Economics Letters 192 (2020) 109223

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

The state-dependence of output revisions☆

Bruno Ducoudré [a], Paul Hubert [a,*], Guilhem Tabarly [b]

[a] Sciences Po – OFCE, France
[b] Paris-Dauphine University, France

ARTICLE INFO

Article history:
Received 4 February 2020
Accepted 11 May 2020
Available online 23 May 2020

JEL classification:
C5
C8
E3

Keywords:
Gross Domestic Product
National accounts
Revision analysis

ABSTRACT

This paper investigates whether economic activity dynamics predict GDP revisions using panel data from 15 OECD countries. We find that economic activity predicts GDP revisions: early releases tend to overestimate GDP growth during slowdowns — and vice-versa. We also find that the source of the predictability could be related to the sampling of information collection. Finally, the predictability comes from short-term economic activity dynamics rather than business cycle position.

1. Introduction

Statistical agencies significantly revise Gross Domestic Product (GDP) figures in the months after their initial announcements. Well-behaved revisions – the difference between revised and initial figures – should be unbiased and unpredictable as they only reflect new information not available at the time of the early estimates. However, even if revisions are unconditionally unpredictable, they could still be correlated with other macroeconomic variables. Since policy decisions are based on real-time data, this issue is of the utmost importance given the cost of potential policy errors due to measurement errors.

Two strands of the economic literature investigate these revisions and their statistical properties. The first strand investigates whether GDP revisions are news or noise (Mankiw et al., 1984; Mankiw and Shapiro, 1986) and whether they are rational and predictable (Aruoba, 2008; Clements and Galvão, 2010; Faust et al., 2005; Rodríguez Mora and Schulstad, 2007; Sinclair and Stekler, 2013). A second strand focuses on the state-dependence of GDP revisions. Mogliani and Ferrière (2016) focus on French GDP data, while Barnes et al. (2012) study US GDP revisions.

The contribution of this paper is to use panel data from 15 OECD countries from 1994 to 2017 to assess in a comprehensive and systematic way the dependence of GDP revisions to economic activity dynamics. We find that economic activity predicts GDP revisions: early releases tend to overestimate GDP growth during slowdowns — and vice-versa. We also find that the source of the predictability could be related to the sampling of information collection. Finally, we provide evidence that the predictability comes from short-term economic activity dynamics rather than business cycle position.

The rest of the paper proceeds as follows. Section 2 specifies the framework. Section 3 presents estimates. Section 4 explores the reasons behind the main result. Section 5 concludes.

2. Framework

Let us denote y_t^{t+k} the value of the quarter-on-quarter growth rate of real GDP of quarter t, released at quarter $t+k$. Initial announcements are usually released between one and two months after the end of the reference quarter, so within a one-quarter lag, and can therefore be denoted $y_t^{t+1} = y_t|I_{t+1}$ where I_{t+1} is the information set when the preliminary estimate for y_t is made.

We define the revision as the difference between two announcements. Reasons for such revisions include the use of more complete data and samples, corrections for measurement errors, and updated seasonal factors. Final figures are generally published 3 years after the initial announcement. Long-term revisions may also occur because of changes in the basis period or changes in statistical methodology and definitions, but these do not include new information (McKenzie, 2006). This paper focuses on revisions up to 3 years.

☆ We thank Christophe Blot, Eric Heyer, Raul Sampognaro and Xavier Timbeau for useful comments. Any remaining errors are ours.

* Correspondence to: Sciences Po - OFCE, 10 place de Catalogne, 75014 Paris, France.
E-mail address: paul.hubert@sciencespo.fr (P. Hubert).

https://doi.org/10.1016/j.econlet.2020.109223

Table 1
The predictive power of economic indicators on GDP revisions.

	Revision.3y			
	OLS	OLS robust	FE	FE robust
Lagged GDP growth	0.079***	0.084***	0.084***	0.084***
	(0.020)	(0.031)	(0.021)	(0.020)
Country FE	No	Yes	Yes	Yes
Observations	1152	1152	1152	1152
R^2	0.013	0.019	0.054	0.054
F Statistic	15.14***	1.31	16.51***	17.08***
	Revision.3y			
	OLS	OLS robust	FE	FE robust
Δ Business surveys	0.117***	0.117***	0.117***	0.117**
	(0.035)	(0.045)	(0.035)	(0.040)
Country FE	No	Yes	Yes	Yes
Observations	581	581	581	581
R^2	0.019	0.020	0.019	0.019
F Statistic	11.15***	0.98	10.93***	8.70**

Note: Estimates from Eq. (2). Standard errors in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01. Sample period: 1994Q4–2017Q1. Lagged GDP growth refers to $Y_{t-1}|I_{t+1}$ and Δ Business surveys to $\hat{Y}_{t-1}|I_{t+1}$.

Our baseline measure is the difference between GDP growth estimate 3 years after a given quarter and the initial estimate:

$$\text{Revision.3}y_t = y_t|I_{t+13} - y_t|I_{t+1} \quad (1)$$

We use the *Main Economic Indicators Original Release Data and Revisions Database* which collects seasonally-adjusted vintages of quarterly GDP from 1994Q4 to 2017Q1, for 15 OECD countries: Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, New Zealand, Norway, Portugal, Spain, Switzerland, UK, and the US.[1]

We select real-time proxies for economic activity dynamics at the time of the early estimate. Although $y_t|I_{t+1}$ appears as a natural candidate, it is part of Revision.3y_t and would most likely yield spurious results. For robustness, we use two alternative variables to proxy real-time economic activity dynamics: *(i)* the most recent vintage of the growth rate of the previous quarter: $y_{t-1}|I_{t+1}$; *(ii)* the change in business surveys from Eurostat: $\hat{y}_{t-1}|I_{t+1}$. These data restrict the sample to EU countries (Belgium, Denmark, Finland, France, Germany, Italy, Portugal, Spain and the UK).[2]

We estimate the following panel regression to test the hypothesis that economic activity dynamics of country i at time t predict future revisions:

$$\text{Revision.3}y_{i,t} = \alpha + \alpha_i + \beta.\text{X}_{i,t} + \varepsilon_t \quad (2)$$

where $\text{X}_{i,t}$ is our measure of economic activity dynamics and α_i are country fixed-effects. Using panel data offers more degrees of freedom and sample variability and helps to mitigate the effects of missing or unobserved variables.

3. Economic indicators and GDP revisions

We estimate Eq. (2) in different ways. In our baseline specification, we estimate the model with the pooled-OLS estimator, which uses between and within variations. We then add country fixed-effects. However, if the error term is correlated with explanatory variables, the OLS estimator will be inconsistent. Using a fixed-effect estimator specifies a common slope across country, but a country-specific intercept that captures the effect of country-specific time invariant factors. We estimate both OLS and fixed-effect models with robust standard errors to account for potential autocorrelation and heteroskedasticity in the residuals.

Eq. (2) is estimated over the sample from 1994Q4 to 2017Q1 (see Table 1). We find a significant positive correlation between our real-time economic activity measures and 3-year GDP revisions. When controlling for country fixed-effects, we find that an increase of 1 percentage point in lagged GDP growth is associated with a 3-year-later vintage 0.084 percentage point higher than the initial vintage. This suggest that early releases tend to overestimate (underestimate) GDP growth during slowdowns (booms). The effect is similar on the subsample using business surveys, an increase of 1 percentage point in these indicators is associated with a 3-year-later vintage 0.117 percentage point higher than the initial vintage.

We perform several robustness checks. We check that our results are not driven by outliers by removing the 20% most influential observations according to Cook's distance. We control for the effect of global macroeconomic factors like the Great Financial Crisis (Shrestha and Marini, 2013) by including time fixed-effects or by excluding these quarters for which time fixed-effects are significant. We also test whether the effect is driven by small countries by focusing on big countries. Moreover, we estimate the fixed-effect model with clustered standard errors or with correction for auto-correlated errors, and a random-effects model to assess the sensitivity of our result to the econometric specification. Table A.1 in the Appendix shows that our results are robust.

A potential caveat is that GDP revisions are not only based on new available data but could also be driven by smoothing corrections between quarterly accounts or by basis changes. We perform the same set of regressions to control for smoothing corrections by including revisions for the previous 3 quarters. We also check that our results are robust to controlling for SEC/statistical basis changes by including dummies for National Accounts basis changes. We find that our main result holds in both specifications (see Tables A.2 and A.3).

4. Exploring the source of predictability

4.1. Quarterly versus annual national accounts

We now explore the mechanism underlying the relationship between GDP revisions and economic conditions. It could be that quarterly accounts (QNA) – up to 1-year vintages – are actually forecasts of the final "true" estimate. On the contrary,

[1] See the Appendix for the time-series of revisions.

[2] Business surveys cover industry, services, retail trade and construction sectors. Eurostat mnemonic: ei_bcs_bs.

Table 2
Different horizons of GDP revisions.

	OLS	OLS robust	FE	FE robust
	Revision.1y			
Lagged GDP growth	0.022	0.020	0.020	0.020
	(0.015)	(0.025)	(0.016)	(0.027)
Country FE	No	Yes	Yes	Yes
Observations	1252	1252	1252	1252
R^2	0.002	0.008	0.001	0.001
	Revision.2y			
Lagged GDP growth	0.068***	0.071**	0.071***	0.071**
	(0.018)	(0.028)	(0.018)	(0.025)
Country FE	No	Yes	Yes	Yes
Observations	1214	1214	1214	1214
R^2	0.012	0.017	0.013	0.013
	Revision.5y			
Lagged GDP growth	0.083***	0.088**	0.088***	0.088**
	(0.024)	(0.037)	(0.024)	(0.030)
Country FE	No	Yes	Yes	Yes
Observations	1034	1034	1034	1034
R^2	0.012	0.023	0.013	0.013
	Revision.3y-1y			
Lagged GDP growth	0.053***	0.061***	0.061***	0.061*
	(0.017)	(0.022)	(0.018)	(0.031)
Country FE	No	Yes	Yes	Yes
Observations	1132	1132	1132	1132
R^2	0.008	0.021	0.010	0.010

Note: Estimates from Eq. (2). Standard errors in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01. Sample period: 1994Q4–2017Q1. Lagged GDP growth refers to $Y_{t-1}|I_{t+1}$.

Table 3
Regression with alternative economic activity measures.

	Revision.3y			
	OLS	OLS robust	FE	FE robust
Δ Lagged GDP growth	0.070***	0.069***	0.069***	0.069***
	(0.017)	(0.024)	(0.017)	(0.020)
Country FE	No	Yes	Yes	Yes
Observations	1137	1137	1137	1137
R^2	0.015	0.019	0.015	0.015
	OLS	OLS robust	FE	FE robust
Δ_4 Lagged GDP growth	0.045***	0.045***	0.045***	0.045***
	(0.014)	(0.020)	(0.014)	(0.008)
Country FE	No	Yes	Yes	Yes
Observations	1092	1092	1092	1092
R^2	0.010	0.015	0.010	0.010
	OLS	OLS robust	FE	FE robust
Recessions	−0.174***	−0.181***	−0.181***	−0.181***
	(0.045)	(0.055)	(0.046)	(0.042)
Country FE	No	No	Yes	Yes
Observations	1167	1167	1167	1167
R^2	0.013	0.019	0.013	0.013
	OLS	OLS robust	FE	FE robust
Output growth gap	0.078***	0.082**	0.082***	0.082***
	(0.020)	(0.032)	(0.021)	(0.024)
Country FE	No	Yes	Yes	Yes
Observations	1152	1152	1152	1152
R^2	0.013	0.018	0.013	0.013

Note: Estimates from Eq. (2). Standard errors in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01. Sample period: 1994Q4–2017Q1.

the information collection process for annual accounts (ANA) – from 1 to 3-year vintages – could introduce biases (small vs. big firms, services vs. industry).[3] The horizons at which revisions are predictable may shed light on this issue.

We estimate Eq. (2) for 1-year, 2-year and 5-year revisions. Table 2 shows that there is no significant link between economy activity measures and 1-year revisions, while the link is significant for 2 and 5-year revisions. Only medium-term revisions tend to be correlated to economic activity. Moreover, revisions between 3-year and 1-year vintages are significantly associated with economic activity. This correlation between real-time economic conditions and medium-term revisions suggests that the predictability arises from sampling issues rather than from quarterly account issues.

4.2. Business cycle position vs. economic activity dynamics

While we find that GDP revisions are predictable from economic activity measures, it remains an open-question whether this predictability comes from the position in the business cycle (the level of the output gap) or short-term dynamics in economic activity (the derivative of the output gap). We estimate Eq. (2) with alternative economic activity measures: the change over one or four quarters in our baseline indicator, country-specific recession dummies, and cycle components of the GDP growth rate (using a one-sided band-pass filter). Table 3 shows a significant relationship between these variables and GDP revisions. This link is positive for growth indicators and negative, as expected, for the recession indicator.

We have also estimated Eq. (2) with measures of the position in the business cycle, such as the level of the output gap or of the unemployment gap (using the one-sided band-pass filter), and the unemployment rate. However, the main result does not hold with these variables.[4] Overall, our results suggest that the predictability of GDP revisions is related to short-term economy activity dynamics more than to the business cycle position.

5. Conclusion

Using a panel of 15 countries, this paper shows that real-time economic activity measures predict GDP revisions. Early releases tend to overestimate (underestimate) GDP growth during slowdowns (booms). The reason for predictability are related to sampling issues rather than quarterly account issues. In addition, predictability is more related to short-term activity dynamics than the position in the business cycle.

Appendix

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2020.109223.

References

Aruoba, S.B., 2008. Data revisions are not well behaved. J. Money Credit Bank 40, 319–340.
Barnes, M.L., Gumbau-Brisa, F., Olivei, G.P., 2012. Do Real-Time Okun's Law Errors Predict GDP Data Revisions? (No. 13). Working Papers, Boston FRB.
Clements, M.P., Galvão, A.B., 2010. First announcements and real economic activity. Eur. Econ. Rev. 54, 803–817.
Faust, J., Rogers, J.H., Wright, J.H., 2005. News and Noise in G-7 GDP announcements. J. Money Credit Bank 37, 403–419.
Mankiw, N.G., Runkle, D.E., Shapiro, M.D., 1984. Are preliminary announcements of the money stock rational forecasts?. J. Monet. Econ. 14, 15–27.
Mankiw, N.G., Shapiro, M.D., 1986. News or noise: An analysis of GNP revision. Surv. Curr. Bus. 66 (20).
McKenzie, R., 2006. Undertaking Revisions and Real-Time Data Analysis using the OECD Main Economic Indicators Original Release Data and Revisions Database. OECD Working Papers.
Mogliani, M., Ferrière, T., 2016. Rationality of announcements, business cycle asymmetry, and predictability of revisions. In: The Case of French GDP. Working paper, Banque de France.
Patterson, K.D., Heravi, S.M., 1991. Are different vintages of data on the components of GDP co-integrated?. Some evidence for the United Kingdom. Econ. Lett. 35, 409–413.
Rodríguez Mora, J.V., Schulstad, P., 2007. The effect of GNP announcements on fluctuations of GNP growth. Eur. Econ. Rev. 51, 1922–1940.
Shrestha, M., Marini, M., 2013. Quarterly GDP Revisions in G-20 Countries: Evidence from the 2008 Financial Crisis (No. 13–60). Working paper, IMF.
Sinclair, T.M., Stekler, H.O., 2013. Examining the quality of early GDP component estimates. Int. J. Forecast. 29, 736–750.

[3] In France and various countries, QNA precede ANA, and then ANA are used to revise QNA. This is not the case in the United Kingdom, which produces annual accounts using quarterly accounts (Patterson and Heravi, 1991).

[4] Estimates are available from the authors upon request.