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Documentation:

**Philadelphia Fed's Real-Time Data Set for Macroeconomists
First-, Second-, and Third-Release Values**

Last Updated: December 16, 2013

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1. Introduction

We document our computational methods for constructing time series of first-, second-, and third-release values for the macroeconomic variables in the Philadelphia Fed's real-time data set for macroeconomists (RTDSM). Researchers can use these series to construct revisions and, perhaps more importantly, measures of the reliability of early releases of the data. We also provide caveats on using the data.

In broad terms, we construct our series in the following manner:

- We begin with the raw data in RTDSM. These data are expressed in levels. (For each variable in the data set, RTDSM records the entire time-series history as that history appeared on various *vintage dates* of the past.)

- For most variables, we transform the data into period-over-period growth rates (month-over-month or quarter-over-quarter) because revisions to growth rates are often more interesting than revisions to levels. We express growth rates in annualized percentage points. For a select few variables, we do not transform the data into growth rates.

- We extract the appropriate growth-rates that represent a government statistical agency's first , second, and third releases for the observation, forming three time series that we appropriately call

  > *First***:** The time series for first-release values;

  > *Second***:** The time series for second-release values;

  > *Third***:** The time series for third-release values.

- Finally, we also provide a time series for the latest-revised historical values. These are the values of the observations as they appear today (in RTDSM's most recent vintage of data available when we made our computations). We call this variable:

    *Most_Recent***:** The time series observations as they appear today (as recorded in the most recent vintage of RTDSM).

2. Revisions

Some users of the data will want to compute times series for revisions. Let t index the observation date. Using the variables defined above, we can easily define many alternative measures of revisions (Rev) . Some examples of interest follow.

Revision From First Release to Second Release:

$$\text{Rev}_{12,t} = Second_t - First_t$$

Revision From Second Release to Third Release:

$$\text{Rev}_{23,t} = Third_t - Second_t$$

Revision From First Release to Third Release:

$$\text{Rev}_{13,t} = Third_t - First_t$$

Revision From First Release to Most Recent Release:

$$\text{Rev}_{1M,t} = Most\_Recent_t - First_t$$

3. Computational Details

Step 1. Compute Growth Rates. We begin (in most cases) by transforming the raw data in RTDSM from levels to period-over-period growth rates, expressed in annualized percentage points. Let X_t denote the period-t observation for the level of variable X . The subscript t indexes either a quarterly or monthly observation date, depending on whether the variable appears in our data set with quarterly or monthly observations. The monthly and quarterly growth-rate calculations (GX) are:

Month-over-Month Growth Rate

$$GX_t = 100.0 \left[\left(\frac{X_t}{X_{t-1}} \right)^{12} - 1 \right]$$

Quarter-over-Quarter Growth Rate

$$GX_t = 100.0 \left[\left(\frac{X_t}{X_{t-1}} \right)^{4} - 1 \right]$$

Figure 1 shows a slice of the Philadelphia Fed's real-time data set for the level of real GDP. The columns show the vintages. The rows show the observations for each vintage. Notice that the columns are named with a suffix (*yy*M*mm*) for the vintage date of data they represent. The column ROUTPUT12M7 shows the observations for real GDP that the U.S. Bureau of Economic Analysis made available to the public in the middle of July 2012.

We highlight six numbers with red boxes at the bottom of selected columns. These numbers are the level of real GDP on first, second, and third release for two observations: 2012 Q2 and 2012 Q3.

Figure 2 shows the results of converting the level of real GDP (Figure 1) into quarter-over-quarter growth rates, expressed in annualized percentage points.

Step 2. Extract the Relevant Observations From the Appropriate Vintages. We now want to extract the relevant observations from the vintages appropriate for first releases, second releases, and third releases. We use the following method: We extract the numbers from three consecutively-dated monthly vintages.

We demonstrate the method in Figure 2 for first-, second-, and third-release values of quarter-over-quarter real GDP growth. We highlight the numbers for two observations: 2012 Q2 and 2012 Q3 (Figure 2). For 2012 Q2: The first-release value is 1.537 percent, the second-release value is 1.732 percent, and the third-release value is 1.253 percent. For 2012 Q3, the values are: 2.014 percent, 2.672 percent, and 3.106 percent.

Figure 3 shows how we arrange these values according to the release. There is one column for first-release values (*First*), one for second-release values (*Second*), and one for third-release values (*Third*). The last column (*Most_Recent*) gives the values as they appear in the most recent vintage of RTDSM. Note that the *Most_Recent* values incorporate the cumulative effect of all prior revisions to the observations.

4. Important Caveats

Important caveats accompany the construction of our values for first-, second-, and third-releases. One algorithm for extracting first-, second-, and third-release values from the Philadelphia Fed's real-time data set is to search over vintages of data for the first, second, and third times each observation appears. This algorithm has a disadvantage: When a government statistical agency delays the release of its data or changes the schedule on which the data are released over time, this algorithm yields estimates that could give a misleading impression about the date on which the release was available to the public. In some empirical studies, ambiguity about the timing of the release could yield incorrect results. Thus, we do not use this approach.

A second, closely related approach is to extract the first-, second-, and third-release observations from the vintages in which they *should* appear, given the timing (as we know it today) with which government statistical agencies release their data. We use the second approach.

The two approaches will, in general, yield nearly identical results, except as noted below.

Variables from the National Income and Product Accounts.

The U.S. Bureau of Economic Analysis (BEA) has changed over time the schedule on which it released its data. Early in our sample period (1965 Q3 to the present), first-releases were often delayed relative to today's schedule. In addition, BEA did not always try to revise its second-release values. These problems are more severe the more disaggregated the variable and the earlier the observation date. In our files, the consequences are as follows:

- In observations of the distant past, we code many first-release values as missing.
- In observations of the distant past, the third-release values are often the same as the second-release values.

Federal Government Shutdown 1995 - Variables From the National Income and Product Accounts: Observation for 1995 Q4.

A shutdown in the federal government occurred in late 1995. This affected the operations of government statistical agencies and produced a delay in the release of data from the national income and product accounts. Accordingly, we record a missing value for the 1995 Q4 first release of real and nominal GDP and the related components.

Variables From the National Income and Product Accounts: Observation for 2003 Q3.

BEA released a benchmark revision to the U.S. national income and product accounts on December 10, 2003. Prior to the release of the benchmark-revised data, BEA released its first estimate for 2003 Q3 U.S. real and nominal GDP and the components. However, the benchmark revision omitted the observation for 2003 Q3. Accordingly, the data set correctly includes the first estimate and (correctly) omits the second estimate.

Consumer Price Indexes and Producer Price Indexes.

The U.S. Bureau of Labor Statistics (BLS) revises its headline and core consumer price indexes annually after it re-estimates new seasonal factors. There are no revisions to the seasonally adjusted CPI outside of those due to re-estimated seasonal factors. Consequently, it makes little sense to provide second-, and third-release values using our methodology: Most observations would show no revision to the first-release value. Therefore, we provide only the values on first release and the values from the most recent vintage.

With one exception, the nature of revisions to headline and core measures of the producer price index for finished goods is the same as that for the consumer price indexes. The exception is that producer price indexes may be revised three to four months after their initial release because BLS incorporates additional information from late reporters and corrections into its initial estimates. Such revisions appear in a monthly vintage that postdates the vintage from which we would extract second- and third-release values. Thus, as above, we provide only the values on first release and the values from the most recent vintage.

Industrial Production Index and Capacity Utilization.

The staff at the Federal Reserve Board of Governors produces the well known monthly indexes of industrial production and related measures of capacity utilization. The unusual feature of the Board's staff's release schedule is that annual revisions are released on a date that falls between the dates of two monthly reports. (In contrast, many government statistical agencies release their annual revisions concurrent with their normal monthly reports.)

The effect on our data for first-, second-, and third-release values is as follows: In defining our values, we stick to the observations published in the normal monthly reports. (For example, if an annual revision occurs on a date that falls between the monthly vintage for the first-release and the monthly vintage for the second release, we take our first- and second-release values from those monthly vintages. We do not record as the second-release value the revised observation published in the annual revision.)

Unit Labor Costs and Output per Hour.

These variables are revised on an atypical basis. We provide the first-release values and the second-release values but no values for the third-release which is made available to the public two months (not one month) after the second release.

Federal Government Shutdown in 2013 - All Variables Except Housing Starts.

The shutdown of the federal government from October 1, 2013, to October 16, 2013, caused U.S. government statistical agencies to delay their releases of new observations for variables in the Philadelphia Fed's real-time data set. However, the delays were minimal for variables other than housing starts. For variables whose releases were subject to these minor delays, we decided to postpone our collection of the data until the new observations became available. (The delay was a couple weeks.) This strategy allowed us to maintain continuity in our time series of first-, second-, and third-release values. Our strategy for housing starts appears below.

Federal Government Shutdown in 2013 - Housing Starts.

As noted above, the federal government shutdown from October 1, 2013, to October 16, 2013, caused major delays in the Census Bureau's release of new observations for housing starts: The Census Bureau postponed its release of housing starts for September 2013 and October 2013 until December 18, 2013. Moreover, the delayed first-release values of these observations in December could incorporate source information not generally available at the time of the standard release schedule. Similar comments apply to second- and third-release values. Accordingly, we have chosen to define missing values for the observations of first-, second-, and third-release values affected by the period of the federal government shutdown.

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Figure 1. Selected Vintages and Observations for Real GDP
Source: Philadelphia Fed's Real-Time Data Set, Levels (Chain-Weighted Dollars)

The figure shows a slice of the Philadelphia Fed's real time data set for the level of real GDP (ROUTPUT). Each column contains the time series history for real GDP as known at the vintage date listed in the column header. The rows list the observations for each vintage date. We use a red box to highlight the last number in each column. The numbers are the Bureau of Economic Analysis's first, second, and third releases for the value of real GDP in 2012 Q2 and 2012 Q3.

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	A	AF	AG	AH	AI	AJ	AK	AL	AM
1	DATE	ROUTPUT12M7	ROUTPUT12M8	ROUTPUT12M9	ROUTPUT12M10	ROUTPUT12M11	ROUTPUT12M12	ROUTPUT13M1	ROUTPUT13M2
236	2005:Q3	12670.5	12670.5	12670.5	12670.5	12670.5	12670.5	12670.5	12670.5
237	2005:Q4	12735.6	12735.6	12735.6	12735.6	12735.6	12735.6	12735.6	12735.6
238	2006:Q1	12896.4	12896.4	12896.4	12896.4	12896.4	12896.4	12896.4	12896.4
239	2006:Q2	12948.7	12948.7	12948.7	12948.7	12948.7	12948.7	12948.7	12948.7
240	2006:Q3	12950.4	12950.4	12950.4	12950.4	12950.4	12950.4	12950.4	12950.4
241	2006:Q4	13038.4	13038.4	13038.4	13038.4	13038.4	13038.4	13038.4	13038.4
242	2007:Q1	13056.1	13056.1	13056.1	13056.1	13056.1	13056.1	13056.1	13056.1
243	2007:Q2	13173.6	13173.6	13173.6	13173.6	13173.6	13173.6	13173.6	13173.6
244	2007:Q3	13269.8	13269.8	13269.8	13269.8	13269.8	13269.8	13269.8	13269.8
245	2007:Q4	13326	13326	13326	13326	13326	13326	13326	13326
246	2008:Q1	13266.8	13266.8	13266.8	13266.8	13266.8	13266.8	13266.8	13266.8
247	2008:Q2	13310.5	13310.5	13310.5	13310.5	13310.5	13310.5	13310.5	13310.5
248	2008:Q3	13186.9	13186.9	13186.9	13186.9	13186.9	13186.9	13186.9	13186.9
249	2008:Q4	12883.5	12883.5	12883.5	12883.5	12883.5	12883.5	12883.5	12883.5
250	2009:Q1	12663.2	12711	12711	12711	12711	12711	12711	12711
251	2009:Q2	12641.3	12701	12701	12701	12701	12701	12701	12701
252	2009:Q3	12694.5	12746.7	12746.7	12746.7	12746.7	12746.7	12746.7	12746.7
253	2009:Q4	12813.5	12873.1	12873.1	12873.1	12873.1	12873.1	12873.1	12873.1
254	2010:Q1	12937.7	12947.6	12947.6	12947.6	12947.6	12947.6	12947.6	12947.6
255	2010:Q2	13058.5	13019.6	13019.6	13019.6	13019.6	13019.6	13019.6	13019.6
256	2010:Q3	13139.6	13103.5	13103.5	13103.5	13103.5	13103.5	13103.5	13103.5
257	2010:Q4	13216.1	13181.2	13181.2	13181.2	13181.2	13181.2	13181.2	13181.2
258	2011:Q1	13227.9	13183.8	13183.8	13183.8	13183.8	13183.8	13183.8	13183.8
259	2011:Q2	13271.8	13264.7	13264.7	13264.7	13264.7	13264.7	13264.7	13264.7
260	2011:Q3	13331.6	13306.9	13306.9	13306.9	13306.9	13306.9	13306.9	13306.9
261	2011:Q4	13429	13441	13441	13441	13441	13441	13441	13441
262	2012:Q1	13491.4	13506.4	13506.4	13506.4	13506.4	13506.4	13506.4	13506.4
263	2012:Q2	-999	13558	13564.5	13548.5	13548.5	13548.5	13548.5	13548.5
264	2012:Q3	-999	-999	-999	-999	13616.2	13638.1	13652.5	13652.5
265	2012:Q4	-999	-999	-999	-999	-999	-999	-999	13647.6
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267									

Figure 2. Selected Vintages and Observations for Q/Q Real GDP Growth (Annualized Percentage Points).

The figure shows quarter-over-quarter growth rates (annualized percentage points) computed from the data in levels in Figure 1. We use a red box to highlight the last number in each column. The numbers are the Bureau of Economic Analysis's first, second, and third releases for the value of real GDP growth in 2012 Q2 and 2012 Q3.

	A	B GROUTPUT12M7	C GROUTPUT12M8	D GROUTPUT12M9	E GROUTPUT12M10	F GROUTPUT12M11	G GROUTPUT12M12	H GROUTPUT13M1	I GROUTPUT13M2
2	2005:03	3.214	3.214	3.214	3.214	3.214	3.214	3.214	3.214
3	2005:04	2.071	2.071	2.071	2.071	2.071	2.071	2.071	2.071
4	2006:01	5.147	5.147	5.147	5.147	5.147	5.147	5.147	5.147
5	2006:02	1.632	1.632	1.632	1.632	1.632	1.632	1.632	1.632
6	2006:03	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053
7	2006:04	2.746	2.746	2.746	2.746	2.746	2.746	2.746	2.746
8	2007:01	0.544	0.544	0.544	0.544	0.544	0.544	0.544	0.544
9	2007:02	3.649	3.649	3.649	3.649	3.649	3.649	3.649	3.649
10	2007:03	2.953	2.953	2.953	2.953	2.953	2.953	2.953	2.953
11	2007:04	1.705	1.705	1.705	1.705	1.705	1.705	1.705	1.705
12	2008:01	-1.765	-1.765	-1.765	-1.765	-1.765	-1.765	-1.765	-1.765
13	2008:02	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324
14	2008:03	-3.663	-3.663	-3.663	-3.663	-3.663	-3.663	-3.663	-3.663
15	2008:04	-8.890	-8.890	-8.890	-8.890	-8.890	-8.890	-8.890	-8.890
16	2009:01	-6.666	-5.249	-5.249	-5.249	-5.249	-5.249	-5.249	-5.249
17	2009:02	-0.690	-0.314	-0.314	-0.314	-0.314	-0.314	-0.314	-0.314
18	2009:03	1.694	1.447	1.447	1.447	1.447	1.447	1.447	1.447
19	2009:04	3.803	4.026	4.026	4.026	4.026	4.026	4.026	4.026
20	2010:01	3.934	2.335	2.335	2.335	2.335	2.335	2.335	2.335
21	2010:02	3.787	2.243	2.243	2.243	2.243	2.243	2.243	2.243
22	2010:03	2.507	2.603	2.603	2.603	2.603	2.603	2.603	2.603
23	2010:04	2.349	2.393	2.393	2.393	2.393	2.393	2.393	2.393
24	2011:01	0.358	0.079	0.079	0.079	0.079	0.079	0.079	0.079
25	2011:02	1.334	2.477	2.477	2.477	2.477	2.477	2.477	2.477
26	2011:03	1.815	1.279	1.279	1.279	1.279	1.279	1.279	1.279
27	2011:04	2.955	4.092	4.092	4.092	4.092	4.092	4.092	4.092
28	2012:01	1.872	1.961	1.961	1.961	1.961	1.961	1.961	1.961
29	2012:02		1.537	1.732	1.253	1.253	1.253	1.253	1.253
30	2012:03					2.014	2.672	3.106	3.106
31	2012:04								-0.143
32									

Figure 3. First- , Second- , and Third-Release Values for Q/Q Real GDP Growth (Annualized Percentage Points)

The figure shows the first-, second-, and third-release values for quarter-over-quarter real GDP growth over the period 2009 Q1 to 2012 Q4. We highlight the values in red boxes for 2012 Q2 and 2012 Q3. The column labeled "Most_Recent" shows the corresponding historical values as they were known in the middle of March 2013 when this documentation was created.

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	A	B	C	D	E	F

	Date	First	Second	Third	Most_Recent
		Real GNP/GDP (ROUTPUT)				
		Q/Q Growth (Annual Rate, Percentage Points)				
		First-Release, Second-Release, Third-Release, and the Most-Recent-Release Values				
180	2009:Q1	-6.144	-5.719	-5.493	-5.249
181	2009:Q2	-1.017	-1.014	-0.738	-0.314
182	2009:Q3	3.534	2.782	2.235	1.447
183	2009:Q4	5.731	5.927	5.554	4.026
184	2010:Q1	3.239	3.036	2.738	2.335
185	2010:Q2	2.387	1.614	1.719	2.243
186	2010:Q3	2.010	2.525	2.559	2.603
187	2010:Q4	3.173	2.788	3.114	2.393
188	2011:Q1	1.748	1.842	1.915	0.079
189	2011:Q2	1.282	0.989	1.334	2.477
190	2011:Q3	2.464	2.004	1.815	1.279
191	2011:Q4	2.752	2.982	2.955	4.092
192	2012:Q1	2.204	1.860	1.872	1.961
193	2012:Q2	1.537	1.732	1.253	1.253
194	2012:Q3	2.014	2.672	3.106	3.106
195	2012:Q4	-0.144	0.126	.	0.126
196					
197					