

Data Revisions are not Well-Behaved - More Results

S. Boragan Aruoba*

University of Maryland

Department of Economics

December 1, 2006

1 Intermediate Revisions

In order to understand which revisions, among the many revisions our variables go through, are responsible for the rejection of (P1), (P2) and (P3), we analyze the intermediate revisions, r_t^h for $h < K$, for some key variables.¹ Table reports the summary of our results. The first panel reports the mean revision of three intermediate revisions: one-quarter,² one-year and two-year revisions along with that of the final revision for comparison. With the exception of the unemployment rate and annual growth of real output, whose mean final revision were not statistically significant, we find that the mean revision for all variables increase with each incremental revision and they are statistically significant. In other words it is not the case that the source of the rejection of (P1) can be traced to a particular revision.

*Department of Economics, University of Maryland, College Park, MD 20742. Email: aruoba@econ.umd.edu

¹We exclude labor productivity and final sales from this analysis.

²Due to our observation frequency, the one-quarter revision for NIPA variables will include the “final” announcement of the BEA which is done 3 months after the end of the quarter.

The second panel reports the standard deviation of the intermediate revisions. We see that about half of the volatility of the final revision comes from the revision after one quarter and about 72% of it comes from the one-year revision. Once again we conclude that it is not the case that the rejection of (P2) can be traced to a particular revision, although the revisions immediately following the initial announcement seems to have a bigger effect.

Finally, the third panel reports the p -value of the Wald test statistic testing the news hypothesis or the rationality of the initial announcements as explained in Section ???. We find that except for annual growth of real output and unemployment, for whose revisions we have failed to reject the news hypothesis and two other intermediate revisions, we reject the news hypothesis for all intermediate revisions of all variables.

From our analysis we conclude that most of the intermediate revisions contribute to the rejection of (P1), (P2) and (P3). We can also infer from our results that simply ignoring the initial announcement and using the second or third announcement would not eliminate the problems with revisions.

2 Revisions to NIPA Variables Realized in a Certain Quarter

According to the revision schedule of the BEA, a NIPA variables that is realized in the first quarter of year t , is announced about 30 days after the end of the quarter (this is captured by our Q2 vintage) and revised twice more in the following two months (the last of these

revisions is in our Q3 vintage). The BEA also revises all variables that are realized within the last three calendar years every summer. It is conceivable that there are differences in the “quality” of revisions because the number of revisions are different for variables realized in different quarters. To investigate this further, we compute the same three statistics as in the previous section for the NIPA variables realized in each quarter. Table 6 reports our findings. We find that for the most part revisions for variables realized in a particular quarter share the same characteristics with the final revision. One can also conclude that revisions for Q3 variables are more “well-behaved” than others and revisions for Q1 variables are the least “well-behaved”, based on these three sets of statistics. This is an interesting finding because Q3 variables are announced in Q4, right after the annual revision and as such their first annual revision comes more than 9 months later.

3 Components of Real Output

We repeat our analysis for components of real output in order to identify the source of the results we find for revisions to real output. The summary of the results are in Table 7. We report the mean and the noise-signal ratio of the final revisions along with the R^2 and the relative RMSE from the ex-post forecasting exercise and p -value of the CW statistic from the real-time forecasting exercise.³ We find that the mean revisions for the annual and quarterly growth of all components are positive, except for three of them. Of these, only three of them are statistically significant but the magnitudes are in general bigger than the mean revision

³With the exception of annual growth of residential investment all CW statistics are positive and they are not reported.

for output. Durables consumption and exports stand out as two components with significant (both statistical and economic) mean revisions. We also find that all components have larger noise-signal ratios as output itself with only two exceptions. Similarly, almost all R^2 's are higher and most of the relative RMSEs are lower for the components than for output itself. It is interesting to note that the real-time forecastability of the components of output is significantly stronger than output itself, especially consumption and its subcomponents.

Overall, our results from this section indicate that the failure of (P1), (P2) and (P3) for revisions to real output is not entirely due to one or a few of its components but rather a general phenomenon which is valid for almost all of its components. Consumption, in particular durables consumption seems to be the component that contributes most to these results. This result is quite significant given the debate concerning measurement of consumer electronics and similar goods whose quality changes quite remarkably in short amounts of time. Our results are at least suggestive that the revisions to components of output which are arguably harder to measure contribute to the results we find in this paper regarding revisions to output.

Table 5 - Analysis of Intermediate Revisions

	Mean				Standard Deviation				Wald Test <i>p</i> -value (News)			
	1Q	1Y	2Y	Final	1Q	1Y	2Y	Final	1Q	1Y	2Y	Final
Annual Growth Variables												
Nominal Output	0.09	0.15	0.25	0.31	0.32	0.55	0.79	0.79	0.00	0.01	0.02	0.00
Real Output	0.05	0.06	0.10	0.17	0.32	0.56	0.77	0.78	0.10	0.64	0.51	0.21
Inflation (Output Deflator)	0.03	0.07	0.12	0.12	0.17	0.28	0.36	0.37	0.10	0.03	0.02	0.03
Non-Farm Payroll Employment	0.04	0.07	0.11	0.13	0.14	0.25	0.38	0.39	0.00	0.00	0.00	0.00
Industrial Production (Total Industry)	0.15	0.22	0.29	0.41	0.47	0.75	0.91	1.04	0.00	0.00	0.00	0.00
Industrial Production (Manufacturing)	0.14	0.16	0.31	0.52	0.48	0.75	1.02	1.29	0.00	0.12	0.01	0.00
Quarterly Growth Variables												
Nominal Output	0.29	0.30	0.40	0.47	0.85	1.17	1.53	1.71	0.00	0.01	0.02	0.01
Real Output	0.18	0.18	0.17	0.26	0.77	1.19	1.53	1.72	0.00	0.10	0.23	0.09
Inflation (Output Deflator)	0.11	0.12	0.21	0.20	0.47	0.61	0.77	0.85	0.03	0.04	0.00	0.00
Monthly Growth Variables												
Non-Farm Payroll Employment	0.27	0.27	0.31	0.35	1.15	1.18	1.33	1.40	0.00	0.00	0.00	0.00
Industrial Production (Total Industry)	0.73	0.76	0.91	1.00	3.42	4.21	4.86	5.17	0.00	0.00	0.00	0.00
Industrial Production (Manufacturing)	0.74	0.77	0.86	1.19	4.11	4.63	4.83	5.44	0.00	0.00	0.00	0.00
Variables in Percentage												
Civilian Unemployment Rate	0.00	0.00	0.00	0.00	0.03	0.05	0.07	0.07	0.30	0.39	0.63	0.95
Capacity Utilization (Total Industry)	0.08	0.10	0.13	0.14	0.39	0.57	0.66	0.81	0.01	0.01	0.00	0.08
Capacity Utilization (Manufacturing)	0.10	0.11	0.13	0.11	0.45	0.67	0.81	0.91	0.01	0.00	0.00	0.00

Notes : 1Q, 1Y and 2Y refer to the revision to the variable after 1 quarter, 1 year and 2 years, respectively. Final refers to the final revision and we simply repeat the results from previous tables.

Table 6 - Analysis of NIPA Revisions for Each Quarter

(a) Mean

	Q1	Q2	Q3	Q4	Final
Annual Growth Variables					
Nominal Output	0.34	0.33	0.32	0.25	0.31
Real Output	0.18	0.19	0.19	0.12	0.17
Inflation (Output Deflator)	0.13	0.11	0.11	0.12	0.12
Quarterly Growth Variables					
Nominal Output	0.71	0.56	0.12	0.50	0.47
Real Output	0.70	0.17	-0.18	0.11	0.26
Inflation (Output Deflator)	-0.02	0.42	0.28	0.37	0.20

(b) Standard Deviation

	Q1	Q2	Q3	Q4	Final
Annual Growth Variables					
Nominal Output	0.78	0.76	0.97	0.68	0.79
Real Output	0.77	0.77	0.86	0.75	0.78
Inflation (Output Deflator)	0.45	0.29	0.36	0.39	0.37
Quarterly Growth Variables					
Nominal Output	1.94	1.75	1.53	1.62	1.71
Real Output	1.12	1.75	1.50	1.62	1.72
Inflation (Output Deflator)	1.56	0.71	0.74	0.77	0.85

(c) Wald Test p -value (News Hypothesis)

	Q1	Q2	Q3	Q4	Final
Annual Growth Variables					
Nominal Output	0.00	0.02	0.13	0.09	0.00
Real Output	0.40	0.20	0.30	0.60	0.21
Inflation (Output Deflator)	0.20	0.06	0.14	0.04	0.03
Quarterly Growth Variables					
Nominal Output	0.08	0.08	0.13	0.02	0.01
Real Output	0.09	0.25	0.52	0.51	0.09
Inflation (Output Deflator)	0.76	0.45	0.06	0.00	0.00

Table 7 - Results for the Components of Output

	N	Mean	Noise / Signal	R^2	RMSE1/ RMSE4	CW p-value
Annual Growth Variables						
Output	150	0.17	0.31	0.13	0.92	0.46
Consumption	137	0.14	0.35	0.21	0.87	0.37
Durables Consumption	137	0.50	0.21	0.16	0.87	0.13
Non-Durables Consumption	137	0.15	0.52	0.33	0.80	0.00
Services Consumption	137	0.04	0.78	0.28	0.85	0.38
Business Fixed Investment	137	-0.66	0.34	0.19	0.87	0.57
Residential Investment	137	0.55	0.20	0.21	0.88	0.79
Government Purchases	137	0.08	0.41	0.20	0.89	0.38
Exports	137	1.33	0.33	0.25	0.72	0.01
Imports	137	0.14	0.34	0.12	0.94	0.18
Quarterly Growth Variables						
Output	150	0.26	0.49	0.10	0.94	0.35
Consumption	137	0.15	0.52	0.31	0.83	0.00
Durables Consumption	137	0.55	0.37	0.29	0.84	0.00
Non-Durables Consumption	137	0.27	0.75	0.39	0.77	0.00
Services Consumption	137	-0.05	0.87	0.23	0.88	0.19
Business Fixed Investment	137	0.03	0.52	0.10	0.95	0.04
Residential Investment	137	0.54	0.45	0.12	0.94	0.96
Government Purchases	137	-0.11	0.69	0.37	0.79	0.01
Exports	137	2.19	0.59	0.19	0.82	0.00
Imports	137	0.82	0.69	0.25	0.86	0.06

Notes : All variables are real. R^2 refers to the R^2 of the regression for the model 1 chosen by AIC. Boldface in the mean and relative RMSE columns show statistical significance at 10% using the appropriate test. Italics in the last column reflect the CW statistic is negative and boldface denotes a p-value less than 10%.