series for the variable as available with each official release which forms the vintages should be provided. This is also an important requirement if the database is to be used for real-time data analysis[9]. A minimum requirement for revisions analysis is that the starting reference point for the time series precedes by at least one year the starting point of the vintages (i.e. if the vintages start in January 1995, then the minimum length of time series available with each vintage should be at least starting from reference point of January 1994). This is required to allow the calculation of year-on-year growth rates from the first vintage to assess for revisions analysis[10].

[9] Here real-time data analysis refers to the process of testing the performance of econometric models in real-time. That is, when an econometric model is used in practice (e.g. to forecast GDP) it will be based on the latest published time series available at that point in time. Thus keeping all historical vintages allows an economist to test what the model performance would have been in real-time in the past. For more information on real-time data analysis, see Orphanides (2001).

[10] This situation can arise where a real-time database is being constructed from historical paper publications, where full time series histories are not available.

G- Ongoing updating

The revisions database should be kept up to date through the use of a regular archiving procedure to store all new vintages as they become available. In particular, if the required metadata as described in Item B is not available for historical vintages, it is important that this is maintained for future vintages.

H- Data access

There can be many appropriate ways for storing data with the above requirements and the structure may differ depending on whether the key purpose of the database is for revision or real-time data analysis. The key issue is that data can be extracted in a form that easily lends itself to performing revisions analysis. This usually requires that a separate 'triangle' table can be produced for each variable, where the vintages (i.e. chronology of official releases) form the rows and reference points of the time series (i.e. 2000Q1, 2000Q2 etc.) form the columns[11].

[11] Such a format allows direct loading to the pre-programmed spreadsheets developed by the OECD / Eurostat taskforce on performing revisions analysis for sub-annual economic statistics.

Annex Examples of currently available real-time databases for performing revision analysis

This Annex lists a selection of freely accessible real-time databases from which revisions analysis and real-time data analysis can be performed, and provides a basic assessment of how the data and metadata available within each meets the guidelines as described in Section 2. The purpose of this Annex is to provide a practical perspective to the guidelines presented above which should aid NSOs in establishing their own real-time databases. A list of sources of real-time databases is also maintained on the OECD website at:
http://www.oecd.org/document/10/0,3343,en_2649_34257_39129226_1_1_1_1,00.html

Examples

Organisation for Economic Co-operation and Development
UK Office for National Statistics
Bureau of Economic Analysis, US department of commerce

Organisation for Economic Co-operation and Development

Overview

The OECD compiles the *Main Economic Indicators Original Release Data and Revisions Database* which is freely available at: http://stats.oecd.org/mei/default.asp?rev=1.

A-Country / region description

All OECD Member countries, the Euro area, and a number of non-OECD countries such as Brazil, China, India, South Africa and the Russian Federation are included. However, not all countries are available for all variables in the database.

B- Variable description (and its evolution over time)

The following 21 variables are included in the database:

1. GDP: Total, constant prices;
2. GDP: Private consumption expenditure, constant prices;
3. GDP: Government consumption expenditure, constant prices;
4. GDP: Gross fixed capital formation, constant prices;
5. GDP: Exports of goods and services, constant prices;
6. GDP: Imports of goods and services, constant prices
7. GDP: Total, current prices;
8. GDP: Total, implicit price deflator;
9. Index of industrial production;
10. Production in construction;
11. OECD Composite leading indicator: trend restored;

12. OECD Composite leading indicator: 6-month rate of change (annualised);
13. Retail trade volume;
14. Consumer Price Index;
15. Standardised unemployment rate;
16. Civilian employment;
17. Hourly earnings, manufacturing;
18. Monetary aggregates – broad money;
19. International trade in goods – exports;
20. International trade in goods – imports;
21. Balance of Payments – current account balance.

Additional metadata for each variable is provided interactively with the database. Basic information such as unit of measure is provided interactively for each country x variable x vintage. In addition, such metadata may also provide information to major definitional or methodological changes which occurred in conjunction with the release of specific vintages at different points in time, but this information is by no means exhaustive.

In general, the variables should equate to nationally published data but there are some circumstances where this might not be the case. A general overview of such circumstances is provided at http://www.oecd.org/dataoecd/29/28/36876629.pdf.

C- Variable measures

The database only provides one measure for each country-variable, generally in level or index form. The target measure is explained in the detailed metadata for each variable as outlined in item B. Where this target is not met by certain countries or for certain vintages, this information is also provided in the variable metadata. The main problem is that for some countries and variables, data may change from being original to seasonally adjusted (or vice versa) at some point in the vintages.

D- Identification of vintage

The vintages have been derived from historical CD-Roms of the monthly Main Economic Indicators (MEI) publication. Consequently they represent a snapshot of country data as provided to the OECD prior to approximately the 5th day of each month. For monthly series, this ensures in most cases that each successive vintage contains a new data point, thus forming a triangular revisions database. For quarterly series there will generally be a new data point every third monthly vintage, although revisions between updates of new data points may occur (e.g. in the case of GDP for several countries). There are of course exceptions (e.g. where a vintage may contain no new data point and the following vintage obtains two new data points thus distorting the triangle) due to a range of reasons which are described at: http://www.oecd.org/dataoecd/29/28/36876629.pdf . This can limit the effectiveness of this database for performing a precise revisions analysis in some cases.

E- Length of vintages

The sequence of monthly vintages starts in February 1999. However, it may start later for some country-variable combinations. In addition, vintages of Total GDP at constant prices are available back to May 1995 for eighteen countries in spreadsheet form at: http://www.oecd.org/document/21/0,2340,en_2825_495684_37047509_1_1_1_1,00.html.

F- Length of time series

The full time series available at the time of publication for each country-variable in the database is provided. This is a key requirement for the other purpose of the database as a source for real-time data analysis.

G- Ongoing updating

The database is updated every month in accordance with the MEI timetable. In general, the latest monthly vintage should appear on the database around the middle of the month.

H- Data access

Data is accessed through the OECD's corporate facility OECD.Stat A detailed user guide[12] is provided explaining how to transform the data as contained in the database (for which the presentation primarily supports extraction for real-time data analysis) to the format of a revisions triangle in Excel. In addition, pre-programmed spreadsheets[13] are also provided to compute summary statistics for the revisions analysis based on the current OECD methodology. Access to previous OECD revisions analysis studies for GDP[14], Index of Industrial Production[15] and Retail Trade Volume[16] are also provided.

12 http://www.oecd.org/dataoecd/4/15/36892430.pdf.
13 See downloadable files at http://www.oecd.org/document/17/0,2340,en_2649_34257_36873169_1_1_1_1,00.html.
14 http://www.oecd.org/document/21/0,2340,en_2825_495684_37047509_1_1_1_1,00.html
15 http://www.oecd.org/document/0/0,2340,en_2825_495649_36508672_1_1_1_1,00.html
16 http://www.oecd.org/document/7/0,2340,en_2649_34239_37088263_1_1_1_1,00.html

UK Office for National Statistics

A- Country / region description

The database is covering data for United Kingdom.

B- Variable description (and its evolution over time)

The following variables are included in the ONS revision database:

1. GDP
2. MOTOR VEHICLES PRODUCTION INQUIRY
3. INDEX OF PRODUCTION
4. UK TRADE
5. RETAIL SALES
6. INVESTMENT BY INSURANCE COMPANIES
7. BUSINESS INVESTMENT
8. INDEX OF DISTRIBUTION
9. GROSS DOMESTIC EXPENDITURE ON RESEARCH AND DEVELOPMENT
10. BALANCE OF PAYMENTS (Q)
11. OVERSEAS TRAVEL AND TOURISM
12. PRODUCTIVITY
13. INTERNET
14. PPI
15. PUBLIC SECTOR FINANCE
16. INDEX OF SERVICES

Data quality is assured by the *quality information for economic statistics* that can be found at http://www.statistics.gov.uk/about_ns/economicstatistics_qualityreports.asp

Additional metadata along with methodological issues for each variable can be found at http://www.statistics.gov.uk/about/Methodology_by_theme/revisions_policies/default.asp. At this link users can find an explanation on how revision policies are taking place in ONS for the variables considered.

ONS launched a website dedicated to *revisions to economic statistics* in April 2004. This brings together ONS work on revisions analysis, linking to articles, revisions analysis, revisions policies and key documentation from the statistics commission report.

The revisions information appears in a standard form in the background notes of each First Release, complemented with explanations of any special features if necessary. Tables containing information on the revisions since the last release ('R tables') are accompanied by summary statistics showing information on revisions made over a period of 5 years. These summary statistics are supported by spreadsheets containing the raw data, which are made available to users via the web. From December 2004 these spreadsheets have been supplemented by revisions triangles, which contain a fuller data set for each indicator, showing how the estimate has changed over time and allowing the user to produce more detailed revisions analysis themselves (see Jenkinson and George 2005). More detailed analysis of revisions to GDP was published in January's Economic

Trends (George 2005), and analysis of revisions to the Balance of Payments was published on the ONS website in May (Turner 2005). Further articles for other key series are to follow.

C- Variable measures

Depending on the type of variable, the abovementioned variables are monthly, quarterly or annual data. Measures include current prices, chained volumes[17], and seasonally adjusted versions are provided where appropriate.

D- Identification of vintage

Revisions tables show revisions since the previous published estimate to all major series contained in the release. A vintage is defined as a set of data that was the latest estimate at a particular moment in time.

GDP Preliminary Estimates are usually released around 25 days after the end of the reference quarter. The preliminary estimate for gross domestic product provides estimates of the growth in the volume of GDP on the previous quarter.

The annual GDP process effectively begins in February, when the previous year is opened for revisions to ensure that the Seasonally Adjusted (SA) and Non-Seasonally Adjusted (NSA) series are consistent. Annual data sources, for example used in benchmarking, typically take around 14 months to deliver results, and consequently there is an annual as well as quarterly revisions cycle.

UK Output, Income and Expenditure are released around 55 days after the end of the reference quarter. QNAs are released around 85 days after the end of the reference quarter.

E- Length of vintages

Vintages length for GDP ONS data starts in Q1 1992.

Revisions analysis in the ONS dates back to 1985, with articles published in Economic Trends looking at revisions to quarterly GDP. The scope was expanded to test a range of economic indicators for bias in 1992. In 2002 the ONS started publishing GDP revisions articles looking at revisions by the stage of the production process.

F- Length of time series

Length of ONS time series start in 1992.

[17] Note that GDP chained volume measures are only used since Blue Book 2003, and prior to this the estimates are that published as constant price growth rates.

G- Ongoing updating

The database is updated in conjunction with the release of data. The ONS is committed to constantly update the revision database- all the information can be found at: http://www.statistics.gov.uk/about/Methodology_by_theme/revisions_policies/default.asp.

H- Data access

Excel spreadsheets listing the revisions triangles for the variables mentioned in B are freely available online at http://www.statistics.gov.uk/about/Methodology_by_theme/revisions_policies/default.asp (bottom of the page).

Bureau of Economic Analysis, US department of commerce

A- Country / region description

The Bureau of Economic Analysis (BEA) real-time datasets are at the USA aggregate level for quarterly data and also at a state and local area level for annual data.

B- Variable description (and its evolution over time)

The following variables are currently available at the BEA website (http://www.bea.gov/histdata/):

1. National Accounts: including National Income and Product Accounts (NIPA) data (measures of GDP and personal income) and fixed asset accounts data (net stock, depreciation and fixed investment by industry and by asset type).
2. Industry Accounts: including measures for Gross domestic Product by Industry, and benchmark and annual input output tables.
3. International Accounts: including measure for the current Account balance and the full set of US International Transactions.
4. Regional Accounts: including measures for Gross Domestic Product by State, and State and Local Area Personal Income.

General metadata information regarding each variable can be found at the BEA homepage http://www.bea.gov/index.htm, whereas some metadata on vintages can be found when accessing to each subject page.

C- Variable measures

Quarterly series are seasonally adjusted, usually expressed in levels (billions of dollars).

D- Identification of vintage

1) National Accounts (NIPA, measures of GDP and personal income and Fixed Asset, net stock, depreciation and fixed investment by industry and by asset type)

These archives contain the NIPA tables that were published at the time of the previous GDP news releases, noting that the USA has three releases for each reference period of quarterly GDP that are contained in the revisions database, referred to as the 'Advance estimates'; 'Preliminary estimates'; and 'Final estimates'.

Annual revisions are released each July for the estimates of Quarterly GDP for the 3 previous years released; 3 annual-vintage estimates are labelled "first", "second" and "third" annual estimates. Information on the quarterly vintages can be derived from the table in E below.

2) Industry Accounts (GDP product by industry and Industry satellite accounts)

These archives contain industry accounts data that were published at the time of the previous Industry Accounts news releases.

GDP product by industry

These archives contain Gross-Domestic-Product (GDP)-by-Industry data that were published at the time of previous GDP-by-Industry news releases. Tables marked as "Comprehensive Revision" contain the results for the comprehensive revision of the annual industry accounts. Data for the most recent year in these tables are "advance" estimates, meaning that the estimates were prepared using a methodology developed for summary source data. Data labelled as "preliminary" estimates implies that the estimates were the first prepared using the integrated annual industry accounts methodology, or they are revised from the previous release.

Industry satellite accounts

These archives contain data for the Travel and Tourism Satellite Accounts (TTSA) that were published at the time of previous TTSA articles in the Survey of Current Business. Tables marked as "Comprehensive Revision" contain the results for the comprehensive revision of the TTSAs. Data for the most recent year in these tables contain "advance" estimates of tourism output and employment. These "advance" estimates are extrapolated from the most recent annual input-output (I-O) accounts. Data for all other years are either preliminary or revised from the previous release.

3) International accounts

These archives contain international transactions tables that were published at the time of the previous Balance of Payments news releases. Tables to be published at the time of the current Balance of Payments news release will be available here shortly after the release.

Tables contain preliminary estimates for the latest quarter and revised estimates for at least one preceding quarter. Preliminary Q1 estimates include revised quarterly estimates for several years. Preliminary Q2 and Q3 estimates include revised estimates for the previous quarter. Preliminary Q4 estimates include revised estimates for the previous three quarters for seasonally adjusted tables and for the previous quarter for tables that are not seasonally adjusted.

4) Regional Accounts

These archives contain the Regional Accounts data that were published at the time of the previous Regional Accounts data news releases. Archive data for the current Regional Accounts data release will be available here shortly after the release.

E- Length of vintages

Length of BEA vintages dates back to Q2 2002.

F- Length of time series

At the earliest, series start in 1929.

G- Ongoing updating

The updating process seems to be very timely, i.e. latest available quarter of current year. All historical data are stored in http://www.bea.gov/histdata/ under the relevant subject area.

H- Data access

Data can be accessed thru the following address http://www.bea.gov/histdata/ where previously published estimates provided by the Bureau of Economic Analysis are stored. Data are presented in zipped excel files (once a BEA Economic Account area is chosen, click on the data year and you will get directed to the zipped files).

References

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