

Predictability of the Euro area Revisions

— Work in progress —

Katharina Glass¹

16th IWH-CIREQ Macroeconometric Workshop

Halle, December 7th-8th, 2015



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG

¹Email: katharina.glass@wiso.uni-hamburg.de

Motivation

- Short-run business and government decisions have to be guided by the preliminary data
- Analysis of **real-time data** may help statistical agencies to understand the revision process and to overlook their estimation methods of preliminary releases
- If the data revision process incorporates only news, than there should be no systematic relation between a preliminary announcement and a subsequent revision
- Flash release should be an optimal forecast of the final

This paper

corroborates the **predictability** of Euro area GDP and its aggregates **revisions** using the real-time data set of the European Central Bank

Previous literature I

- **Forecasting real-time literature:** Keane and Runkle (1990), Croushore and Stark (2001), Koenig et al. (2003), Croushore and Stark (2003) and Croushore (2006), Campbell (2007), Croushore (2011), Kholodilin and Siliverstovs (2009), Oeller and Barot (2000), Clements and Galvao (2013), Arnold (2015), Glass and Fritsche (2015)
- **Modeling data revisions:** Koenig et al. (2003), Döpke and Fritsche (2004), Jacobs and van Norden S. (2011), Clements and Galvao (2012), Kishor and Koenig (2012)

● **Properties of Revisions:**

- ▶ Oeller and Hansson (2004): Swedish revisions are biased
- ▶ Faust et al. (2005): Predictable revisions in the UK, Italy, Japan
- ▶ Swanson and Dijk (2006): US not s.a. IP and PPI become rational after 3-4 months and s.a. IP and PPI remain irrational up to 1 year
- ▶ Aruoba (2008): US revisions are biased and not rational forecasts
- ▶ Croushore (2011): Evidence on predictability of the US industrial production led to modification of procedures.
- ▶ Siliverstovs (2012): Swiss revisions are highly predictable

This list is far from being exhaustive ...

Previous literature III

- **Parametric methodology:** Mankiw et al. (1984), Mankiw and Shapiro (1986), Mork (1987), Jong (1987), Mork (1990), Keane and Runkle (1990), Patterson and Heravi (1991), Young (1994), Oeller and Barot (2000), Croushore and Stark (2003), Faust et al. (2005), Swanson and Dijk (2006), Aruoba (2008), Croushore (2011), Siliverstovs (2012)
- **Nonparametric methodology:** Dufour (1981), Campbell and Dufour (1991), Campbell and Dufour (1995), Campbell and Ghysels (1995), Fritsche and Heilemann (2010)
- **Data perspective:** Giannone et al. (2012)

Preliminary results

- Revisions of Y_{real} , C , I , NE , Y_{nom} are not rational
- ⇒ Revisions are not optimal forecasts of the final release
- Distribution of revision errors throughout the quarters exhibit no tendency to be more biased or inefficient during the crisis than at the normal times

Revisions and revision process

- Revisions are replacements of preliminary releases with final data
- Real-time dataset is a collection of vintages
- Vintage (I) is a release of a variable in quarter t at a particular date I
- The first release is called **flash** release (or estimate) and is announced by a statistical agency 45 days after the end of the report quarter
- During the revision period statistical office publishes **monthly** updates of the preliminary estimates as **new information** becomes available
- The **final** release should incorporate all relevant information about the variable; it is considered to be its **true** value
- The revision process is assumed to last **24 months** after the end of the report period
- In the practice the **last known** vintage is usually applied

Example of my dataset

	l_1	l_2	l_3	l_4	...	l_{19}	l_{20}	l_{21}	l_{22}	l_{23}	l_{24}
...
var2006Q1	0,90	0,75	0,75	0,12	...	-0,30	-0,20	-0,20	-0,23	0,00	0,00
var2006Q2	0,41	0,42	0,23	0,23	...	0,09	0,08	-0,08	-0,08	0,00	0,00
var2006Q3	0,04	0,01	0,01	-0,15	...	-0,18	-0,18	-0,11	-0,05	-0,05	0,00
var2006Q4	-0,20	-0,20	-0,20	-0,12	...	0,01	0,01	0,03	0,09	0,02	0,00
var2007Q1	0,32	0,32	-0,09	-0,09	...	-0,14	-0,09	-0,14	-0,10	-0,10	0,00
var2007Q2	0,29	0,29	0,42	0,45	...	-0,13	-0,13	-0,11	-0,01	-0,01	0,00
var2007Q3	-0,29	-0,49	-0,49	-0,44	...	0,10	0,10	0,17	-0,07	0,00	0,00
var2007Q4	-0,15	-0,04	-0,04	0,13	...	-0,19	-0,15	-0,15	-0,02	0,00	0,00
var2008Q1	-0,13	-0,13	0,16	0,40	...	-0,16	-0,14	-0,14	-0,13	0,00	0,00
var2008Q2	-0,69	-0,69	-0,80	-0,78	...	-0,22	-0,21	-0,21	-0,05	0,00	0,00
var2008Q3	-1,28	-1,35	-1,39	-1,14	...	-0,17	-0,23	-0,23	0,00	0,00	0,00
var2008Q4	-1,39	-1,39	-0,95	-0,23	...	0,04	0,07	0,07	-0,02	-0,03	0,00
var2009Q1	0,12	0,12	0,17	-0,13	...	-0,03	-0,08	-0,05	-0,11	0,00	0,00
var2009Q2	-0,21	0,01	0,01	-0,09	...	-0,10	-0,06	-0,06	0,02	0,00	0,00
var2009Q3	0,25	0,09	0,09	0,11	...	0,12	0,17	0,17	0,08	0,00	0,00
var2009Q4	1,01	1,30	1,30	0,99	...	0,11	-0,07	-0,07	-0,04	0,00	0,00
...

Table : Real GDP revision errors

Note: final release is defined as l_{24}

Predictability measures I

To measure predictability of revisions I **test predictability of revision errors**.

Revision errors

difference between preliminary estimate and the final release

$$e_t^I = x_t^L - x_t^I \quad (1)$$

The final release is defined as

- 1 Release 24 months after the end of the report quarter: $x_t^L = x_t^{24}$
- 2 Last known release

Predictability measures II

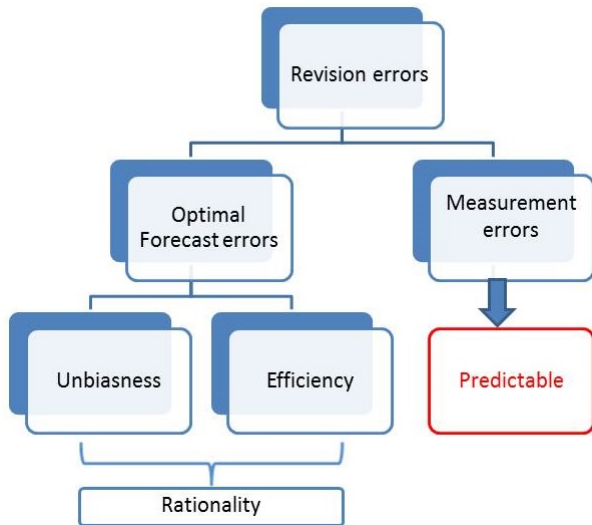


Figure : Roadmap

1 Parametric regression tests

- ▶ Mincer and Zarnowitz (1969) test for unbiasedness and weak efficiency
- ▶ Nordhaus (1987) test for serial correlation between the revision errors (strong rationality)

Mankiw et al. (1984), Mankiw and Shapiro (1986), Mork (1987) and Mork (1990), Oeller and Barot (2000), Croushore and Stark (2003), Faust et al. (2005), Swanson and Dijk (2006), Aruoba (2008), Croushore (2011), Siliverstovs (2012)

2 Nonparametric tests

Unsystematic forecast errors need not to have fixed variance nor need to be normally distributed.

Dufour (1981), Campbell and Dufour (1991), Campbell and Dufour (1995), Campbell and Ghysels (1995), Fritsche and Heilemann (2010)

- ▶ Robust against traditional assumptions about residual properties
- ▶ Perform better in small samples
- ▶ Focus on median rather than mean of the revision errors

Hypotheses

Euro area aggregates revision errors are

- ① Measurement errors or *noise* \Rightarrow the agency announces raw data:

$$x_t^{output} = x_t^I$$

$$x_t^I = \alpha_0 + \alpha_1 x_t^L + u_t^{ME} \quad (2)$$

Test the joint hypothesis H_0 : $\alpha_0 = 0$ and $\alpha_1 = 1$

If this hypothesis is not rejected then $u_t^{ME} = x_t^I - x_t^L$

- ② Optimal forecast errors or *news*

\Rightarrow the agency announces an optimal forecast: $x_t^I = x_t^{OF}$

$$x_t^L = \beta_0 + \beta_1 x_t^I + u_t^{OF} \quad (3)$$

Test the joint hypothesis H_0 : $\beta_0 = 0$ and $\beta_1 = 1$

If the null is not rejected then $u_t^{OF} = x_t^L - x_t^I$

Unbiasedness and efficiency

The optimal forecast has to be:

- unbiased
- efficient

Parametric tests:

① Mincer and Zarnowitz (1969)

$$x_t^L = \beta_0 + \beta_1 x_t^I + u_t^{OF} \quad (4)$$

② Nordhaus (1987)

$$e_t^I = \gamma_1 e_{t-1}^I + u_t \quad (5)$$

	Unbiasedness	Weak efficiency	Strong efficiency
Parametric	$H_0: \beta_0 = 0$	$H_0: \beta_1 = 1$	$H_0: \gamma_1 = 0$
Nonparametric	$Med(e_t^I) = 0$		$Med(e_t^I * e_t^{I-1}) = 0$

Results: real GDP

Hypotheses	final = l_{24}	final = last known
noise	not reject	reject, except for $l_{13} - l_{18}$
news	not reject	reject
unbiasedness	not reject	reject
weak efficiency	not reject	reject
strong efficiency	reject	reject
nonparametric unbiasedness	not reject	reject from l_{10}
nonparametric efficiency	reject	reject

Table : Test results for the real GDP

Results: real consumption

Hypotheses	final = l_{24}	final = last known
noise	reject $l_1 - l_{14}$	reject
news	not reject	reject $l_4 - l_6$ & from l_{11}
unbiasedness	not reject	reject $l_4 - l_6$ & from l_{11}
weak efficiency	reject	reject from l_{13}
strong efficiency	reject	reject
nonparametric unbiasedness	not reject	reject $l_4 - l_6$; $l_{11} - l_{14}$
nonparametric efficiency	reject	reject

Table : Test results for the real consumption

Results: real investment

Hypotheses	final = l_{24}	final = last known
noise	reject $l_1 - l_3$	reject
news	reject	reject from l_5
unbiasedness	reject	reject
weak efficiency	not reject	not reject
strong efficiency	reject	reject
nonparametric unbiasedness	not reject	not reject $l_1 - l_4; l_{19} - l_{24}$
nonparametric efficiency	reject	reject

Table : Test results for the real investment

Results: nominal GDP

Hypotheses	final = l_{24}	final = last known
noise	not reject	reject
news	not reject	reject from l_4
unbiasedness	not reject	not reject
weak efficiency	not reject	reject from l_4
strong efficiency	reject	reject
nonparametric unbiasedness	not reject	reject from l_7
nonparametric efficiency	reject	reject

Table : Test results for the nominal GDP

Conclusions

- Notwithstanding the definition of the final estimate, the revisions of the GDP and its aggregate are inefficient
- Unbiasedness can not be rejected in nonparametric tests and in parametric tests under the assumption that the final estimate is released 24 months after the end of report quarter
- Unbiasedness seems to change **during** the revision period, if the last known vintage is taken as the final
- Distribution of revision errors throughout the quarters exhibit no tendency to be more biased or inefficient during the crisis than at the normal times

Thank you for your attention

- Arnold, Eva**, "The Role of Data Revisions and Disagreement in Professional Forecasts," *Journal of Business Cycle Measurement and Analysis*, 2015, *forthcoming*.
- Aruoba, S.B.**, "Data Revisions Are Not Well Behaved," *Journal of money, credit and banking*, 2008, 40 (2-3), 319–340.
- Campbell, B. and E. Ghysels**, "Federal Budget Projections: A Nonparametric Assessment of Bias and Efficiency," *The Review of Economics and Statistics*, 1995, 77 (1), 17 – 31.
- Campbell, Bryan and Jean-Marie Dufour**, "Exact Nonparametric Orthogonality and Random Walk Tests," *The Review of Economics and Statistics*, 1995, 77 (1), pp. 1–16.
- **and Jean-Marie Dufour**, "Over-rejections in rational expectations models," *Economics Letters*, 1991, 35 (3), 285 – 290.

Literatur II

- Campbell, Sean D.**, “Macroeconomic Volatility, predictability, and Uncertainty in the great Moderation: Evidence from the survey of professional Forecasters,” *Journal of Business and*, 2007, 25 (2), 191–200.
- Clements, Michael B. and Ana B. Galvao**, “Real-time forecasting of inflation and output growth with autoregressive models in the presence of data revisions,” *Journal of applied econometrics*, 2013, 28 (3), 458–477.
- Croushore, Dean**, “Forecasting with real-time macroeconomic data,” in Graham Elliott, Clive Granger, and Allan Timmermann, eds., *Handbook of Economic Forecasting*, Vol. 1, Elsevier B.V, 2006.
- , “Frontiers of Real-Time Data Analysis,” *Journal of Economic Literature*, 03 2011, 49 (1), 72–100.
- **and Tom Stark**, “A real-time data set for macroeconomists,” *Journal of Econometrics*, 2001, 105 (1), 111 – 130. Forecasting and empirical methods in finance and macroeconomics.

Literatur III

- **and** — , “A Real-Time Data Set for Macroeconomists: Does the Data Vintage Matter?,” *The Review of Economics and Statistics*, 2003, 85 (3), 605–617.
- de Jong, Piet**, “Rational Economic Data Revisions,” *Journal of Business & Economic Statistics*, 1987, 5 (4), pp. 539–548.
- Döpke, Jörg and Ulrich Fritsche**, “Growth and Inflation Forecasts in Germany - An Assessment of Accuracy and Dispersion,” Technical Report 399, DIW (German Institute for Economic Research) Berlin February 2004.
- , — , **and Christian Pierdzioch**, “Predicting Recessions in Germany With Boosted Regression Trees,” DEP (Socioeconomics) Discussion Papers, Macroeconomics and Finance Series 5/2015, University of Hamburg 2015.
- Dufour, J.**, “Rank Tests for Serial Dependence,” *Journal of Time Series Analysis*, 1981, 2 (3), 117–128.

Literatur IV

- Faust, J., J.H. Rogers, and J.H. Wright**, “News and Noise in G-7 GDP Announcements,” *Journal of Money, Credit and Banking*, 2005, 37 (3), 403–419.
- Fritsche, Ulrich and Ullrich Heilemann**, “Too Many Cooks? The German Joint Diagnosis and Its Production,” Technical Report 1/2010 2010.
- Giannone, Domenico, Jerome Henry, Magdalena Lalik, and Michele Modugno**, “An area-wide real-time database for the Euro area,” *The Review of Economics and Statistics*, November 2012, 94 (4), 1000–1013.
- Glass, Katharina and Ulrich Fritsche**, “Real-time Macroeconomic Data and Uncertainty,” DEP (Socioeconomics) Discussion Papers, Macroeconomics and Finance Series 6/2014, Universitaet Hamburg 2015.
- Jacobs, J.P.A.M and van Norden S.**, “Modeling Data Revisions: Measurement Error and Dynamics of “True” Values,” *Journal of Econometrics*, 2011, 161 (2), 101–109.

- Keane, M.P and D.E Runkle**, “Testing the Rationality of Price Forecasts: New Evidence from Panel Data,” *American Economic Review*, 1990, 80 (4), 714–735.
- Kholodilin, Konstantin A. and Boriss Siliverstovs**, “Do forecasters inform or reassure? Evaluation of the German real- time data,” Discussion Paper 858, DIW Berlin February 2009.
- Kishor, N. Kundan and Evan F. Koenig**, “VAR Estimation and Forecasting When Data Are Subject to Revision,” *Journal of Business & Economic Statistics*, 2012, 30 (2), 181–190.
- Koenig, Evan F., Sheila Dolmas, and Jeremy Piger**, “THE USE AND ABUSE OF REAL-TIME DATA IN ECONOMIC FORECASTING.,” *Review of Economics & Statistics*, 2003, 85 (3), 618 – 628.
- Mankiw, N. Gregory and Matthew D. Shapiro**, “News or Noise: An Analysis of GNP Revisions,” *Survey of Current Business*, 1986, 66, 20–25.

Literatur VI

— , **David E. Runkle, and Matthew D. Shapiro**, “Are Preliminary Announcements of the Money Stock Rational Forecasts?,” *Journal of Monetary Economics*, 1984, 14, 15–27.

Mincer, Jacob and Victor Zarnowitz, “The Evaluation of Economic forecasts,” in J. Mincer, ed., *Economic forecasts and expectations*, National Bureau of Economic Research, 1969.

Mork, Knut Anton, “Ain’t Behavin’: Forecast Errors and Measurement Errors in Early GNP Estimates,” *Journal of Business & Economic Statistics*, 1987, 5 (2), pp. 165–175.

— , “Forecastable Money-Growth Revisions: A Closer Look at the Data,” *The Canadian Journal of Economics / Revue canadienne d’Economie*, 1990, 23 (3), pp. 593–616.

Nordhaus, William D., “Forecasting Efficiency: Concepts and Applications,” *The Review of Economics and Statistics*, 1987, 69 (4), 667–674.

- Oeller, Lars-Erik and Bharat Barot**, "The Accuracy of European Growth and Inflation Forecasts," *International Journal of Forecasting*, 2000, 16 (3), 293–315.
- **and Karl-Gustav Hansson**, "Revision of Swedish National Accounts," *Journal of Business Cycle Measurement and Analysis*, 2004, 2004/1, 363–386.
- Patterson, Kerry D. and Saeed Heravi**, "Direct Estimation of Entropy and Revisions to the National Income Accounts," *Journal of the Royal Statistical Society. Series D (The Statistician)*, 1991, 40 (1), pp. 35–50.
- Siliverstovs, Boriss**, "Are GDP Revisions Predictable? Evidence for Switzerland," *Applied Economics Quarterly*, 2012, 58 (4), 299–326.
- Swanson, Norman R. and Dick van Dijk**, "Are Statistical Reporting Agencies Getting It Right? Data Rationality and Business Cycle Asymmetry," *Journal of Business & Economic Statistics*, 2006, 24 (1), pp. 24–42.

Young, Allan H, "The Statistics corner: reliability and accuracy of quarterly GDP," *Business Economics*, 1994, 29 (4), 63–67.