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The improvement of annual economic forecasts by using non-annual indicators

An empirical investigation for the G7 states

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An Empirical Investigation for the G7 states

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Abstract

A key demand made of business cycle forecasts is the efficient processing of freely available information. On the basis of two early indicators, this article shows that these opportunities are not being exploited. To this end, consensus forecasts for the economies of the G7 states from 1991-2009 were examined in this study. According to the present state of research, the forecasts are of moderate quality depending on the forecast horizon. The situation is different with regard to the early indicators which were examined. Both the results of a worldwide survey among experts by the Ifo Institute as well as the Composite Leading Indicators of the OECD exhibit a measurable correlation to the economic development considerably earlier for all countries. If viewed simultaneously, it can be seen that the forecast quality for most G7 states could be improved by taking the early indicators into consideration.

Keywords: adjusting forecasts, business cycles, macroeconomic forecasts, evaluating forecasts, forecast accuracy, forecast efficiency, forecast monitoring, panel data, time series

JEL classification: E17, E32, E37, E60

I. Introduction

A wide range of demands are made of business cycle forecasts. The main demand is for them to be of good quality so that they can serve as a planning basis for states, companies and financial market participants.

The basis for the division of this main demand into individual sub-elements was created by Muth (1961) in his rational expectations hypothesis. According to this hypothesis, a perfect forecast diverges from the actual realization of the forecast subject only to the extent of unforeseeable random influences. To achieve this, forecasts have to exhibit several features:

1. They must not contain any systematic bias. This is present if the same forecasting errors occur repeatedly.
2. All relevant information has to be taken into account when drawing up the forecasts. This includes an awareness of one's own forecasting errors in the past.
3. A particular requirement for business cycle forecasts is that the forecaster needs to possess knowledge of the issues which contribute towards the dynamics of the overall economy.

If all three points are fulfilled, this is referred to as efficient forecasting. The financial crisis revealed to economists once again that there appear to be considerable deficits with regard to the third point. Economies are extremely complex structures which are additionally subject to constant change. In spite of a tradition of forecasting covering 150 years, even the debate about how economic trends arise is still continuing with no end in sight.[1]

This incomplete knowledge of economic phenomena is also expressed in the limited accuracy of business cycle forecasts. This does not affect the first two requirements, however. If, for example, economic growth is continuously overestimated, future forecasts should be revised downwards to reflect this. Nevertheless, these types of systematic errors in business cycle forecasts can be observed with great regularity – also in this study.

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[1] The following are some of the reasons for business cycles which are debated: temporary imbalances on the goods and factor markets (Keynesianism), monetary reasons (Austrian School), politically induced cycles (new political economy), external shocks, and a loss of trust as the reason for recessions.

With regard to the second point, Nordhaus (1987) points out that it would be very difficult to test "all" information as to its relevance.[2] This is the point which this study addresses. If freely available early indicators exhibit a greater link to future economic trends than professional business cycle forecasts, the demand that this information has to be processed by forecasters is certainly legitimate. The link to the future is understood here as the strength of the relationship between the forecast or early indicator and the actual economic trend.

This research focuses on early indicators with a high level of qualitative input. Almost thirty years ago, Kirchgässner (1982) provided an indication of their usefulness by comparing the results of the New Year's Survey of the Allensbach Institute for Public Opinion Research in Germany with the business cycle forecast of the German Government's Council of Experts. The results of the survey revealed a greater correlation with the economic trends of the following year. The usefulness of qualitative early indicators has been established on repeated occasions, particularly for the timely recognition of turning points in the business cycle (Fritsche 1999, Hüfner / Schröder 2002, Kunkel 2003, Abberger / Nierhaus 2007, Seiler 2009 and Ziegler 2009). Claveria, Pons and Ramos (2007) tested the use of such indicators in artificial economic forecasting models and found little improvement. Clements and Galvão (2008) showed a sizable error reduction by using indicators even in mixed data-frequency circumstances, which is of interest in regards to this studies database. Nevertheless, no comparison on an annual basis with actually submitted business cycle forecasts is available.

Observed data

A comparison of this kind is, however, carried out in this study by means of two data series which are analysed with regard to their relevance for business cycle forecasts. Firstly, an analysis of the Composite Leading Indicators (CLI) is carried out which are published monthly by the OECD. These indicators are individually calculated for each national economy and contain both quantitative and qualitative early indicators. Secondly, an examination of the World

[2] He therefore proposes that only a test of the so-called weak efficiency of the forecasts should be carried out. Weak efficiency is present when the forecast errors are not autocorrelated but are subject to a so-called random walk.

Economic Survey (WES) of the Munich-based Ifo Institute is made, in which economists and business experts throughout the world are asked about their assessment of the world economic situation for the coming six months.

The consensus forecasts issued by the British specialist journal of the same name are used as a data basis. They are published on a monthly basis, whereby one forecast is for the current year and one is for the following year. There are thus 24 separate forecasts every year. The study covers the period 1991-2009 and the economies of the G7 states referring the annual GDP growth.

The second section of this article evaluates the quality of the business cycle forecasts which are the subject of analysis. In the third section, a comparison between the connection to the future of these forecasts and the time series of the OECD and the Ifo Institute is carried out. The fourth and final section shows that taking this additional information into account would – with a high degree of probability – have contributed towards improving the business cycle forecasts.

II. Forecast quality

First of all, an evaluation of the quality of the business cycle forecasts which are analysed in this study is carried out. The forecasts published by the British specialist journal Consensus Forecasts are used as a data basis. This journal was founded in 1989 as a result of a debate among academics about the uses of summarized forecasts.[3] Since then, forecasts from around 40 banks and economic research institutions for various economic indicators and states have been published monthly – together with the respective arithmetic mean of the individual forecasts, the so-called consensus forecast.

The forecasts can be divided into two categories – those with fixed horizons and those with variable horizons. In the case of fixed-horizon forecasts, no change of the time period between the publication and the occurrence of the subject of the forecast takes place between two issues. The interest rate forecasts

[3] Bates and Granger were the first to examine the opportunities offered by consensus forecasts in 1969. The debate on the usefulness and limitations of consensus forecasts reached its peak in 1989 in special issues of the Journal of Forecasting and the International Journal of Forecasting. Subsequently, Consensus Economics was founded and the Consensus Forecasts series of publications began.

(horizon of three months) from the January edition are valid in April, while the forecasts from the February edition are valid in May.

The forecasts for Gross Domestic Product (GDP) which are analysed in this study belong to the second category, the so-called fixed event or fixed-target forecasts. One forecast for the current and one for the following year are published each month. The forecasts in the January issue thus reach their full validity at the end of the current and the end of the following year – as do the forecasts in the February issue. The forecast horizon for the current year is reduced from 12 to 11 months between the two issues, while that for the following year is reduced from 24 to 23 months. The institutes thus issue 24 forecasts every year with continuously falling forecast horizons. This makes it possible to consider the quality of the forecasts on the basis of the forecast horizon.

Recent evaluations

Consensus Forecasts has been published since October 1989. The constant enlargement of this data basis is increasing, leading to publications which deal with its evaluation. Batchelor (2001) established that the forecasts of the International Monetary Fund and the OECD fared worse than the consensus forecasts given in the publication of the same name, which are largely based on the forecasts of private banks. He urged caution in the interpretation of the results as the data basis at that time was still rather narrow. Blix et al. (2001) also came to the same conclusion in their research. In addition, in the 1990s inflation rate forecasts were more successful than the corresponding forecasts for GDP. They also noted indications of herd behaviour among forecasters, as their forecast revisions exhibited considerable similarities over the course of time. Loungani (2001) was unable to discern any major differences between the quality of the forecasts for industrial and developing nations. However, he perceived the forecasts for developing nations in particular as being distorted by overestimation, and generally too flat due to high correlations between their respective revisions. He therefore concluded that there was a lack of “efficiency” in the time series. In addition he pointed out that recessions were not forecasted successfully. In an analysis of GDP forecasts for 18 states, Isiklar and Lahiri

(2007) established that forecast quality only reached a satisfactory level from a horizon of 14 months onwards.

Ager *et al.* (2007) identified systematic forecasting errors in the majority of forecasts for the GDP of 12 industrial nations in cases where the forecasts referred to the following year. They presumed that this was caused by herd behaviour.

In his analysis of GDP forecasts for Germany, Osterloh (2008) concluded that forecasts for the respective coming year were rarely successful. As a possible explanation he points to the numerous exogenous shocks in the investigation period, compounded by the hesitance of forecasts to reflect them in their forecasts. Dovern and Weisser (2011) analysed the data from Consensus Economics using a panel-based approach, whereby they also took the individual forecasts for the G7 states into account. They established a high degree of rationality and heterogeneity in the precision of the forecasts, whereby the forecasts for inflation rates tended to be more successful.

Data and methodology

In this study, GDP forecasts (GNP for Japan until 1993) for the G7 states are analysed. These were included in the Consensus Forecasts publications from the very beginning, whereas other states were only added later. The first year for which forecasts are able from January of the previous year is 1991. This evaluation covers forecasts for the years 1991-2009.

The forecasts are measured against the actual GDP growth rates of the G7 states, whereby the choice of comparative data is less trivial than it initially appears. Considerable revisions as a consequence of changes in data-recording methods or the processing of the data have to be expected if time series from the respective national statistical offices for the entire investigation period are used. These can lead to ‘artificial’ forecast errors which would distort the results of the analysis. In other studies with this data set, the actual figures which were published in Consensus Forecasts in the middle of the following year are therefore mainly used as a benchmark. This is also the case in this

study, where the GDP of the May edition of the following year is employed as a benchmark.

Absolute forecast errors

In order to be able to assess the quality of a forecast, first of all the mean absolute error (MAE) for the individual countries and forecast horizons is considered. This is the average of all absolute forecast errors, which itself is the product of the difference between the predicted value *P* and the actual value *A* at the respective point in time *t* with a total figure of *T*=19 years.

$$(1) \qquad \mathrm{MAE} = \frac{1}{\mathrm{T}} \sum_{t=1}^{\mathrm{T}} \left| \mathrm{P_t} - \mathrm{A_t} \right|$$

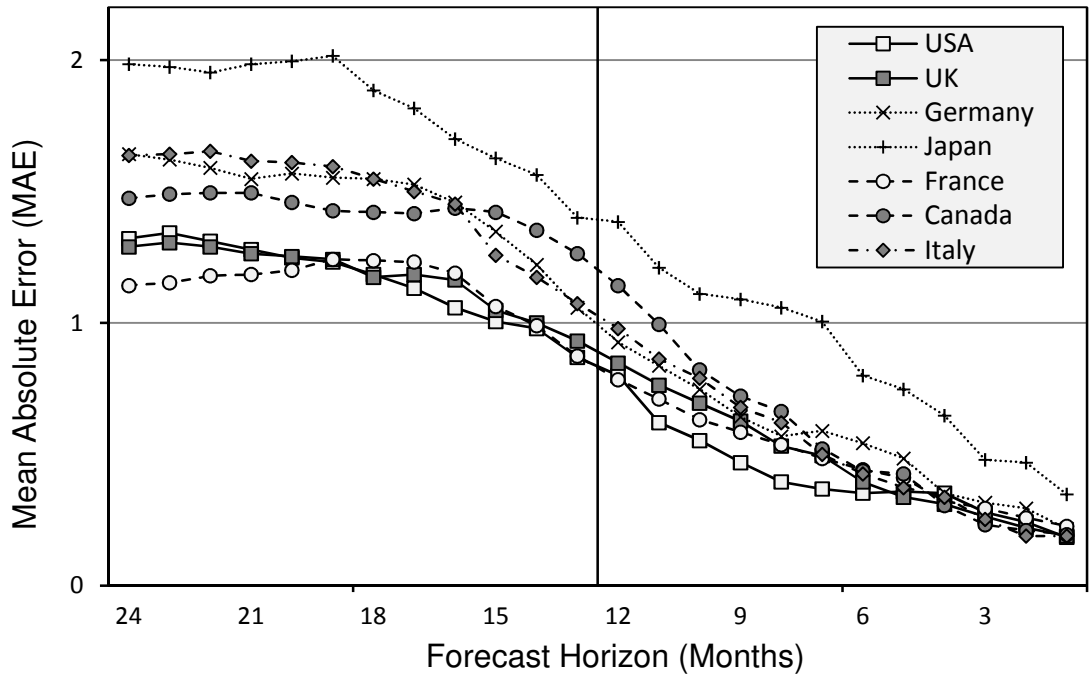

Fig. 1: Mean absolute error of the consensus G7 GDP forecasts from 1991 - 2009

This provides a similar picture for all G7 states (Fig. 1). The forecasts for the respective following year almost always have an MAE > 1 percentage point. Around the New Year period, the forecasts improve noticeably and acquire an MAE < 1 percentage point given a forecast horizon of eleven months (except for the forecasts for Japan). On average, the GDP for the respective current year has thus been predicted with an error which is clearly below one percentage point. The information advantage created by shorter forecast horizons and the

resulting lower level of forecasting errors are equally obvious for all states. The individual values can be seen in Table 1.

Table 1: Mean absolute error of the consensus G7 GDP forecasts from 1991 - 2009

fh	(1)	(2)	(3)	(4)	(5)	(6)	(7)
months	USA	UK	GE	JA	FR	CA	IT
24	1.32	1.29	1.64	1.98	1.14	1.47	1.64
23	1.34	1.31	1.62	1.97	1.15	1.49	1.64
22	1.31	1.29	1.59	1.95	1.18	1.49	1.65
21	1.28	1.26	1.55	1.98	1.18	1.49	1.62
20	1.25	1.25	1.57	1.99	1.20	1.46	1.61
19	1.23	1.24	1.55	2.02	1.24	1.43	1.59
18	1.18	1.17	1.55	1.88	1.24	1.42	1.55
17	1.13	1.18	1.53	1.82	1.23	1.42	1.50
16	1.06	1.16	1.46	1.70	1.19	1.44	1.45
15	1.01	1.05	1.35	1.63	1.06	1.42	1.26
14	0.98	1.00	1.22	1.56	0.99	1.35	1.17
13	0.87	0.93	1.06	1.40	0.87	1.26	1.07
12	0.80	0.85	0.93	1.38	0.78	1.14	0.98
11	0.62	0.76	0.84	1.21	0.71	0.99	0.86
10	0.55	0.69	0.75	1.11	0.63	0.82	0.79
9	0.47	0.63	0.64	1.09	0.58	0.72	0.68
8	0.39	0.53	0.57	1.06	0.54	0.66	0.62
7	0.37	0.49	0.59	1.01	0.48	0.52	0.50
6	0.35	0.39	0.54	0.80	0.44	0.44	0.43
5	0.36	0.34	0.48	0.75	0.41	0.43	0.37
4	0.35	0.31	0.35	0.65	0.32	0.31	0.34
3	0.28	0.26	0.32	0.48	0.29	0.23	0.25
2	0.24	0.22	0.29	0.47	0.26	0.21	0.19
1	0.18	0.19	0.22	0.35	0.23	0.19	0.19

fh = forecast horizon

In order to answer the question of whether these values or good or poor, a benchmark is of assistance. When evaluating forecasts, it is usual to compare them with the naive forecast; either with the mean absolute error relative to naive forecasts (MAERNF) or Theil's U (Theil 1971). In a naive forecast, current values are merely projected into the future. The French mathematician Pierre Simon Laplace (1841) introduced this concept to the literature as the principle of indifference (also known as the principle of insufficient reason).

Due to the nature of the study design, this popular measure of quality is not applied here. For a forecast at the beginning of the year, the previous year's figure could possibly be used as a naïve forecast if it has already been

published by the relevant statistical offices. From the middle of the year onwards, however, the current figure cannot be projected into the future, as the economic growth of the current year has not yet been established. An alternative would be the measured average fluctuation of GDP in the period under observation. It is legitimate to demand from forecasters that the forecasting error is lower than the average rates of change of the subject of the forecast. If the errors are greater than this, the forecasts are of no value.

In order to obtain results which are easy to interpret, the absolute forecast errors are divided by the respective absolute rates of change of GDP, in a similar way to the MAERNF. In this way the mean absolute error relative to the mean forecast item fluctuation (MAERFI) is obtained.

$$\text{MAERFI} = \frac{\frac{1}{T}\sum_{t=1}^{T}\left|P_t - A_t\right|}{\frac{1}{T}\sum_{t=1}^{T}\left|A_{t-1} - A_t\right|} \qquad (2)$$

A MAERFI < 1 signifies that the forecasting errors are lower than the average fluctuation of GDP. One should be able to expect such a value from a worthwhile forecast, at least over a longer period of investigation.

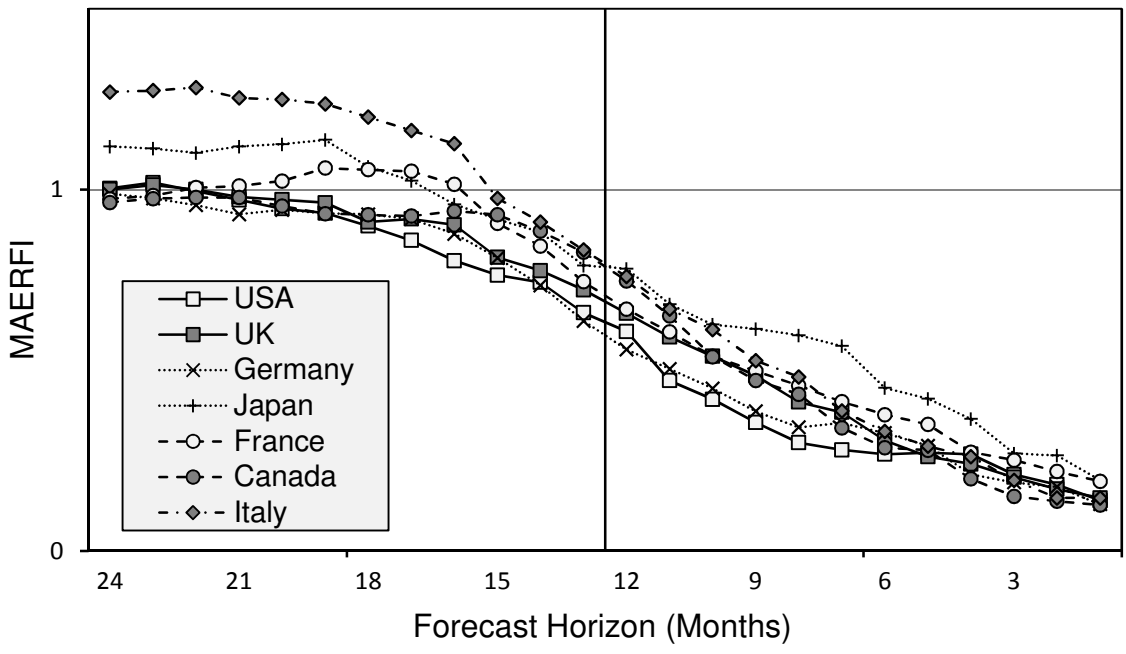

Fig. 2: Mean absolute error relative to the mean forecast item fluctuation of the consensus G7 GDP forecasts from 1991 - 2009

Fig. 2 clearly shows that the forecasters are not fulfilling this requirement. The forecasts for the coming year only reach a value which is clearly < 1 towards the end of the current year. The forecasting errors in the GDP forecasts which were submitted in the first half of the year for the following year are of a similar dimension to the average rate of change of economic growth. Initially, the forecasting errors for Italy and Japan are actually clearly above this level. From autumn onwards, the forecasts for all of the G7 states improve considerably. The additional information acquired due to the late submission of the forecast appears to benefit the forecasters. The forecasts for the respective current year (forecast horizon ≤ 12 months) always have a MAERFI which is clearly < 1. This achievement is, however, qualified somewhat by the fact that in this case actually measured GDP values can be used for the forecasts. The individual values can be seen in Table 2.

Table 2: Mean absolute error relative to the mean forecast item fluctuation of the consensus G7 GDP forecasts from 1991 - 2009

fh	(1)	(2)	(3)	(4)	(5)	(6)	(7)
months	USA	UK	GE	JA	FR	CA	IT
24	1.00	1.00	0.99	1.12	0.97	0.96	1.27
23	1.02	1.01	0.98	1.11	0.98	0.97	1.27
22	1.00	1.00	0.96	1.10	1.01	0.98	1.28
21	0.97	0.98	0.93	1.12	1.01	0.98	1.25
20	0.95	0.97	0.94	1.13	1.02	0.95	1.25
19	0.94	0.96	0.93	1.14	1.06	0.93	1.24
18	0.90	0.91	0.93	1.06	1.06	0.93	1.20
17	0.86	0.92	0.92	1.02	1.05	0.93	1.16
16	0.80	0.90	0.88	0.96	1.01	0.94	1.13
15	0.76	0.81	0.81	0.92	0.91	0.93	0.98
14	0.74	0.78	0.74	0.88	0.84	0.89	0.91
13	0.66	0.72	0.64	0.79	0.75	0.83	0.83
12	0.61	0.66	0.56	0.78	0.67	0.75	0.76
11	0.47	0.59	0.50	0.68	0.61	0.65	0.67
10	0.42	0.54	0.45	0.63	0.54	0.54	0.61
9	0.36	0.49	0.39	0.61	0.50	0.47	0.53
8	0.30	0.41	0.34	0.60	0.46	0.43	0.48
7	0.28	0.38	0.35	0.57	0.41	0.34	0.39
6	0.27	0.31	0.33	0.45	0.38	0.29	0.33
5	0.27	0.26	0.29	0.42	0.35	0.28	0.29
4	0.27	0.24	0.21	0.37	0.27	0.20	0.26
3	0.21	0.20	0.19	0.27	0.25	0.15	0.20
2	0.18	0.17	0.18	0.26	0.22	0.14	0.15
1	0.14	0.15	0.13	0.20	0.19	0.13	0.15

fh = forecast horizon

Systematic forecast errors

In this section the characteristics of the forecasting errors are considered in more detail. 'Efficient' forecasts should not contain errors of a systematic nature. This is derived from the rational expectations principle of Muth (1961). The simplest form of systematic forecasting error is a continuous over- or underestimation of the forecast subject.

An initial overview can be obtained by calculating the mean error (ME), which allows over- and underestimations on the part of the forecaster to be cancelled out. A longer forecast time series would need to exhibit an average MP close to zero to be considered undistorted.

The predicted value is *P* again, and the actual value is *A* at the respective point in time *t*, with a total number of observations *T*=19 years. The mean forecasting error is then calculated as follows:

$$\text{(3)} \qquad \mathrm{ME} = \frac{1}{\mathrm{T}} \sum_{\mathrm{t=l}}^{\mathrm{T}} \mathrm{P_t} - \mathrm{A_t}$$

The mean forecasting errors of the consensus forecasts for the G7 states are shown in Fig. 3.

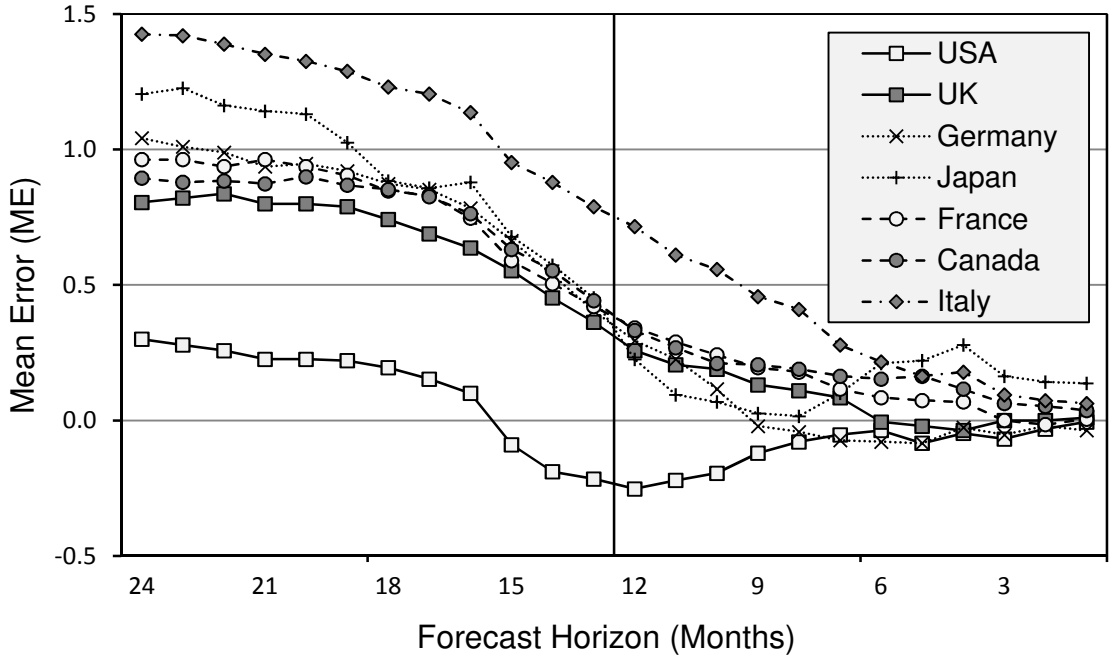

Fig. 3: Mean error of the consensus G7 GDP forecasts from 1991 - 2009

In the case of the forecasts for the coming year (forecast horizon > 12 months), the forecasters almost always overestimated economic growth. Average underestimations for the USA can only be observed from a forecast horizon of 15 months onwards. There is no longer a clear pattern among the forecasts for the current year. The phenomenon of average overestimation of economic growth disappears rapidly with lower forecast horizons. The individual values can be seen in Table 3.

Table 3: Mean error of the consensus G7 GDP forecasts from 1991 - 2009

fh	(1)	(2)	(3)	(4)	(5)	(6)	(7)
months	USA	UK	GE	JA	FR	CA	IT
24	0.30	0.81	1.04	1.21	0.96	0.89	1.43
23	0.28	0.82	1.01	1.23	0.96	0.88	1.42
22	0.26	0.84	0.99	1.16	0.94	0.88	1.39
21	0.23	0.80	0.94	1.14	0.96	0.87	1.35
20	0.23	0.80	0.95	1.13	0.94	0.90	1.33
19	0.22	0.79	0.92	1.03	0.91	0.87	1.29
18	0.19	0.74	0.87	0.88	0.85	0.85	1.23
17	0.15	0.69	0.85	0.86	0.83	0.83	1.21
16	0.10	0.64	0.78	0.88	0.75	0.76	1.14
15	-0.09	0.55	0.66	0.68	0.59	0.63	0.95
14	-0.19	0.45	0.54	0.57	0.51	0.55	0.88
13	-0.22	0.36	0.41	0.45	0.42	0.44	0.79
12	-0.25	0.26	0.29	0.23	0.34	0.33	0.72
11	-0.22	0.21	0.23	0.09	0.29	0.27	0.61
10	-0.19	0.19	0.12	0.07	0.24	0.21	0.56
9	-0.12	0.13	-0.02	0.03	0.19	0.21	0.46
8	-0.08	0.11	-0.04	0.02	0.18	0.19	0.41
7	-0.05	0.08	-0.07	0.10	0.12	0.16	0.28
6	-0.04	-0.01	-0.08	0.21	0.08	0.15	0.22
5	-0.08	-0.02	-0.08	0.22	0.07	0.16	0.16
4	-0.05	-0.04	-0.03	0.28	0.07	0.12	0.18
3	-0.07	0.00	-0.05	0.16	0.00	0.06	0.09
2	-0.03	0.00	-0.02	0.14	-0.02	0.05	0.07
1	-0.01	0.01	-0.04	0.14	0.01	0.04	0.06

fh = forecast horizon

For a more precise examination of forecast errors to ascertain whether they have systematic elements, the unbiasedness test in the form of the Mincer-Zarnowitz regression (Mincer / Zarnowitz 1969) has established itself as standard procedure. If *A* is the respective real value, *P* is the related predicted value und u is the error term, and the point of time is *t*, the Mincer-Zarnowitz regression takes the following form:

(4) $$A_t = \alpha + \beta\ P_t + u_t$$

In order to prove unbiasedness, a test of the joint hypothesis α=0 and β=1 is carried out. Moreover, the error term *u* should not contain any autocorrelation. This is normally ascertained by means of the Durbin-Watson test.

At this point it is appropriate to refer to the rather low number of observations for each regression which is carried out. From 1991-2009 there are only 19 years and thus 19 observations available for each forecast horizon and each country. This leads to large confidence intervals, so that the rejection of the joint hypothesis with a solely due to the number of observations becomes improbable (with a low probability of error). The results in Figure 4 and Table 4 – in which the probability of the unjustified rejection of the hypothesis α=0 und β=1 is recorded for each country and each forecast horizon – have to be interpreted with care. Conversely, however, when systematic forecast errors have been established, this has to be considered to be a much clearer result due to the low number of observations.

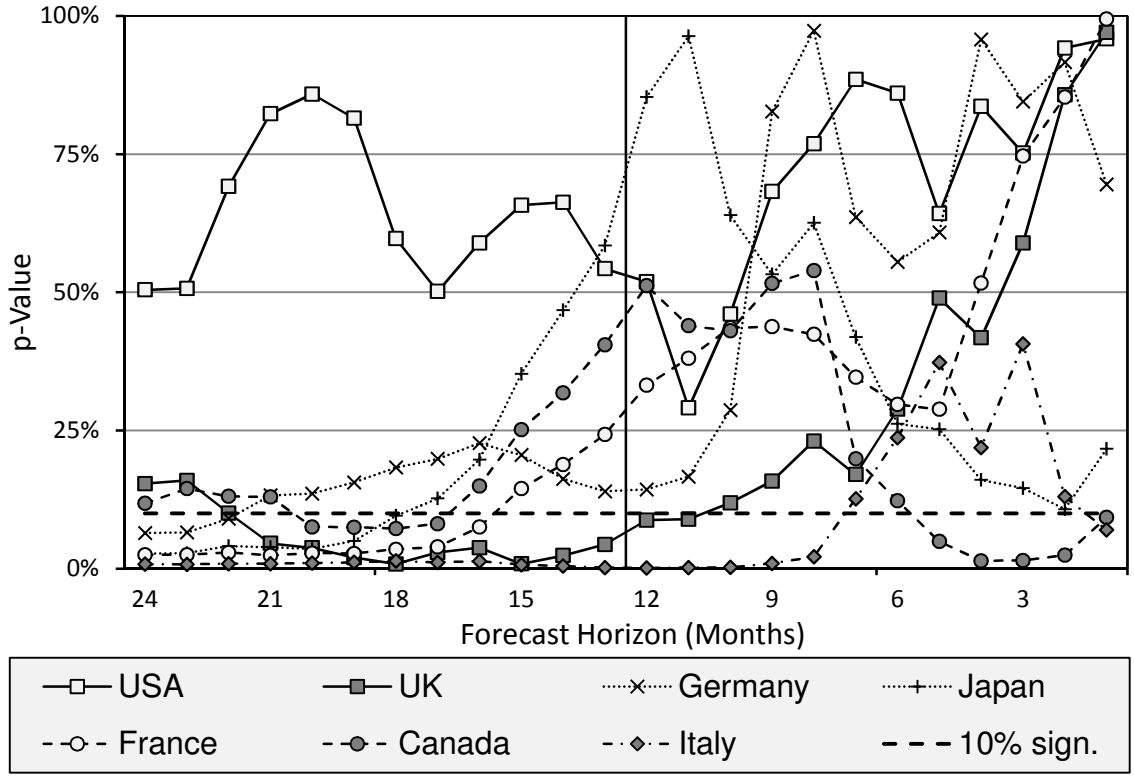

Fig. 4: *p*-values of the Mincer-Zarnowitz version of the unbiasedness test

Table 4: *p*-values of the Mincer-Zarnowitz version of the unbiasedness test

fh	(1)	(2)	(3)	(4)	(5)	(6)	(7)
months	USA	UK	GE	JA	FR	CA	IT
24	0.504	0.154	0.065	0.027	0.025	0.118	0.008
23	0.507	0.160	0.065	0.028	0.025	0.145	0.008
22	0.691	0.101	0.091	0.041	0.029	0.131	0.009
21	0.823	0.046	0.133	0.039	0.024	0.130	0.009
20	0.859	0.038	0.136	0.036	0.028	0.076	0.010
19	0.815	0.020	0.156	0.050	0.028	0.075	0.012
18	0.597	0.008	0.183	0.096	0.035	0.072	0.014
17	0.501	0.029	0.199	0.127	0.039	0.081	0.011
16	0.589	0.038	0.227	0.197	0.075	0.150	0.014
15	0.657	0.009	0.206	0.353	0.145	0.252	0.007
14	0.663	0.024	0.163	0.467	0.189	0.318	0.005
13	0.543	0.044	0.140	0.584	0.243	0.405	0.002
12	0.519	0.088	0.143	0.853	0.332	0.512	0.001
11	0.291	0.090	0.167	0.963	0.381	0.440	0.002
10	0.460	0.119	0.287	0.639	0.436	0.430	0.002
9	0.682	0.158	0.827	0.532	0.438	0.516	0.010
8	0.769	0.231	0.973	0.625	0.424	0.539	0.022
7	0.885	0.170	0.636	0.419	0.346	0.199	0.127
6	0.860	0.289	0.555	0.262	0.297	0.123	0.237
5	0.642	0.489	0.608	0.252	0.289	0.049	0.373
4	0.836	0.418	0.957	0.160	0.517	0.014	0.219
3	0.751	0.589	0.845	0.146	0.746	0.015	0.407
2	0.942	0.857	0.916	0.108	0.853	0.024	0.130
1	0.958	0.970	0.695	0.217	0.994	0.093	0.070

fh = forecast horizon

The results indicate a marked tendency towards systematic forecast errors in the forecasts for the coming year (forecast horizon > 12 months). The hypothesis of a constant of 0 and a coefficient of 1 (see (4)) is largely rejected apart from the forecasts for the USA. The result is even clearer if the Durbin-Watson test is included.

For the longer forecast horizons up to and including 18 months, the Durbin-Watson statistics for almost all of the countries exhibit an autocorrelation of the first order (5% significance level, Table 5). Systematic elements are thus measurable among the residuals.

Table 5: Results of the Durbin-Watson test of autocorrelation in the residuals

fh	(1)	(2)	(3)	(4)	(5)	(6)	(7)
months	USA	UK	GE	JA	FR	CA	IT
24	0.90	0.93	1.31	1.01	1.30	1.06	1.25
23	0.90	0.96	1.30	1.02	1.30	1.07	1.28
22	0.91	0.98	1.34	1.02	1.32	1.15	1.29
21	0.93	1.10	1.39	1.03	1.40	1.13	1.30
20	0.97	1.10	1.42	1.03	1.39	1.23	1.33
19	1.00	1.10	1.49	1.02	1.35	1.31	1.32
18	0.96	1.24	1.51	1.05	1.37	1.36	1.33
17	1.12	1.16	1.54	1.07	1.36	1.48	1.42
16	1.30	1.25	1.61	1.14	1.66	1.49	1.42
15	1.78	1.64	1.71	1.23	2.00	1.85	1.78
14	1.87	1.67	1.83	1.34	2.22	1.96	2.09
13	1.97	1.88	2.10	1.59	2.22	2.13	2.24
12	1.88	2.02	2.23	1.69	2.28	2.37	2.46
11	1.96	2.10	2.09	1.99	2.49	2.48	2.48
10	1.92	2.20	1.97	2.21	2.51	2.59	2.51
9	1.98	2.33	1.87	2.19	2.48	2.55	2.66
8	2.35	2.36	1.57	2.25	2.39	2.57	2.67
7	2.29	2.34	1.57	2.39	2.08	2.71	2.31
6	2.33	2.32	1.58	2.23	2.09	2.34	2.22
5	2.06	2.35	1.45	2.27	1.92	2.23	2.28
4	2.04	2.22	1.14	2.21	1.86	1.63	2.43
3	2.29	1.90	0.99	2.34	1.78	1.59	2.49
2	2.11	1.99	0.94	2.29	1.67	1.50	2.14
1	2.17	1.68	0.77	2.30	1.55	2.02	2.13

fh = forecast horizon; Durbin-Watson statistic: 0 = perfect positive autocorrelation, 2 = no autocorrelation, 4 = perfect negative autocorrelation; Critical value: 1.4 (5% level of significance, 19 observations, one dependent and one independent variable); values less than 1.4 are highlighted

Refraining from a country-specific evaluation is one way of raising the number of observations. A panel data analysis with the respective country as the panel variable and the year as the time variable leads to the results shown in Fig. 5. The calculation is carried out as a county-fixed effects model in the form of (5), where *A* again represents actual GDP growth in percentage points and *P* the corresponding consensus forecast. *t* is again the point in time and *i* now represents the G7 state which is being analysed. Similarly to (4), a test of the joint hypothesis of a constant (α) of 0 and of the estimated parameter of the forecasts (β) of 1 is carried out.

$$A_{i,t} = \alpha + \beta\ P_{i,t} + u_{i,t} \qquad (5)$$

Enlarging the degrees of freedom by refraining from a country-specific evaluation leads to a clarification of the previous results. Given a forecast

horizon of 11-24 months, systematic forecast errors are demonstrable for the G7 states as a whole with a probability of error of clearly below 1% (Fig. 5). This does not exclude unbiased consensus forecasts for individual countries, but clearly points towards the existence of systematic forecast errors based on the forecast horizon.

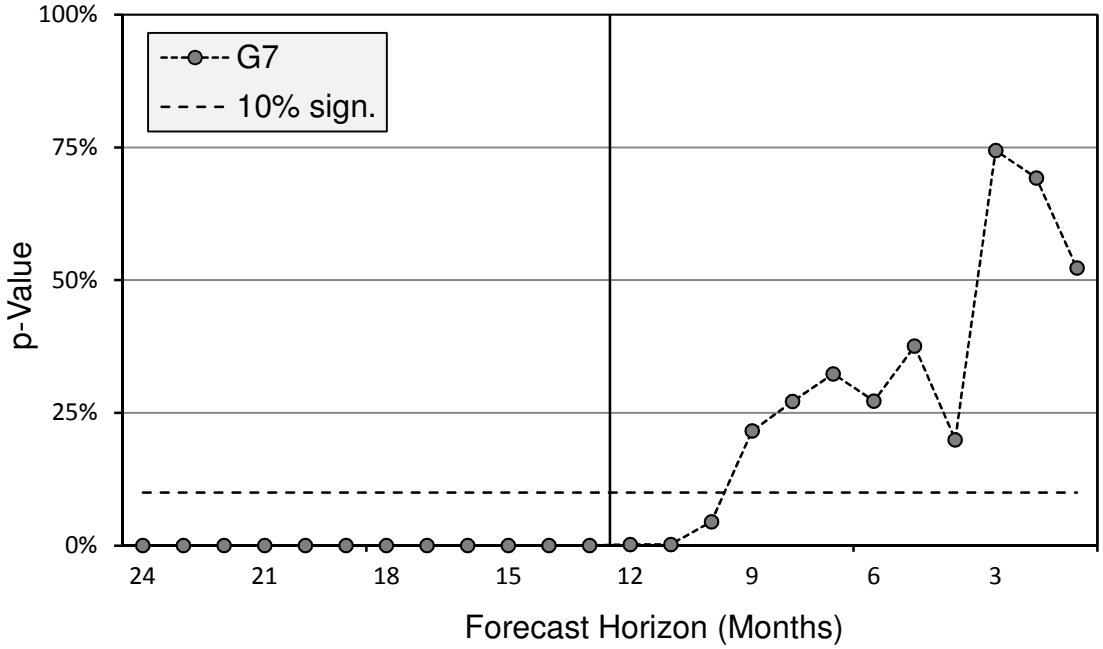

Fig. 5: *p*-values of the Mincer-Zarnowitz version of the panel-based unbiasedness test

The final evaluation of the quality of the forecasts can be divided into three time periods/intervals. The longer-term forecasts with a horizon > 15 months can only be evaluated as poor. The mean absolute forecast error is clearly above one percentage point for all states in this case and is thus higher than the corresponding average fluctuation of the respective GDP growth rates. Depending on the country, a more or less marked overestimation of growth can be established for the period of investigation. However, systematic forecast errors can only be detected for the minority of the consensus forecasts for the individual G7 states. If the forecasts for all of the G7 states are considered as a whole, however, a systematic bias can be clearly identified, even including forecasts for the current year.

From autumn onwards, the values for the forecasts for the coming year improve noticeably. The forecast errors drop below the real fluctuation of growth rates and the overestimates fall markedly in the process. Nevertheless, systematic forecast errors can be proven in this period if no country-specific evaluation is carried out.

This changes among the forecasts for the current year from spring onwards: the forecast errors are now also clearly smaller. However, actually measured values can also increasingly be integrated into the forecasts.

Overall, the forecasts appear to exhibit a noticeable link to the future only shortly before the beginning of the forecasted year. This result is not particularly flattering for the consensus forecasts, but it corresponds to the current state of research.

III. Comparison with early indicators

The following section focuses on the question of whether consensus forecasts can measure up to the link to upcoming economic trends exhibited by other information sources. On the one hand, an analysis is carried out of the OECD's Composite Leading Indicators (CLI) which are available for the individual G7 states in the investigation period. On the other hand, the results of the Ifo Institute's World Economic Survey (WES) are included, in which experts are surveyed worldwide about their expectations for the future development of the world economy.

First of all, the two data sets are presented. Then their link to the future in comparison with the consensus forecasts is examined. As the data is available in various scales, the analysis of its correlation to the development of the economy is carried out by means of the coefficient of determination. In addition, a test of the hypothesis that no correlation to economic development can be measured is made for each forecast horizon and each country.

Additional data

The CLI of the OECD were created for the early detection of turning points in the business cycle and have been highly successful (Nilsson / Guidetti 2008).

The calculation of the CLIs is carried out individually for each national economy based on its economic significance, its cyclical behaviour and the quality of the data available. The number of time series included in an aggregation fluctuates between 5 and 11; no weighting is carried out.[4] Alongside quantitative data such as industry order books, the interest rate structure, planning permission for new buildings or car registration data, country-specific surveys of the expectations of companies and consumers are also included. The goal of the indicators is to provide early signals of turning points between expansions and slowdowns of economic activity, whereby early recognition of the extent of change in growth rates is not an objective.

The time series can be downloaded in different variations from the statistics section of the OECD website. For this study, the CLI which covers the percentage change of the reference time series[5] on a 12-months basis is used. In addition, the time series is adjusted by the OECD for long-term trends in the month in which it is published.[6]

In contrast to the consensus forecasts analysed, the association to the future which is targeted by the indicator always remains constant. The CLI is calculated on a monthly basis and is then published with a delay of two months. Revisions are carried out in the meantime, as not all of the time series which are included in the aggregation are immediately available. The effects of these revisions were studied by Nilsson and Guidetti (2007), whereby no significant effect could be established for the G7 states analysed in this study.

The second data series which is included in the study is based on the results of a survey by the Munich Institute for Economic Research (Ifo) in cooperation with the International Chamber of Commerce (ICC) in Paris. In this survey, over 1000 experts from 119 countries worldwide (as at February 2011) are questioned in the first month of every quarter about their assessment of the current economic situation and their expectations for the next six months, whereby they only give their view on trends (better / no change / worse). The

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4 The precise composition can be viewed on the website of the OECD: www.oecd.org → Search: CLI

5 For most countries this is manufacturing, as this value – unlike GDP – is available on a monthly basis.

6 See OECD (2008), http://www.oecd.org/dataoecd/26/39/41629509.pdf

results are then published in the second month of each quarter under the title of World Economic Survey (WES).

The Ifo Institute transforms the qualitative information into time series in the following way: first of all, the two statements are classified with figures (better = 9, no change = 5, worse = 1). The respective country-specific average is then weighted by the proportion of world trade which is accounted for by its national economy. This is followed by indexing (year 2005=100) and a combination of the time series on the current situation and the expectations for the next six months to form a new time series which constitutes the Ifo World Economic Climate index.[7]

The time series for the experts' expectations for the next six months is used for this analysis. As with the CLI, the possible link to future economic developments remains constant here. Whereas the survey at the beginning of the 1st quarter asks about expectations for the first half of the year, the survey at the beginning of the 2nd quarter deals with expectations for the 2nd and 3rd quarters of a year.

Methodology

Due to the different temporal goals of the forecasting efforts, a comparison between the consensus forecasts and the OECD CLI on the one hand and the results of the Ifo WES on the other is not possible without the use of a special method. This procedure can be explained by the following example:

In the 1/2000 edition of Consensus Forecasts, which was published in mid-January, two consensus forecasts for the GDP of the G7 states were provided – as already detailed in the second section. One refers to the current year, the other to the following year (Table 6, 2nd and 3rd columns). They have horizons of 12 and 24 months respectively until the forecasted GDP is ultimately established. Now the OECD CLI of January 2000 and the results of the Ifo WES of the first quarter are used for a comparison with the consensus forecasts for the two horizons. The data from the OECD and the Ifo Institute are thus used twice (Table 6, 4th + 5th columns).

[7] Plenk et al. (2011), p. 2.

Table 6: (Supposed) interval between compilation of the different forecasting approaches and conclusive validation of the GDP in months

issue / month of compilation	consensus forecasts current year	consensus forecasts forthcoming year	OECD CLI	Ifo WES
January	12	24	12 / 24	12 / 24
February	11	23	11 / 23	-
March	10	22	10 / 22	-
April	9	21	9 / 21	9 / 21
May	8	20	8 / 20	-
June	7	19	7 / 19	-
July	6	18	6 / 18	6 / 18
August	5	17	5 / 17	-
September	4	16	4 / 16	-
October	3	15	3 / 15	3 /15
November	2	14	2 / 14	-
December	1	13	1 / 13	-

In contrast to their original scope – constantly shifting into the future for every publication – it is implied that they have a fixed relationship to the economic growth of the current and the following year. This is of particular significance when considering the results of the analysis.

Comparison of the link to the future

First of all, a comparison is carried out of the coefficients of determination of each of the individual estimates made for each of the three forecasting approaches, each country and each forecast horizon.

$$A_t = \alpha + \beta\ P_t + u_t \qquad (6)$$

A represents the economic growth of the forecasted year, *P* is the respective consensus forecast, the OECD CLI or the results of the Ifo WES, and *t* is the relevant point in time in the period of investigation 1991-2009 (19 observations). This results in 392 individual estimations for seven countries, the three time series which were analysed and 24 forecast horizons which were considered (eight for the quarterly published Ifo WES).

The coefficients of determination provide information about what percentage of the variance of economic growth has been recorded by the forecasting approaches and are presented in Fig. 6. Afterwards the results of the test of the

hypothesis β=0 from (6) are presented (Fig. 7). This takes the form of a graph of the *p*-values – in other words, the probability that this hypothesis is rejected without good reason. In the case of values lower than 0.05 (level of significance of 5%), it is assumed there is a high probability that the forecasting approach exhibits a correlation to upcoming economic developments at this point in time. The tables with the values listed according to countries can be found in the appendix.

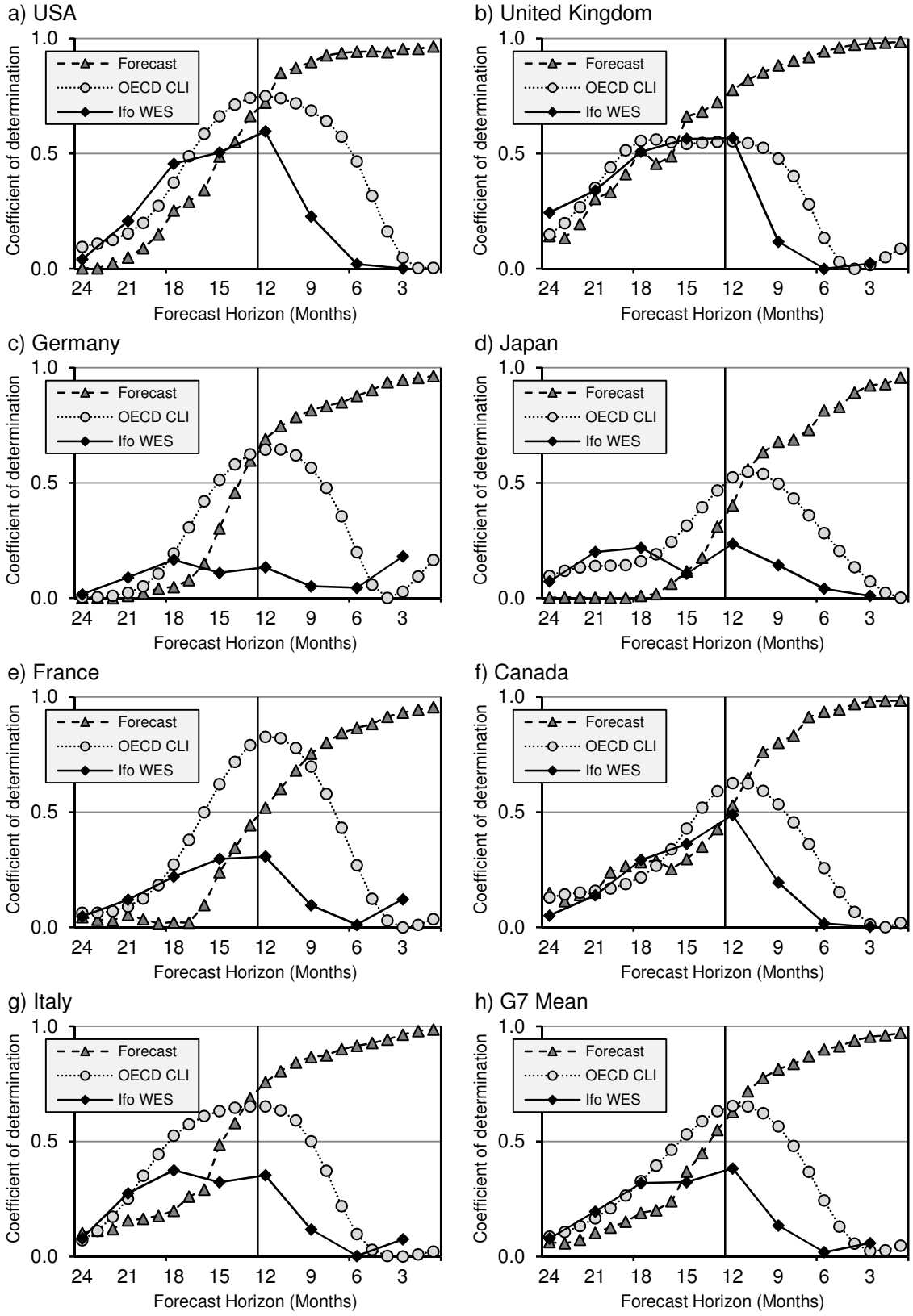

Fig. 6: Coefficient of determination for each forecasting approach

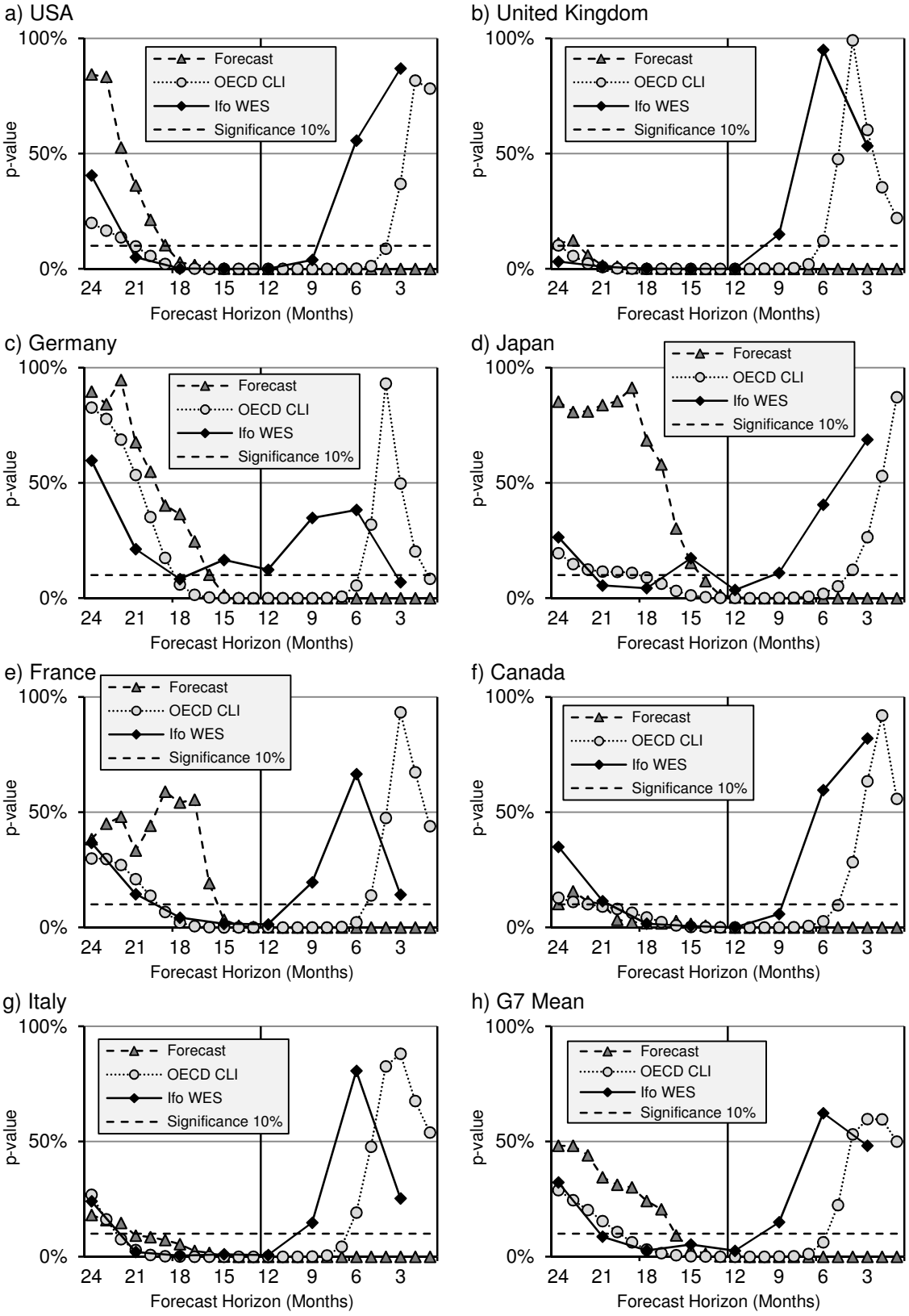

Fig. 7: *p*-value of the hypothesis that there is no reference to the upcoming GDP growth rate

The coefficients of determination (R^2) in Fig. 6 reveal major similarities between the individual G7 states. After the analysis of the forecast quality in the second section, it is hardly surprising that the consensus forecasts with long forecast horizons exhibit a low R^2, which after an initially slow increase then accelerates considerably from a forecast horizon of 15 months onwards. In the case of the forecasts which were made for the economic growth of the current year (forecast horizon < 13 months), the R^2 is almost always > 0.5. For the USA, the UK, Canada and Italy, coefficients of determination which are clearly over 0 can already be established for the longer forecast horizons. Among the forecasts for the Japanese economy, however, the coefficient of determination is only 0.4 for a forecast horizon of 12 months. This is reflected in the results in Fig. 7. With the exception of the forecasts for Japan, the correlation to economic trends is significant at the 5%-level for all states given a forecast horizon of 15 months. This is also mirrored here by the supposedly[8] better forecasting performance for the USA, the UK, Canada and Italy. The low probability of error of 5% is partly reached much earlier in these states.

In the case of the longer forecast horizons, the coefficients of determination for the OECD CLI and the results of the Ifo WES initially exhibit similar behaviour (Fig. 6). Here again, a continuous increase can be observed for all countries after a low starting level around 0 (horizon = 24 months). However, this occurs earlier than in the consensus forecasts. At a forecast horizon of 21 months, for example, the coefficients of determination of the OECD and Ifo time series are higher than the forecasts which were submitted at the same time. This applies equally to all states with the exception of Canada. This is remarkable, as the time series of the OECD and the Ifo Institute were not designed with the goal of forecasting economic growth in the forthcoming year. The Ifo time series is actually hampered by the fact that the findings of the survey of experts were not evaluated on a country-specific basis – making it even more noteworthy that the figures for the world economic situation exhibit a greater correlation to the economic trends in individual countries than the country-specific forecasts of the

[8] The word “supposedly” is used because the evaluation of forecast quality by means of simple forecast error benchmarks in the second section provides no indication of improved quality.

experts. These surprising results, which show that the two time series both have a stronger link to upcoming economic trends, apply to almost all states.

At a forecast horizon of 15 months, the correlation between the analysed time series is more differentiated. The R^2 of the OECD CLI continues to rise for all states in this phase, and is always above the coefficient of determination of the consensus forecasts, except for the UK. The situation is different for the time series of the World Economic Survey of the Ifo Institute. On average, no further increase is recorded here. Nevertheless, the value in three states is still above that of the corresponding consensus forecasts.

A glance at the *p*-values confirms the early onset of a link to future economic trends in the OECD and Ifo time series. On average, they show a significant link to the economic development of the following year some months before the consensus forecasts.

In the case of the single-figure forecast horizons, the time series of the OECD and the Ifo Institute exhibit a significant loss of strength. This was to be expected, however, as the point in time for which the time series is valid shifts into the future with every publication. They thus refer increasingly to the following year and no longer to the current year, which makes their falling correlation to the economic development of the current year plausible. The poor performance of the Ifo time series at a horizon of nine months is nevertheless remarkable, as the experts surveyed were expressing their expectations for the next six months. The values for a forecast horizon of 12-18 months are noticeably better, so that expectations apparently only exhibit a relationship to actual trends with a significantly longer delay than six months.

IV. Information Processing

This section is intended to show how business cycle forecasts could actually benefit from the OECD CLI and the results of the Ifo WES. If this is the case, the forecasts are not efficient. A differentiation between stronger and weaker forecast efficiency has been made since Nordhaus (1987). Strong efficiency is present when all information which was available for drawing up the forecast has been optimally processed. This includes knowledge of economic

phenomena and also inside information. Nordhaus refers at this point to the parallels to the efficiency in the capital markets (Fama 1970). This strong efficiency could not be expected in practice, however, as economists have no access to inside information.

As an alternative, Nordhaus proposes the test for weak efficiency. Here, the forecasters are expected to at least analyse their own forecasting errors and to draw the correct consequences from them. This test is not applied in this study, as the investigation period is too brief to permit a meaningful evaluation of past forecast revisions.

Fama's theory of capital markets' informational efficiency should be mentioned again here. It contains a stage of semi-strong efficiency in which all publicly available information contributes to efficient price formation. The use of the time series of the OECD and the Ifo Institute for business cycle forecasts can be seen as similar here. Both sets of information are publicly available. Viewed in this light, a further differentiation is required here. This study shows that the forecasts do not possess semi-strong efficiency at crucial points in time.

In order to examine whether the information could contribute to an improvement of the business cycle forecasts, the Mincer-Zarnowitz regression presented in the second section is extended (Holden / Peel 1990). Let *X* be an arbitrary item of information at the point in time t. *A* is the actually measured value again, *P* is the corresponding forecast, and *u* is the error term.

$$A_t = \alpha + \beta\, P_t + \gamma\, X_t + u_t \qquad (7)$$

The verification whether the additional information would have contributed to a better forecast is carried out by a test of the hypothesis γ=0.

With reference to this study, *A* is GDP growth on an annual basis, *P* is the corresponding consensus forecast, and *X* is on one occasion the OECD Composite Leading Indicators and on another occasion the results of the Ifo World Economic Survey. The period of investigation is again 1991-2009, and an individual calculation is carried out for each G7 state, whereby in the case of the Ifo WES expectations about the world economic situation, the same data series is used for each state.

At this point it is necessary to broach the issue of the time at which forecasts were made and the time when the data was acquired. For business cycle forecasts to benefit from the data of the OECD and the Ifo Institute, the data has to be available in good time. The forecasts are published in the middle of each month so that changes can be made until the beginning of the month. The aggregation of the OECD CLIs is based on the quantitative and qualitative data obtained over the course of a month. Publication does not take place until the following month. The forecasters can thus only take the OECD CLIs into account a month later. The forecasts which were published in Consensus Forecasts in February are thus analysed as to whether the January CLIs were given sufficient consideration.

The worldwide survey of experts by the Ifo Institute takes place in the first month of each quarter. The corresponding press release containing the results is published at the beginning of the following month. In order to grant the forecasters sufficient time to process this information, a time lag of one month is taken into account.

The question is whether the forecasts for the coming year can be improved with the two sets of additional information. Forecast horizons of 23 months (February), 20 months (May), 17 months (August) and 14 months (November) are analysed. Table 7 provides an overview of the analysed forecast horizons of the consensus forecasts and the months in which the time series of the OECD and the Ifo Institute were compiled.

Table 7: Chronological overview of data input in the test of efficiency

Consensus Forecasts release month		Month of compilation of CLI and WES	
Issue	Forecast horizon	OECD CLI	Ifo WES
February	23 months	January	January
May	20 months	April	April
August	17 months	July	July
November	14 months	October	October

If the estimated parameter γ from Equation (7) deviates significantly from 0, there is a high probability that the additional information would have contributed

to an improvement of the business cycle forecasts for the respective country. The results of the estimates can be seen in Tables 8 and 9.

Table 8: Results of the efficiency test regarding the additional information provided by the OECD Composite Leading Indicators

	fh	(1) USA	(2) UK	(3) GE	(4) JA	(5) FR	(6) CA	(7) IT
Consensus Forecasts	23 months	0.390 (0.642)	1.731 (0.327)	-0.182 (0.838)	0.068 (0.887)	0.515 (0.581)	0.825 (0.384)	0.942 (0.338)
OECD CLI		0.164 (0.189)	0.260 (0.264)	0.026 (0.825)	0.146 (0.214)	0.102 (0.377)	0.118 (0.307)	0.055 (0.652)
Constant		1.035 (0.680)	-2.724 (0.525)	1.577 (0.443)	0.677 (0.556)	0.187 (0.936)	-0.554 (0.843)	-1.318 (0.549)
Observations		19 (period 1991 - 2009)						
R^2		0.107	0.200	0.006	0.098	0.081	0.172	0.125
Consensus Forecasts	20 months	0.978 (0.199)	2.167* (0.093)	0.414 (0.614)	0.078 (0.869)	0.157 (0.862)	1.311 (0.119)	0.626 (0.429)
OECD CLI		0.195* (0.096)	0.396* (0.071)	0.063 (0.598)	0.179 (0.127)	0.114 (0.329)	0.098 (0.357)	0.180 (0.126)
Constant		-0.666 (0.755)	-3.763 (0.220)	0.224 (0.902)	0.663 (0.545)	1.093 (0.626)	-2.024 (0.409)	-0.598 (0.726)
Observations		19 (period 1991 - 2009)						
R^2		0.239	0.459	0.039	0.141	0.093	0.281	0.282
Consensus Forecasts	17 months	1.395** (0.022)	1.295* (0.096)	0.534 (0.428)	0.322 (0.515)	-0.532 (0.402)	1.262 (0.139)	0.423 (0.473)
OECD CLI		0.280*** (0.007)	0.438** (0.015)	0.187 (0.100)	0.175* (0.092)	0.264** (0.021)	0.092 (0.406)	0.263*** (0.007)
Constant		-1.920 (0.218)	-1.441 (0.413)	-0.131 (0.927)	0.278 (0.780)	2.706* (0.085)	-1.766 (0.461)	-0.084 (0.945)
Observations		19 (period 1991 - 2009)						
R^2		0.554	0.629	0.226	0.182	0.306	0.321	0.541
Consensus Forecasts	14 months	0.531* (0.085)	1.430** (0.012)	0.913** (0.042)	0.652 (0.116)	0.040 (0.921)	0.395 (0.508)	0.920* (0.052)
OECD CLI		0.248*** (0.006)	0.120 (0.436)	0.194** (0.016)	0.205** (0.021)	0.303*** (0.003)	0.187 (0.120)	0.182** (0.016)
Constant		0.771 (0.237)	-1.349 (0.236)	-0.565 (0.462)	-0.065 (0.928)	1.404 (0.105)	0.812 (0.594)	-0.737 (0.361)
Observations		19 (period 1991 - 2009)						
R^2		0.721	0.694	0.627	0.416	0.622	0.445	0.712

Dependent variable: GDP growth rate (per cent); *fh* = forecast horizon (months); CLI = Composite Leading Indicator (significant values are highlighted); *p*-values in parentheses (*** p<0.01; ** p<0.05. * p<0.1)

Table 9: Results of the efficiency test regarding the additional information provided by the Ifo World Economic Survey

	fh	(1) USA	(2) UK	(3) GE	(4) JA	(5) FR	(6) CA	(7) IT
Consensus Forecasts	23 months	-0.080 (0.930)	0.534 (0.792)	-0.077 (0.932)	0.195 (0.691)	0.862 (0.353)	1.079 (0.267)	1.197 (0.144)
Ifo WES		0.023 (0.433)	0.058 (0.138)	0.015 (0.630)	0.038 (0.259)	0.022 (0.296)	0.013 (0.677)	0.032 (0.211)
Constant		0.555 (0.859)	-5.221 (0.184)	-0.097 (0.981)	-3.200 (0.371)	-2.732 (0.414)	-2.345 (0.469)	-4.917 (0.119)
Observations		19 (period 1991 - 2009)						
R^2		0.041	0.248	0.017	0.082	0.099	0.124	0.198
Consensus Forecasts	20 months	0.228 (0.802)	1.994 (0.183)	0.533 (0.496)	0.039 (0.933)	0.383 (0.626)	1.390 (0.143)	0.949 (0.157)
Ifo WES		0.055 (0.138)	0.055 (0.165)	0.045 (0.208)	0.071* (0.064)	0.032 (0.195)	0.018 (0.633)	0.059** (0.040)
Constant		-3.613 (0.251)	-8.840** (0.013)	-4.513 (0.272)	-6.425 (0.104)	-2.671 (0.347)	-3.927 (0.226)	-7.184** (0.019)
Observations		19 (period 1991 - 2009)						
R^2		0.210	0.411	0.117	0.200	0.134	0.251	0.363
Consensus Forecasts	17 months	0.313 (0.723)	1.359 (0.113)	0.782 (0.234)	0.250 (0.601)	0.159 (0.777)	0.993 (0.261)	1.090** (0.045)
Ifo WES		0.082** (0.040)	0.075** (0.043)	0.061* (0.084)	0.076* (0.051)	0.047* (0.057)	0.047 (0.247)	0.069** (0.010)
Constant		6.565** (0.021)	9.104*** (0.003)	-6.532* (0.086)	7.282* (0.070)	-3.616 (0.165)	5.567* (0.078)	8.401*** (0.003)
Observations		19 (period 1991 - 2009)						
R^2		0.461	0.582	0.239	0.232	0.224	0.349	0.518
Consensus Forecasts	14 months	0.763 (0.111)	1.370** (0.017)	1.435*** (0.003)	0.746 (0.116)	0.800** (0.027)	0.571 (0.426)	1.489*** (0.000)
Ifo WES		0.029 (0.301)	0.025 (0.371)	0.022 (0.257)	0.029 (0.271)	0.029* (0.052)	0.036 (0.340)	0.034** (0.025)
Constant		-1.961 (0.287)	-3.513* (0.060)	-3.374* (0.080)	-2.929 (0.240)	2.765** (0.043)	-2.702 (0.213)	4.829*** (0.001)
Observations		19 (period 1991 - 2009)						
R^2		0.580	0.698	0.501	0.238	0.487	0.388	0.697

Dependent variable: GDP growth rate (per cent); *fh* = forecast horizon (months); WES = World Economic Survey (significant values are highlighted); *p*-values in parentheses (*** p<0.01; ** p<0.05. * p<0.1)

Given a forecast horizon of 23 months, the analysed data of the OECD and the Ifo Institute are not of benefit.

However, this situation changes at a forecast horizon of 20 months. The parameter for the OECD CLIs is estimated to be significantly (10% level) different from zero for the USA and the UK. The business cycle forecasts for two of the most important economies of the world could thus possibly be improved with the assistance of the OECD CLIs. The experts' opinions on the world economic outlook recorded by the Ifo Institute is significant at a horizon (of the consensus forecasts) of 20 months for Japan (10% level) and Italy (5% level).

Almost all of the business cycle forecasts which were issued for the G7 states in August for the following year (horizon: 17 months) could benefit from the additional information tested here. The OECD CLIs are significant at least at a 10% level in 5 out of 7 states. The same applies to the Ifo time series in 6 out of 7 states. Only in the case of Canada can no significance be established in either time series. This does not mean, however, that the business cycle forecasts were successful. At a forecast horizon of 17 months and in almost all cases, the estimated parameters for the consensus forecasts provide no significant contribution towards explaining the variations in economic development in the countries analysed.

The forecasts submitted in November for the following year (a horizon of 14 months) are quite successful overall (see Section 2), but the additional information could also contribute towards an improvement here. The OECD CLIs are significant at least at a 5% level in 5 of the 7 states, while the data surveyed by the Ifo Institute is significant at least at a level of 10% in 2 of the 7 states.

V. Conclusion

This study shows that not all means to achieve high forecasting quality are exploited in the drawing up of business cycle forecasts for the G7 states. Relevant and publicly available information is not given sufficient consideration or not used at all. Two time series were tested here with regard to their

suitability for this purpose: the OECD's Composite Leading Indicators and the World Economic Survey of the Ifo Institute in Munich. Unrestricted public access is available to both of these sources of information. In addition, the study design provided forecasters with sufficient time to incorporate the information in their models.

The following results can be confirmed:

- The business cycle forecasts which were analysed only have a clear link to future economic trends from a forecast horizon of 15 months onwards.
- A possible cause of this is the systematic misjudgement of economic growth in the period of investigation, which is primarily based on frequent overestimations.
- Although this is not their objective, the time series of the OECD and the Ifo Institute exhibit an earlier link to future economic trends on an annual basis.
- From a forecast horizon of 17 months onwards, the analysed time series of the OECD and the Ifo Institute would have been able to contribute towards an improvement of business cycle forecasts for most G7 states during the period of investigation.

The question arises as to why forecasters have not made sufficient use of this information until now. The following factors may have led to this situation:

- The information refers to the coming months and not to the economic trends of an entire year. This factor may lead to the data being disregarded.
- The Ifo Institute's time series do not have a country-specific reference. This could have led to the data not being considered when drawing up country-specific business cycle forecasts.
- The additional information which was analysed in this study was mainly data obtained qualitatively – which largely reflects expectations. It is possible that forecasters generally underestimate the relevance of economic agents' expectations.

Further research will be carried out using the findings of this study as a basis. The various possibilities for processing the information should be studied with a view to improving the forecasting models as much as possible. Different weightings on the basis of the forecast horizon would be conceivable here, or a reworking of the surveys with the goal of creating a fixed-target indicator to show the economic development of the coming year.

Research into the causes for the insufficient attention paid to this information should focus on the qualitative form of the surveys and in particular on the effects of the expectations of economic agents. Tests should be carried out to ascertain whether forecasters give comparatively more consideration to quantitative early indicators.

It would also be interesting to find out whether there are individual forecasters who show a greater awareness of this information. This study only analysed consensus forecasts without taking individual forecasters into account.

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Appendix

USA

Table 10: Coefficients of determination and *p*-values of the three forecasting approaches referring to the GDP growth rate of the USA between 1991 and 2009

fh	Coefficient of determination			*p*-value		
months	forecasts	OECD CLI	Ifo WES	Forecasts	OECD CLI	Ifo WES
24	0.00	0.09	0.04	0.843	0.199	0.406
23	0.00	0.11	-	0.833	0.165	-
22	0.02	0.13	-	0.526	0.137	-
21	0.05	0.15	0.21	0.361	0.097*	0.051*
20	0.09	0.20	-	0.213	0.056*	-
19	0.15	0.27	-	0.103	0.022**	-
18	0.25	0.37	0.46	0.028**	0.005***	0.002***
17	0.29	0.49	-	0.017**	0.001***	-
16	0.34	0.59	-	0.009***	0.000***	-
15	0.49	0.66	0.50	0.001***	0.000***	0.001***
14	0.55	0.71	-	0.000***	0.000***	-
13	0.66	0.74	-	0.000***	0.000***	-
12	0.72	0.75	0.60	0.000***	0.000***	0.000***
11	0.85	0.74	-	0.000***	0.000***	-
10	0.87	0.72	-	0.000***	0.000***	-
9	0.90	0.69	0.23	0.000***	0.000***	0.039**
8	0.93	0.64	-	0.000***	0.000***	-
7	0.94	0.57	-	0.000***	0.000***	-
6	0.94	0.47	0.02	0.000***	0.001***	0.557
5	0.94	0.32	-	0.000***	0.012**	-
4	0.94	0.16	-	0.000***	0.088*	-
3	0.95	0.05	0.00	0.000***	0.368	0.869
2	0.95	0.00	-	0.000***	0.816	-
1	0.97	0.00	-	0.000***	0.782	-

fh = forecast horizon; Dependent variable: GDP growth rate (percent); Independent variable in each case separately: consensus forecasts / OECD Composite Leading Indicator (CLI) / Ifo World Economic Survey (WES); Number of observations: 19 in each case (years 1991-2009); p-values: probability of mistaken relation to the GDP growth rate. *** p<0.01 / ** p<0.05 / * p<0.1

United Kingdom

Table 11: Coefficients of determination and *p*-values of the three forecasting approaches referring to the GDP growth rate of the United Kingdom between 1991 and 2009

fh	Coefficient of determination			*p*-value		
months	forecasts	OECD CLI	Ifo WES	forecasts	OECD CLI	Ifo WES
24	0.14	0.15	0.24	0.111	0.102	0.031**
23	0.13	0.20	-	0.124	0.056*	-
22	0.20	0.27	-	0.058*	0.023**	-
21	0.30	0.35	0.34	0.014**	0.007***	0.009***
20	0.33	0.44	-	0.010**	0.002***	-
19	0.41	0.51	-	0.003***	0.001***	-
18	0.52	0.56	0.51	0.001***	0.000***	0.001***
17	0.46	0.56	-	0.002***	0.000***	-
16	0.49	0.55	-	0.001***	0.000***	-
15	0.66	0.54	0.56	0.000***	0.000***	0.000***
14	0.68	0.55	-	0.000***	0.000***	-
13	0.72	0.55	-	0.000***	0.000***	-
12	0.78	0.55	0.57	0.000***	0.000***	0.000***
11	0.82	0.55	-	0.000***	0.000***	-
10	0.85	0.52	-	0.000***	0.000***	-
9	0.88	0.48	0.12	0.000***	0.001***	0.150
8	0.90	0.40	-	0.000***	0.004***	-
7	0.92	0.28	-	0.000***	0.020**	-
6	0.94	0.13	0.00	0.000***	0.122	0.950
5	0.96	0.03	-	0.000***	0.476	-
4	0.97	0.00	-	0.000***	0.991	-
3	0.98	0.02	0.02	0.000***	0.602	0.533
2	0.98	0.05	-	0.000***	0.354	-
1	0.98	0.09	-	0.000***	0.221	-

fh = forecast horizon; Dependent variable: GDP growth rate (percent); Independent variable in each case separately: consensus forecasts / OECD Composite Leading Indicator (CLI) / Ifo World Economic Survey (WES); Number of observations: 19 in each case (years 1991-2009); p-values: probability of mistaken relation to the GDP growth rate. *** p<0.01 / ** p<0.05 / * p<0.1

Germany

Table 12: Coefficients of determination and *p*-values of the three forecasting approaches referring to the GDP growth rate of Germany between 1991 and 2009

fh	Coefficient of determination			*p*-value		
months	forecasts	OECD CLI	Ifo WES	Forecasts	OECD CLI	Ifo WES
24	0.00	0.00	0.02	0.897	0.827	0.597
23	0.00	0.00	-	0.842	0.778	-
22	0.00	0.01	-	0.947	0.688	-
21	0.01	0.02	0.09	0.677	0.535	0.213
20	0.02	0.05	-	0.548	0.352	-
19	0.04	0.11	-	0.403	0.174	-
18	0.05	0.19	0.17	0.365	0.059*	0.083*
17	0.08	0.31	-	0.247	0.014**	-
16	0.15	0.42	-	0.102	0.003***	-
15	0.30	0.51	0.11	0.015**	0.001***	0.166
14	0.46	0.58	-	0.001***	0.000***	-
13	0.60	0.62	-	0.000***	0.000***	-
12	0.69	0.64	0.13	0.000***	0.000***	0.123
11	0.75	0.65	-	0.000***	0.000***	-
10	0.79	0.62	-	0.000***	0.000***	-
9	0.82	0.57	0.05	0.000***	0.000***	0.348
8	0.83	0.48	-	0.000***	0.001***	-
7	0.85	0.36	-	0.000***	0.007***	-
6	0.88	0.20	0.05	0.000***	0.055*	0.383
5	0.90	0.06	-	0.000***	0.319	-
4	0.94	0.00	-	0.000***	0.931	-
3	0.95	0.03	0.18	0.000***	0.497	0.069
2	0.96	0.09	-	0.000***	0.203	-
1	0.96	0.17	-	0.000***	0.084*	-

fh = forecast horizon; Dependent variable: GDP growth rate (percent); Independent variable in each case separately: consensus forecasts / OECD Composite Leading Indicator (CLI) / Ifo World Economic Survey (WES); Number of observations: 19 in each case (years 1991-2009); p-values: probability of mistaken relation to the GDP growth rate. *** p<0.01 / ** p<0.05 / * p<0.1

Japan

Table 13: Coefficients of determination and *p*-values of the three forecasting approaches referring to the GDP growth rate of Japan between 1991 and 2009

fh	Coefficient of determination			*p*-value		
months	forecasts	OECD CLI	Ifo WES	forecasts	OECD CLI	Ifo WES
24	0.00	0.10	0.07	0.853	0.195	0.264
23	0.00	0.12	-	0.808	0.148	-
22	0.00	0.13	-	0.810	0.124	-
21	0.00	0.14	0.20	0.838	0.115	0.055*
20	0.00	0.14	-	0.854	0.114	-
19	0.00	0.14	-	0.913	0.110	-
18	0.01	0.16	0.22	0.685	0.090*	0.044**
17	0.02	0.19	-	0.581	0.062*	-
16	0.06	0.24	-	0.303	0.031**	-
15	0.12	0.32	0.11	0.154	0.012**	0.173
14	0.18	0.39	-	0.074*	0.004***	-
13	0.31	0.47	-	0.013**	0.001***	-
12	0.40	0.52	0.24	0.004***	0.000***	0.035**
11	0.56	0.55	-	0.000***	0.000***	-
10	0.63	0.54	-	0.000***	0.000***	-
9	0.68	0.50	0.14	0.000***	0.001***	0.110
8	0.69	0.43	-	0.000***	0.002***	-
7	0.73	0.36	-	0.000***	0.007***	-
6	0.82	0.28	0.04	0.000***	0.019**	0.406
5	0.83	0.21	-	0.000***	0.051*	-
4	0.89	0.13	-	0.000***	0.123	-
3	0.92	0.07	0.01	0.000***	0.264	0.688
2	0.93	0.02	-	0.000***	0.529	-
1	0.96	0.00	-	0.000***	0.872	-

fh = forecast horizon; Dependent variable: GDP growth rate (percent); Independent variable in each case separately: consensus forecasts / OECD Composite Leading Indicator (CLI) / Ifo World Economic Survey (WES); Number of observations: 19 in each case (years 1991-2009); p-values: probability of mistaken relation to the GDP growth rate. *** p<0.01 / ** p<0.05 / * p<0.1

France

Table 14: Coefficients of determination and *p*-values of the three forecasting approaches referring to the GDP growth rate of France between 1991 and 2009

fh	Coefficient of determination			*p*-value		
months	forecasts	OECD CLI	Ifo WES	forecasts	OECD CLI	Ifo WES
24	0.05	0.06	0.05	0.383	0.299	0.367
23	0.03	0.06	-	0.450	0.297	-
22	0.03	0.07	-	0.481	0.271	-
21	0.06	0.09	0.12	0.334	0.209	0.145
20	0.04	0.13	-	0.441	0.138	-
19	0.02	0.18	-	0.590	0.067**	-
18	0.02	0.27	0.22	0.542	0.021**	0.043**
17	0.02	0.38	-	0.555	0.005***	-
16	0.10	0.50	-	0.193	0.001***	-
15	0.24	0.62	0.30	0.033**	0.000***	0.016**
14	0.34	0.72	-	0.008***	0.000***	-
13	0.44	0.79	-	0.002***	0.000***	-
12	0.52	0.83	0.31	0.000***	0.000***	0.014**
11	0.60	0.82	-	0.000***	0.000***	-
10	0.68	0.78	-	0.000***	0.000***	-
9	0.75	0.70	0.10	0.000***	0.000***	0.196
8	0.80	0.58	-	0.000***	0.000***	-
7	0.84	0.43	-	0.000***	0.002***	-
6	0.87	0.27	0.01	0.000***	0.022**	0.666
5	0.88	0.12	-	0.000***	0.139	-
4	0.91	0.03	-	0.000***	0.476	-
3	0.93	0.00	0.12	0.000***	0.933	0.142
2	0.94	0.01	-	0.000***	0.674	-
1	0.96	0.04	-	0.000***	0.439	-

fh = forecast horizon; Dependent variable: GDP growth rate (percent); Independent variable in each case separately: consensus forecasts / OECD Composite Leading Indicator (CLI) / Ifo World Economic Survey (WES); Number of observations: 19 in each case (years 1991-2009); p-values: probability of mistaken relation to the GDP growth rate. *** p<0.01 / ** p<0.05 / * p<0.1

Canada

Table 15: Coefficients of determination and *p*-values of the three forecasting approaches referring to the GDP growth rate of Canada between 1991 and 2009

fh	Coefficient of determination			*p*-value		
months	forecasts	OECD CLI	Ifo WES	forecasts	OECD CLI	Ifo WES
24	0.15	0.13	0.05	0.102	0.129	0.350
23	0.11	0.14	-	0.157	0.110	-
22	0.14	0.15	-	0.113	0.100	-
21	0.15	0.16	0.14	0.100	0.091*	0.115
20	0.24	0.17	-	0.033**	0.080*	-
19	0.27	0.19	-	0.024**	0.063*	-
18	0.28	0.22	0.29	0.019**	0.044**	0.017**
17	0.29	0.27	-	0.017**	0.023**	-
16	0.25	0.34	-	0.028**	0.009***	-
15	0.30	0.43	0.36	0.016**	0.002***	0.006***
14	0.35	0.52	-	0.008***	0.000***	-
13	0.43	0.59	-	0.002***	0.000***	-
12	0.53	0.63	0.49	0.000***	0.000***	0.001***
11	0.65	0.63	-	0.000***	0.000***	-
10	0.76	0.59	-	0.000***	0.000***	-
9	0.80	0.53	0.20	0.000***	0.000***	0.058*
8	0.83	0.46	-	0.000***	0.002***	-
7	0.91	0.36	-	0.000***	0.006***	-
6	0.94	0.26	0.02	0.000***	0.027**	0.596
5	0.95	0.15	-	0.000***	0.097*	-
4	0.97	0.07	-	0.000***	0.284	-
3	0.98	0.01	0.00	0.000***	0.634	0.820
2	0.98	0.00	-	0.000***	0.920	-
1	0.98	0.02	-	0.000***	0.558	-

fh = forecast horizon; Dependent variable: GDP growth rate (percent); Independent variable in each case separately: consensus forecasts / OECD Composite Leading Indicator (CLI) / Ifo World Economic Survey (WES); Number of observations: 19 in each case (years 1991-2009); p-values: probability of mistaken relation to the GDP growth rate. *** p<0.01 / ** p<0.05 / * p<0.1

Italy

Table 16: Coefficients of determination and *p*-values of the three forecasting approaches referring to the GDP growth rate of Italy between 1991 and 2009

fh	Coefficient of determination			*p*-value		
months	forecasts	OECD CLI	Ifo WES	forecasts	OECD CLI	Ifo WES
24	0.10	0.07	0.08	0.181	0.268	0.241
23	0.11	0.11	-	0.159	0.162	-
22	0.12	0.17	-	0.147	0.076*	-
21	0.16	0.25	0.28	0.092*	0.029*	0.021**
20	0.16	0.35	-	0.085*	0.007***	-
19	0.18	0.45	-	0.072*	0.002***	-
18	0.20	0.53	0.38	0.055*	0.000***	0.005***
17	0.26	0.58	-	0.026**	0.000***	-
16	0.29	0.61	-	0.017**	0.000***	-
15	0.49	0.63	0.32	0.001***	0.000***	0.011**
14	0.58	0.65	-	0.000***	0.000***	-
13	0.69	0.65	-	0.000***	0.000***	-
12	0.76	0.65	0.35	0.000***	0.000***	0.007***
11	0.80	0.64	-	0.000***	0.000***	-
10	0.84	0.59	-	0.000***	0.000***	-
9	0.87	0.50	0.12	0.000***	0.001***	0.148
8	0.87	0.37	-	0.000***	0.005***	-
7	0.90	0.22	-	0.000***	0.043**	-
6	0.92	0.10	0.00	0.000***	0.191	0.806
5	0.93	0.03	-	0.000***	0.477	-
4	0.94	0.00	-	0.000***	0.826	-
3	0.96	0.00	0.08	0.000***	0.880	0.253
2	0.98	0.01	-	0.000***	0.676	-
1	0.99	0.02	-	0.000***	0.539	-

fh = forecast horizon; Dependent variable: GDP growth rate (percent); Independent variable in each case separately: consensus forecasts / OECD Composite Leading Indicator (CLI) / Ifo World Economic Survey (WES); Number of observations: 19 in each case (years 1991-2009); p-values: probability of mistaken relation to the GDP growth rate. *** p<0.01 / ** p<0.05 / * p<0.1