How the US-Eurozone growth differential gets revised away

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- In this note, as national statistics offices publish their first official estimates of 1Q18 GDP growth, we examine how reliable early estimates of GDP growth are in the Euro area and the US by looking at past revisions.
- We find that US GDP growth tends to be revised down and Euro area growth revised up from the initial estimates. The effect is significant: since 1999, the annual average growth differential between the US and Euro area is subsequently halved between the first estimate and the near-final estimate. After further adjusting for population growth, the growth differential between the US and Euro area almost disappears.
- We also find that both in the Euro area and the US, GDP revisions are pro-cyclical - that is, they are revised up in good times and down in bad times. Moreover, the initial estimates tend to lag the "true" business cycle revealed in mature estimates, meaning the initial estimates are slow to identify turning points.
- Finally, business surveys such as the PMIs have predictive power for GDP revisions, meaning they are a better guide to the mature – rather than the initial – estimates of growth.

Revisions: Eurozone up, US down

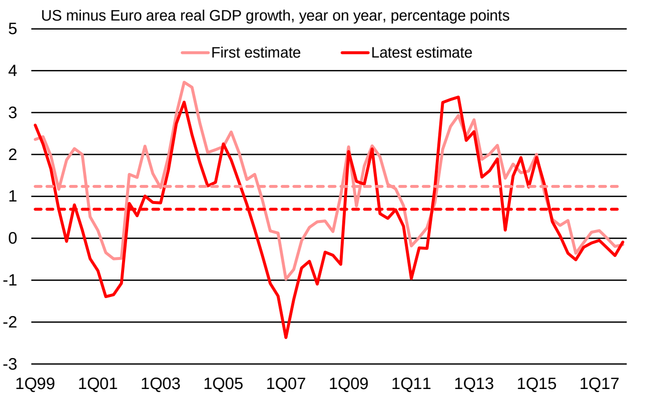
National statistics offices are now publishing the first official estimates of 1Q18 GDP growth. Today, the BEA published its advance estimate of US GDP growth for 1Q18, which was 2.3% qoq annualised. Next week, on Wednesday, Eurostat will release its first estimate of 1Q18 growth, which we expect to come in at 1.6% qoq annualized. In this paper, we examine how reliable these estimates are based on past revisions, and identify patterns in the revisions that render them predictable. We focus mostly on the Eurozone and the US.

The first estimates (or vintages) of quarterly GDP are inevitably revised overtime as: **(1)** more data comes in (in particular, quarterly data are benchmarked to annual data received with a lag, while supply-use balancing can generate revisions up to three years after the first estimates); and **(2)** methodological changes generate further revisions.[1] It turns out that the growth profile can change materially in later (and, hence, more accurate) vintages of the data.

Chart 1 plots the difference, in percentage points, between the year-on-year real GDP growth rate in the US and that in the Euro area.

The light-red line is the growth differential according to the first estimate of GDP growth, the dark-red line is according to the latest estimate of GDP growth. Between 1Q1999 and 4Q2017, the US-Euro area growth differential averaged 1.24pp. in the first estimate, but just 0.69pp. in the latest estimate. In other words, the rate at which the US grew faster than the Euro area was subsequently revised down significantly, with the differential almost halving in size.

CHART 1: US-EURO AREA GROWTH DIFFERENTIAL



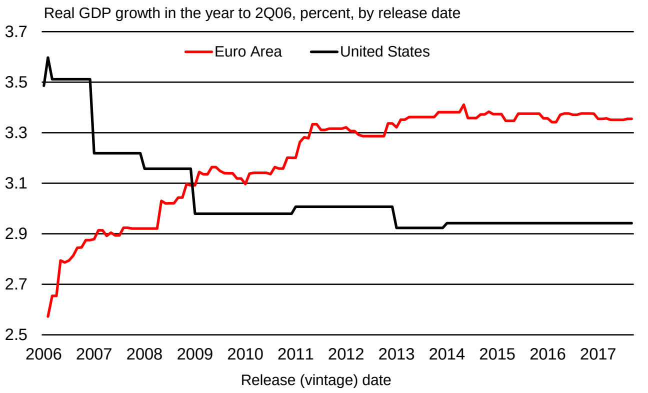
Source: OECD Revisions Analysis Dataset, UniCredit Research

Interestingly, while still a sizable, but reduced, differential remains in the latest vintage of the data, it can almost entirely be accounted for differences in the rate of population growth. Indeed, on IMF numbers, the annual average GDP *per capita* growth differential between the US and Euro area was just 0.15pp. between 2000 and 2017. And this is a period that includes the Euro area sovereign debt crisis.

Chart 2 shows the estimated real GDP growth rate in the US and Euro area for one specific period, 2Q2006, and shows how the estimates changed as the vintages matured (the release date is marked on the horizontal axis). For 2Q2006, US growth was initially estimated to be much higher than Euro area growth, but after several successive revisions growth is now estimated to have been lower in the US than in the Euro area in 2Q2006. We chose this example because it is visually striking that the estimated growth differential changed sign in later vintages, however the chart highlights a couple of points that generalise: **(1)** Revisions to GDP growth occur over several years following the first release; and **(2)** The biggest revisions tend to take place in the first three years after the first estimate is released.

[1] The updating of seasonal adjustment factors can also generate revisions but these tend to be small, particularly for series such as GDP where a long history exists, and year-on-year growth rates are less affected.

CHART 2: SEQUENTIAL ESTIMATES OF GROWTH IN 2Q06



Source: OECD Revisions Analysis Dataset, UniCredit Research

Since estimates tend to settle down as they mature, there is greater confidence surrounding mature estimates than early estimates, and hence we can be more confident about the distant past than the recent past. Therefore, a better measure of the scale of revisions is achieved by using fixed lengths of time that have elapsed since the first estimate.

Table 1 displays the average (mean) revisions to Euro area and US real GDP growth for one-year later, two-years later, and three-years later after the first release.[2] It confirms that US growth tends to be revised down and Euro area growth revised up, although average revisions to Euro area growth for the period 1Q08-4Q14 were marginally negative. The scale and direction of revisions tend to be reinforced as time elapses, from one-year later to two-years later to three-years later. The largest revisions are in the second and third years after the first release: so, it can take a while before the picture becomes clear. After three years, the average annual revision to the US-Euro area growth differential was a substantial -0.82pp. in 1Q99-4Q07, and a significant -0.42pp. in 1Q08-4Q14.

TABLE 1:
1-YEAR, 2-YEAR AND 3-YEAR REVISIONS, BY TIME PERIOD

		Average (mean) revisions to year-on-year real GDP growth, in percentage points		
Period	**Vintage**	**US**	**Euro area**	**Differential (pp)**
1Q99-4Q14	1-year later	-0.05	0.03	-0.08
	2-years later	-0.36	0.10	-0.46
	3-years later	-0.49	0.15	-0.64
1Q99-4Q07	1-year later	-0.09	0.09	-0.18
	2-years later	-0.45	0.19	-0.64
	3-years later	-0.54	0.28	-0.82
1Q08-4Q14	1-year later	0.01	-0.04	0.05
	2-years later	-0.23	-0.01	-0.22
	3-years later	-0.43	-0.01	-0.42
1Q15-4Q17	1-year later	0.03	0.26	-0.23
	2-years later*	0.20	0.52	-0.32

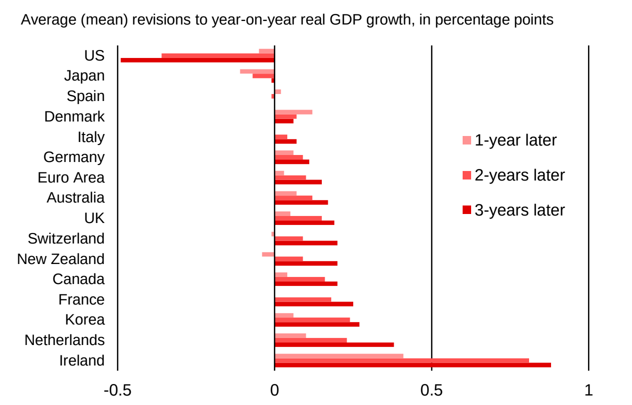
Note: * denotes the fact that for the period 1Q15-4Q17, the sample for "2-years later" only includes the 4 quarters 1Q15-4Q16.

Source: OECD Revisions Analysis Dataset, UniCredit Research

International comparisons and the Ireland effect

In order to put the US and Euro area revisions in a broader perspective, Chart 3 maps the one-year later, two-years later, and three-years later revisions for 16 selected OECD countries. Among this group, the US had the largest average downward revision. Ireland had the largest average upward revision, at +0.88pp. after three years. To be sure, since Ireland accounts for only around 2.6% of Euro area GDP, its contribution to the Euro area average revision is just 0.02pp.

CHART 3: AVERAGE REVISIONS TO GDP GROWTH, 1Q99-4Q14, BY COUNTRY



Source: OECD Revisions Analysis Dataset, UniCredit Research

[2] For "three-years later", the latest data is for 4Q14, which was published in 1Q18.

Other patterns in GDP revisions

Other than the important and large average revisions to GDP growth, there are other patterns in the GDP revisions, which provide a further element of predictability. Here we consider two properties: **(A)** procyclicality; and **(B)** whether alternative sources of data, namely business surveys, can help predict GDP revisions.

(A) Procyclicality of revisions

In both the Euro area and the US, GDP growth revisions are pro-cyclical; in other words, growth tends to be revised up in good times and down in bad times. Formal statistical tests confirm this, although the effect is only statistically significant for the Euro zone (see Table 2).

TABLE 2: PROCYCLICALITY ESTIMATION RESULTS

Dependent variable: Three-year revision of year-on-year real GDP growth, percentage points	Euro area		US	
	Coef.	S.E.	Coef.	S.E.
First vintage of year-on-year real GDP growth	0.12***	(0.02)	0.09	(0.06)
Constant	0.03	(0.04)	-0.66***	(0.18)
No. of observations	64		68	
R-squared	0.33		0.06	

Notes: The table displays the output from a simple OLS regression. The dependent variable is the revision to real GDP growth three years after the first estimate. The independent variables are a constant term and the first estimate of real GDP growth. Significance levels: * 10%; ** 5%; *** 1%.

Source: OECD Revisions Analysis Dataset, UniCredit Research.

This pro-cyclicality of revisions is also depicted graphically in Charts 4 and 5, which plot the first estimate of GDP growth alongside the three-years later revision, for the Euro area and US respectively. Importantly, the charts reveal another property of revisions: they tend to lead (in the statistical sense) the initial estimate of GDP growth. This is formally confirmed by Table 3, which displays the cross-correlations between various lead lengths of the three-years later revision and the first estimate of GDP growth. The correlation is maximised with a lead of two-quarters for the three-years revision, both for the Euro area and the US. In other words, the initial estimates of GDP growth are slow in identifying turning points in the business cycle.

CHART 4: EURO AREA REVISIONS PRO-CYCLICAL AND LEADING

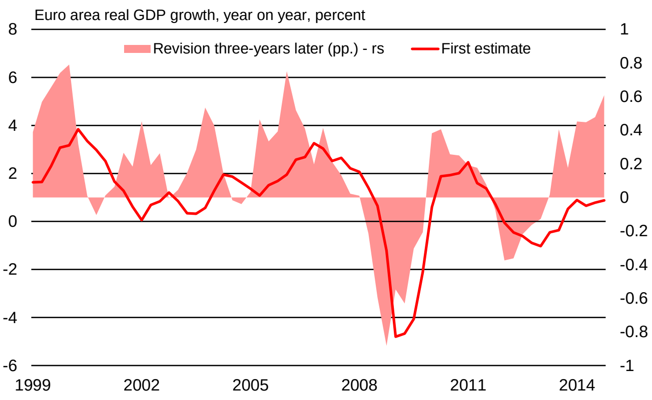


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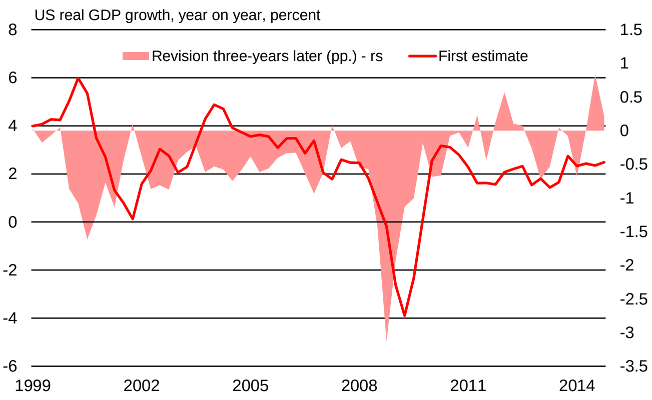
CHART 5: US REVISIONS PRO-CYCLICAL AND LEADING



Source: OECD Revisions Analysis Dataset, UniCredit Research

TABLE 3: CROSS-CORRELATIONS BETWEEN REVISIONS AND THE FIRST ESTIMATE

Three-years later revision lead (quarters)	First estimate of real GDP growth, year-on-year: Euro area	US
0	0.58	0.24
1	0.77	0.44
2	0.82	0.53
3	0.75	0.43

Notes: The table displays the correlation between various lead lengths (in quarters) of the three-year revision to GDP growth and the first estimate of GDP growth. GDP growth is quarter on the same quarter one-year ago, in percent.

Source: OECD Revisions Analysis Dataset, UniCredit Research

(B) Business surveys predict revisions

Purchasing Managers' Indexes (PMI) often provide the earliest gauge of economic activity. PMIs are produced by Markit for the Euro area and the Institute for Supply Management for the US. They are based on monthly surveys of carefully selected firms. They send a questionnaire each month to a purchasing manager in the firm, asking whether the variable is higher, lower, or the same compared to the previous month. The responses are converted to an index by adding the percentage that report "higher" to half of the percentage that report "unchanged". Therefore, the 50-level is consistent with no change. The PMI is typically released in the first week following the end of the month to which the data relates (or, for the flash PMI, later in the same month).

Compared to official estimates of GDP, the PMIs are less comprehensive (lower coverage in terms of sectors and smaller samples) and measure the spread (diffusion) of a change in economic activity, not the intensity of the change. However, they receive considerable attention from investors because they are released in a timely fashion and have substantial forecasting power for the official estimates of GDP growth. Also, and importantly, the PMIs are not revised[3], which adds to their usefulness in gauging economic activity in real-time.

As a result of our revisions analysis, we can now add a new advantage of the PMIs: we find that the PMIs also have predictive power for revisions to GDP growth both in the Euro area and the US. Box 1 presents the formal statistical tests showing this. Therefore, we should trust the signal from the PMIs more than the early official estimates of GDP growth.

[3] Both Markit and the ISM do not revise the underlying data but updates to seasonal-adjustment factors can generate small revisions to the seasonally-adjusted series.

BOX 1: PMIS HELP TO PREDICT GDP REVISIONS

We first confirm the well-known result that the PMIs have strong predictive power for GDP growth. We use the (quarterly average) composite PMI produced by Markit for the Euro area and the ISM for the US. GDP growth is the "three-years later" (labelled "mature" below) estimate of year-on-year growth, and the sample is 2Q98-1Q15 for the US and 1Q99-4Q14 for the Euro area.

The estimation output for the US is (standard errors are in parentheses):

$$\text{(1)}\quad GDP\ growth\ (mature) = \underset{(0.04)}{0.42}(pmi\_comp - \underset{(4.61)}{48.7}) \qquad R^2=0.67,\ \text{Obs.} = 68$$

And for the Euro area:

$$\text{(2)}\quad GDP\ growth\ (mature) = \underset{(0.03)}{0.35}(pmi\_comp - \underset{(4.25)}{49.3}) \qquad R^2=0.71,\ \text{Obs.} = 64$$

The regression output shows that the PMIs explain 67% of the variation in the mature estimate of US GDP growth, and 71% of the variation in the mature estimate of Euro area GDP growth, as indicated by the R-squared.

We now re-estimate the equations for the first (labelled "initial" below) estimate of GDP growth as the dependent variable. The estimation output for the US is:

$$\text{(3)}\quad GDP\ growth\ (initial) = \underset{(0.04)}{0.34}(pmi\_comp - \underset{(5.7)}{46.3}) \qquad R^2=0.58,\ \text{Obs.} = 68$$

And for the Euro area:

$$\text{(4)}\quad GDP\ growth\ (initial) = \underset{(0.03)}{0.30}(pmi\_comp - \underset{(4.83)}{49.3}) \qquad R^2=0.66,\ \text{Obs.} = 64$$

The regression output shows that the PMIs explain 58% of the variation in the initial estimate of US GDP growth, and 66% of the variation in the initial estimate of Euro area GDP growth. In other words, the PMIs do a better job at predicting the mature estimate – compared to the initial estimate – of GDP growth.

To determine whether the difference is statistically significant, we regress the "three-years later" revision to GDP growth on the PMI. For the US the output is:

$$\text{(5)}\quad GDP\ growth\ revision = \underset{(0.02)}{0.08}(pmi\_comp - \underset{(11.7)}{59.2}) \qquad R^2=0.24,\ \text{Obs.} = 68$$

And for the Euro area:

$$\text{(6)}\quad GDP\ growth\ revision = \underset{(0.01)}{0.05}(pmi\_comp - \underset{(6.72)}{49.7}) \qquad R^2=0.50,\ \text{Obs.} = 64$$

For both the US and the Euro area, the coefficient on the PMI is statistically significant and positive, implying the PMIs are helpful in predicting revisions to GDP growth.

Concluding remarks

In this paper we have analysed the past revisions to GDP growth in the Euro area and the US, with a view to documenting the scale of revisions and patterns. We found that US growth tends to be revised down and Euro area growth revised up from the initial estimates. We also reported evidence of procyclicality of revisions, particularly in the Eurozone, and that the initial estimates of GDP growth are slow to identify turning points in the business cycle. We show that business surveys, specifically the PMIs (which are not revised), have predictive power for GDP revisions.

What can we learn from our results about the current growth picture in the Euro area and the US? To the extent that past revisions to GDP growth are a useful guide to future revisions, the growth differential between the US and the Euro area is smaller than what appears from first estimates (which gets all the market attention), and indeed no greater than what is explained by population growth differentials. Recent growth in the Euro area will likely turn out stronger – and growth in the US weaker – than the current vintage of GDP growth suggests. Also, the recent moderation of business surveys in the Euro area since the start of the year, with the composite PMI easing from 58.8 in January to 55.2 in March is – in itself – nothing to worry about. Indeed, the quarterly average PMI, at 57.0 in 1Q18, is consistent with a mature estimate of four-quarter GDP growth of 2.7%, up from a fitted initial estimate of GDP growth of 2.3%.[4]

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[4] These estimates follow directly from substituting a PMI equal to 57.0 in equations (2) and (4) of Box 1, respectively.

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