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The Impact of Seasonal and Price Adjustments on the Predictability of German GDP Revisions

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Abstract:
Releases of the GDP are subject to revisions over time. This paper examines the predictability of German GDP revisions using forecast rationality tests. Previous studies of German GDP covering data until 1997 finds that revisions of real seasonally adjusted GDP are predictable. This paper uses a newly available real-time data to analyze the revisions of real seasonal adjusted GDP, of nominal unadjusted GDP, of the seasonal pattern, and of the GDP deflator for the period between 1992 and 2006. We find that the revisions of the nominal unadjusted GDP are unpredictable, but that the revisions of the price adjustments are predictable. Nevertheless, revisions of real seasonally adjusted GDP are hardly predictable and less well predictable compared to earlier studies. This lower predictability seems to be linked to the finding that revisions of seasonal adjustments are hardly predictable, too, and that their predictability decreased over time.

Keywords: Real-time data, GDP revisions, noise, news, forecasting, seasonal adjustment, price adjustment

JEL classification: C82

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1 Introduction

The problem that policy makers and researchers face is that they have to use currently available data which can be preliminary, partly revised, or final. The quality of the preliminary and partly revised data is very crucial, as important decisions rely on that data. Croushore and Stark (2003) show that data revisions can have significant effects on the empirical results of macroeconomic models. The impact of revisions on economic and policy analysis is the topic of several papers for example Bernanke and Bovin (2003), Clausen and Meier (2003), and Gerberding et al. (2005). Orphanides (2003) concludes that policy makers should make their decisions more passively and cautiously the larger the noise in the real time data is. Therefore decision makers need a way to quantify the noise in the available real time data and, if possible, enhance the preliminary data to conduct an optimal policy. Consequently, the question arises whether early estimates of GDP figures can be improved to improve the basis for making policy decisions, i.e., the question arises whether revisions are predictable.

In their seminal study on the nature of errors in preliminary GNP data, Mankiw and Shapiro (1986) analyze the revisions of real and nominal seasonally adjusted US GNP in the period between Q1 1976 and Q4 1982. They check the correlations and variance of the subsequent revisions and try to predict those using data that were available at the time of the preliminary announcement. Their main finding is that revisions of GNP data cannot be predicted, which implies that preliminary estimates of the GNP are rational estimates that use all available information. This finding is challenged by Faust et al. (2005) and Fixler and Grimm (2006), who find predictability of US GDP revisions between 1983 and 2000. They analyze real and nominal seasonally adjusted GDP and find it possible to predict future revisions in some part by using real-time vintage data. Considering economic variables does not improve predictability substantially. Hogrefe (2008) analyzes US GDP between 1985 and 2003 and finds, like Fixler and Grimm, predictability of revisions. The predictability of revisions increases, in comparison to Fixler and Grimm, by using a mixed frequency approach.

Studies for German data are among other presented by Faust et al. (2005). They analyze the predictability of revisions of real seasonally adjusted GDP for the G7 countries between Q4 1979 and Q4 1997. They reject the hypothesis that the first estimates are rational for all 7 countries for long-term revisions and short-term revisions except for US short-term revisions. This means that the revisions are to a substantial degree due to noise and can be predicted. They find that at least one quarter of the variance in short-term revisions can be predicted by using information that was available at the time of the preliminary announcement. The preliminary announcement itself has the biggest impact in their regressions. This is evidence for noise driven revisions, where one would expect that extreme values tend to be revised towards to the mean. De Antonio Liedo and Carstensen (2005) provide a model to decompose revisions into pure news and noise components and analyze US, German and euro area real seasonally adjusted GDP/GNP revisions. Their data for West Germany covers Q1 1962 to 1994 Q4. They find that the news component is the dominating reason, but not the only reason for revisions. The news component is still significant after two and three years, which means that even after such a long time new data becomes available the GDP measurement. They conclude that it is possible to improve the releases of the statistical agency, as data revisions are partly subject to noise. All the studies for German GDP deal with real seasonally adjusted data only. However, Kavajacz and Collins (1995) show that seasonal adjustment at the current edge can induce noise. The same might be true for price adjustment. Thus, adjustments may play an important role in assessing the predictability of data revisions. Until now, studies on the predictability of German GDP revisions did not incorporate an analysis on the impact of adjustments on the predictability.

This study contributes to the literature in two ways. Firstly, it assesses a new data set on GDP revisions provided by the Deutsche Bundesbank and thus provides an update compared to earlier studies regarding the predictability of revisions of real seasonally adjusted GDP growth rates. Secondly, revisions of unadjusted GDP, revisions of price adjustments, and revisions of seasonal adjustments are assessed for the first time. For this purpose the real time data set of the Deutsche Bundesbank is enhanced correspondingly. Thus, this study provides a new real time data set on price and seasonal adjustments. It analyzes the predictability of their revisions and assesses the impact of adjustments on the predictability of revisions of real seasonally adjusted GDP. To provide a benchmark, we also assess the GNP data in the data set provided by Gerberding et al. (2005), as this data set also contains nominal as well as seasonally unadjusted data.

We find that the revisions of the original series, nominal unadjusted GDP, are not predictable. The Mincer-Zarnowitz forecast rationality tests do reject the null hypothesis for several revision horizons, but the improvements are rather small and economically insignificant. This result is also found for the older GNP data. Revisions of the seasonal adjustments and, particularly, of the price adjustments are predictable. However, the predictability is only partly transferred to the revisions of real seasonally adjusted GDP growth. Thus, the predictability of revisions of real seasonal adjusted GDP growth is diminished compared to studies on earlier data. The loss of predictability is also true for the revisions of the seasonal adjustments. This change in predictability may be due to the changeover from X-11 to X-12 ARIMA that took place within our sample. We conclude that more accurate procedures for adjusting data is crucial for the rationality of data announcements as revisions of the original data are not predictable and predictability of the revisions of real seasonally adjusted GDP seems to hinge on the predictability of revisions of the seasonal adjustments. Furthermore, we can confirm the usefulness of survey data for forecasting revisions, as already noticed by Matheson et al. (2010). We successfully apply the ifo index following Jacobs and Sturm (2004), who predict revisions of industrial production. The survey data seem to include information able to correct inaccurate data adjustments.

The rest of the paper is structured as follows. Section 2 discusses the process of data revision in Germany. Section 3 explains the real time data set. Section 4 presents our course of the analysis. Section 5 presents the results of our analysis, both in-sample and out-of-sample. Section 6 concludes.

2 Data Revision Process in Germany

The German statistical agency (Statistisches Bundesamt) revises GDP estimates quite frequently. They differentiate between ongoing revisions and benchmark revisions. The process of ongoing revisions take about four years. During this time, the preliminary estimate of GDP is revised several times as new data becomes available. While calculating the first estimate of GDP, which is announced in February, May, August, and November, the data for the other quarterly GDP figures of that year are also revised. In August, the preceding sixteen quarters are analyzed and revised if necessary. After four years the data is considered final and will only be changed when benchmark revisions are made. Later during the revision process, it is possible for the agency to access complete corporate statistics especially cost structure and turnover tax statistics. In the earlier estimates the agency has to use output indicators.

Benchmark revisions are done approximately every five years to take new methods, data and statistics into account. Four benchmark revisions took place during the time period covered by our sample. The last benchmark revision in our sample was in the beginning of 2005, when the statistical agency introduced a chain price index that changes every year. Before then, the base year was fixed for several years. Additionally, from 2005 on, the real GDP has been reported as an index and the method of measuring banking services (FISIM) was changed to harmonize with EU methods. In 2000, the Deutsche Bundesbank started to use the Census X-12-ARIMA method for seasonal adjustment instead of Census X-11. This was done in order to obtain more reliable results using state-of-the art mathematical methods that the size of revisions allow to be reduced. The main changes in the benchmark revision of 1999 were the switch to a new year as the price base, in this case 1995, and the application of the rules of the European System of Accounts (ESA). This was done to have common and comparable statistics in Europe. The benchmark revision of 1993 included mainly the change from West Germany to whole Germany.

3 Data description and preliminary analysis

We use data in the new real time data base of the Deutsche Bundesbank and, in addition, from other sources. The Deutsche Bundesbank supplies real time data sets for national accounts, prices, and short-term business cycle and labor markets indicators. The data for the real calendar and seasonally adjusted GDP for the period between Q1 1995 and Q2 2007 are from the database of the Deutsche Bundesbank. Due to the benchmark revision in 2005 mentioned above, real GDP is only available as a chain index since then. For the period between Q1 1992 and Q4 1994 we use real GDP data from Gerberding et al. (2005). The use of the chain index from 2005 onwards prevents us from analyzing the revisions in absolute values but only in growth rates, which is consistent with most of the work in this field. As Mankiw and Shapiro (1986) point out, using growth rates instead of level variables has the advantage that growth rates are mostly stationary. Data for the nominal calendar and seasonally adjusted GDP in the Deutsche Bundesbank database are only available from 2005 on. The previous data we use are from the Deutsche Bundesbank publication"Saisonbereingte Wirtschaftszahlen" from 1992 until 1999. The data for the period between 2000 and 2004 are from the German statistical agency. The vintage data for the nominal unadjusted GDP are also from the data base of the Deutsche Bundesbank for the period between 2005 and now. Time series for the time between 2000 and 2004 are from the statistical agency. The previous vintage data are from the Destatis publication "Fachserie 18 Reihe 3". We had to make some assumptions for this data, as the publication did not contain all values. It did not contain the data for June 1995, so we assumed that there were no revisions between March and June, which fits the pattern of the revision presented in section 2. The value for 1995 Q1, which should have been published in June, was calculated using the value for Q1 published Sept. 95 but multiplied with 0.93, which was the average between the benchmark revisions factors for the preceding four quarters (1994 Q1 - Q4). We also assumed that the 13th vintages for 92 Q1, 93 Q1, 94 Q1, and 95 Q1 are the same as in 12th vintage, which also fits the revision pattern namely that long term revisions are only done when the first estimate of the second quarter is announced.

We constructed dummies for all the time series to capture the effects of the benchmark revisions in 1993, 1995, 1999, and 2005 and to check for differences in the revision process of each quarter. A revision is calculated as the difference between the revised value and the first announcement. The first announcement was taken as the preliminary data for GDP growth. While other papers analyze very short-, short- and long-term revisions, we also look at all revisions made within 12 quarters after the first announcement. We do not consider all revisions made within 16 quarters since we only observe 12 quarters of revisions for the nominal unadjusted GDP. This should not pose a problem, as most of the revisions take place in the first three years while more and more information becomes available to the statistical agency. The following revisions were computed as the difference between the revised data at time h for the data of period t and the preliminary data of period t. In addition to the revisions of GDP, we also calculate those of price adjustments and the seasonal adjustments. The price adjustments (p) are calculated as the difference between the nominal adjusted GDP and the real adjusted GDP (r), the seasonal adjustments (s) as the difference between the nominal unadjusted GDP (u) and the nominal adjusted GDP.

The summary statistics of the revisions are presented in tables 1 to 4, the plots in figure 1. They show that the mean and median of the revisions are larger than zero for all of the four time series. Only the adjustments show mixed patterns. While the mean of the price adjustment is mostly negative for the first six revisions, it is positive for the longer term revisions. The mean of the seasonal adjustment shows both positive and negative values for the whole revision period. Following Mankiw and Shapiro (1986), we checked the variance of the revisions. When the preliminary announcement is an efficient forecast of subsequent estimates, then the variance of the subsequent estimates should increase. On the other hand, if a revision only clears the measurement error of former estimates, then the variance should decrease over time. In our sample the variance is positive for all revisions and is increasing with the revision horizon. Hereby especially the nominal unadjusted GDP and the seasonal adjustment stand out due to their comparatively high variance. These results support, in the sense of Mankiw and Shapiro, the hypothesis, that the earlier estimates are efficient forecasts of the subsequent estimates. From this preliminary analysis, it is not clear whether the revisions to German GDP are rational or not.

The revisions of adjustments and of nominal unadjusted GDP do not seem to be independent of each other. Especially revisions of seasonal adjustments and the nominal unadjusted data are highly correlated (table 5). With regard to the real seasonally adjusted series, the correlations are much lower. The co-movements of the revisions of the seasonal adjustments and the nominal unadjusted series cancel each other by construction. Correlations between revisions of price adjustments and nominal unadjusted GDP are also modest.

We use business cycle indicators that are generally in line with prior work in this topic to analyze the revisions of GDP and its adjustments. We use the ifo Business Situation (adjusted and unadjusted) as a main indicator for German GDP. Like Mankiw and Shapiro we use an equity index, in this case German DAX performance. As supplemental business cycle indicators, we use the unemployment rate, the first estimate of the German CPI, the oil price (BRENT), and the base money M1. The summary statistics for those variables are presented in tables 1 through 4.

4 Course of the analysis

A test for forecast rationality can be used to determine if the revisions of German GDP are subject to news or noise. The test used here is the so-called Mincer-Zarnowitz forecast rationality test, which relates the revision of the data with the preliminary data. The corresponding model is given by the equation below:

$$r_{h,t} = y_{h,t} - y_{1,t} = \alpha + \beta y_{1,t} + u_t, \tag{1}$$

where $r_{h,t}$ denotes the revision in vintage h of the figure belonging to the time period t, and $y_{1,t}$ denotes the first vintage of this figure. The null hypothesis of rational vintages corresponds to the restriction on the parameters $\alpha = \beta = 0$. A rejection of this parameter restriction indicates that revisions are predictable. However, we consider an extended equation that includes additional information X_t available at the time of the first vintage throughout the paper:

$$r_{h,t} = \alpha + \beta y_{1,t} + \gamma X_t + u_t. \tag{2}$$

The first model that we estimate (model I) considers dummies for benchmark revisions and seasonal dummies that we selected via AIC. In a second round we include the ifo index (model II), and in third round we include other variables that we selected via AIC (model III). Selection of dummies and variables was done for the highest revision horizon only. The corresponding results were also used for the shorter horizons.

We apply these models for all revision horizons from 2 to 13 quarters to assess the predictability over time. In addition to the growth rates of real seasonal adjusted GDP, we also examine revisions of the growth rates of nominal unadjusted GDP (original data), the growth rates of the price adjustments, and the seasonal adjustments. Thus, we examine not only the aggregate typically analyzed in the literature (s.a., real GDP) but also its components. All the model estimations are done using OLS. The correlations between the components, especially between revisions of the seasonal adjustments and the original data, suggest using a seemingly unrelated regression would increase efficiency. However, the results obtained using this method were basically the same as the results obtained by OLS. Thus, we only report the OLS results.

Given the short sample and some indication that our in-sample results may be misspecified results of in-sample analysis have to be interpreted with care. Therefore, we also perform out-of-sample analysis to validate our findings. All models are estimated with expanding windows and one-step-ahead forecasts are calculated. This is done for the last 20 observations.

5 Results

5.1 In-sample: Nominal unadjusted GDP

The forecast rationality test according to model I for the nominal unadjusted GDP is shown in table 6. It rejects forecast rationality for most of the revision horizons at common levels: only the first revision u_{21} seems to be purely news driven. The preliminary announcement of the nominal unadjusted GDP, as well as the constant, are highly significant throughout the revision horizon and the magnitude of the coefficients increase. Also, the dummy for the first quarter is generally significant and negative, which indicates that the estimates for the first quarter tend to be revised downwards. Although the coefficients are mostly significant, the adjusted R^2 is low, with a maximum of 18.5%. In summary, the first estimate of the nominal unadjusted GDP by the statistical agency does not seem to be rational, but model I can explain only a fraction of the variation. Results for model II that adds the ifo index are given in Table 7. The additional variable is only significant in a few cases and the explanatory power of this model is basically the same as the explanatory power of model I.

In model III, we add the unemployment rate, the quarter-on-quarter preliminary inflation rate (CPI) and the quarter-on-quarter rate of change of the German Stock Index (DAX) (Table 8). Especially the DAX is highly significant over the whole revision process, although the coefficient is somewhat small. Both CPI and unemployment rate are only significant towards the end of the revision horizon. In summary, models II and III provide no improvement and no insights, as the preliminary announcement is still significant in most cases.

5.2 In-sample: Seasonal adjustment

The Mincer-Zarnowitz test based on model I rejects the null hypothesis for revisions of seasonal adjustments (Table 9). The preliminary announcement is significant over the whole revision process. A high first estimate seems to be revised down. Also the dummies for the first and fourth quarter are significant in all but one case and also seem to be revised downwards in general.

Results for model II indicate that the ifo Busines Situation does not contain much information about future revisions of seasonal adjustments (Table 10). We were still able to reject forecast rationality in all cases and the preliminary announcement was still highly significant. However, the adjusted R^2 only changed marginally by adding the ifo Business Situation.

By adding further information, that was available at the time of the first official estimate of the seasonal adjustment we tried to increase the explanatory power (Table 11). In model III we use, additional to the ifo Buiness Situation, the unemployment rate and the quarterly change of M1. These additional variables also do not seem to include much information for the future revisions of the seasonal adjustment. The first estimate itself stays highly significant throughout the revision horizon.

As noted above, the Deutsche Bundesbank has been using the Census X-12-ARIMA method for seasonal adjustment since the first quarter of 2000. The purpose of this changeover was to have a more reliable method and to reduce the size of revisions. If the new method is successful in reducing the noise in the first estimate, we should see a lower variance in the revisions that were made for the estimates since 2000. As can be seen in Figure 1, it seems that the variance of the revisions was reduced by the introduction of Census X-12-ARIMA. In order to analyze the effect of the changeover closer, we split our sample at Q4 1999. The standard deviation of the first subsample is more then twice as big as of the standard deviation of the second subsample. This indicates that the changeover to Census X-12-ARIMA fulfilled its purpose by reducing the size of revisions.

This could introduce a break in our data. We apply the Chow break test on the general Mincer-Zarnowitz specification to check for a possible structural break at the first quarter 2000 in our sample. However, we found that the changeover from Census X-11 to Census X-12-ARIMA has basically no impact on the mean regressions.

5.3 In-sample: Price adjustment

Using model I the Mincer-Zarnowitz forecast rationality test rejects the null hypothesis in all cases at the 1 % significance level (Table 12). Even with model I it is possible to predict a large fraction of future revisions. The adjusted R^2 increases with the revision horizon to over 50%. This result indicates that revisions of the first estimate by the statistical agency are noise driven to a big stack.

In model II, we enhance the regression equation by introducing the quarterly change of the ifo Business Situation (Table 13). The test rejects forecast rationality in all cases and also the adjusted R^2 increases throughout the revision horizon compared to model I. The Business Situation is highly significant and negative in most cases. The preliminary announcement though still is significant, which indicates that it contains information beyond the business situation.

By adding more data that was available at the time of the first estimate we were able to enhance the explaining power (Table 14). We use the quarterly change of the ifo Business Situation, the unemployment rate, the quarterly change of the DAX, and the year-on-year change of the oil price (BRENT), and a dummy for the benchmark revision in 1993, and a dummy for the first quarter. Using other data, like CPI, interest rates, or monetary aggregates yield no additional information. Particularly the preliminary CPI correlates only modestly with the first estimate of the price adjustment. Also with model III Mincer-Zarnowitz forecast rationality test rejects forecast rationality in all cases. Additionally, the adjusted R^2 increases compared to model I and model II. The chosen variables seem to contain information for revisions of price adjustments. However, there is still additional information in the first estimate, which is highly significant in all cases.

5.4 In-sample: Real seasonally adjusted GDP

We would expect high predictability of revisions of real adjusted GDP since this data contains adjustments whose revisions are predictable. A revision of the real adjusted GDP equals the revision of the nominal unadjusted GDP minus the revisions of the seasonal adjustment and the price adjustment. As two of the three components showed predictability, the real adjusted GDP revisions could also be predictable.

The Mincer-Zarnowitz forecast rationality test in model I rejects the null hypothesis in six out of twelve cases at a level of 5%, and the adjusted R^2 is, compared to the results presented above, quite low (Table 15). These results model seems to contradict the previous results.

We continue by adding the ifo Business Situation (Table 16). This enhanced the results notably.

Thus, the ifo Business Situation seems to contain information on future revisions. The test rejects the hypothesis of rational forecasts in seven cases at the 5% level, and the adjusted R^2 also increased. The Business Situation is only significant in revisions that are done after one year.

In model III, we use the quarterly growth rate of M1 as additional indicator, but doing so did not basically increase the predictability of the revisions of the real adjusted GDP. The results are shown on table 17. The explanatory power of the model is higher than the one of model I. In sum, it can be concluded, that the first estimate of the real adjusted GDP is not rational and the reduction of the noise can be forecasted to some degree.

The rather low predictability of revisions of the real adjusted GDP in comparison to the predictability of revisions of seasonal adjustments and price adjustments can be explained to some degree by looking at the correlations between the revisions. It can be assumed that the revisions of the real adjusted GDP, which is the nominal unadjusted GDP minus the adjustments, can be predicted quite well, as two of its three components are not very rational. An explanation for the fact that they are not could be that the revisions of the nominal unadjusted GDP are highly correlated with the revisions of the seasonal adjustment. In table 5, we find that the seasonal adjustment has a correlation of 0.78 with the revision of the nominal unadjusted GDP. This is not surprising, as the seasonal adjustment is basically a filter that smoothes the nominal unadjusted GDP. Due to this, revisions of the nominal unadjusted GDP lead to revisions of the seasonal adjustment. As the seasonal adjustment is subtracted from to nominal unadjusted GDP in order to get the real adjusted GDP, those revisions cancel each other out. Due to this, the higher predictability of the revisions of seasonal adjustments does not translate to the predictability of revisions of the real adjusted GDP. The higher predictability of the real adjusted GDP in comparison to the nominal unadjusted GDP is mostly due to the price adjustment.

5.5 Out-of-sample results

The out-of-sample forecasting exercise underlines the in-sample results. While the revisions of the price adjustment are predictable even with model I, the revisions of the other two components of real adjusted GDP are not predictable (table 18 through 21). The forecasting exercise suggests that the data processes for the seasonal adjustments and for the nominal unadjusted GDP are almost rational. Especially for the seasonal adjustments this result is surprising as the mechanics of seasonal adjustment are a possible source of noise (see Kavejaz and Collins, 1995). Further, this result is in contrast to findings for earlier data revisions of German GNP (see Appendix). The revision process has improved substantially in this regard. We assume that the changeover from Census X-11 to Census X-12-ARIMA that took place within the sample is mainly responsible for this improvement. We attribute it to pure luck that this changeover did not invoke a detectable structural break within the revisions of the seasonal adjustment. However, improvements in the data process seem to be limited to seasonal adjustment as the results concerning the price adjustment are almost unchanged. Further, nominal unadjusted GDP growth rates are unpredictable. This was true with the GNP data, too, and is in line with the findings of Kavejaz and Collins (1995) for the US money stock. Predictability of revisions seems to be induced by adjustments procedures.

For the revisions of real adjusted GDP, results are mixed. On the one hand, models can be found that prove predictability. Especially the ifo index seems to be a good predictor of future revisions, which is in line with Jacobs and Sturm (2004), who assess the ifo index for revisions of industrial production and recent findings underlining the importance of survey data for predicting revisions by Matheson et al. (2010). On the other hand, the explaining power of the forecasts is limited and much smaller than previously. The high predictability of the revisions of the price adjustment do not contribute substantially to the overall predictability. The small volatility contribution of the revisons of price adjustments to the total volatility of revisions of real adjusted GDP and the correlation between the revisions of price adjustments and the revisions of unadjusted GDP hinder this. In sum, we conclude that the loss in the predictability of revisions of the seasonal adjustment induced a substantial improvement in the early data quality of real adjusted GDP.

In addition, the out-of-sample experiment reveals that revisions with a horizon of about eight quarters can be better predicted than revisions with a horizon of 12 quarters. This is true for price adjustments and real adjusted GDP. Thus, one can conclude that particularly revisions after the eighth quarter are driven by news.

6 Conclusion

This paper analyzes the predictability of revisions of German GDP growth rates focussing on the impact of adjustment procedures, namely price adjustment and seasonal adjustment. For this reason, we not only assess revisions of real seasonally adjusted GDP but also revisions of the price adjustment, the seasonal adjustment, and the original series. We find that revisions of nominal GDP are defacto unpredictable as they were in a sample with earlier West German GNP. The predictability of revisions is mainly due to adjustment procedures. Revisions of the price adjustment are highly irrational. Already simple models yield a high R^2. This is also in line with the findings for GNP data from an earlier sample. However, concerning the revisions of the seasonal adjustment the changeover from Census X-11 to Census X-12-ARIMA seems to have improved the data quality substantially. While in-sample results still point at some predictability, the out-of-sample exercise points at rationality which is in clear contrast to the results for the earlier GNP sample. Seasonal adjustment was previously the major source of noise. Correspondingly, the predictability of revisions of real adjusted GDP growth rates declined, too, but is still relevant. Especially the ifo index helps predicting future revisions.

For practitioners, this study provides support for modelling revisions of price adjustments, as the out-of-sample analysis indicates fairly substantial gains even though the in-sample regressions seem to suffer from misspecification. Gains of modelling revisions of real adjusted GDP are somewhat lower, but it is still advisable to include survey data to forecast upcoming revisions.

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7 Figures and Tables

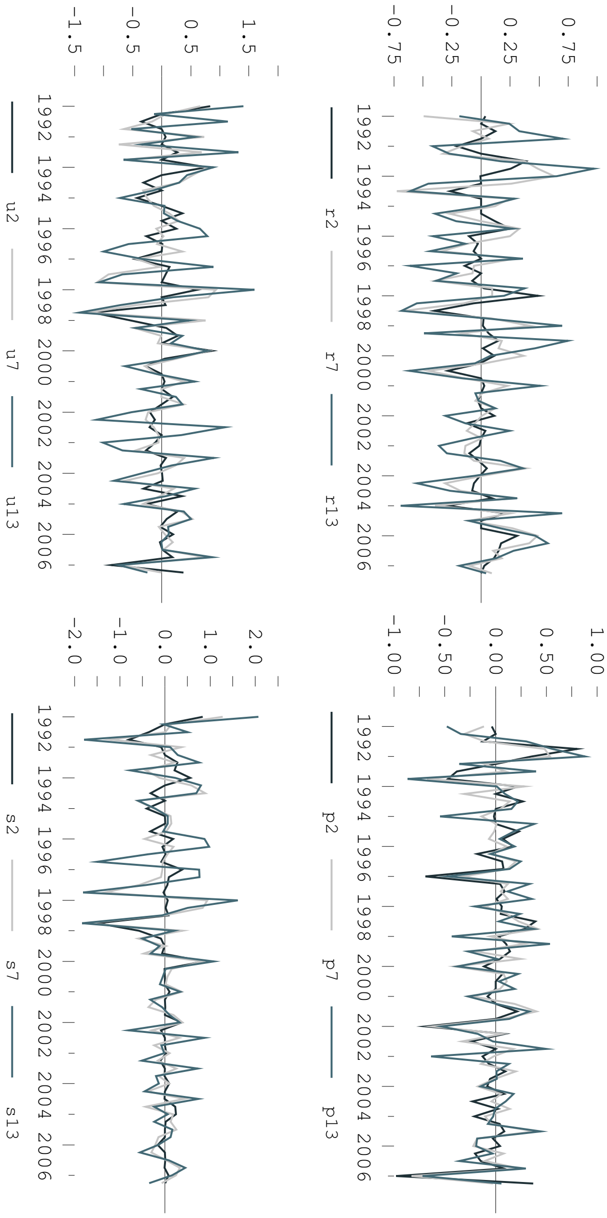

Figure 1: Data set.

Table 1: Summary statistics: unadjusted GDP

	u2	u3	u4	u5	u6	u7	u8	u9	u10	u11	u12	u13
Observations	62	62	62	62	62	62	62	62	62	62	62	62
Sample Mean	0.005	-0.013	0.019	0.013	0.009	0.007	0.039	0.029	-0.003	0.005	0.049	0.045
Variance	0.112	0.127	0.145	0.204	0.196	0.234	0.283	0.288	0.383	0.398	0.455	0.468
Standard Error	0.334	0.357	0.381	0.451	0.443	0.484	0.532	0.537	0.619	0.631	0.675	0.684
t-Statistic (Mean=0)	0.116	-0.282	0.400	0.219	0.167	0.119	0.582	0.432	-0.044	0.059	0.569	0.523
Skewness	-0.357	-0.019	0.099	0.784	-0.017	-0.238	-0.056	0.053	0.336	0.257	0.139	0.094
Kurtosis	3.233	0.878	0.575	1.904	0.138	0.013	-0.209	-0.192	0.052	-0.072	-0.450	-0.551
Jarque-Bera	28.320	1.997	0.956	15.726	0.052	0.586	0.145	0.125	1.174	0.698	0.721	0.876

Note: u2 denotes the revision made with the second vintage, u3 the revision made with the third vintage etc.

Table 2: Summary statistics: seasonal adjustment

	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13
Observations	62	62	62	62	62	62	62	62	62	62	62	62
Sample Mean	-0.004	-0.017	0.005	0.013	-0.006	-0.010	0.005	0.008	-0.006	-0.009	0.017	0.030
Variance	0.100	0.122	0.160	0.216	0.228	0.253	0.267	0.301	0.388	0.431	0.496	0.512
Standard Error	0.317	0.350	0.400	0.464	0.478	0.503	0.517	0.548	0.623	0.656	0.704	0.715
t-Statistic (Mean=0)	-0.105	-0.392	0.105	0.219	-0.096	-0.159	0.077	0.112	-0.071	-0.103	0.193	0.331
Skewness	-1.369	-0.092	0.384	0.496	-0.720	-0.645	-0.748	-0.704	-0.285	-0.413	-0.184	-0.277
Kurtosis	8.924	4.888	4.609	3.922	2.971	2.659	1.942	2.344	2.187	2.033	1.764	1.678
Jarque-Bera	225.073	61.809	56.393	42.291	28.160	22.562	15.520	19.311	13.191	12.440	8.386	8.060

Note: s2 denotes the revision made with the second vintage, s3 the revision made with the third vintage etc.

Table 3: Summary statistics: price adjustment

	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	p12	p13
Observations	62	62	62	62	62	62	62	62	62	62	62	62
Sample Mean	-0.007	-0.016	0.005	-0.003	-0.004	-0.003	0.009	0.010	0.003	0.000	0.019	0.011
Variance	0.067	0.082	0.087	0.082	0.082	0.066	0.077	0.088	0.100	0.101	0.109	0.114
Standard Error	0.259	0.287	0.295	0.286	0.287	0.257	0.277	0.297	0.316	0.319	0.330	0.338
t-Statistic (Mean=0)	-0.214	-0.434	0.132	-0.080	-0.113	-0.101	0.249	0.278	0.081	0.008	0.452	0.253
Skewness	-0.935	-0.841	-0.859	-0.854	-0.521	-0.720	-0.605	-0.599	-0.211	-0.165	-0.241	-0.314
Kurtosis	4.554	2.425	3.086	2.045	1.177	1.514	0.939	0.309	0.070	0.128	-0.139	0.197
Jarque-Bera	62.618	22.505	32.223	18.337	6.380	11.283	6.058	3.956	0.473	0.324	0.649	1.117

Note: p2 denotes the revision made with the second vintage, p3 the revision made with the third vintage etc.

Table 4: Summary statistics: adjusted GDP

	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13
Observations	62	62	62	62	62	62	62	62	62	62	62	62
Sample Mean	0.016	0.020	0.009	0.003	0.019	0.021	0.026	0.011	-0.001	0.013	0.013	0.005
Variance	0.022	0.033	0.053	0.058	0.072	0.079	0.085	0.104	0.129	0.144	0.152	0.168
Standard Error	0.148	0.181	0.231	0.240	0.268	0.282	0.292	0.322	0.360	0.380	0.389	0.409
t-Statistic (Mean=0)	0.861	0.889	0.310	0.083	0.569	0.581	0.688	0.273	-0.023	0.268	0.254	0.087
Skewness	0.287	0.187	-0.356	-0.457	-0.286	-0.353	-0.352	-0.453	-0.248	-0.146	-0.019	0.228
Kurtosis	2.358	0.915	0.706	0.431	0.201	0.098	-0.173	-0.153	-0.196	-0.295	-0.600	-0.698
Jarque-Bera	15.211	2.522	2.596	2.638	0.947	1.309	1.355	2.181	0.734	0.447	0.932	1.798

Note: r2 denotes the revision made with the second vintage, r3 the revision made with the third vintage etc.

Table 5: Correlation between revisions

	r2	r13	u2	u13	p2	p13	s2	s13
r2	1.00	0.63	0.31	0.37	-0.21	-0.20	0.04	0.10
r13		1.00	0.19	0.22	0.06	-0.21	-0.14	-0.27
u2			1.00	0.49	0.31	0.06	0.66	0.34
u13				1.00	0.01	0.13	0.34	0.77
p2					1.00	0.58	-0.40	-0.29
p13						1.00	-0.32	-0.23
s2							1.00	0.55
s13								1.00

Table 6: In-sample results: unadjusted GDP – model I

	u2	u3	u4	u5	u6	u7	u8	u9	u10	u11	u12	u13
Constant	0.141	0.219	0.216	0.250	0.255	0.317	0.323	0.293	0.286	0.326	0.323	0.355
	(1.305)	(1.958)	(1.790)	(1.786)	(1.961)	(2.223)	(2.007)	(1.821)	(1.507)	(1.679)	(1.558)	(1.714)
Pre. An.	-0.056	-0.088	-0.084	-0.112	-0.130	-0.147	-0.142	-0.143	-0.152	-0.158	-0.154	-0.172
	(-1.731)	(-2.624)	(-2.319)	(-2.660)	(-3.318)	(-3.419)	(-2.934)	(-2.954)	(-2.671)	(-2.700)	(-2.467)	(-2.771)
Dummy Quarter 1	-0.377	-0.626	-0.587	-0.705	-0.730	-0.881	-0.864	-0.812	-0.919	-0.987	-0.963	-1.064
	(-1.369)	(-2.196)	(-1.906)	(-1.977)	(-2.204)	(-2.418)	(-2.100)	(-1.978)	(-1.899)	(-1.991)	(-1.819)	(-2.013)
Dummy Quarter 3	-0.007	-0.050	0.042	0.076	0.117	0.057	0.133	0.165	0.198	0.152	0.311	0.324
	(-0.069)	(-0.455)	(0.357)	(0.557)	(0.925)	(0.407)	(0.846)	(1.052)	(1.070)	(0.802)	(1.535)	(1.608)
adj. R^2	0.007	0.068	0.046	0.090	0.185	0.174	0.126	0.146	0.107	0.098	0.100	0.130
Regression F	0.495	0.124	0.204	0.073	0.005	0.007	0.024	0.014	0.046	0.059	0.049	0.022
White	0.259	0.098	0.385	0.033	0.140	0.473	0.627	0.626	0.203	0.274	0.211	0.162
BGLM(1)	0.544	0.475	0.438	0.177	0.222	0.330	0.028	0.346	0.206	0.306	0.116	0.329
BGLM(2)	0.730	0.628	0.446	0.227	0.024	0.189	0.010	0.127	0.007	0.039	0.014	0.041
BGLM(4)	0.026	0.010	0.314	0.081	0.131	0.390	0.033	0.213	0.030	0.139	0.011	0.043
BGLM(8)	0.095	0.101	0.385	0.320	0.428	0.629	0.243	0.576	0.132	0.481	0.093	0.123
RESET(2) LM	0.716	0.099	0.102	0.159	0.766	0.443	0.851	0.418	0.617	0.616	0.612	0.581
ARCH	0.983	0.787	0.633	0.570	0.007	0.004	0.025	0.518	0.235	0.158	0.424	0.553

Note: Results for regressions with revisions relative to the first vintage as dependent variable. u2 denotes the revision made with the second vintage, u3 the revision made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 7: In-sample results: unadjusted GDP – model II

	u2	u3	u4	u5	u6	u7	u8	u9	u10	u11	u12	u13
Constant	0.159	0.232	0.230	0.255	0.227	0.295	0.293	0.277	0.251	0.289	0.266	0.292
	(1.368)	(2.032)	(1.886)	(1.791)	(1.718)	(2.026)	(1.791)	(1.691)	(1.297)	(1.458)	(1.261)	(1.392)
Pre. An.	-0.064	-0.091	-0.088	-0.115	-0.128	-0.146	-0.141	-0.144	-0.150	-0.156	-0.148	-0.166
	(-1.786)	(-2.686)	(-2.409)	(-2.732)	(-3.258)	(-3.381)	(-2.906)	(-2.967)	(-2.619)	(-2.644)	(-2.377)	(-2.669)
Ifo Busi. Sit.	0.012	0.008	0.012	0.029	0.028	0.032	0.041	0.041	0.040	0.041	0.039	0.034
	(0.707)	(0.428)	(0.582)	(1.220)	(1.252)	(1.273)	(1.460)	(1.456)	(1.195)	(1.190)	(1.076)	(0.945)
Dummy 1993	-0.178	-0.195	-0.213	-0.053	0.241	0.192	0.264	0.140	0.303	0.326	0.512	0.561
	(-0.456)	(-0.715)	(-0.868)	(-0.208)	(1.109)	(0.802)	(0.981)	(0.521)	(0.951)	(0.999)	(1.479)	(1.629)
Dummy Quarter 1	-0.422	-0.644	-0.606	-0.723	-0.724	-0.879	-0.860	-0.818	-0.912	-0.979	-0.941	-1.036
	(-1.448)	(-2.236)	(-1.964)	(-2.025)	(-2.180)	(-2.404)	(-2.093)	(-1.992)	(-1.876)	(-1.966)	(-1.781)	(-1.971)
Dummy Quarter 3	-0.007	-0.055	0.051	0.082	0.124	0.064	0.143	0.174	0.207	0.162	0.321	0.334
	(-0.064)	(-0.499)	(0.432)	(0.602)	(0.977)	(0.459)	(0.908)	(1.111)	(1.117)	(0.850)	(1.588)	(1.661)
adj. R^2	-0.012	0.053	0.044	0.094	0.183	0.169	0.129	0.149	0.101	0.093	0.106	0.140
Regression F	0.477	0.109	0.162	0.061	0.006	0.008	0.030	0.015	0.049	0.065	0.066	0.031
White	0.394	0.080	0.427	0.222	0.602	0.757	0.797	0.864	0.361	0.443	0.518	0.517
BGLM(1)	0.515	0.495	0.388	0.234	0.184	0.288	0.023	0.253	0.199	0.276	0.065	0.197
BGLM(2)	0.698	0.689	0.514	0.333	0.019	0.169	0.006	0.060	0.004	0.019	0.002	0.008
BGLM(4)	0.087	0.036	0.591	0.138	0.120	0.311	0.018	0.119	0.024	0.098	0.006	0.026
BGLM(8)	0.081	0.142	0.362	0.324	0.459	0.583	0.159	0.426	0.092	0.364	0.073	0.144
RESET(2) LM	0.976	0.444	0.827	0.562	0.735	0.430	0.763	0.289	0.560	0.672	0.649	0.912
ARCH	0.983	0.787	0.633	0.570	0.007	0.004	0.025	0.518	0.235	0.158	0.424	0.553

Note: Results for regressions with revisions relative to the first vintage as dependent variable. u2 denotes the revision made with the second vintage, u3 the revision made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 8: In-sample results: unadjusted GDP – model III

	u2	u3	u4	u5	u6	u7	u8	u9	u10	u11	u12	u13
Constant	0.345	0.763	0.747	0.631	1.240	1.815	1.789	1.565	2.255	2.396	2.891	3.186
	(0.565)	(1.194)	(1.098)	(0.788)	(1.690)	(2.245)	(1.967)	(1.742)	(2.162)	(2.206)	(2.508)	(2.780)
Pre. An.	-0.028	-0.045	-0.047	-0.059	-0.086	-0.094	-0.094	-0.097	-0.110	-0.106	-0.110	-0.120
	(-1.656)	(-2.590)	(-2.542)	(-2.724)	(-4.329)	(-4.280)	(-3.791)	(-3.960)	(-3.881)	(-3.586)	(-3.520)	(-3.855)
Ifo Busi. Sit.	0.027	0.030	0.035	0.040	0.038	0.050	0.055	0.053	0.056	0.057	0.053	0.049
	(1.384)	(1.453)	(1.622)	(1.548)	(1.603)	(1.932)	(1.903)	(1.864)	(1.695)	(1.651)	(1.436)	(1.341)
Unemployment	-0.047	-0.086	-0.084	-0.067	-0.129	-0.177	-0.174	-0.153	-0.226	-0.234	-0.277	-0.303
	(-0.828)	(-1.451)	(-1.333)	(-0.906)	(-1.894)	(-2.356)	(-2.067)	(-1.831)	(-2.336)	(-2.328)	(-2.588)	(-2.854)
CPI Prelim QoQ	0.140	-0.016	-0.028	-0.136	-0.170	-0.321	-0.323	-0.352	-0.438	-0.463	-0.573	-0.621
	(0.893)	(-0.099)	(-0.160)	(-0.662)	(-0.902)	(-1.549)	(-1.384)	(-1.526)	(-1.634)	(-1.661)	(-1.937)	(-2.111)
Dax QoQ	0.004	0.006	0.007	0.008	0.007	0.006	0.006	0.010	0.013	0.011	0.010	0.010
	(1.067)	(1.531)	(1.658)	(1.557)	(1.623)	(1.222)	(1.122)	(1.755)	(2.002)	(1.687)	(1.363)	(1.414)
Dummy Quarter 2	0.118	0.232	0.254	0.218	0.316	0.328	0.366	0.325	0.432	0.385	0.404	0.390
	(0.954)	(1.788)	(1.842)	(1.343)	(2.124)	(1.999)	(1.986)	(1.784)	(2.043)	(1.747)	(1.727)	(1.676)
Dummy Quarter 3	0.135	0.184	0.295	0.328	0.410	0.349	0.446	0.493	0.616	0.534	0.675	0.690
	(1.051)	(1.370)	(2.058)	(1.942)	(2.652)	(2.052)	(2.330)	(2.603)	(2.803)	(2.335)	(2.781)	(2.860)
adj. R^2	0.000	0.043	0.047	0.059	0.182	0.167	0.126	0.164	0.152	0.116	0.128	0.163
Regression F	0.581	0.157	0.128	0.092	0.002	0.003	0.009	0.005	0.005	0.012	0.007	0.002
White	0.388	0.309	0.331	0.026	0.136	0.050	0.046	0.109	0.146	0.337	0.286	0.214
BGLM(1)	0.308	0.641	0.299	0.281	0.169	0.277	0.018	0.216	0.243	0.348	0.171	0.447
BGLM(2)	0.558	0.772	0.448	0.482	0.074	0.332	0.030	0.332	0.145	0.320	0.203	0.354
BGLM(4)	0.008	0.028	0.302	0.161	0.316	0.309	0.079	0.273	0.393	0.496	0.118	0.214
BGLM(8)	0.054	0.212	0.403	0.374	0.629	0.289	0.267	0.222	0.414	0.514	0.157	0.158
RESET(2) LM	0.664	0.679	0.360	0.226	0.595	0.467	0.514	0.232	0.316	0.207	0.108	0.038
ARCH	0.983	0.787	0.633	0.570	0.007	0.004	0.025	0.518	0.235	0.158	0.424	0.553

Note: Results for regressions with revisions relative to the first vintage as dependent variable. u2 denotes the revision made with the second vintage, u3 the revision made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification;

Table 9: In-sample results: seasonal adjustment – model I

	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13
Constant	0.132	0.164	0.237	0.288	0.288	0.321	0.341	0.370	0.445	0.493	0.551	0.591
	(2.177)	(2.546)	(2.749)	(3.045)	(3.191)	(3.344)	(3.626)	(3.666)	(4.047)	(4.137)	(4.163)	(4.470)
Pre. An.	-0.076	-0.084	-0.088	-0.126	-0.129	-0.140	-0.131	-0.155	-0.197	-0.224	-0.231	-0.251
	(-2.552)	(-2.670)	(-2.275)	(-3.067)	(-3.349)	(-3.733)	(-3.303)	(-3.666)	(-4.251)	(-4.369)	(-4.043)	(-4.676)
Dummy Quarter 1	-0.438	-0.494	-0.614	-0.833	-0.827	-0.928	-0.894	-1.001	-1.297	-1.506	-1.580	-1.679
	(-1.900)	(-2.230)	(-2.404)	(-3.095)	(-2.864)	(-3.254)	(-2.996)	(-3.083)	(-3.837)	(-3.960)	(-3.844)	(-4.267)
Dummy Quarter 4	-0.108	-0.234	-0.315	-0.264	-0.351	-0.399	-0.452	-0.451	-0.509	-0.498	-0.555	-0.560
	(-1.154)	(-2.618)	(-3.266)	(-2.400)	(-2.667)	(-3.014)	(-3.260)	(-3.116)	(-3.370)	(-3.140)	(-3.386)	(-3.429)
adj. R^2	0.184	0.283	0.228	0.236	0.312	0.333	0.314	0.364	0.411	0.414	0.394	0.445
Regression F	0.089	0.006	0.004	0.008	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
White	0.043	0.021	0.006	0.004	0.022	0.061	0.056	0.192	0.037	0.072	0.046	0.117
BGLM(1)	0.036	0.020	0.218	0.030	0.216	0.393	0.108	0.765	0.237	0.435	0.048	0.326
BGLM(2)	0.078	0.056	0.422	0.034	0.018	0.048	0.004	0.018	0.000	0.001	0.001	0.002
BGLM(4)	0.032	0.014	0.306	0.032	0.069	0.051	0.004	0.010	0.001	0.002	0.000	0.001
BGLM(8)	0.467	0.043	0.045	0.074	0.255	0.154	0.019	0.007	0.011	0.005	0.002	0.027
RESET(2) LM	0.631	0.943	0.679	0.531	0.551	0.335	0.293	0.758	0.888	0.497	0.674	0.763
ARCH	0.958	0.607	0.718	0.045	0.068	0.204	0.128	0.020	0.030	0.019	0.063	0.081

Note: Results for regressions with revisions relative to the first vintage as dependent variable. s2 denotes the revision of the seasonal adjustment made with the second vintage, s3 the revision of the seasonal adjustment made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 10: In-sample results: seasonal adjustment – model II

	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13
Constant	0.127	0.162	0.232	0.282	0.286	0.319	0.336	0.365	0.441	0.486	0.547	0.589
	(2.142)	(2.451)	(2.654)	(2.947)	(3.191)	(3.385)	(3.666)	(3.683)	(3.992)	(4.182)	(4.135)	(4.461)
Pre. An.	-0.072	-0.083	-0.085	-0.122	-0.128	-0.139	-0.128	-0.152	-0.194	-0.220	-0.229	-0.250
	(-2.592)	(-2.567)	(-2.119)	(-2.863)	(-3.295)	(-3.742)	(-3.294)	(-3.628)	(-4.101)	(-4.408)	(-3.988)	(-4.611)
Ifo Busi. Sit.	0.023	0.010	0.019	0.025	0.010	0.010	0.020	0.022	0.020	0.028	0.019	0.008
	(1.712)	(0.636)	(1.096)	(1.362)	(0.551)	(0.521)	(1.103)	(1.085)	(0.884)	(1.191)	(0.707)	(0.301)
Dummy Quarter 1	-0.411	-0.482	-0.592	-0.804	-0.815	-0.916	-0.871	-0.975	-1.274	-1.473	-1.558	-1.670
	(-1.870)	(-2.133)	(-2.232)	(-2.859)	(-2.833)	(-3.298)	(-2.990)	(-2.993)	(-3.692)	(-4.019)	(-3.815)	(-4.239)
Dummy Quarter 4	-0.126	-0.242	-0.329	-0.284	-0.359	-0.407	-0.468	-0.469	-0.524	-0.520	-0.570	-0.567
	(-1.330)	(-2.565)	(-3.276)	(-2.464)	(-2.667)	(-2.942)	(-3.268)	(-3.123)	(-3.323)	(-3.194)	(-3.365)	(-3.340)
adj. R^2	0.208	0.276	0.231	0.244	0.303	0.324	0.313	0.365	0.408	0.417	0.388	0.437
Regression F	0.067	0.004	0.002	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
White	0.220	0.063	0.025	0.030	0.125	0.082	0.038	0.092	0.033	0.069	0.063	0.084
BGLM(1)	0.081	0.020	0.191	0.043	0.188	0.363	0.088	0.679	0.211	0.348	0.037	0.315
BGLM(2)	0.204	0.062	0.421	0.078	0.016	0.048	0.003	0.018	0.000	0.001	0.000	0.002
BGLM(4)	0.083	0.021	0.385	0.063	0.062	0.046	0.002	0.007	0.001	0.001	0.000	0.001
BGLM(8)	0.598	0.051	0.027	0.155	0.247	0.163	0.014	0.006	0.013	0.008	0.002	0.031
RESET(2) LM	0.278	0.850	0.552	0.582	0.550	0.337	0.347	0.902	0.920	0.585	0.707	0.768
ARCH	0.958	0.607	0.718	0.045	0.068	0.204	0.128	0.020	0.030	0.019	0.063	0.081

Note: Results for regressions with revisions relative to the first vintage as dependent variable. s2 denotes the revision of the seasonal adjustment made with the second vintage, s3 the revision of the seasonal adjustment made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 11: In-sample results: seasonal adjustment – model III

	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13
Constant	0.443	0.626	1.277	1.282	1.059	1.206	1.031	1.234	1.196	1.007	1.062	1.815
	(0.901)	(1.180)	(1.984)	(1.803)	(1.640)	(1.778)	(1.680)	(1.914)	(1.627)	(1.319)	(1.206)	(2.315)
Pre. An.	-0.056	-0.060	-0.059	-0.104	-0.118	-0.128	-0.121	-0.143	-0.173	-0.195	-0.199	-0.224
	(-2.053)	(-2.050)	(-1.738)	(-2.897)	(-3.040)	(-3.443)	(-2.816)	(-3.352)	(-3.476)	(-3.626)	(-3.297)	(-4.169)
Ifo Busi. Sit.	0.031	0.020	0.042	0.046	0.027	0.028	0.034	0.036	0.035	0.040	0.030	0.034
	(1.519)	(1.026)	(2.141)	(1.954)	(1.100)	(1.096)	(1.380)	(1.414)	(1.331)	(1.435)	(1.024)	(1.217)
Unemployment	-0.033	-0.047	-0.110	-0.108	-0.080	-0.093	-0.073	-0.093	-0.079	-0.054	-0.055	-0.132
	(-0.689)	(-0.914)	(-1.723)	(-1.512)	(-1.227)	(-1.361)	(-1.160)	(-1.461)	(-1.094)	(-0.720)	(-0.635)	(-1.689)
M1 QoQ	-0.014	-0.016	-0.015	-0.007	-0.001	-0.003	0.001	-0.002	-0.015	-0.020	-0.025	-0.017
	(-1.018)	(-1.241)	(-1.063)	(-0.453)	(-0.041)	(-0.219)	(0.041)	(-0.114)	(-0.781)	(-1.022)	(-1.196)	(-0.811)
Dummy Quarter 1	0.169	-0.214	0.177	0.687	0.053	0.099	0.073	0.296	0.068	-0.008	0.045	0.274
	(3.180)	(-0.919)	(0.633)	(2.562)	(0.175)	(0.378)	(0.286)	(1.339)	(0.299)	(-0.034)	(0.191)	(1.269)
Dummy Quarter 4	-0.286	-0.320	-0.322	-0.589	-0.670	-0.750	-0.750	-0.826	-1.070	-1.283	-1.342	-1.398
	(-1.357)	(-1.555)	(-1.401)	(-2.362)	(-2.314)	(-2.816)	(-2.462)	(-2.628)	(-3.104)	(-3.341)	(-3.223)	(-3.598)
adj. R^2	0.192	0.285	0.260	0.345	0.286	0.312	0.289	0.366	0.392	0.397	0.367	0.442
Regression F	0.287	0.069	0.011	0.006	0.012	0.004	0.005	0.004	0.001	0.002	0.003	0.000
White	0.217	0.033	0.039	0.087	0.012	0.000	0.042	0.018	0.019	0.037	0.050	0.083
BGLM(1)	0.069	0.112	0.095	0.107	0.144	0.335	0.082	0.654	0.186	0.304	0.046	0.271
BGLM(2)	0.164	0.204	0.315	0.248	0.014	0.056	0.004	0.016	0.000	0.001	0.000	0.002
BGLM(4)	0.063	0.053	0.197	0.503	0.052	0.054	0.003	0.008	0.001	0.000	0.000	0.002
BGLM(8)	0.489	0.107	0.011	0.695	0.190	0.120	0.020	0.013	0.006	0.001	0.001	0.033
RESET(2) LM	0.177	0.649	0.817	0.168	0.302	0.237	0.131	0.571	0.672	0.341	0.550	0.323
ARCH	0.958	0.607	0.718	0.045	0.068	0.204	0.128	0.020	0.030	0.019	0.063	0.081

Note: Results for regressions with revisions relative to the first vintage as dependent variable. s2 denotes the revision of the seasonal adjustment made with the second vintage, s3 the revision of the seasonal adjustment made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 12: In-sample results: price adjustment – model I

	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	p12	p13
Constant	0.088	0.097	0.117	0.113	0.102	0.114	0.112	0.132	0.137	0.134	0.155	0.160
	(2.433)	(2.693)	(3.138)	(3.275)	(3.001)	(3.942)	(3.298)	(3.947)	(3.986)	(3.826)	(4.057)	(4.076)
Pre. An.	-0.217	-0.282	-0.346	-0.410	-0.412	-0.390	-0.400	-0.465	-0.458	-0.437	-0.422	-0.442
	(-3.452)	(-4.531)	(-5.452)	(-6.811)	(-6.761)	(-7.393)	(-6.594)	(-7.486)	(-7.344)	(-7.043)	(-6.189)	(-6.194)
Dummy 1993	0.463	0.464	0.359	0.341	0.393	0.348	0.374	0.433	0.452	0.470	0.455	0.414
	(1.991)	(2.885)	(2.667)	(3.056)	(3.823)	(3.971)	(3.683)	(4.261)	(4.409)	(4.491)	(3.871)	(3.298)
Dummy 1995	0.158	0.155	0.164	0.097	0.196	0.033	0.131	0.157	0.165	0.118	0.097	0.091
	(0.682)	(0.968)	(1.219)	(0.892)	(2.002)	(0.424)	(1.569)	(1.952)	(2.143)	(1.589)	(1.188)	(1.040)
Dummy Quarter 1	-0.116	-0.137	-0.069	-0.007	-0.042	-0.051	-0.036	-0.061	-0.137	-0.151	-0.171	-0.181
	(-1.569)	(-1.953)	(-0.968)	(-0.114)	(-0.639)	(-0.928)	(-0.559)	(-0.951)	(-2.100)	(-2.291)	(-2.358)	(-2.418)
adj. R^2	0.251	0.407	0.409	0.469	0.478	0.534	0.459	0.540	0.567	0.565	0.515	0.519
Regression F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
White	0.142	0.554	0.039	0.110	0.288	0.002	0.054	0.451	0.086	0.119	0.309	0.009
BGLM(1)	0.564	0.142	0.809	0.619	0.613	0.162	0.147	0.005	0.002	0.019	0.003	0.049
BGLM(2)	0.111	0.318	0.489	0.472	0.406	0.310	0.379	0.017	0.008	0.066	0.006	0.019
BGLM(4)	0.094	0.449	0.677	0.107	0.066	0.045	0.012	0.045	0.002	0.016	0.017	0.023
BGLM(8)	0.489	0.682	0.466	0.068	0.144	0.037	0.108	0.429	0.062	0.047	0.150	0.125
RESET(2) LM	0.030	0.074	0.956	0.929	0.677	0.828	0.442	0.943	0.323	0.697	0.948	0.594
ARCH	0.988	0.756	0.984	0.939	0.950	0.968	0.600	0.174	0.246	0.450	0.522	0.375

Note: Results for regressions with revisions relative to the first vintage as dependent variable. p2 denotes the revision of the price adjustment made with the second vintage, p3 the revision of the price adjustment made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 13: In-sample results: price adjustment – model II

	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	p12	p13
Constant	0.102	0.106	0.129	0.128	0.119	0.123	0.122	0.138	0.146	0.142	0.167	0.171
	(2.885)	(2.847)	(3.414)	(3.835)	(3.748)	(4.334)	(3.703)	(4.077)	(4.246)	(4.025)	(4.402)	(4.418)
Pre. An.	-0.260	-0.305	-0.374	-0.443	-0.447	-0.415	-0.427	-0.481	-0.477	-0.452	-0.445	-0.470
	(-4.087)	(-4.585)	(-5.703)	(-7.521)	(-7.804)	(-7.878)	(-7.143)	(-7.555)	(-7.608)	(-7.223)	(-6.568)	(-6.599)
Ifo Busi. Sit.	-0.026	-0.012	-0.020	-0.031	-0.039	-0.022	-0.027	-0.013	-0.019	-0.017	-0.025	-0.026
	(-2.249)	(-0.984)	(-1.487)	(-2.558)	(-3.312)	(-2.078)	(-2.257)	(-1.109)	(-1.588)	(-1.359)	(-1.910)	(-1.923)
Dummy 1993	0.313	0.389	0.263	0.209	0.237	0.264	0.268	0.381	0.368	0.392	0.331	0.275
	(1.335)	(2.187)	(1.773)	(1.763)	(2.232)	(2.790)	(2.457)	(3.418)	(3.226)	(3.313)	(2.506)	(1.927)
Dummy 1995	0.194	0.185	0.216	0.189	0.312	0.098	0.197	0.186	0.196	0.140	0.132	0.135
	(0.864)	(1.136)	(1.570)	(1.723)	(3.221)	(1.201)	(2.300)	(2.201)	(2.502)	(1.849)	(1.604)	(1.523)
Dummy Quarter 1	-0.095	-0.128	-0.059	0.001	-0.031	-0.042	-0.023	-0.053	-0.129	-0.144	-0.158	-0.164
	(-1.313)	(-1.797)	(-0.834)	(0.023)	(-0.516)	(-0.772)	(-0.374)	(-0.822)	(-1.995)	(-2.192)	(-2.226)	(-2.235)
adj. R^2	0.301	0.406	0.421	0.516	0.556	0.560	0.496	0.542	0.579	0.572	0.537	0.540
Regression F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
White	0.006	0.364	0.312	0.533	0.422	0.003	0.168	0.109	0.241	0.271	0.072	0.085
BGLM(1)	0.361	0.088	0.897	0.024	0.029	0.012	0.011	0.002	0.000	0.006	0.000	0.004
BGLM(2)	0.205	0.194	0.469	0.080	0.088	0.044	0.077	0.005	0.002	0.028	0.000	0.003
BGLM(4)	0.178	0.381	0.690	0.079	0.071	0.020	0.008	0.029	0.002	0.020	0.003	0.006
BGLM(8)	0.377	0.702	0.358	0.039	0.186	0.002	0.057	0.344	0.075	0.059	0.063	0.033
RESET(2) LM	0.043	0.030	0.593	0.347	0.574	0.721	0.865	0.645	0.609	0.886	0.383	0.712
ARCH	0.988	0.756	0.984	0.939	0.950	0.968	0.600	0.174	0.246	0.450	0.522	0.375

Note: Results for regressions with revisions relative to the first vintage as dependent variable. p2 denotes the revision of the price adjustment made with the second vintage, p3 the revision of the price adjustment made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 14: In-sample results: price adjustment – model III

	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	p12	p13
Constant	0.862	0.680	0.636	0.487	0.356	0.434	0.918	0.611	0.610	0.476	0.521	0.520
	(2.424)	(1.763)	(1.653)	(1.408)	(0.928)	(1.370)	(2.555)	(1.722)	(1.663)	(1.278)	(1.230)	(1.212)
Pre. An.	-0.353	-0.387	-0.448	-0.494	-0.469	-0.447	-0.488	-0.512	-0.513	-0.499	-0.482	-0.499
	(-4.889)	(-4.951)	(-6.031)	(-7.640)	(-6.991)	(-8.072)	(-7.762)	(-8.251)	(-7.993)	(-7.663)	(-6.505)	(-6.635)
Ifo Busi. Sit.	-0.012	-0.000	-0.004	-0.015	-0.019	-0.012	-0.009	0.000	-0.008	-0.008	-0.016	-0.016
	(-0.940)	(-0.024)	(-0.294)	(-1.298)	(-1.537)	(-1.152)	(-0.792)	(0.039)	(-0.672)	(-0.706)	(-1.173)	(-1.151)
Unemployment	-0.074	-0.054	-0.046	-0.032	-0.019	-0.028	-0.076	-0.043	-0.043	-0.030	-0.032	-0.031
	(-2.083)	(-1.416)	(-1.220)	(-0.942)	(-0.511)	(-0.903)	(-2.129)	(-1.236)	(-1.194)	(-0.818)	(-0.764)	(-0.738)
Dax QoQ	0.000	0.001	0.001	0.002	-0.000	0.001	0.004	0.005	0.006	0.005	0.003	0.003
	(0.104)	(0.302)	(0.437)	(0.782)	(-0.019)	(0.670)	(1.902)	(2.642)	(3.205)	(2.655)	(1.337)	(1.334)
Oil YoY	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(-1.576)	(-2.100)	(-2.620)	(-2.616)	(-2.363)	(-2.371)	(-2.538)	(-3.232)	(-2.638)	(-2.675)	(-1.975)	(-2.152)
Dummy 1993	0.184	0.286	0.224	0.208	0.230	0.222	0.146	0.295	0.319	0.389	0.349	0.322
	(0.784)	(1.515)	(1.463)	(1.668)	(1.794)	(2.096)	(1.210)	(2.484)	(2.595)	(3.120)	(2.465)	(2.237)
Dummy Quarter 1	0.034	-0.030	0.022	0.054	0.018	0.006	0.085	0.007	-0.057	-0.089	-0.111	-0.126
	(0.401)	(-0.335)	(0.251)	(0.723)	(0.219)	(0.088)	(1.122)	(0.091)	(-0.738)	(-1.130)	(-1.236)	(-1.380)
adj. R^2	0.348	0.435	0.457	0.540	0.507	0.582	0.536	0.608	0.629	0.624	0.545	0.556
Regression F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
White	0.040	0.959	0.761	0.652	0.501	0.123	0.430	0.447	0.534	0.762	0.174	0.456
BGLM(1)	0.299	0.035	0.707	0.050	0.055	0.007	0.095	0.035	0.017	0.164	0.001	0.025
BGLM(2)	0.219	0.036	0.222	0.153	0.173	0.010	0.277	0.080	0.040	0.354	0.001	0.005
BGLM(4)	0.303	0.166	0.326	0.213	0.188	0.004	0.029	0.249	0.044	0.180	0.009	0.018
BGLM(8)	0.570	0.393	0.270	0.170	0.387	0.012	0.161	0.818	0.717	0.549	0.177	0.142
RESET(2) LM	0.005	0.010	0.317	0.204	0.476	0.455	0.606	0.162	0.546	0.686	0.374	0.630
ARCH	0.988	0.756	0.984	0.939	0.950	0.968	0.600	0.174	0.246	0.450	0.522	0.375

Note: Results for regressions with revisions relative to the first vintage as dependent variable. p2 denotes the revision of the price adjustment made with the second vintage, p3 the revision of the price adjustment made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation

Table 15: In-sample results: real adjusted GDP – model I

	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13
Constant	0.010	0.025	0.032	0.017	0.037	0.029	0.045	0.039	0.022	0.026	0.029	0.039
	(0.530)	(0.972)	(0.722)	(0.447)	(0.932)	(0.703)	(1.192)	(0.925)	(0.505)	(0.657)	(0.573)	(0.656)
Pre. An.	0.007	-0.015	-0.080	-0.065	-0.092	-0.086	-0.103	-0.109	-0.068	-0.073	-0.046	-0.080
	(0.212)	(-0.345)	(-1.105)	(-1.141)	(-1.931)	(-1.669)	(-2.107)	(-1.807)	(-0.874)	(-0.958)	(-0.709)	(-1.102)
Dummy 1999	-0.418	-0.335	-0.099	-0.110	-0.151	-0.183	-0.186	-0.210	-0.261	-0.240	-0.280	-0.271
	(-15.062)	(-9.930)	(-1.117)	(-1.308)	(-2.237)	(-2.587)	(-3.008)	(-2.705)	(-4.262)	(-3.178)	(-3.653)	(-4.430)
Dummy 2005	0.046	-0.049	-0.147	-0.118	-0.059	-0.053	-0.050	-0.118	-0.181	-0.145	-0.157	-0.195
	(1.796)	(-1.429)	(-3.624)	(-3.343)	(-0.883)	(-1.030)	(-0.849)	(-1.974)	(-3.497)	(-2.671)	(-2.758)	(-3.664)
Dummy Quarter 4	0.042	0.053	0.069	0.096	0.129	0.182	0.178	0.216	0.266	0.304	0.318	0.345
	(1.726)	(1.353)	(1.861)	(2.573)	(2.840)	(3.714)	(3.379)	(3.497)	(3.608)	(3.453)	(3.412)	(3.274)
adj. R^2	0.092	0.079	0.036	0.034	0.078	0.136	0.150	0.161	0.158	0.173	0.186	0.196
Regression F	0.030	0.146	0.104	0.009	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
White	0.687	0.822	0.349	0.321	0.412	0.513	0.381	0.389	0.710	0.735	0.683	0.483
BGLM(1)	0.594	0.256	0.124	0.309	0.222	0.420	0.558	0.619	0.606	0.524	0.958	0.598
BGLM(2)	0.749	0.528	0.158	0.404	0.136	0.215	0.432	0.576	0.707	0.477	0.595	0.440
BGLM(4)	0.527	0.427	0.347	0.528	0.384	0.479	0.514	0.810	0.632	0.316	0.383	0.170
BGLM(8)	0.838	0.915	0.866	0.770	0.848	0.771	0.790	0.934	0.835	0.547	0.464	0.717
RESET(2) LM	0.225	0.354	0.039	0.053	0.027	0.178	0.199	0.133	0.284	0.534	0.307	0.446
ARCH	0.603	0.900	0.670	0.297	0.273	0.342	0.420	0.789	0.778	0.979	0.973	0.622

Note: Results for regressions with revisions relative to the first vintage as dependent variable. r2 denotes the revision made with the second vintage, r3 the revision made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 16: In-sample results: real adjusted GDP – model II

	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13
Constant	0.015	0.040	0.057	0.056	0.093	0.089	0.110	0.106	0.088	0.067	0.072	0.082
	(0.551)	(1.187)	(1.303)	(1.270)	(1.966)	(1.820)	(2.105)	(1.731)	(1.270)	(0.896)	(0.922)	(1.002)
Pre. An.	-0.005	-0.046	-0.133	-0.146	-0.201	-0.195	-0.215	-0.217	-0.172	-0.140	-0.117	-0.155
	(-0.131)	(-0.977)	(-2.182)	(-2.373)	(-3.078)	(-2.920)	(-3.092)	(-2.722)	(-1.902)	(-1.425)	(-1.184)	(-1.510)
Ifo Busi. Sit.	0.005	0.013	0.022	0.033	0.045	0.046	0.046	0.043	0.042	0.027	0.028	0.029
	(0.586)	(1.300)	(1.693)	(2.575)	(3.272)	(3.209)	(3.122)	(2.532)	(2.180)	(1.311)	(1.355)	(1.379)
Dummy 1999	-0.407	-0.333	-0.092	-0.110	-0.166	-0.211	-0.227	-0.248	-0.308	-0.253	-0.292	-0.277
	(-2.811)	(-2.666)	(-0.688)	(-0.944)	(-1.476)	(-1.972)	(-2.185)	(-2.255)	(-2.558)	(-2.032)	(-2.418)	(-2.281)
Dummy 2005	0.040	-0.065	-0.172	-0.157	-0.127	-0.129	-0.132	-0.212	-0.266	-0.192	-0.201	-0.234
	(0.271)	(-0.518)	(-1.288)	(-1.330)	(-1.118)	(-1.193)	(-1.257)	(-1.840)	(-2.131)	(-1.512)	(-1.618)	(-1.868)
Dummy Quarter 4	0.035	0.032	0.033	0.039	0.057	0.108	0.100	0.142	0.199	0.260	0.270	0.294
	(0.743)	(0.561)	(0.456)	(0.537)	(0.740)	(1.360)	(1.216)	(1.537)	(1.906)	(2.319)	(2.361)	(2.457)
adj. R^2	0.081	0.090	0.067	0.121	0.212	0.257	0.263	0.234	0.210	0.183	0.197	0.209
Regression F	0.559	0.278	0.075	0.044	0.003	0.001	0.001	0.001	0.005	0.005	0.005	0.002
White	0.734	0.879	0.115	0.388	0.694	0.486	0.442	0.135	0.697	0.764	0.864	0.685
BGLM(1)	0.646	0.394	0.240	0.612	0.697	0.834	0.608	0.213	0.237	0.296	0.619	0.335
BGLM(2)	0.787	0.655	0.333	0.594	0.282	0.257	0.537	0.305	0.422	0.329	0.533	0.293
BGLM(4)	0.522	0.452	0.563	0.570	0.412	0.302	0.211	0.285	0.294	0.073	0.081	0.008
BGLM(8)	0.822	0.840	0.777	0.777	0.792	0.510	0.426	0.557	0.682	0.349	0.259	0.249
RESET(2) LM	0.818	0.522	0.939	0.614	0.823	0.810	0.921	0.843	0.876	0.735	0.941	0.861
ARCH	0.603	0.900	0.670	0.297	0.273	0.342	0.420	0.789	0.778	0.979	0.973	0.622

Note: Results for regressions with revisions relative to the first vintage as dependent variable. r2 denotes the revision made with the second vintage, r3 the revision made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 17: In-sample results: real adjusted GDP – model III

	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13
Constant	0.014	0.040	0.054	0.054	0.089	0.087	0.106	0.102	0.080	0.057	0.062	0.065
	(0.502)	(1.171)	(1.201)	(1.191)	(1.849)	(1.739)	(1.992)	(1.650)	(1.145)	(0.769)	(0.807)	(0.776)
Pre. An.	-0.004	-0.046	-0.131	-0.145	-0.198	-0.194	-0.213	-0.215	-0.166	-0.132	-0.110	-0.142
	(-0.112)	(-0.971)	(-2.126)	(-2.326)	(-3.014)	(-2.866)	(-3.033)	(-2.671)	(-1.839)	(-1.344)	(-1.121)	(-1.380)
Ifo Busi. Sit.	0.005	0.013	0.022	0.033	0.045	0.046	0.046	0.043	0.043	0.027	0.029	0.029
	(0.579)	(1.289)	(1.677)	(2.554)	(3.244)	(3.181)	(3.104)	(2.520)	(2.204)	(1.343)	(1.403)	(1.351)
M1 QoQ	0.001	-0.001	0.004	0.003	0.004	0.003	0.006	0.006	0.015	0.018	0.021	0.019
	(0.201)	(-0.072)	(0.401)	(0.290)	(0.409)	(0.239)	(0.501)	(0.428)	(0.997)	(1.168)	(1.341)	(1.121)
Dummy 1999	-0.408	-0.332	-0.093	-0.110	-0.166	-0.212	-0.226	-0.250	-0.317	-0.269	-0.305	-0.285
	(-2.791)	(-2.626)	(-0.691)	(-0.933)	(-1.469)	(-1.963)	(-2.168)	(-2.257)	(-2.623)	(-2.150)	(-2.538)	(-2.352)
Dummy 2005	0.044	-0.067	-0.168	-0.155	-0.124	-0.127	-0.133	-0.213	-0.272	-0.201	-0.217	-0.216
	(0.293)	(-0.518)	(-1.241)	(-1.307)	(-1.082)	(-1.170)	(-1.255)	(-1.839)	(-2.176)	(-1.587)	(-1.750)	(-1.716)
Dummy Quarter 4	0.029	0.034	0.015	0.026	0.038	0.096	0.075	0.118	0.135	0.180	0.175	0.215
	(0.516)	(0.510)	(0.178)	(0.305)	(0.414)	(1.027)	(0.773)	(1.082)	(1.104)	(1.373)	(1.314)	(1.546)
adj. R^2	0.065	0.074	0.053	0.106	0.201	0.244	0.253	0.223	0.210	0.188	0.209	0.212
Regression F	0.823	0.461	0.170	0.099	0.017	0.011	0.008	0.013	0.094	0.146	0.192	0.111
White	0.946	0.968	0.281	0.328	0.934	0.801	0.688	0.344	0.663	0.640	0.870	0.909
BGLM(1)	0.662	0.390	0.251	0.605	0.725	0.855	0.616	0.212	0.179	0.207	0.454	0.256
BGLM(2)	0.815	0.656	0.352	0.598	0.284	0.268	0.512	0.283	0.321	0.262	0.527	0.292
BGLM(4)	0.517	0.453	0.573	0.587	0.444	0.352	0.238	0.280	0.277	0.084	0.087	0.016
BGLM(8)	0.809	0.844	0.747	0.732	0.766	0.481	0.331	0.498	0.611	0.395	0.289	0.331
RESET(2) LM	0.567	0.534	0.870	0.545	0.878	0.842	0.984	0.925	0.618	0.480	0.571	0.360
ARCH	0.603	0.900	0.670	0.297	0.273	0.342	0.420	0.789	0.778	0.979	0.973	0.622

Note: Results for regressions with revisions relative to the first vintage as dependent variable. r2 denotes the revision made with the second vintage, r3 the revision made with the third vintage etc. Point estimates with t-values below; for all specification tests: p-values; White: Test on heteroskedasticity; BGLM 1: Breusch-Godfrey test on autocorrelation of order 1; BGLM 2: Breusch-Godfrey test on autocorrelation of order 2; RESET: Ramsey test on misspecification; ARCH: ARCH-test.

Table 18: Forecasting performance - real, seasonal adjusted data: MSFE

	r2	r3	r4	r5	r6	r7	r8	r9	r10	r11	r12	r13
Rational	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Naive	0.98	0.99	1.02	1.03	1.00	1.00	0.99	1.02	1.02	1.01	1.02	1.02
M-Z	0.99	0.98	1.00	1.02	1.02	1.01	0.98	1.03	1.02	1.01	1.02	1.02
Ifo	0.93	0.91	0.88	0.81	0.79	0.76	0.72	0.85	0.91	0.94	0.93	0.95
Full	1.00	0.97	1.06	0.85	0.84	0.80	1.14	0.86	1.02	1.13	1.40	1.06
Aggregate	1.61	1.13	1.15	1.37	1.38	0.95	1.01	1.07	2.05	1.79	1.20	1.36

Note: All results are relative to the assumption of data rationality. Naive denotes a model with a constant only (mean revisions of all periods before); M-Z denotes the results for the freely estimated Minzer-Zarnowitz equation, ifo, and Full correspond to extended Minzer-Zarnowitz equations. Aggregate denotes the results for forecasts composed from the forecasts of the components via the Minzer-Zarnowitz equation.

Table 19: Forecasting performance - original data: MSFE

	u2	u3	u4	u5	u6	u7	u8	u9	u10	u11	u12	u13
Rational	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Naive	1.03	1.01	1.03	1.04	1.03	1.02	1.01	1.03	1.02	1.02	1.01	1.02
M-Z	1.03	1.28	1.11	1.11	0.90	1.46	1.32	1.32	0.95	1.70	1.41	1.22
Ifo	1.28	1.22	1.01	1.51	1.36	1.31	1.19	1.49	1.41	1.46	1.03	1.34
Full	1.42	1.26	1.51	1.54	1.50	1.41	1.79	1.55	1.75	1.61	1.61	1.29

Note: All results are relative to the assumption of data rationality. Naive denotes a model with a constant only (mean revisions of all periods before); M-Z denotes the results for the freely estimated Minzer-Zarnowitz equation, Ifo, and Full correspond to extended Minzer-Zarnowitz equations.

Table 20: Forecasting performance - GDP deflator: MSFE

	p2	p3	p4	p5	p6	p7	p8	p9	p10	p11	p12	p13
Rational	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Naive	1.04	1.01	1.07	1.04	1.06	1.03	1.07	1.06	1.04	1.03	1.06	1.04
M-Z	0.82	0.70	0.57	0.42	0.56	0.43	0.41	0.26	0.38	0.46	0.49	0.45
Ifo	0.79	0.68	0.55	0.56	0.52	0.45	0.36	0.27	0.32	0.44	0.45	0.42
Full	0.78	0.67	0.57	0.51	0.52	0.45	0.40	0.27	0.34	0.44	0.46	0.42

Note: All results are relative to the assumption of data rationality. Naive denotes a model with a constant only (mean revisions of all periods before); M-Z denotes the results for the freely estimated Minzer-Zarnowitz equation, Ifo, and Full correspond to extended Minzer-Zarnowitz equations.

Table 21: Forecasting performance - seasonal pattern: MSFE

	s2	s3	s4	s5	s6	s7	s8	s9	s10	s11	s12	s13
Rational	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Naive	1.08	1.01	1.02	1.04	1.04	1.03	1.02	1.02	1.02	1.03	1.01	1.02
M-Z	1.25	0.97	1.13	1.07	0.74	1.03	1.15	1.24	0.95	1.58	1.50	1.62
Ifo	2.74	1.32	1.86	1.95	1.48	1.31	1.52	1.32	1.72	1.86	1.67	1.60
Full	3.57	1.57	1.85	1.91	1.40	1.31	1.49	1.16	1.46	1.68	1.57	1.34

Note: All results are relative to the assumption of data rationality. Naive denotes a model with a constant only (mean revisions of all periods before); M-Z denotes the results for the freely estimated Minzer-Zarnowitz equation, Ifo, and Full correspond to extended Minzer-Zarnowitz equations.

A Results for German GNP 1978-1993

The data set was taken from Gerberding et al. (2005). This real-time data set includes seasonally and seasonally unadjusted GNP data, and the seasonally adjusted GNP deflator. We constructed the seasonal pattern as explained above and perform a forecasting exercise for the three variables nominal unadjusted GNP, GNP deflator, and seasonal pattern, and for the real, seasonally adjusted GNP. The data span from 1978 to 1993. Analysis was performed for growth rates. For brevity, we only considered revisions with a horizon of one year. In addition to the pure Mincer-Zarnowitz equation, we include an extended version by considering the ifo Business Climate. Results for further extended models are not reported, as they provide no substantial improvements. We performed 20 out-of-sample forecasts and applied an expanding window scheme. Table 22 gives the results.

The forecasts reveals that the revisions of nominal unadjusted GNP growth rates are not predictable, as all relative mean squared forecast errors are greater than unity. In contrast, revisions of the seasonal adjustments, and revisions of the price adjustment seem to be predictable. Forecast errors for theses variables are substantially lower. Further, the revisions of real seasonally adjusted GNP are predictable, too.

Table 22: Forecasting performance: MSFE

	Naive	M-Z	Ifo
Real, s.a.	1.001	0.610	0.538
Nominal, n.s.a.	1.018	1.469	1.469
Seasonal pattern	1.022	0.796	0.796
GNP deflator	1.011	0.598	0.598

Note: All results are relative to the assumption of data rationality. Naive denotes a model with a constant only (mean revisions of all periods before); M-Z denotes the results for the freely estimated Minzer-Zarnowitz equation, and Ifo corresponds to the extended Minzer-Zarnowitz equation.