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Do the OECD Forecasts for the Belgian Economy Contain Information ?

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Abstract

We propose an easy direct regression test to evaluate forecasts with respect to the naïve most recent observation alternative. The test is applied to thirteen macroeconomic forecasts published by the OECD. Four time horizons are considered: starting with eighteen months and declining to zero for the December current year forecast. Our results show that the longest horizon forecasts are essentially worthless. Unfortunately, the naïve forecasts do not have any value either. In general, naïve forecasts are inferior to OECD forecasts, but frequently the current year forecasts compare in quality to the one-year-ahead forecast.

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Introduction

Forecasts serve a multiple purpose. Although most users are interested in the data as such, they frequently also aim for an understanding of the forecasting process, the forecasting method, the derivation of exogenous variables etc. One important question to them is whether the forecasts contain useful information. Is it worthwhile to consider them or could one be better off extrapolating the most recent observation? Most studies on the quality of forecasts compare statistical evaluation indicators of forecasts.

We propose below a direct regression test of whether the published forecast is better than the naïve one. To this end we decompose the forecast for, for example, growth this year into its components, i.e. the most recent observation, growth last year, and the deviation of the forecast from this observation. By introducing these components in a forecast evaluation regression, the significance of the variables provides a direct test of the information content of the forecasts.

We apply this test to evaluate the forecasts of the OECD for thirteen Belgian macroeconomic variables. We consider four forecasting horizons: starting with the eighteen months horizon (the June one-year-ahead forecasts) to the zero month horizon (the December current year forecast). The results indicate that neither the eighteen-months forecasts nor the naïve forecasts contain much information. Forecasts ameliorate as the forecasting horizon shortens. Most of the time, they beat naïve forecasts. We also found that for several variables the current year forecasts are as good forecasts for next year as the published one-year-ahead forecasts.

We start in a second section with the derivation of the information test. This test is then applied in a third section to OECD forecasts for Belgium. Before that we report traditional evaluation statistics. The last section concludes.

1. The Information Content of Forecasts

Users of forecasts are interested in economic forecasts made by experts if the quality of these forecasts is superior to the quality they could produce[2] themselves. It is difficult to say anything general about the forecasts that users could make, but a reasonable benchmark for everyone is that forecasts by experts should beat a naïve forecast that consists of a simple extrapolation of the most recent observation. Applied to annual macroeconomic growth forecasts, the alternative in, for example, 1995 for expert forecasts for growth that year or any year in the future, is the observed growth rate in 1994. The dif-

[2] It is difficult to evaluate the quality of forecasts since we do not have a view on the consequences of forecast errors. Two small errors do not necessarily have similar consequences as their sum. See Diebold and Mariano (1995) for a discussion and alternative statistics. Also note that we perform a relative and not an absolute evaluation of the forecasts, i.e. with respect to the most recent observation. We, indeed, do not analyse the forecastability of the series. We refer to Oke and Öller (1999) for a discussion and application of the concept of forecastability.

ference between the forecasted growth by experts and the rate observed last year is a measure of the forecaster's information contribution. The question about the usefulness of forecasts constructed by experts thus amounts to the question whether their contribution is also valuable.

An interesting issue is the information content of macroeconomic forecasts. One important piece of information that macroeconomic forecasters certainly introduce into their forecasts, is their view on the business cycle. Indeed, forecasters do not publish a single forecast, but a series of forecasts for the near and less-near future. The user thus obtains a view on how forecasters perceive the evolution of the business cycle. This information is not available when naïve forecasts are considered.

Let us define a forecast made in period t for t+1, as F^t_{t+1}. The superscript refers to the time period the forecast is made, the subscript to the time period that is being forecasted. When F^t_{t+1} is published, a forecast for the current period, F^t_t, and an estimate of the observation in the previous period, A_{t-1}, will be published. The sequence A_{t-1}, F^t_t and F^t_{t+1} thus reflects the view of the forecaster on the business cycle. Users of forecasts will not only pay attention to the size of the forecasts but also to the business cycle view contained in the forecasts since accelerations and decelerations can be studied.

In periods of high uncertainty about future growth, users pay more attention to the business cycle view contained in the forecasts than to the forecasts themselves. We refer, for example, to the recent discussion about the double dip: nearly no attention was paid to the depth of the first dip since the primary concern was whether there would be a second dip.

The forecast for next year, the longest forecast horizon considered, can be seen as the sum of two consecutive changes made to the most recent observation on growth (A_{t-1}):

$$F^t_{t+1} = A_{t-1} + (F^t_t - A_{t-1}) + (F^t_{t+1} - F^t_t) \qquad [1]$$

The first of these changes, $(F^t_t - A_{t-1})$, reflects the view of the forecaster on how current growth will differ from last year's; the second change, $(F^t_{t+1} - F^t_t)$, concerns how growth next year will deviate from current forecasted growth. Obviously, the forecast for this and next year will be identical to the most recent observation when the forecaster believes that the business cycle will be flat. The most recent observation will then be as good a forecast as the data produced by the forecaster. This forecast is also known as the 'no change' forecast.

The previous discussion about the information content of forecasts leads to the question whether the information forecasters incorporate in their data, improves the accuracy of the forecasts. Both 'deviations' of the forecasts from the most recent observation can be seen as the quality or value forecasters add to the last observation. We propose to test the quality of the macroeconomic OECD forecasts by using expression [1].

We have to accept that forecasts are not perfect and hence decompose the observed value of economic growth in any period (A_{t+1}) in a forecasted part (F^t_{t+1}) and a random error (u_{t+1}):

$$A_{t+1} = F^t_{t+1} + u_{t+1} \qquad [2]$$

Although 'quality' of a forecast is difficult to define (for some users biased forecasts can be acceptable if their cost is low), rationality does capture the most desirable qualities of forecasts[3]. This implies that forecasts are unbiased, efficient and consistent (see Holden and Peel (1990)). Unbiased forecasts have no systematic forecast error; the expected value of the forecast error is zero. Efficient forecasts contain all the available information. As a result, the forecast error is orthogonal to the available information. Formulated differently, forecasts will be efficient if the forecasting error only contains unpredictable effects. Consistency implies that the revision of forecasts is random.

A traditional way of testing for unbiasedness involves estimating the regression transcription of expression [2]:

$$A_{t+1} = \alpha + \beta F^t_{t+1} + v_{t+1} \qquad [3]$$

and test whether $\alpha = 0$ and $\beta = 1$. This is, however, a sufficient condition, not a necessary one (see Holden and Peel (1990)).

Forecasts are weakly efficient when the error terms have a moving average of the appropriate order. The overlapping forecast horizon indeed implies that the error terms have a moving average order equal to the forecast horizon less one. Proving that forecasts are strongly efficient is nearly impossible, due to the difficulty of defining the available information when forecasts were made. As a result, one cannot really prove that forecasts are strongly efficient so passing a test for efficiency is a necessary condition, not a sufficient one. In practice, forecasts can be shown to be strongly efficient with respect to a defined information set, for example, past forecasts.

Consistency implies that users of forecasts are not able to predict how forecasts will be revised. The initial forecast of growth for any year will be consistent if it is also a rational forecast of all the later forecasts that will be made for growth for that same year.

Regressions like [3] are informative but are not really constructive: even when we accept that the forecast under consideration is unbiased, we know nothing about the relative quality of this forecast. The question 'Is this forecast better than a readily available alternative?' remains unanswered. This is even more true when the forecast is biased: do we adjust the forecast for the bias or do we switch to another forecast?

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[3] We refer to Mincer and Zarnowitz (1969) or McNees (1988) for a broad evaluation of forecasts and to Stekler (1991) and Fildes and Stekler (2002) for a general discussion of evaluation techniques.

Obviously, when percentage changes are used, the extrapolation of the last observation is the straightforward alternative for expert forecasts. So if users are not satisfied with the information content of the forecasts, they will switch to this naïve forecast[4].

We propose a direct relative evaluation test of the quality of forecasts by experts and of the most recent observation. Replacing F^t_{t+1} in regression [3] by its decomposition in expression [1] leads to the regression:

$$A_{t+1} = \gamma + \delta\, A_{t-1} + \eta\, (F^t_t - A_{t-1}) + \epsilon\, (F^t_{t+1} - F^t_t) + v_{t+1} \qquad [4]$$

This regression boils down to regression [3] when $\gamma = \alpha$ and $\delta = \eta = \epsilon = \beta$. Forecasts will thus be unbiased when simultaneously $\gamma = 0$ and $\eta = \epsilon = \delta = 1$. If forecasters do not add value to the last realisation of growth A_{t-1}, $\eta = \epsilon = 0$ and users are better off by a naïve forecast that consists in the extrapolation of the most recent observed growth rate. Note that this example illustrates the power of the test. Indeed, coefficients can have the nice properties in regressions like [3], but still not be superior to naïve forecasts. A regression like [4] tests this.

Also note that the coefficients η and ϵ can be seen as directional tests of the forecasts (we refer to Ash, Smyth and Heravi (1998) for an application to OECD forecasts). Indeed they capture the extent the forecasted change coincides with the observed change.

If in addition to $\eta = \epsilon = 0$, also $\delta = 0$, the best available forecast is a random walk with a drift equal to γ.

Whenever $\eta \neq 0$ and/or $\epsilon \neq 0$, forecasts add value to the existing realisations, therefore forecasts are better than a simple random walk in levels (δ=0) or growth rates (δ=1), with ($v \neq 0$) or without (v=0) drift. Note that this does not require that the forecasts are unbiased.

Another interesting result that can be derived from an estimation of expression [4], is that when $\gamma = \epsilon = 0$ and $\delta = \eta = 1$, the best forecast for next year is identical to the forecast made for this year. Phrased differently, only the forecasts for the near future contain information, not the one-year-ahead forecasts. One explanation for such a conclusion would be that forecasts for the current year are made in the spring and are therefore based on some partial information about the current economic situation. This should have a positive effect on the quality of the forecasts. No such information is available for next year so the best forecast would be actual growth and this variable is best approximated by the current forecast.

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[4] This is not to deny that other more or less simple altrenative forecasts can be constructed. A time series forecast is the obvious example. The decomposition in expression [1] illustrates, however, that for our purposes the last published observation is the evident choice for the naïve forecast.

Summarizing, the estimation of expression [4] instead of [3] produces a direct test on how forecasts differ from the most obvious alternative forecast, i.e. the most recent observation. In the traditional evaluation statistics only the U-inequality-statistic introduced by Theil (1966), compares directly forecasts to a naïve 'no growth' alternative. A Theil U-statistic less than one indicates the superiority of the forecasts.

Note that regression [4] offers some advantages relative to the Theil-measure[5]. For example, the regression tests simultaneously to what extent the published and naïve forecasts differ, whether they are unbiased, how large the bias is etc. In a nutshell, the proposed regression gives users of forecasts direct insights into the quantitative difference between the forecasts under study and a most recent observation forecast. Our test complies therefore with the statement by Fildes and Stekler (2002) that 'Whatever benchmark is used in the evaluation of forecasts, the difference between the two sets of errors should be tested for statistical significance' (p. 439).

The previous discussion of the differences between our test procedure and the traditional evaluation statistics does not, however, intend to deny the usefulness of these statistics. They do offer an informative view on the value of the forecasts. Our and other regression tests supplement and refine this information. It should, however, also be clear that although our approach tests for the value of the information content of forecasts, we do not test for any form of efficiency of this content. All in all, we test whether it is worthwhile to have a look at the forecasts or to simply extrapolate the last realization.

2. Application to the OECD Forecasts for Belgium

A. Introduction

The OECD forecasts have been evaluated many times[6]. We refer, for example, to recent evaluations by Ash, Smyth and Heravi (1998), Batchelor (2002), Koutsogeorgopoulou (2000), Kreinin (2000), Pons (2000) and Öller and Barot (2000); in these studies references to earlier analyses can be found. Most of these studies consider only a few countries, frequently the G7-countries, and a few variables, frequently growth and inflation. Their methodology is quite similar: traditional statistical accuracy measures are combined with regressions that test for rationality. Frequently the results indicate that the current year forecasts are valuable; the one-year-ahead forecasts contain less useful information.

Especially the study by Öller and Barot (2000) is of interest for us since they include Belgium in their data set. They analyse the growth and inflation forecast of the OECD and a number of forecasting institutions over the period 1971-1998. The data set con-

[5] We refer to Fildes and Stekler (2002) for a summary of the discussion on the relative merits of evaluation statistics.

[6] In Vuchelen and Gutierrez (2001 and 2002) the growth forecasts by the OECD for Belgium are compared to other growth forecasts.

sists of forecasts for thirteen countries. Only the December one-year-ahead forecasts are considered. The evaluation for the whole period indicates that the growth and inflation forecasts for Belgium are significantly better than a naïve 'forecast equal to past growth or past inflation'. Similar results are obtained for the other countries. Öller and Barot (2000) also find that all growth and inflation forecast errors are unbiased and do not exhibit autocorrelation.

With respect to the direction of the forecasts, i.e. the quality of forecasted changes, Öller and Barot (2000) find that the OECD missed as many Belgian direction for growth (increases or declines) as would a naïve forecast that extrapolated the past change; inflation forecasts, however, were better than naïve ones. Especially these results lead the authors to conclude that the inflation forecasts are better than the growth forecasts.

The previous results do offer an interesting benchmark for our analysis. We do, however, stress that we analyse more variables and consider four forecast horizons for the Belgian forecasts produced by the OECD.

B. Data

We analyse the macroeconomic forecasts for Belgium produced by the OECD. The OECD started to publish these forecasts for a limited number of variables in 1971. Since we aim for the longest possible series, the number of forecasts differs between the variables. The exact information is given in the tables that contain the regression results.

Economic Outlook is published twice a year. We consider forecasts for the current and for next year. As a result every variable is forecasted four times: in the middle of last year, near the end of last year, in the middle of the current year and near the end of the current year. The forecast horizon thus declines from about eighteen months to zero. The choice of a realisation is difficult. Even more when series are not always well defined as 'investment' or 'unemployment'; furthermore the statistical definition and/or statistical methodology can change through time. However, our approach stresses that a forecast should not be viewed in isolation but as part of the view forecasters have on the business cycle. The forecasts for this and next year published at a certain time period, should thus be combined with the realisation for last year available at that time. We therefore choose as 'actual' for last year the figure that is published as the most recent observation simultaneously with the forecasts. For example, the June 1995 edition of Economic Outlook publishes an inflation rate for 1994. This is our realization when the June forecasts for 1995 and 1996 are considered; when we turn to the December issue, we consider as actual the realisation for 1994 published in that issue. We believe that this procedure minimizes the risk of inconsistencies in the series and reflects the business cycle view of forecasters. We do acknowledge, however, that

[7] Fildes and Stekler (2002) illustrate the impact of data vintages on evaluation statistics.

alternative approaches are possible[7]. For example, one can select the most recent historical series as 'actuals'. Some national institute will most likely publish this series but the question then is: 'Is this what the OECD forecasters tried to forecast?'. Indeed, this series will contain changes in statistical methodology and revisions[8]. We note that this discussion has not been settled; we do not have any new arguments that could affect the discussion so we opt for avoiding inconsistencies.

Do note that the OECD forecasts are conditional forecasts (we refer to Batchelor (2002) for a general discussion of the OECD forecasts). The OECD is thus not forecasting the most likely outcomes, but predicts under an explicit assumption about a number of important exogenous policy variables. The difference between conditional and unconditional forecasts, can be illustrated by referring to an announced reduction in taxes. Usually forecasters will incorporate this announcement to the extent they believe the plan is credible and will be implemented. The OECD, however, will incorporate the whole policy plan without considering that parts may not be implemented.

Whether the difference between conditional and unconditional forecasts is important, is very difficult to judge. It is probably exaggerated to conclude that this difference would affect the accuracy of the OECD systematically in an important way. There are indeed numerous possibilities to construct acceptable forecasts even if the values for some exogenous variables are not very credible. This is certainly the case with forecasts which do not derive mechanically from an econometric model such as the OECD forecasts. Indeed, the OECD admits that '...the projections embody an important judgmental element,...' (OECD (1992), p. 49). Notwithstanding this, the conditional nature of the OECD forecasts quite likely explains occasional important forecast errors. Especially when key policy changes are announced, users of OECD forecasts should keep in mind that forecasts are conditional.

A last point we should mention before turning to the results, concerns the properties of the disturbance term in regression [4]. Box and Jenkins (1970) and Brown and Maital (1981) show that forecast errors will not be random if the forecast horizon exceeds one period. This derives from the fact that larger forecast horizons will overlap so that forecasting errors will be correlated. Note that the forecast horizon includes the information lag, i.e. the time span between the last available realisation and the period the forecast is made. So, when forecasts are published in 1995 for 1996 and the last available realisation relates to 1994, the overlapping error problem will also exist. Neglecting this process will not affect the regression coefficients but leads to biased and inconsistent standard errors. The traditional procedure to solve this problem is to accept the OLS estimates for the coefficients but to recalculate their variance as:

[8] We refer to Öller and Hansson (2002) for a profound study of the revisions of Swedish national accounts and of the GDP revisions in a number of OECD countries. They found that, generally, revisions are positive indicating that preliminary data are biased.

$$\text{Corrected Variance} = s^2 (X'X)^{-1}X'\Omega X(X'X)^{-1} \qquad [5]$$

Where X is the matrix of the explanatory variables in [4] and Ω a band matrix with the appropriate autocorrelation coefficients. The order equals the forecasting horizon, including the information lag, minus one. The coefficients are estimated by using the residuals of the OLS regression; s^2 is the variance of the residuals.

Before presenting the regression result, we discuss briefly the evaluation statistics.

Table 1 reports three standard evaluation statistics, more precisely the mean error (ME), the root mean square error (RMSE) and the U-inequality coefficient developed by Theil (1966). We consider two forecasts for the current year: the forecasts published by the OECD and the last realization as a benchmark forecast (A_{t-1}). For next year, three forecasts are considered: OECD forecasts, the last realization (A_{t-1}) and the forecast by the OECD for the current year (F^t_t). This last forecast is an alternative naïve forecast. We observe that most mean errors are relatively small. Remarkable is that the OECD forecast is not systematically outperforming the naïve forecasts on this criterion. The superior quality of the OECD forecasts is, however, obvious when we make use of the RMSE and U-coefficient. The naïve extrapolation 'current forecast equals last realization' beats the forecasts by the experts only for the one-year-ahead forecasts for the current account. Due to the volatility of this variable, one is tempted to conclude that one should not pay too much attention to this result.

Considering the one-year-ahead forecast, we do note that most statistics are larger than for the forecasts for the current year. This indicates a worsening of the quality as the forecast horizon rises. The third forecast for next year (the forecast equals the current year forecast), frequently beats the traditional naïve forecasts (last realization is forecast for next year). The exceptions are the twelve months horizon forecasts for investment, government consumption and exports. The evaluation statistics of both naïve forecasts are, however, only lower than those of the OECD forecasts for both current account forecasts and for the June investment forecasts. The conclusion is thus that the current year forecasts contain more information about next year than the last realization. This can be explained by the fact that current year forecasts are published in spring, so contain, partially, information about the economic situation in the current year. Phrased differently, they are not completely 'ex ante' forecasts.

The evaluation statistics thus indicate that the forecasts by the business cycle analysts of the OECD outperform both naïve forecasts. The last realization is a reasonable benchmark for the current year forecasts; the current year forecast is, however, a better choice for the benchmark for the evaluation of the forecasts for next year.

In the next section we test the proposed regression approach.

TABLE 1. EVALUATION STATISTICS FOR THE OECD FORECASTS[a]

	MEB			RMSEB			UB		
	OECD	A_{t-1}	Ft_t	OECD	A_{t-1}	Ft_t	OECD	A_{t-1}	Ft_t
GDP									
June t	-0.03	-0.14		0.86	1.89		0.10	0.46	
December t	0.09	-0.17		0.62	2.09		0.05	0.50	
June t+1	-0.18	-0.15	-0.08	1.52	2.21	1.87	0.39	0.67	0.48
December t+1	0.02	-0.24	-0.04	1.08	2.37	2.17	0.28	0.71	0.60
PRIVATE CONSUMPTION									
June t	-0.06	0.03		0.98	1.54		0.20	0.50	
December t	0.33	-0.06		0.95	1.76		0.18	0.61	
June t+1	-0.11	0.06	-0.05	1.43	1.97	1.63	0.44	0.81	0.56
December t+1	0.21	0.05	0.38	1.33	1.82	1.70	0.34	0.62	0.55
INVESTMENTS									
June t	-0.03	0.12		3.12	4.73		0.31	0.71	
December t	-0.17	-0.21		5.65	6.63		0.80	1.11	
June t+1	1.56	0.41	0.20	5.27	5.95	4.59	0.76	1.09	0.65
December t+1	-0.52	0.02	-0.03	5.41	6.98	7.36	0.72	1.19	1.32
GOVERNMENT CONSUMPTION									
June t	0.39	-0.15		1.00	1.62		0.19	0.52	
December t	0.96	-0.02		2.81	1.78		1.22	0.49	
June t+1	0.19	-0.22	0.32	1.07	1.97	1.48	0.64	0.81	0.46
December t+1	0.64	-0.20	0.77	1.32	1.84	3.29	0.37	0.72	2.29
EXPORT									
June t	0.01	-0.15		2.87	4.62		0.24	0.62	
December t	-0.20	-0.07		1.96	3.40		0.14	0.43	
June t+1	-0.32	0.40	0.34	3.99	4.63	4.46	0.44	0.59	0.55
December t+1	-0.39	0.34	-0.20	3.30	3.64	4.39	0.38	0.47	0.68
IMPORT									
June t	-0.08	-0.08		3.07	4.98		0.28	0.73	
December t	0.00	0.11		1.80	3.67		0.11	0.46	
June t+1	-0.67	0.68	0.46	3.28	4.90	4.61	0.32	0.68	0.60
December t+1	-0.06	0.62	0.12	2.24	3.68	4.39	0.17	0.43	0.62
FINAL DOMESTIC DEMAND									
June t	-0.01	0.03		1.04	1.70		0.18	0.48	
December t	0.08	-0.09		0.80	2.05		0.10	0.68	
June t+1	-0.08	0.10	0.03	1.75	2.31	1.76	0.48	0.85	0.50
December t+1	0.10	0.01	0.11	1.63	2.33	1.96	0.41	0.84	0.60
SAVINGS									
June t	0.08	-0.13		3.23	3.20		0.04	0.04	
December t	0.09	-0.02		1.91	2.17		0.01	0.02	
June t+1	0.22	-0.15	0.09	4.70	4.74	4.72	0.08	0.08	0.08
December t+1	0.27	-0.16	-0.03	2.87	3.13	2.92	0.03	0.04	0.03

TABLE 1. CONTINUED: EVALUATION STATISTICS FOR THE OECD FORECASTS[a]

	MEB			RMSEB			UB		
	OECD	A_{t-1}	F^t_t	OECD	A_{t-1}	F^t_t	OECD	A_{t-1}	F^t_t
CONSUMER PRICE INDEX									
June t	-0.06	-0.17		0.44	1.79		0.01	0.10	
December t	-0.03	-0.16		0.32	1.76		0.00	0.10	
June t+1	0.04	-0.54	-0.47	1.33	2.67	1.61	0.12	0.26	0.10
December t+1	-0.22	-0.54	-0.40	1.17	2.59	1.46	0.05	0.25	0.08
GDP IMPLICIT PRICE DEFLATOR									
June t	-0.24	-0.20		0.70	1.59		0.02	0.09	
December t	-0.08	-0.19		0.93	1.79		0.03	0.11	
June t+1	0.00	-0.60	-0.59	1.00	2.30	1.55	0.08	0.23	0.10
December t+1	-0.32	-0.61	-0.46	1.33	2.55	1.80	0.07	0.27	0.13
UNEMPLOYMENT									
June t	-0.42	-0.41		1.75	1.94		0.03	0.03	
December t	-0.25	-0.39		0.68	1.14		0.00	0.01	
June t+1	-0.62	-0.73	-0.76	2.09	2.43	2.19	0.04	0.06	0.05
December t+1	-0.50	-0.74	-0.59	1.48	2.15	1.60	0.02	0.04	0.02
CURRENT (ACCOUNT) BALANCE									
June t	-0.02	0.31		2.80	2.78		0.40	0.40	
December t	0.04	0.24		1.14	1.16		0.08	0.08	
June t+1	-0.20	0.37	0.08	3.29	3.04	3.01	0.55	0.47	0.46
December t+1	-0.25	0.49	0.20	2.00	1.67	1.75	0.22	0.15	0.17
GENERAL GOVERNMENT FINANCIAL BALANCE									
June t	-0.01	0.56		0.68	0.95		0.02	0.05	
December t	0.12	0.55		0.42	0.84		0.01	0.04	
June t+1	0.29	1.15	0.59	1.12	1.66	1.18	0.07	0.15	0.08
December t+1	0.19	1.13	0.66	0.80	1.58	1.08	0.03	0.13	0.06

Notes: (a) The sample period differs between forecasts. We refer to the tables in the appendix for the exact sample period of the forecasts. The 'June t' forecasts refer to the forecasts published in June for the current year; the 'December t' forecasts refer to the forecasts published in December for the current year; the 'June t+1' forecasts refer to the forecasts published in June for next year and the 'December t+1' forecasts refer to the forecasts published in December for next year.

(b) ME is the mean error, RMSE the root mean square error and U the Theil-coefficient.

OECD refers to the forecasts published by the OECD; A_{t-1} is the last realization and F^t_t the forecast for the current year. The interpretation is given in the text.

D. RESULTS OF THE REGRESSION TESTS

The estimation results of regressions [3] and [4] for the different variables and forecasts are reported in tables A.1 to A.13 in the appendix[10]. To facilitate the interpretation of the results, every table is similar and relates to only one variable. Since every variable is forecasted twice a year in two consecutive years, we have a total of eight regressions. Note that the last explanatory variable in expression [4] is dropped when current year forecasts are analysed. An overview of the estimated regressions and of the F-tests is given in the appendix.

We consider the forecasts for thirteen variables: gross domestic product (till June 1981 gross national product), private consumption, investment, government consumption, exports, imports, final domestic demand, savings, the consumer price index, the implicit GDP deflator, unemployment, the current account and the government financial balance. Except for savings (percentage disposable income), unemployment (percentage labour force), the current account and the government financial balance (percentages gross domestic product), percentage changes are considered.

Several F-statistics are calculated. Fe tests whether the slope-coefficients are equal to one. As mentioned in Section 2, this implies that in a regression like [4], the null hypothesis will be $\delta = \eta = \epsilon = 1$. The degrees of freedom indicate, of course, the number of coefficients that are involved in the test. Ft is a combined test of the intercept equal to zero and the previous null hypothesis. Fd tests whether forecasts for next year are better than the naïve forecast, i.e. the most recent observation. Thus whether $\eta = \epsilon = 0$ in regression [4]. Finally, Fv tests whether the slope-coefficients in the regressions [3] and [4] are equal. Thus whether $\beta = \delta = \eta = \epsilon$.

In order to facilitate the interpretation of the results we summarize in table 2 the F-tests. The detailed tables are reported in the appendix. The values in table 2 are p-values, i.e. the lowest significance level at which the null hypothesis can be rejected.

The results reported in columns 1 and 3 concern regression [3] and test, respectively, the June and December forecasts for the current year. Columns 2 and 4 relate to the estimation results of expression [4]. Regression results reported in columns 5 and 7 relate to the one-year-ahead forecasts for the first and second semester respectively. The regressions match expression [3]. Regression results reported in columns 6 and 8 concern the same forecasts but the estimated regression is now expression [4].

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[10] A few Durbin-Watson and h-statistics point towards the possible presence of autocorrelation. Due to our small sample, these results, especially for the h-statistics, should be interpreted with care. Remedial actions can, however, be questioned since the specification of the regressions cannot be modified. This problem is only encountered in a limited number of regressions, therefore we do not think that the general conclusions are affected.

Table 2. Summary of the F-tests (p-values), (a).

Regression	1	2	3	4	5	6	7	8
GDP								
Fe	0.508	0.773	0.305	0.594	0.125	0.240	0.477	0.208
Ft	0.788	0.909	0.430	0.646	0.263	0.334	0.578	0.269
Fd						0.683		0.007
Fv	0.961		1.000		0.577		0.255	
PRIVATE CONSUMPTION								
Fe	0.659	0.370	0.032	0.003	0.294	0.612	0.112	0.314
Ft	0.905	0.562	0.014	0.002	0.539	0.736	0.220	0.396
Fd						0.434		0.045
Fv	0.406		0.032		0.853		0.768	
INVESTMENTS								
Fe	0.070	0.166	0.071	0.069	0.889	0.184	0.257	0.246
Ft	0.186	0.296	0.189	0.141	0.432	0.163	0.470	0.352
Fd						0.150		0.062
Fv	0.820		0.340		0.186		0.404	
GOVERNMENT CONSUMPTION								
Fe	0.157	0.280	0.000	0.000	0.434	0.853	0.636	0.797
Ft	0.029	0.056	0.000	0.000	0.554	0.854	0.043	0.144
Fd						0.242		0.014
Fv	0.744		0.023		0.975		0.846	
EXPORT								
Fe	0.865	0.161	0.093	0.235	0.025	0.113	0.002	0.003
Ft	0.980	0.287	0.220	0.374	0.069	0.176	0.008	0.007
Fd						0.350		0.075
Fv	0.163		0.914		0.728		0.162	
IMPORT								
Fe	0.768	0.138	0.472	0.767	0.568	0.136	0.795	0.371
Ft	0.951	0.250	0.767	0.908	0.717	0.195	0.821	0.469
Fd						0.011		0.006
Fv	0.143		0.990		0.155		0.382	
FINAL DOMESTIC DEMAND								
Fe	0.386	0.574	0.435	0.136	0.630	0.174	0.780	0.970
Ft	0.662	0.754	0.595	0.214	0.879	0.272	0.923	0.990
Fd						0.085		0.073
Fv	0.828		0.183		0.191		0.985	
SAVINGS								
Fe	0.311	0.225	0.398	0.083	0.113	0.074	0.222	0.350
Ft	0.585	0.367	0.687	0.155	0.264	0.117	0.448	0.476
Fd						0.123		0.326
Fv	0.364		0.117		0.187		0.576	
CONSUMER PRICE INDEX								
Fe	0.041	0.126	0.435	0.744	0.211	0.019	0.017	0.048
Ft	0.102	0.211	0.668	0.853	0.444	0.037	0.028	0.052
Fd						0.001		0.000
Fv	0.980		1.000		0.037		0.476	

TABLE 2. CONTINUED: SUMMARY OF THE F-TESTS (P-VALUES)

Regression	1	2	3	4	5	6	7	8
GDP IMPLICIT PRICE DEFLATOR								
Fe	0.020	0.068	0.018	0.062	0.162	0.170	0.000	0.003
Ft	0.011	0.029	0.028	0.069	0.367	0.269	0.000	0.002
Fd						0.000		0.000
Fv	0.970		0.961		0.363		0.881	
UNEMPLOYMENT								
Fe	0.164	0.124	0.548	0.514	0.144	0.099	0.845	0.111
Ft	0.284	0.185	0.425	0.450	0.215	0.120	0.579	0.125
Fd						0.035		0.001
Fv	0.313		0.612		0.226		0.113	
CURRENT (ACCOUNT) BALANCE								
Fe	0.002	0.008	0.019	0.033	0.000	0.010	0.000	0.001
Ft	0.008	0.018	0.058	0.069	0.002	0.019	0.001	0.002
Fd						0.915		0.420
Fv	0.666		0.462		0.984		0.323	
GENERAL GOVERNMENT FINANCIAL BALANCE								
Fe	0.665	0.839	0.149	0.345	0.338	0.666	0.119	0.509
Ft	0.897	0.946	0.193	0.348	0.451	0.695	0.212	0.572
Fd						0.289		0.032
Fv	0.915		0.924		0.852		0.979	

Note (a): Columns 1 and 3 report the estimation results of regression [3] and test, respectively, the June and December forecasts for the current year. Columns 2 and 4 relate to the estimation results of expression [4]. Regression results reported in columns 5 and 7 relate to the one-year-ahead forecasts for the first and second semester respectively. The regressions match expression [3]. Regression results reported in columns 6 and 8 concern the same forecasts but the estimated regression is now expression [4].

An appendix summarizes all regressions and tests.

The two forecasts that are traditionally analysed are GDP growth and inflation. With respect to growth (see table A.1 for details), we note that only one null hypothesis is rejected, more precisely Fd in the last regression that concerns the December one-year-ahead forecast. This rejection is favourable to the OECD forecast: the forecasts do add value to the most recent observation. This is not the case for the growth forecasts published six month earlier: these forecasts do not contain any value (see Fd row and column 6). However, since the coefficient of the most recent observation does not differ significantly from zero (see sixth regression in table A.1), the naïve forecast is also worthless. This verifies the test result in column 5. Note that in the last regression (see table A.1) the coefficients of the explanatory variables are, although not significantly, larger than 1. This could indicate a tendency to underestimate the change in growth.

Important differences appear in the quality of one-year-ahead forecasts. Growth forecasts with a horizon of eighteen months are essentially worthless; forecasts with a horizon of 12 months do contain information. The current year forecasts contain even more information and the December forecasts for the current year are quite good. This confirms results obtained by Mills and Pepper (1999) and by Pons (2000). Recall, however, that the extrapolation of the most recent observation does not yield better forecasts, so forecasters do face a challenge when the horizon exceeds one year.

One of the interesting features of this analysis, is that we evaluate all the forecasts that the OECD made for Belgium. One could indeed argue that since more attention is paid to the growth and inflation forecasts these will be qualitatively better. As 'the test of the cake is in the eating', one can only verify this statement by evaluating the forecasts. We note that the forecasts for private consumption, (see table A.2 for details), are inferior to the growth forecasts: all current year coefficients of determination are smaller than for similar growth forecast regressions. Especially striking is that the December current year forecasts are biased: the intercept differs significantly from zero and the slope from one. However, the forecasts with a horizon of eighteen months do have value, although not much. Note that the December one-year-ahead forecasts do not contain more information than the forecasts made for the current year. Phrased differently, the December one-year-ahead forecasts do not contain additional information compared to the available current year forecasts.

The forecasts for investments are peculiar (see table A.3 for details): as for growth, the eighteen months ahead forecasts are worthless, but the forecasts become valuable as the horizon shortens. Surprisingly, the December current year forecasts are worse than the forecasts that were produced six months earlier. This result could be the consequence of wrong revisions in preliminary data.

The eighteen months horizon forecasts for government consumption (see table A.4 for details), do not contain information but this should not be surprising since the government has still to announce its budget. Surprising, as with investments, is that, although the quality of the forecasts improves as the forecast horizon shortens, this process does not continue till the last forecasts: the December current year forecasts are much worse than the June forecasts. Even more worrisome, except for the initial bad forecasts, is that the forecasts are biased. This is quite surprising since the OECD maintains multiple contacts with the Belgian authorities as part of the production process of their forecasts. However, do take into account that during most of the sample, Belgian public finances experienced tremendous difficulties. Maybe our results illustrate the problems authorities faced to regain control over government expenditures. Probably we should also take into account that the OECD forecasts are conditional ones. Our results indicate that this seems very important for variables that relate to public finances. Furthermore, some variables such as investment and government expenditures, are revised substantially.

The forecasts of exports (see table A.5 for details), are of special interest because the OECD should enjoy a comparative advantage in these forecast. Indeed, they construct forecasts for most industrialized countries which are the main Belgian export markets. A test of the accuracy of the forecasts for exports is, indirectly, a test on the consistency of the OECD forecast procedure and on the usefulness of a global forecasting process. The results are disappointing: the forecasts with a horizon of eighteen months as well as twelve months do not have much value. Even the June and December current year forecasts are not very good.

Forecasts for imports (see table A.6 for details) are better although they remain weak. The initial forecasts with an eighteen-month horizon are not too bad: the coefficients are significant and the forecasts are unbiased. Their relation with the observed growth of imports is, however, weak. When the forecast horizon drops, the quality of the forecasts improves but not uniformly: the June current year forecasts are worse than the December one-year-ahead forecasts.

As one could expect, forecasts for final domestic demand (see table A.7 for details) are better than the forecasts of the components. The quality of the forecasts improves systematically as the horizon drops. Note also that the forecasts are unbiased and are, except for the eighteen-month horizon forecasts, superior to the most recent observation. It is instructive to observe, as was the case for the private consumption forecasts, that the December one-year-ahead forecasts could very well be replaced by the December current year forecast since the difference between both forecasts is not statistically different from zero (this is ϵ in expression [4]).

The quality of the forecasts for savings (see table A.8 for details) is poor, especially considering that this variable is expressed as a fraction of disposable income. It is therefore relatively stable. Both one-year-ahead forecasts are worthless; a similar conclusion holds for the most recent observation. The current year forecasts are better although the coefficient of determination is not very high. At least, the OECD forecasts beat the most recent observation as forecasts.

The consumption price index (see table A.9 for details) is quite well forecasted. Even the initial eighteen-month horizon forecasts are acceptable. Note that the forecasts for the current year would be as good a forecast since the coefficient of the difference between both forecasts does not differ significantly from zero (this is ϵ in expression [4]). The December one-year-ahead and the June current year forecasts are slightly biased: the statistically significance of this bias is due to the low standard deviation, not to the size of the bias. That inflation forecasts improve as the horizon shortens should not be surprising since a steady stream of monthly information reaches the forecasters. The December current year forecasts are nearly 'perfect'.

Forecasts for the change in the implicit GDP deflator (see table A.10 for details) are excellent but not as good as for the change in the CPI. All forecasts are slightly biased except for the initial eighteen-month horizon forecasts. Note that these forecasts do not add information compared to the current year forecast.

Since for unemployment also monthly statistics are available, one would expect a somewhat similar evaluation as for inflation (see table A.11 for details). This is not the case: unemployment forecasts are not as good. One has to wait for the last December forecasts to see a significant improvement in the forecasts. The June as well as the December one-year-ahead forecasts do not add information to the last available realization since the coefficient of the difference between the one-year-ahead and the current year forecast does not differ statistically from zero (this is ϵ in expression [4]).

It should not surprise that forecasts for the current account balance are not good (see table A.12 for details). This balance equals the difference between two large variables (exports and imports) and includes many smaller items. None of the forecasts has any value confirming the results of the evaluation statistics (see table 1) .

The last forecast we consider is the government's financial balance (see table A.13 for details); note, however, that the sample is small. Although the construction of this variable is similar to the current account (difference between two large variables and lots of small items), this forecast is quite good. The forecasts with a horizon of eighteen months are acceptable with a coefficient of determination of 0.83. One obvious explanation for the quality of this forecast is that the financial balance of the government was an important policy variable. Indeed, one of the aims of Belgian economic policy in the nineties was the participation in the European monetary union. Since the Treaty of Maastricht did contain strict targets for the government deficit, forecasters had an 'easy' job. Note that the two one-year-ahead forecasts could have easily been replaced by the current year forecast. The future will tell whether the forecasts for the government balance will remain good or whether, now that Belgium participates in the monetary union, the information content of the forecasts for this variable will 'converge' to the content of the other macroeconomic variables.

Summarizing, we conclude that most of the forecasts with a horizon of eighteen months do not contain much information. Exceptions are inflation and the government balance. Forecasts with a horizon of twelve months, the December forecasts made in the previous year, beat the previous June forecasts but are not really satisfactory. We have to wait for the current mid-year forecasts to really have a good view on current and near-future economic developments. This lack of predictive information explains why many users consider the OECD forecasts not very valuable since then they have also lots of information 'of their own'.

With respect to the direct test proposed in this article, we conclude that the forecasts by the OECD are better than the naïve most recent observation forecasts except for the current year December forecasts for investments and the current account. We do acknowledge, however, that both variables are difficult to forecast. Note that whenever forecasts are worthless, the naïve forecasts do not offer an alternative since they are as bad.

Our regression results show that frequently the one-year-ahead forecasts do not contain information relative to the current year forecasts (see the June forecasts for the CPI, the GDP deflator and unemployment and the December forecasts for private consumption, final domestic demand, unemployment and the government deficit). Users of longer-term forecasts should thus not view the most recent observation as the sole alternative for the forecasts, but should also consider the current year forecasts.

CONCLUSION

We proposed in this article a direct regression test of the quality of forecasts. The test simultaneously evaluates, forecasts and compares their quality to naïve forecasts obtained by an extrapolation of the last realization. The test is applied to the OECD forecasts of thirteen macroeconomic variables. Four forecasting horizons are considered. We conclude that the eighteen-month horizon forecasts do not have much value. The naïve forecasts, however, do not have any value either so an extrapolation of the most recent observation is not really an alternative. Forecasts mostly ameliorate as the horizon declines. Most of the time, the OECD forecasts are superior to naïve forecasts. However, one interesting implication of our test is that regularly the current year forecast is as good a forecast for next year as the published one-year-ahead forecast.

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APPENDIX

ESTIMATED REGRESSIONS AND F-TESTS:

Current mid-year and end-year forecasts:

$A_t = a + \beta F^t_t + v_t$

Fe: H_0: $\beta = 1$

Ft: H_0: $\alpha = 0$, $\beta = 1$

$A_t = \gamma + \delta A_{t-1} + \eta (F^t_t - A_{t-1}) + v_t$

Fe: H_0: $\delta = \eta = 1$

Ft: H_0: $\gamma = 0$, $\delta = \eta = 1$

The test Fv: H_0: $\beta = \delta = \eta$ relates to both regressions.

One-year-ahead mid-year and end-year forecasts:

$A_{t+1} = \alpha + \beta F^t_t{+1} + v_t$

Fe: H_0: $\beta = 1$

Ft: H_0: $\alpha = 0$, $\beta = 1$

$A_{t+1} = \gamma + \delta A_{t-1} + \eta (F^t_t - A_{t-1}) + \epsilon (F^t_{t+1} - F^t_t) + v_t$

Fe: H_0: $\delta = \eta = \epsilon = 1$

Ft: H_0: $\gamma = 0$, $\delta = \eta = \epsilon = 1$

Fd: H_0: $\eta = \epsilon = 0$

The test Fv: H_0: $\beta = \delta = \eta = \epsilon$ relates to both regressions.

TABLE A.1. REGRESSION RESULTS OF EXPRESSIONS FOR THE GDP FORECASTS

Current year forecasts:

Mid-year forecasts: 1972 - 2001

$At = -0.19 + 1.08\, F^t_t$

(-0.65) (9.03)

$R2 = 0.74$ $d = 1.32$ $Fe(1,28) = 0.45$ $Ft(2,28) = 0.24$

$At = -0.17 + 1.07A_{t-1} + 1.10\, (F^t_t - A_{t-1})$

(-0.52) (8.31) (7.88)

$R^2 = 0.75$ $h = 2.49$ $Fe(2,27) = 0.26$ $Ft(3,27) = 0.18$

$Fv(2,27) = 0.04$

End year forecasts: 1971 - 2001

$At = 0.22 + 0.94\, F^t_t$

(1.32) (15.13)

$R2 = 0.89$ $d = 2.11$ $Fe(1,29) = 1.09$ $Ft(2,29) = 0.87$

$At = 0.22 + 0.94A_{t-1} + 0.93\, (F^t_t - A_{t-1})$

(1.10) (12.68) (13.75)

$R^2 = 0.89$ $h = -0.42$ $Fe(2,28) = 0.53$ $Ft(3,28) = 0.56$

$Fv(2,28) = 0.00$

One-year-ahead forecasts:

Mid-year forecasts: 1982 - 2001

$A_{t+1} = 1.94 + 0.03\, F\tau_{t+1}$

(1.43) (0.04)

$R2 = 0.00$ $\delta = 1.22$ $Fe(1,18) = 2.59$ $Ft(2,18) = 1.44$

$A_{t+1} = 2.87 - 0.27A_{t-1} - 0.46\, (F^t_t - A_{t-1}) - 0.88\, (F^t_{t+1} - F^t_t)$

(1.71) (-0.39) (-0.67) (-0.87)

$R^2 = 0.11$ $h = 5.12$ $Fe(3,16) = 1.55$ $Ft(4,16) = 1.24$ $Fd(2,16) = 0.39$

$Fv(3,16) = 0.68$

End year forecasts: 1973 - 2001

$A_{t+1} = 0.23 + 0.79\, F^t_{t+1}$

(0.32) (2.76)

$R2 = 0.22$ $d = 2.04$ $Fe(1,27) = 0.52$ $Ft(2,27) = 0.56$

$A_{t+1} = -0.76 + 1.17A_{t-1} + 1.15\, (F^t_t - A_{t-1}) + 1.83\, (F^t_{t+1} - F^t_t)$

(-0.89) (3.41) (3.46) (3.20)

$R^2 = 0.34$ $h = 2.03$ $Fe(3,25) = 1.63$ $Ft(4,25) = 1.38$ $Fd^*(2,25) = 6.07$

$Fv(3,25) = 1.44$

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H_0 is rejected.

TABLE A.2. REGRESSION RESULTS OF EXPRESSIONS FOR THE PRIVATE CONSUMPTION

Current year forecasts:

Mid-year forecasts: 1977 - 2001

$At = 0.08 + 0.94\ F^t_t$
(0.28) (6.43)
$R^2 = 0.64$ d = 1.64 Fe(1,23) = 0.20 Ft(2,23) = 0.10

$At = 0.11 + 0.92\ A_{t-1} + 1.20\ (F^t_t - A_{t-1})$
(0.38) (6.42) (4.99)
$R^2 = 0.67$ h = 2.34 Fe(2,22) = 1.04 Ft(3,22) = 0.70
Fv(2,22) = 0.94

End year forecasts: 1976 - 2001

$At = 0.71 + 0.76\ F^t_t$
(3.18) (7.14)
$R^2 = 0.68$ δ = 2.52 Fe*(1,24) = 5.19 Ft*(2,24) = 5.08

$At = 1.08 + 0.59\ A_{t-1} + 0.94\ (F^t_t - A_{t-1})$
(4.59) (5.36) (8.30)
$R^2 = 0.76$ h = 0.61 Fe*(2,23) = 7.39 Ft*(3,23) = 7.07
Fv*(2,23) = 4.03

One-year-ahead forecasts:

Mid-year forecasts: 1982 - 2001

$A_{t+1} = 0.40 + 0.67\ F^t_{t+1}$
(0.70) (2.24)
$R^2 = 0.22$ δ = 1.26 Fe(1,18) = 1.17 Ft(2,18) = 0.64

$A_{t+1} = 0.98 + 0.47\ A_{t-1} + 0.46\ (F^t_t - A_{t-1}) - 0.26\ (F^t_{t+1} - F^t_t)$
(1.06) (1.15) (1.02) (-0.22)
$R^2 = 0.25$ h = 2.01 Fe(3,16) = 0.62 Ft(4,16) = 0.50 Fd(2,16) = 0.88
Fv(3,16) = 0.26

End year forecasts: 1977 - 2001

$A_{t+1} = 0.81 + 0.61\ F^t_{t+1}$
(1.76) (2.64)
$R^2 = 0.23$ δ = 2.07 Fe(1,23) = 2.73 Ft(2,23) = 1.62

$A_{t+1} = 0.62 + 0.70\ A_{t-1} + 0.79\ (F^t_t - A_{t-1}) + 1.19\ (F^t_{t+1} - F^t_t)$
(1.03) (2.35) (2.68) (1.89)
$R^2 = 0.27$ h = 0.31 Fe(3,21) = 1.26 Ft(4,21) = 1.07 Fd*(2,21) = 3.60
Fv(3,21) = 0.38

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.3. REGRESSION RESULTS OF EXPRESSIONS FOR THE INVESTMENTS

Current year forecasts:

Mid-year forecasts: 1977 - 2001

$At = -0.77 + 1.37\ F^t_t$

(-1.02) (7.04)

$R^2 = 0.68$ d = 1.54 Fe(1,23) = 3.60 Ft(2,23) = 1.81

$At = -0.75 + 1.36\ A_{t-1} + 1.27\ (F^t_t - A_{t-1})$

(-0.98) (6.91) (5.00)

$R^2 = 0.66$ h = 2.22 Fe(2,22) = 1.95 Ft(3,22) = 1.31

Fv(2,22) = 0.20

End year forecasts: 1976 - 2001

$At = 0.64 + 0.59\ F^t_t$

(0.54) (2.73)

$R^2 = 0.24$ d = 1.53 Fe(1,24) = 3.56 Ft(2,24) = 1.79

$At = 0.47 + 0.72\ A_{t-1} + 0.44\ (F^t_t - A_{t-1})$

(0.41) (3.17) (1.86)

$R^2 = 0.31$ h = -0.53 Fe(2,23) = 3.01 Ft(3,23) = 2.01

Fv(2,23) = 1.13

One-year-ahead forecasts:

Mid-year forecasts: 1982 - 2001

$A_{t+1} = 1.29 + 1.17\ F^t_{t+1}$

(0.61) (1.07)

$R^2 = 0.06$ d = 0.85 Fe(1,18) = 0.02 Ft(2,18) = 0.88

$A_{t+1} = 3.12 - 0.51\ A_{t-1} - 0.63\ (F^t_t - A_{t-1}) - 1.63\ (F^t_{t+1} - F^t_t)$

(1.45) (-0.39) (-0.43) (-0.99)

$R^2 = 0.30$ h = 1.70 Fe(3,16) = 1.82 Ft(4,16) = 1.88 Fd(2,16) = 2.14

Fv(3,16) = 1.81

End year forecasts: 1977 - 2001

$A_{t+1} = -2.21 + 1.69\ F^t_{t+1}$

(-1.20) (2.83)

R2 = 0.26 d = 1.98 Fe(1,23) = 1.35 Ft(2,23) = 0.78

$A_{t+1} = -2.18 + 1.73\ A_{t-1} + 1.42\ (F^t_t - A_{t-1}) + 1.75\ (F^t_{t+1} - F^t_t)$

(-1.18) (2.91) (2.24) (2.51)

$R^2 = 0.35$ h = 0.77 Fe(3,21) = 1.49 Ft(4,21) = 1.17 Fd(2,21) = 3.18

Fv(3,21) = 1.02

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.4. REGRESSION RESULTS OF EXPRESSIONS FOR THE GOVERNMENT CONSUMPTION

Current year forecasts:
Mid-year forecasts: 1977 - 2001

$$At = 0.28 + 1.20\, F^t_t$$
$$(1.34) \quad (8.79)$$
$$R^2 = 0.77 \quad d = 2.45 \quad Fe(1,23) = 2.14 \quad Ft^*(2,23) = 4.16$$

$$At = 0.22 + 1.21\, A_{t-1} + 1.11\, (F^t_t - A_{t-1})$$
$$(1.00) \quad (8.75) \quad (6.23)$$
$$R^2 = 0.78 \quad h = -2.20 \quad Fe(2,22) = 1.35 \quad Ft(3,22) = 2.93$$
$$Fv(2,22) = 0.30$$

End year forecasts: 1976 - 2001

$$At = 1.28 + 0.30\, F^t_t$$
$$(4.81) \quad (3.82)$$
$$R^2 = 0.38 \quad d = 1.24 \quad Fe^*(1,24) = 80.10 \quad Ft^*(2,24) = 46.48$$

$$At = 0.71 + 0.59\, A_{t-1} + 0.20\, (F^t_t - A_{t-1})$$
$$(2.36) \quad (4.98) \quad (2.73)$$
$$R^2 = 0.55 \quad h = -0.46 \quad Fe^*(2,23) = 57.77 \quad Ft^*(3,23) = 44.22$$
$$Fv^*(2,23) = 4.47$$

One-year-ahead forecasts:
Mid-year forecasts: 1982 - 2001

$$A_{t+1} = 0.33 + 0.72\, F^t_{t+1}$$
$$(1.08) \quad (2.03)$$
$$R^2 = 0.19 \quad d = 1.54 \quad Fe(1,18) = 0.64 \quad Ft(2,18) = 0.61$$

$$A_{t+1} = 0.35 + 0.71\, A_{t-1} + 0.85\, (F^t_t - A_{t-1}) + 0.80\, (F^t_{t+1} - F^t_t)$$
$$(1.06) \quad (1.90) \quad (1.65) \quad (0.88)$$
$$R^2 = 0.20 \quad h = 0.26 \quad Fe(3,16) = 0.26 \quad Ft(4,16) = 0.33 \quad Fd(2,16) = 1.55$$
$$Fv(3,16) = 0.07$$

End year forecasts: 1977 - 2001

$$A_{t+1} = 0.71 + 0.90\, F^t_{t+1}$$
$$(2.54) \quad (4.58)$$
$$R2 = 0.48 \quad d = 2.14 \quad Fe(1,23) = 0.23 \quad Ft^*(2,23) = 3.63$$

$$A_{t+1} = 0.56 + 0.94\, A_{t-1} + 0.81\, (F^t_t - A_{t-1}) + 0.85\, (F^t_{t+1} - F^t_t)$$
$$(1.70) \quad (4.41) \quad (3.25) \quad (3.02)$$
$$R^2 = 0.50 \quad h = -0.11 \quad Fe(3,21) = 0.34 \quad Ft(4,21) = 1.92 \quad Fd^*(2,21) = 5.28$$
$$Fv(3,21) = 0.27$$

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.5. REGRESSION RESULTS OF EXPRESSIONS FOR THE EXPORTS

Current year forecasts:
Mid-year forecasts: 1984 - 2001

$At = 0.38 + 0.93\ F^t_t$
(0.19) (2.46)
$R^2 = 0.27$ d = 1.66 Fe(1,16) = 0.03 Ft(2,16) = 0.02

$At = 0.36 + 0.95\ A_{t-1} + 1.48\ (Ftt - A_{t-1})$
(0.20) (2.75) (3.37)
$R^2 = 0.43$ h = 1.81 Fe(2,15) = 2.07 Ft(3,15) = 1.38
Fv(2,15) = 2.05

End year forecasts: 1983 - 2001

$At = 1.22 + 0.71\ F^t_t$
(1.35) (4.31)
$R^2 = 0.52$ d = 1.70 Fe(1,17) = 3.16 Ft(2,17) = 1.66

$At = 1.48 + 0.65\ A_{t-1} + 0.73\ (F^t_t - A_{t-1})$
(1.32) (3.02) (4.17)
$R^2 = 0.53$ h = 0.98 Fe(2,16) = 1.59 Ft(3,16) = 1.11
Fv(2,16) = 0.09

One-year-ahead forecasts:
Mid-year forecasts: 1985 - 2001

$A_{t+1} = 8.50 - 0.68\ F^t_{t+1}$
(2.31) (-1.01)
$R^2 = 0.06$ d = 1.63 Fe*(1,15) = 6.23 Ft(2,15) = 3.22

$A_{t+1} = 6.64 - 0.42\ A_{t-1} - 0.68\ (F^t_t - A_{t-1}) + 0.45\ (F^t_{t+1} - F^t_t)$
(1.61) (-0.58) (-0.90) (0.35)
$R^2 = 0.15$ h = 1.92 Fe(3,13) = 2.42 Ft(4,13) = 1.87 Fd(2,13) = 1.14
Fv(3,13) = 0.44

End year forecasts: 1984 - 2001

$A_{t+1} = 6.13 - 0.25\ F^t_{t+1}$
(3.28) (-0.71)
$R^2 = 0.03$ d = 1.74 Fe*(1,16) = 12.97 Ft*(2,16) = 6.55

$A_{t+1} = 5.15 - 0.07\ A_{t-1} - 0.16\ (F^t_t - A_{t-1}) + 0.63\ (F^t_{t+1} - F^t_t)$
(2.85) (-0.19) (-0.48) (1.31)
$R^2 = 0.32$ h = 2.10 Fe*(3,14) = 7.39 Ft*(4,14) = 5.58 Fd(2,14) = 3.14
Fv(3,14) = 1.99

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

Table A.6. Regression results of expressions for the imports

Current year forecasts:

Mid-year forecasts: 1984 - 2001

$At = 0.57 + 0.89\ F^t_t$

(0.30) (2.37)

$R^2 = 0.26$ d = 1.68 Fe(1,16) = 0.09 Ft(2,16) = 0.05

$At = 0.07 + 0.99\ A_{t-1} + 1.53\ (F^t_t - A_{t-1})$

(0.04) (2.89) (3.35)

$R^2 = 0.43$ h = 2.39 Fe(2,15) = 2.27 Ft(3,15) = 1.52

Fv(2,15) = 2.22

End year forecasts: 1983 - 2001

$At = 0.53 + 0.89\ F^t_t$

(0.62) (5.67)

$R^2 = 0.65$ d = 1.52 Fe(1,17) = 0.54 Ft(2,17) = 0.27

$At = 0.59 + 0.87\ A_{t-1} + 0.90\ (F^t_t - A_{t-1})$

(0.61) (4.69) (5.18)

$R^2 = 0.65$ h = 0.96 Fe(2,16) = 0.27 Ft(3,16) = 0.18

Fv(2,16) = 0.01

One-year-ahead forecasts:

Mid-year forecasts: 1985 - 2001

$A_{t+1} = -2.31 + 1.35\ F^t_{t+1}$

(-0.72) (2.28)

R2 = 0.26 d = 1.66 Fe(1,15) = 0.34 Ft(2,15) = 0.34

$A_{t+1} = -0.23 + 0.83\ A_{t-1} + 0.65\ (F^t_t - A_{t-1}) + 1.75\ (F^t_{t+1} - F^t_t)$

(-0.08) (1.48) (0.97) (3.07)

$R^2 = 0.50$ h = 0.11 Fe(3,13) = 2.21 Ft(4,13) = 1.77 Fd*(2,13) = 6.50

Fv(3,13) = 2.06

End year forecasts: 1984 - 2001

$A_{t+1} = 0.64 + 0.93\ F^t_{t+1}$

(0.45) (3.37)

R2 = 0.42 d = 1.18 Fe(1,16) = 0.07 Ft(2,16) = 0.20

$A_{t+1} = 2.12 + 0.62\ A_{t-1} + 0.60\ (F^t_t - A_{t-1}) + 0.91\ (F^t_{t+1} - F^t_t)$

(1.33) (1.96) (1.49) (3.01)

$R^2 = 0.53$ h = 2.82 Fe(3,14) = 1.13 Ft(4,14) = 0.94 Fd*(2,14) = 7.60

Fv(3,14) = 1.10

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.7. REGRESSION RESULTS OF EXPRESSIONS FOR THE FINAL DOMESTIC DEMAND

Current year forecasts:
Mid-year forecasts: 1977 - 2001

$At = -0.14 + 1.13\ F^t_t$
(-0.48) (7.89)
$R^2 = 0.73$ $d = 1.47$ $Fe(1,23) = 0.78$ $Ft(2,23) = 0.42$

$At = -0.14 + 1.13\ A_{t-1} + 1.23\ (Ftt - A_{t-1})$
(-0.45) (7.78) (5.52)
$R^2 = 0.73$ $h = 2.24$ $Fe(2,22) = 0.57$ $Ft(3,22) = 0.40$
$Fv(2,22) = 0.19$

End year forecasts: 1976 - 2001

$At = 0.21 + 0.93\ F^t_t$
(1.01) (10.70)
$R^2 = 0.83$ $d = 2.21$ $Fe(1,24) = 0.63$ $Ft(2,24) = 0.53$

$At = 0.35 + 0.86\ A_{t-1} + 1.05\ (F^t_t - A_{t-1})$
(1.63) (9.43) (10.13)
$R^2 = 0.85$ $h = 0.23$ $Fe(2,23) = 2.18$ $Ft(3,23) = 1.61$
$Fv(2,23) = 1.83$

One-year-ahead forecasts:
Mid-year forecasts: 1982 - 2001

$A_{t+1} = 0.26 + 0.80\ F^t_{t+1}$
(0.32) (1.99)
$R^2 = 0.18$ $d = 0.96$ $Fe(1,18) = 0.24$ $Ft(2,18) = 0.13$

$A_{t+1} = 2.24 + 0.05\ A_{t-1} + 0.16\ (F^t_t - A_{t-1}) - 1.62\ (F^t_{t+1} - F^t_t)$
(1.98) (0.10) (0.28) (-1.46)
$R^2 = 0.39$ $h = 2.39$ $Fe(3,16) = 1.88$ $Ft(4,16) = 1.42$ $Fd(2,16) = 2.88$
$Fv(3,16) = 1.78$

End year forecasts: 1977 - 2001

$A_{t+1} = 0.24 + 0.91\ F^t_{t+1}$
(0.39) (2.91)
$R^2 = 0.27$ $d = 1.63$ $Fe(1,23) = 0.08$ $Ft(2,23) = 0.08$

$A_{t+1} = 0.16 + 0.96\ A_{t-1} + 1.03\ (F^t_t - A_{t-1}) + 1.12\ (F^t_{t+1} - F^t_t)$
(0.20) (2.28) (2.24) (1.39)
$R^2 = 0.27$ $h = 1.33$ $Fe(3,21) = 0.08$ $Ft(4,21) = 0.07$ $Fd(2,21) = 2.98$
$Fv(3,21) = 0.05$

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.8. REGRESSION RESULTS OF EXPRESSIONS FOR THE SAVINGS

Current year forecasts:
Mid-year forecasts: 1991 - 2001

$At = 5.08 + 0.68\ F^t_t$
(1.06) (2.36)
$R^2 = 0.38$ d = 1.54 Fe(1,9) = 1.15 Ft(2,9) = 0.57

$At = 9.46 + 0.36\ A_{t-1} - 3.82\ (F^t_t - A_{t-1})$
(1.77) (1.03) (-1.28)
$R^2 = 0.52$ h = -0.90 Fe(2,8) = 1.81 Ft(3,8) = 1.21
Fv(2,8) = 1.15

End year forecasts: 1990 – 2001

$At = 3.16 + 0.81\ F^t_t$
(0.89) (3.70)
$R^2 = 0.58$ d = 1.86 Fe(1,10) = 0.78 Ft(2,10) = 0.39

$At = 2.84 + 0.86\ A_{t-1} + 4.07\ (F^t_t - A_{t-1})$
(0.96) (4.71) (2.90)
$R^2 = 0.74$ h = -0.27 Fe(2,9) = 3.32 Ft(3,9) = 2.22
Fv(2,9) = 2.75

One-year-ahead forecasts:
Mid-year forecasts: 1992 - 2001

$A_{t+1} = 12.23 + 0.25\ F^t_{t+1}$
(1.75) (0.58)
$R^2 = 0.04$ d = 0.74 Fe(1,8) = 3.16 Ft(2,8) = 1.58

$A_{t+1} = 27.45 - 0.80\ A_{t-1} - 3.44\ (F^t_t - A_{t-1}) - 10.43\ (F^t_{t+1} - F^t_t)$
(3.23) (-1.48) (-0.85) (-1.62)
$R^2 = 0.55$ h = -0.45 Fe(3,6) = 3.88 Ft(4,6) = 2.91 Fd(2,6) = 3.04
Fv(3,6) = 2.22

End year forecasts: 1991 - 2001

$A_{t+1} = 7.90 + 0.52\ F^t_{t+1}$
(1.33) (1.43)
R2 = 0.19 d = 0.68 Fe(1,9) = 1.72 Ft(2,9) = 0.88

$A_{t+1} = 7.64 + 0.58\ A_{t-1} + 4.05\ (F^t_t - A_{t-1}) + 0.56\ (F^t_{t+1} - F^t_t)$
(1.19) (1.38) (1.58) (0.18)
$R^2 = 0.38$ h = 0.17 Fe(3,7) = 1.29 Ft(4,7) = 0.98 Fd(2,7) = 1.32
Fv(3,7) = 0.71

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.9. REGRESSION RESULTS OF EXPRESSIONS FOR THE CONSUMER PRICE INDEX

Current year forecasts:
Mid-year forecasts: 1975 - 2001

$At = 0.19 + 0.94\ F^t_t$
(1.38) (37.00)
$R^2 = 0.98$ d = 2.14 Fe*(1,25) = 4.65 Ft(2,25) = 2.50

$At = 0.19 + 0.94\ A_{t-1} + 0.96\ (F^t_t - A_{t-1})$
(1.37) (36.22) (14.63)
$R^2 = 0.98$ h = -0.64 Fe(2,24) = 2.26 Ft(3,24) = 1.62
Fv(2,24) = 0.02

End year forecasts: 1975 - 2001

$At = 0.05 + 0.98\ F^t_t$
(0.40) (45.28)
$R^2 = 0.99$ d = 1.62 Fe(1,25) = 0.63 Ft(2,25) = 0.41

$At = 0.04 + 0.98\ A_{t-1} + 0.98\ (F^t_t - A_{t-1})$
(0.39) (44.37) (18.84)
$R^2 = 0.99$ h = 0.49 Fe(2,24) = 0.30 Ft(3,24) = 0.26
Fv(2,24) = 0.00

One-year-ahead forecasts:
Mid-year forecasts: 1982 - 2001

$A_{t+1} = 0.59 + 0.82\ F^t_{t+1}$
(1.13) (5.88)
$R^2 = 0.66$ d = 2.17 Fe(1,18) = 1.68 Ft(2,18) = 0.85

$A_{t+1} = 0.82 + 0.66\ A_{t-1} + 1.09\ (F^t_t - A_{t-1}) - 0.64\ (F^t_{t+1} - F^t_t)$
(1.76) (5.05) (4.83) (-1.39)
$R^2 = 0.80$ h = -1.01 Fe*(3,16) = 4.42 Ft*(4,16) = 3.32 Fd*(2,16) = 11.67
Fv*(3,16) = 3.59

End year forecasts: 1976 - 2001

$A_{t+1} = 0.52 + 0.81\ F^t_{t+1}$
(1.39) (10.87)
R2 = 0.83 d = 1.60 Fe*(1,24) = 6.54 Ft*(2,24) = 4.18

$A_{t+1} = 0.59 + 0.82\ A_{t-1} + 1.03\ (F^t_t - A_{t-1}) + 0.99\ (F^t_{t+1} - F^t_t)$
(1.56) (10.61) (6.46) (2.69)
$R^2 = 0.85$ h = -1.77 Fe*(3,22) = 3.09 Ft(4,22) = 2.78 Fd*(2,22) = 22.77
Fv(3,22) = 0.86

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.10. REGRESSION RESULTS OF EXPRESSIONS FOR THE GDP IMPLICIT PRICE DEFLATOR

Current year forecasts:
Mid-year forecasts: 1975 - 2001

$At = 0.17 + 0.90\, F^t_t$
(0.83) (22.17)
$R^2 = 0.95$ d = 2.21 Fe*(1,25) = 6.20 Ft*(2,25) = 5.49

$At = 0.18 + 0.90\, A_{t-1} + 0.93\, (F^t_t - A_{t-1})$
(0.84) (21.62) (8.46)
$R^2 = 0.95$ h = -0.73 Fe(2,24) = 3.02 Ft*(3,24) = 3.55
Fv(2,24) = 0.03

End year forecasts: 1975 - 2001

$At = 0.31 + 0.88\, F^t_t$
(1.30) (19.20)
$R^2 = 0.94$ d = 1.80 Fe*(1,25) = 6.42 Ft*(2,25) = 4.15

$At = 0.30 + 0.88\, A_{t-1} + 0.85\, (F^t_t - A_{t-1})$
(1.21) (18.79) (7.47)
$R^2 = 0.94$ h = 0.30 Fe(2,24) = 3.13 Ft(3,24) = 2.69
Fv(2,24) = 0.04

One-year-ahead forecasts:
Mid-year forecasts: 1982 - 2001

$A_{t+1} = 0.53 + 0.83\, F^t_{t+1}$
(1.23) (6.89)
$R^2 = 0.73$ d = 2.11 Fe(1,18) = 2.13 Ft(2,18) = 1.06

$A_{t+1} = 0.65 + 0.74\, A_{t-1} + 1.00\, (F^t_t - A_{t-1}) + 0.32\, (F^t_{t+1} - F^t_t)$
(1.25) (4.68) (4.80) (1.06)
$R^2 = 0.77$ h = 0.22 Fe(3,16) = 1.90 Ft(4,16) = 1.43 Fd*(2,16) = 15.29
Fv(3,16) = 1.14

End year forecasts: 1976 - 2001

$A_{t+1} = 0.80 + 0.71\, F^t_{t+1}$
(2.39) (10.49)
$R^2 = 0.82$ d = 1.66 Fe*(1,24) = 18.95 Ft*(2,24) = 12.01

$A_{t+1} = 0.88 + 0.70\, A_{t-1} + 0.81\, (F^t_t - A_{t-1}) + 0.72\, (F^t_{t+1} - F^t_t)$
(2.45) (9.79) (5.20) (3.38)
$R^2 = 0.83$ h = 0.57 Fe*(3,22) = 6.19 Ft*(4,22) = 5.84 Fd*(2,22) = 20.56
Fv(3,22) = 0.22

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.11. REGRESSION RESULTS OF EXPRESSIONS FOR THE UNEMPLOYMENT

Current year forecasts:
Mid-year forecasts: 1987 - 2001

$At = 2.76 + 0.70\ F^t_t$
(1.29) (3.47)
$R^2 = 0.48$ d = 2.53   Fe(1,13) = 2.18   Ft(2,13) = 1.39

$At = 4.12 + 0.57\ A_{t-1} + 1.82\ (F^t_t - A_{t-1})$
(1.87) (2.73) (2.51)
$R^2 = 0.57$ h = -1.97   Fe(2,12) = 2.50   Ft(3,12) = 1.89
Fv(2,12) = 1.28

End year forecasts: 1986 - 2001

$At = -0.79 + 1.06\ F^t_t$
(-0.81) (11.74)
$R^2 = 0.91$ d = 1.70   Fe(1,14) = 0.38   Ft(2,14) = 0.91

$At = -0.50 + 1.03\ A_{t-1} + 1.26\ (F^t_t - A_{t-1})$
(-0.49) (11.10) (5.62)
$R^2 = 0.91$ h = -0.22   Fe(2,13) = 0.70   Ft(3,13) = 0.94
Fv(2,13) = 0.51

One-year-ahead forecasts:
Mid-year forecasts: 1988 - 2001

$A_{t+1} = 3.61 + 0.60\ F^t_{t+1}$
(1.33) (2.39)
R2 = 0.32   d = 1.09   Fe(1,12) = 2.44   Ft(2,12) = 1.75

$A_{t+1} = 6.74 + 0.27\ A_{t-1} + 3.44\ (F^t_t - A_{t-1}) - 1.93\ (F^t_{t+1} - F^t_t)$
(2.38) (1.00) (2.45) (-0.94)
$R^2 = 0.55$ h = 0.45   Fe(3,10) = 2.74   Ft(4,10) = 2.39   Fd*(2,10) = 4.77
Fv(3,10) = 1.72

End year forecasts: 1987 - 2001

$A_{t+1} = 0.10 + 0.95\ F^t_{t+1}$
(0.04) (4.02)
$R^2 = 0.55$ d = 0.85   Fe(1,13) = 0.04   Ft(2,13) = 0.57

$A_{t+1} = 3.60 + 0.64\ A_{t-1} + 2.27\ (F^t_t - A_{t-1}) - 0.42\ (F^t_{t+1} - F^t_t)$
(1.43) (2.80) (4.04) (-0.37)
$R^2 = 0.74$ h = 0.85   Fe(3,11) = 2.53   Ft(4,11) = 2.29   Fd*(2,11) = 12.56
Fv(3,11) = 2.51

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.12. REGRESSION RESULTS OF EXPRESSIONS FOR THE CURRENT (ACCOUNT) BALANCE

Current year forecasts:
Mid-year forecasts: 1987 - 2001

$$A_t = 4.02 - 0.01\,F^t_t$$
$$(3.32) \quad (-0.04)$$
$$R^2 = 0.00 \quad d = 1.81 \quad Fe^*(1,13) = 14.37 \quad Ft^*(2,13) = 7.19$$

$$A_t = 3.82 + 0.07\,A_{t-1} - 0.80\,(F^t_t - A_{t-1})$$
$$(3.09) \quad (0.24) \quad (-0.89)$$
$$R^2 = 0.07 \quad h = -0.12 \quad Fe^*(2,12) = 7.51 \quad Ft^*(3,12) = 5.01$$
$$Fv(2,12) = 0.42$$

End year forecasts: 1986 - 2001

$$A_t = 2.12 + 0.49\,F^t_t$$
$$(2.54) \quad (2.52)$$
$$R^2 = 0.31 \quad d = 1.51 \quad Fe^*(1,14) = 7.05 \quad Ft(2,14) = 3.52$$

$$A_t = 1.92 + 0.55\,A_{t-1} + 0.19\,(F^t_t - A_{t-1})$$
$$(2.31) \quad (2.82) \quad (0.64)$$
$$R^2 = 0.29 \quad h = 0.57 \quad Fe^*(2,13) = 4.51 \quad Ft(3,13) = 3.01$$
$$Fv(2,13) = 0.82$$

One-year-ahead forecasts:
Mid-year forecasts: 1988 - 2001

$$A_{t+1} = 4.66 - 0.14\,F^t_{t+1}$$
$$(4.03) \quad (-0.58)$$
$$R^2 = 0.03 \quad d = 1.97 \quad Fe^*(1,12) = 22.87 \quad Ft^*(2,12) = 11.46$$

$$A_{t+1} = 4.64 - 0.13\,A_{t-1} + 0.21\,(F^t_t - A_{t-1}) - 0.32\,(F^t_{t+1} - F^t_t)$$
$$(3.45) \quad (-0.41) \quad (0.20) \quad (-0.39)$$
$$R^2 = 0.04 \quad h = 0.01 \quad Fe^*(3,10) = 6.49 \quad Ft^*(4,10) = 4.88 \quad Fd(2,10) = 0.09$$
$$Fv(3,10) = 0.05$$

End year forecasts: 1987 - 2001

$$A_{t+1} = 4.31 - 0.03\,F^t_{t+1}$$
$$(4.31) \quad (-0.14)$$
$$R^2 = 0.00 \quad d = 0.78 \quad Fe^*(1,13) = 24.70 \quad Ft^*(2,13) = 13.10$$

$$A_{t+1} = 3.65 + 0.20\,A_{t-1} - 0.24\,(F^t_t - A_{t-1}) - 0.47\,(F^t_{t+1} - F^t_t)$$
$$(3.69) \quad (0.90) \quad (-0.55) \quad (-0.88)$$
$$R^2 = 0.26 \quad h = 2.86 \quad Fe^*(3,11) = 10.75 \quad Ft^*(4,11) = 8.50 \quad Fd(2,11) = 0.94$$
$$Fv(3,11) = 1.30$$

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.

TABLE A.13. REGRESSION RESULTS OF EXPRESSIONS FOR THE GENERAL GOVERNMENT FINANCIAL BALANCE

Current year forecasts:

Mid-year forecasts: 1991 - 2001

$At = 0.12 + 1.04\, F^t_t$
(0.30) (10.60)
$R^2 = 0.93$ d = 2.38 Fe(1,9) = 0.20 Ft(2,9) = 0.11

$At = 0.26 + 1.05\, A_{t-1} + 0.83\, (F^t_t - A_{t-1})$
(0.48) (10.10) (1.61)
$R^2 = 0.93$ h = -0.71 Fe(2,8) = 0.18 Ft(3,8) = 0.12
Fv(2,8) = 0.09

End year forecasts: 1990 - 2001

$At = 0.41 + 1.08\, F^t_t$
(1.97) (22.00)
$R^2 = 0.98$ d = 2.16 Fe(1,10) = 2.44 Ft(2,10) = 1.95

$At = 0.37 + 1.08\, A_{t-1} + 1.18\, (F^t_t - A_{t-1})$
(1.51) (21.05) (4.39)
$R^2 = 0.98$ h = -0.83 Fe(2,9) = 1.20 Ft(3,9) = 1.25
Fv(2,9) = 0.08

One-year-ahead forecasts:

Mid-year forecasts: 1992 - 2001

$A_{t+1} = 1.02 + 1.20\, F^t_{t+1}$
(1.30) (6.15)
$R^2 = 0.83$ d = 1.95 Fe(1,8) = 1.04 Ft(2,8) = 0.88

$A_{t+1} = 0.99 + 1.16\, A_{t-1} + 1.40\, (F^t_t - A_{t-1}) + 0.39\, (F^t_{t+1} - F^t_t)$
(0.98) (5.35) (1.67) (0.41)
$R^2 = 0.85$ h = 0.05 Fe(3,6) = 0.55 Ft(4,6) = 0.57 Fd(2,6) = 1.54
Fv(3,6) = 0.26

End year forecasts: 1991 - 2001

$A_{t+1} = 0.85 + 1.19\, F^t_{t+1}$
(1.91) (10.88)
$R^2 = 0.93$ d = 1.72 Fe(1,9) = 2.97 Ft(2,9) = 1.85

$At+1 = 0.68 + 1.18\, A_{t-1} + 1.43\, (F^t_t - A_{t-1}) + 1.18\, (F^t_{t+1} - F^t_t)$
(1.08) (9.03) (2.34) (1.57)
$R^2 = 0.93$ h = -0.09 Fe(3,7) = 0.85 Ft(4,7) = 0.78 Fd*(2,7) = 5.83
Fv(3,7) = 0.06

Notes: t-values in parenthesis; R^2: the coefficient of determination; d: the Durbin-Watson autocorrelation coefficient; h: the Durbin h coefficient; Fe, Ft, Fd and Fv: F-values explained in the text, where F* means that H0 is rejected.