An evaluation of forecasts for the Swedish economy

By Mårten Blix, Kent Friberg and Fredrik Åkerlind
Monetary policy department.

In this paper we use a comprehensive forecast database to address questions about forecasting performance for the Swedish economy. The size and scope of the database allows us to investigate questions that have so far received little attention: Which institutions make the best forecasts? What can we learn about the forecasting errors made? Does a high profile in one area go hand in hand with superior forecasting performance? Can model based methods shed more light on potential herd behaviour? We also provide an overall ranking for a large number of variables.

Introduction

Forecasts span over most walks of life and affect society in both direct and unknowable ways. Bad forecasts can lead to loss of business opportunities, missed investments or to misguided government macroeconomic policy; good forecasts, on the other hand, can lead to the opposite.

Forecasting is big business, but how well does it stand up to scrutiny? In this paper we address the question of how well the forecasters perform. In a previous article[1], about 52 000 GDP and inflation forecasts for several OECD countries were evaluated. The focus here, by contrast, is on forecasts for one country only, Sweden, but for a large range of variables, including wages, consumption, investment, public expenditure, unemployment, industrial production, imports, exports as well as GDP

The focus in this study is on forecasts for Sweden only, and for a large range of variables.

We thank Hans Dillén, Hans Lindblad and Staffan Viotti for comments.

[1] Blix et al. (2001).

and inflation. Altogether, we have about 20 000 forecasts in this evaluation (see Table D1 in the appendix).

Several other papers evaluate forecasts, such as Batchelor (1997), Gavin et al. (2000), Öller and Barot (2000) and National Institute of Economic Research (NIER) (2002) to cite a few. The contribution of this article is to be more comprehensive in scope while posing a few specific questions about the forecasts and how they are related. For example, we can decompose the forecasting error of GDP growth into its various components, which may provide information on which shocks have occurred in the economy as well as which area(s) of forecasting methodology need most improvement. We also show that virtually all forecasters were very wrong regarding the economic development for 2001. Connected to this is the question of herd behaviour. We use a model based approach to investigate the extent of herd behaviour among forecasters.

We investigate if a particular interest in certain variables leads to a superior forecasting performance.

Moreover, some forecasters have a particular interest in certain variables, either as a part of a policy choice, such as inflation for the Riksbank, or as a raison d'être, for example wages and unemployment for the labour unions. Our database allows us to investigate if having such a "special interest" in some variable leads to a superior forecasting performance.

Our method is based on root mean square errors and mean prediction errors.

All data on forecasts in the article comes from NIER and Consensus forecasts on a monthly frequency. The sample period is from 1993 to 2001 except where otherwise stated. Our method of evaluation is based on simple tools such as calculating root mean square errors (RMSE). This measure is based on the square of the forecasting errors and is a fairly standard tool for forecast evaluation. We also evaluate the forecasters using the mean prediction errors (MPE). This measure is a simple average of the forecasting errors and hence should be close to zero over a longer time period in order to be unbiased.

For some analysis we have used slightly non-standard techniques and these are outlined in the appendices. Also included is a comprehensive ranking for the different variables, while the main text is used to illustrate particular points that are of interest.

Similar to all evaluations, there are difficulties that place limits on the conclusions that can safely be drawn. The sample is rather short (1993–2001) and the economy has undergone significant structural changes during this time, not least the introduction of an inflation target. Moreover, some forecasters find reason to

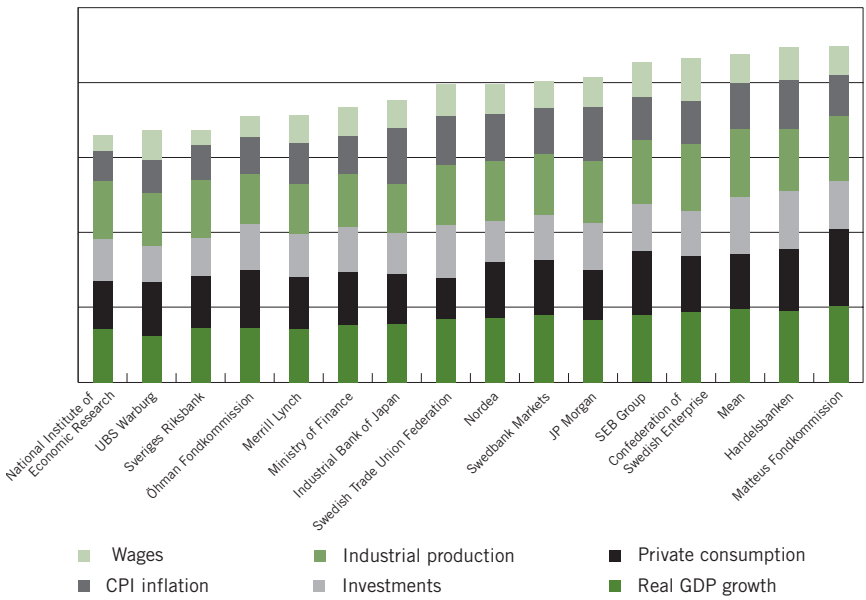
make technical assumptions that are known to be less than optimal predictions.[2] In addition, there are sometimes changes in variable-definitions so that the original forecast need not wholly correspond to the final version of the statistic in question. Notwithstanding these difficulties, we judge the conclusions presented in the main text to be fairly robust.

The economy has undergone significant structural changes during the sample period, 1993–2001, which may affect the forecasting performance.

Overall ranking of forecasters 1993–2001

Figures 1, 2 and 3 display the relative forecasting performance for several institutions during 1993–2001. The variables that are included are those that we deem

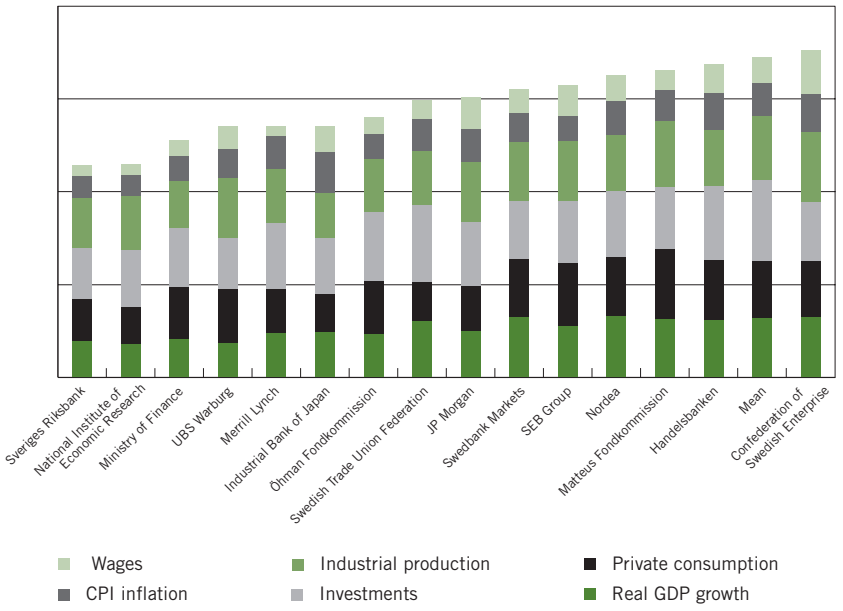
Figure 1. Average RMSE for both within-year and next-year forecasts (1–24 months horizon) normalised with standard deviation, 1993–2001



Note. The figure displays the RMSE for each variable divided by the standard deviation of all institutions' forecasting error. The institutes with the low bars are the better forecasters. Note that the scale is of little importance and therefore the units are omitted. Also note that small differences in bar length should not be overinterpreted.

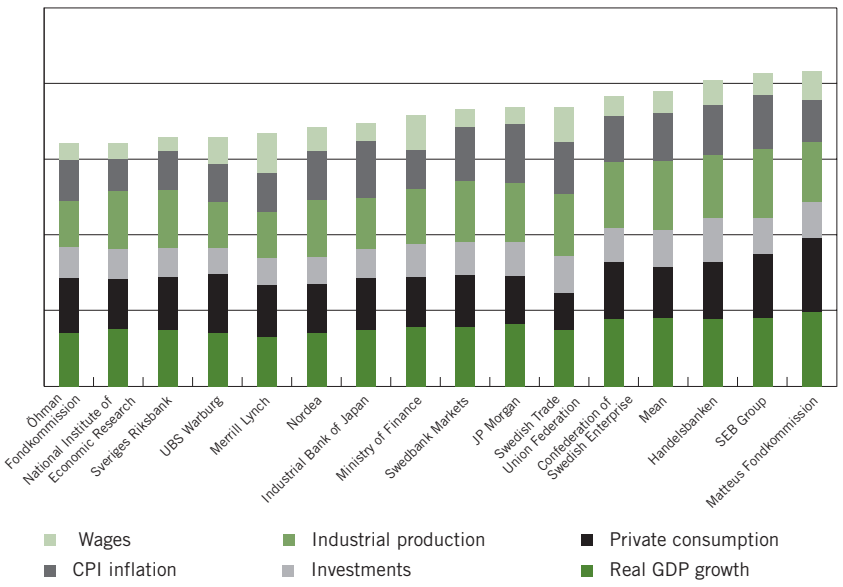
[2] For example, the Riksbank assumes a constant repo rate over its forecast horizon. Thus, if the forecast for 1–2 years ahead differs from the target level the repo rate is adjusted and hence the forecast is wrong ex post. The Ministry of Finance's forecasts for wages and unemployment tend to be more policy goals rather than forecasts. The NIER forecasts government expenditure based on parliamentary approved spending programs only – and so on.

Figure 2. Average RMSE for within-year forecasts (1–12 months horizon) normalised by the standard deviation, 1993–2001



Note. See note in Figure 1.

Figure 3. Average RMSE for next-year forecasts (13–24 months horizon) normalised by the standard deviation, 1993–2001



Note. See note in Figure 1.

to be both of particular interest and for which there are a large number of observations available: wages, CPI, industrial production, investments, private consumption and GDP. Other variables of interest (imports, exports, government expenditure and unemployment), for which the number of observations is an order of magnitude less than the other in Table D1, are shown in Appendix A.

The institutions with the smallest bars in the figures are by our measure the best forecasters.

Each variable included in the figures is based on evaluating the particular institutions' root mean square error and normalising this with the standard deviation. The normalisation is carried out so that a variable for which the RMSE is larger than for other variables should not be given undue weight in the overall ranking. By simply adding these normalised RMSE, we thus obtain an overall picture of an institution's forecasting performance. The institutions with the smallest bars are by this measure the best forecasters. Note, however, that small differences in bar lengths should not be overinterpreted.

The National Institute of Economic Research, UBS Warburg, Sveriges Riksbank and Öhmans are the overall best forecasters.

We find that NIER, UBS Warburg, Sveriges Riksbank and Öhmans are the overall best forecasters. The individual ranking for all institutions changes only slightly depending on whether the forecasting horizon is the whole sample of 1–24 months (see Figure 1), 1–12 months denoted "within-year forecasts" (see Figure 2) or 13–24 months denoted "next-year forecasts" (see Figure 3). The same picture of ranking emerges also with other methods.[3] Similar to Blix et al. (2001), we find that the mean does not give such a good forecast for Sweden, although it performs well for several other countries.

Are institutions with special focus better at "their" variable(s)?

Some institutions in the evaluation have a special interest or can be presumed to have special competence in some particular variable(s). Does this result in better forecasts for the variables concerned?

The Riksbank's monetary policy is guided by its inflation forecast.[4] It is therefore a variable that the Riksbank should excel in forecasting. Figure 4 shows

[3] For example, assigning relative rank to each forecaster and taking averages across variables leads to a similar picture. Another measure of evaluation, the Theil inequality coefficient, may also be informative, but we have not used it in this paper.

[4] Note that the Riksbank bases its policy decisions on UND1X-inflation, as this measure excludes mortgage interest payments and is less sensitive to the assumption of a constant repo rate.

Figure 4. RMSE for CPI, average of within- and next-year forecasts, 1993–2001

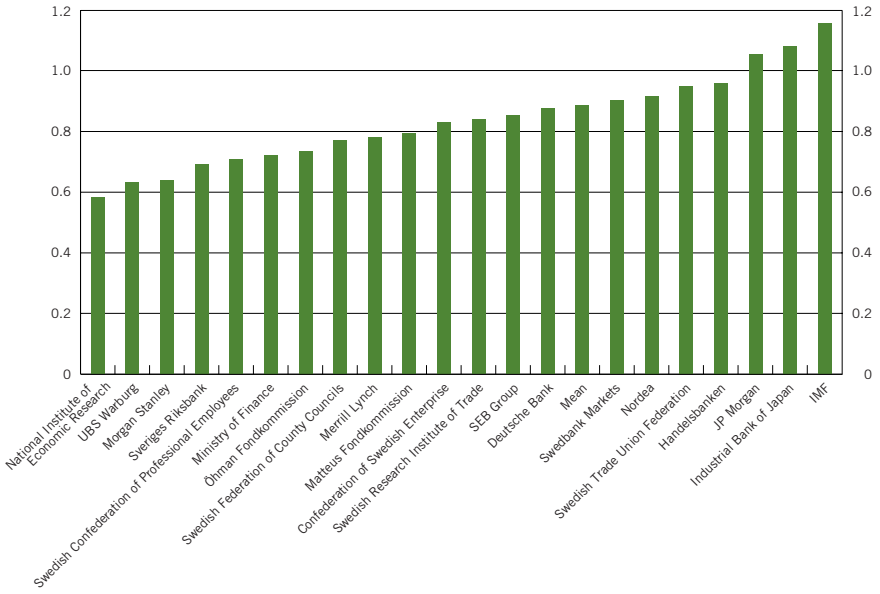
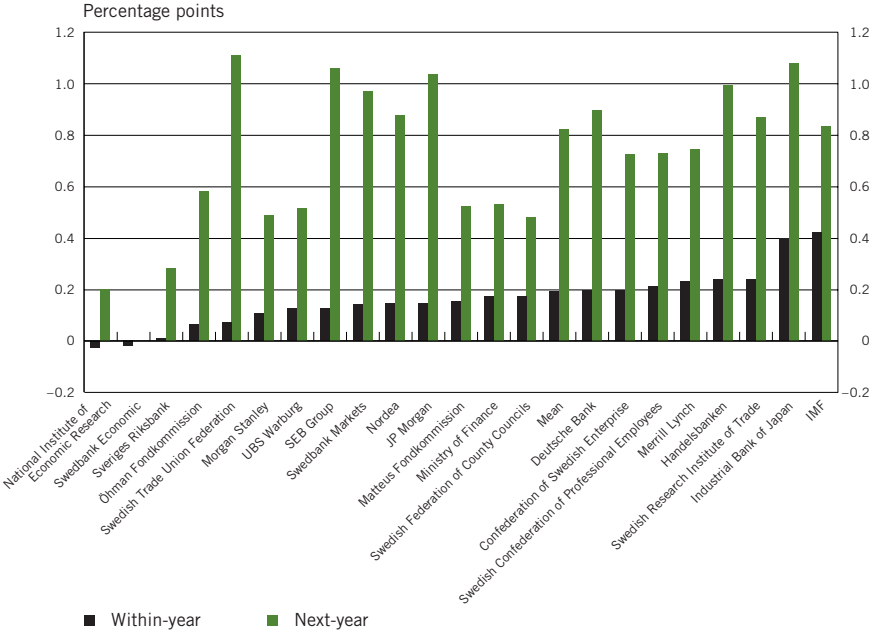


Figure 5. MPE for CPI forecasts, 1993–2001

Percentage points



that the NIER is the best CPI-forecaster, closely followed by the Riksbank.[5] The Swedish Trade Union Federation (LO) and the IMF are among the less successful CPI-forecasters. Underpinning the CPI-forecast is a considerable systematic error; most forecasters have on average overestimated inflation during the period (see Figure 5). For example, LO has overpredicted inflation by more than 1 percentage point for their next-year forecasts. The Riksbank and the NIER have almost no bias in their within-year CPI-forecasts and the least bias in their next-year forecasts among those surveyed. Öhman had the best CPI-forecasts in the study by Blix et al. (2001) and is still among the top forecasters.[6]

NIER is the best CPI-forecaster, closely followed by the Riksbank.

It should be noted, however, that the Riksbank's forecasts are conditioned on the assumption of an unchanged repo rate. We have computed a series of CPI-forecasts adjusted for this assumption (not displayed), but, as noted in NIER (2002), the Riksbank's performance does not improve: for within-year forecasts, the RMSE is unchanged; for next-year forecasts it is marginally worse.

For wage growth there are several institutions that can be presumed to have a special interest.[7] The LO gives high priority to its members' wage increases while institutions representing the employer side, the Swedish Federation of County Councils (Landstingförbundet) and the Confederation of Swedish Enterprise, have an interest in their members' nominal wage costs. Therefore, wage growth is at least to some extent a policy variable for these institutions. Figure 6 shows that Landstingsförbundet is best, closely followed by the Riksbank. Notably, for within-year forecasts and for next-year forecasts the Confederation of Swedish Enterprise and the Ministry of Finance are among the less successful forecasters by an order of magnitude. The Ministry of Finance and the LO have on average underestimated wage growth by more than 0.3 percentage points while the Confederation of Swedish Enterprise has overestimated it by more than 0.4 percentage points. (see Figure 7).[8]

For wage growth the Swedish Federation of County Councils is the best forecaster, closely followed by the Riksbank.

Unemployment is of special interest for several institutions, but perhaps in particular for the Ministry of Finance and the LO. The union wants to protect its

[5] It should be noted, however, that the top ten inflation forecasters have RMSEs that differ by only about 0.2 percentage points. Thus, the ranking may easily change if a different time period is considered.
[6] Öhmans is ranked below some institutions that were not included in the previous study.
[7] Note that some institutions may use the total wage sum divided by the number of persons employed as wage-measure rather than the one used here.
[8] The Ministry of Finance's wage forecasts are perhaps more of a "wage-growth assumption".

Figure 6. RMSE for wage-growth, average of within- and next-year forecasts, 1993–2001

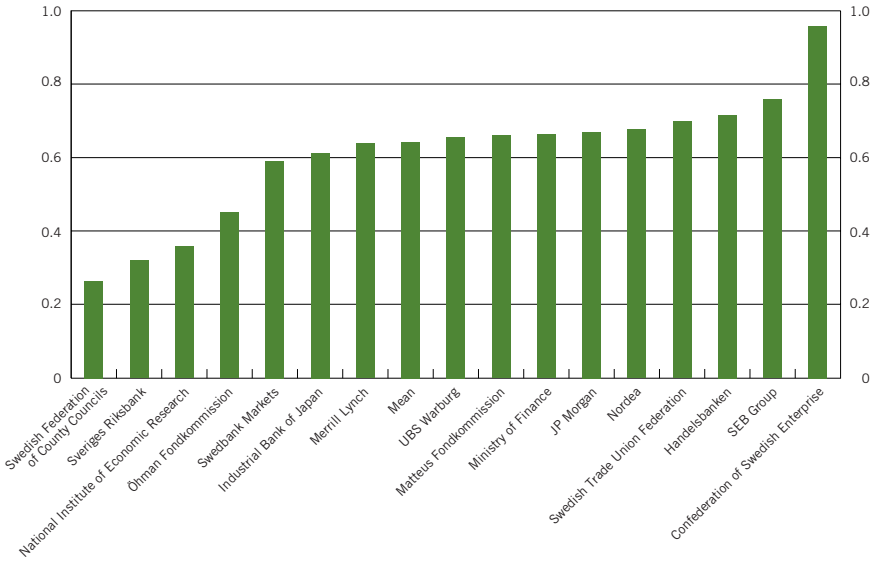
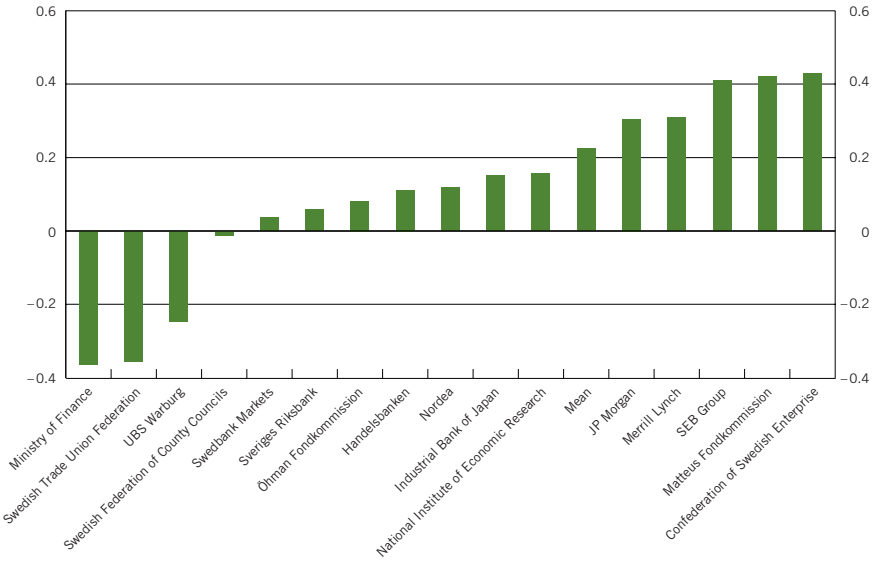


Figure 7. MPE for wage-growth forecasts, average of within- and next-year forecasts, 1993–2001

Percentage points



members interest, both in and out of employment; the Ministry of Finance has a political interest in achieving the government's goals for lowering unemployment. Figure 8 shows that it is the OECD that has the best forecasts for unemployment closely followed by the NIER and the Riksbank. The LO, the Confederation of Swedish Enterprise and the Ministry of Finance forecasts are in fact among the least accurate. Figure 9 shows that the LO and the Ministry of Finance have systematically underestimated unemployment while the Confederation of Swedish Enterprise and the Riksbank have a slight systematic upward bias in the forecast-error.

The OECD has the best forecasts for unemployment closely followed by the NIER and the Riksbank.

With regard to government expenditure, the Ministry of Finance presumably has considerable expertise about the current spending situation. For longer time horizons, its forecasts might contain more elements of political concerns. Although other explanations are of course possible, figure 10 is consistent with this hypothesis: the Ministry of Finance is a top forecaster only for one-year ahead forecasts; for next-year forecasts it is instead among the less successful. Landstingsförbundet is the best forecaster both for within-year and next-year forecasts. LO has the lowest rank, closely contested by the Riksbank and the NIER. Noteworthy is also that all the institutions have systematically underestimated government expenditure by a considerable amount (see Figure 11). LO has by far the largest bias in its forecasts while the Confederation of Swedish Enterprise, the Ministry of Finance and the Riksbank have the lowest.

For government expenditure the Ministry of Finance is a top forecaster but only for one-year ahead.

To summarise, we find that institutions that have a special interest in a particular variable are not necessarily the best forecasters for the variable concerned. Sometimes the explanation may be that the variable concerned is less of a forecast than a policy variable. A "policy variable" forecast may be useful in many ways, but as a forecast it has clear limitations. The Riksbank's inflation forecast, though in this sense being a policy variable, is still among the best forecasts.

One conclusion is that institutions that have a special interest in a particular variable are not necessarily the best forecasters for the variable concerned.

Figure 8. RMSE for unemployment, average of within- and-next year forecasts, 1993–2001

Percentage points

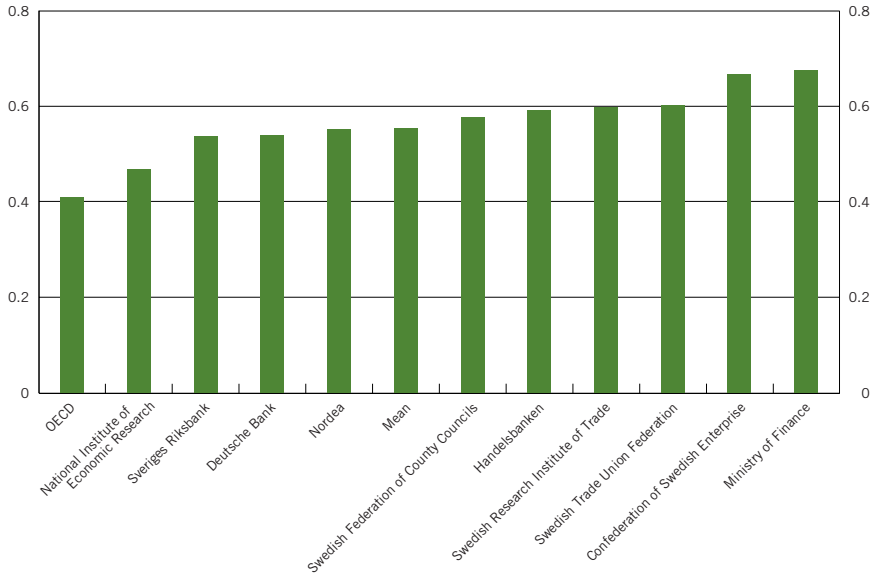


Figure 9. MPE for unemployment forecasts, average of within- and next-year forecasts, 1993–2001

Percentage points

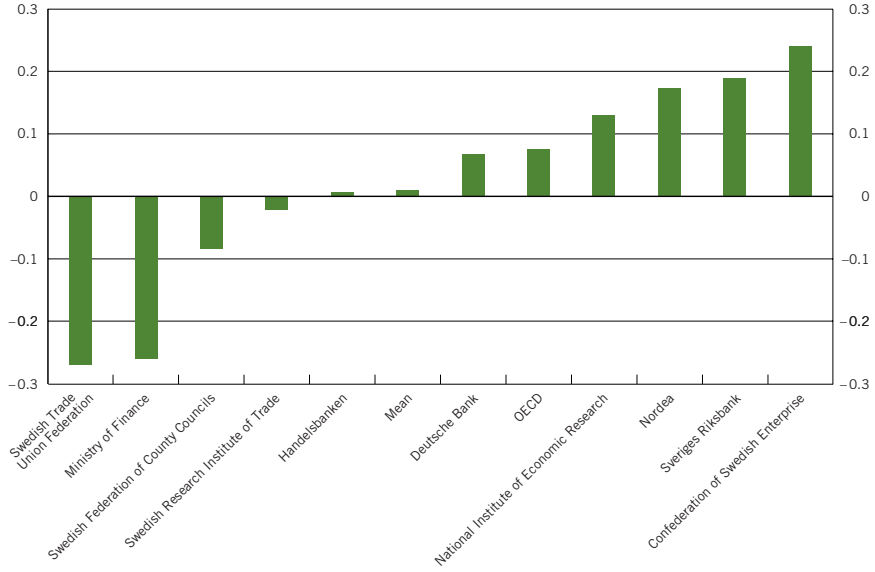


Figure 10. RMSE for government expenditure, average of within- and next-year forecasts, 1993–2001

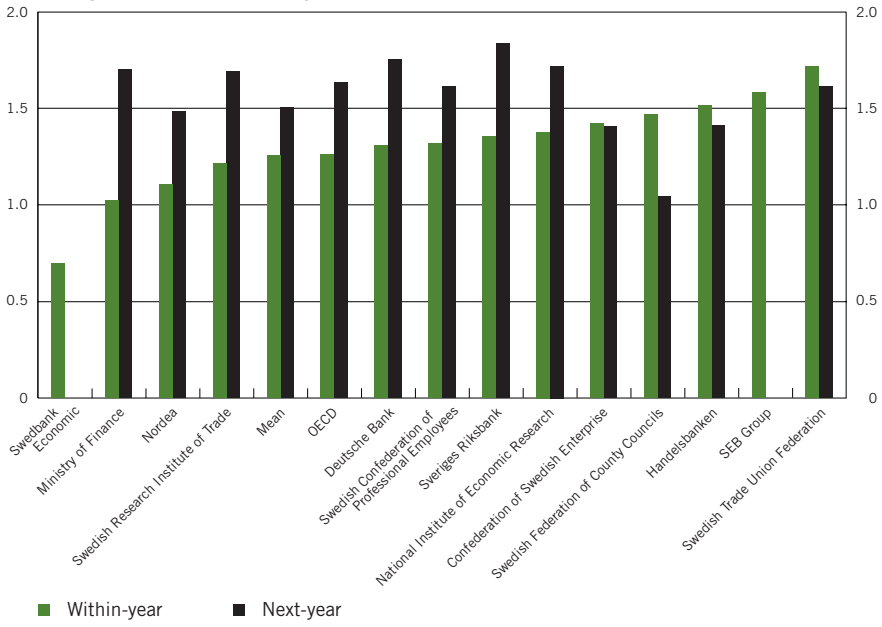
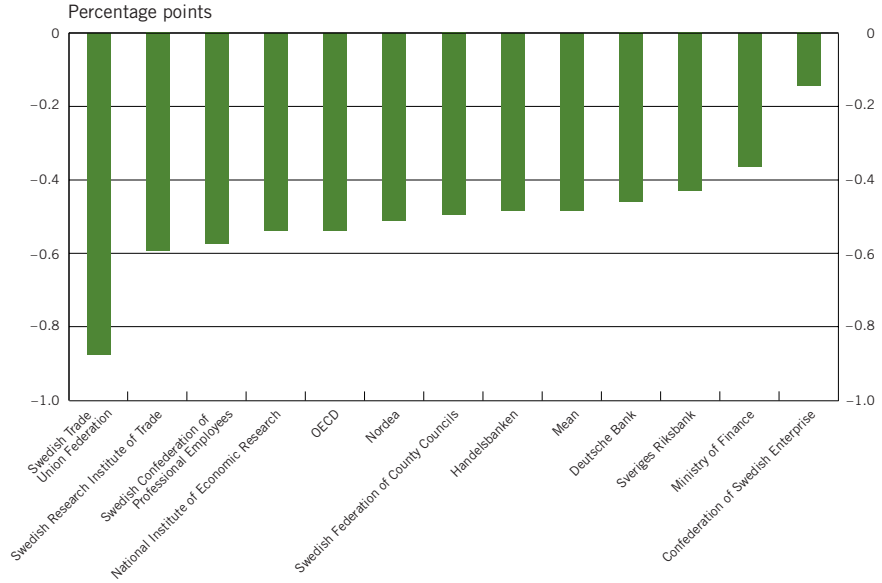


Figure 11. MPE for government expenditure forecasts, average of within- and next-year forecasts, 1993–2001

Percentage points



What explains the forecast error in GDP?

Decomposing the GDP forecast error into its components can provide useful information. Systematic patterns in forecasting errors can help improve future forecasts as well as provide information about the shocks that have occurred in the economy.

In this section there are fewer institutions than when the variables are evaluated one-by-one. This is because the database does not contain all the GDP components for some institutions, and all components are needed to make this decomposition. Moreover, we use data from 1994–2001 only, as 1993 is of a different base year compared to the rest of the data and is problematic for our decomposition. Altogether, we have about 3 000 observations in this section compared to about 13 500 for the GDP-components in the rest of the paper where we do not require a complete set of national accounts.

Tables 1 and 2 show that the largest forecasting bias for national income oc-

Table 1. MPE 1994–2001, contribution to GDP growth within-year forecasts
Percentage points

	Private consumption	Government expenditure	Investment	Stock-building	Net-exports	Exports	Imports	Total	Residual	GDP
Ministry of Finance	0.01	–0.06	0,10	0.00	–0.04	–0.25	–0.17	0.01	–0.25	–0.24
Swedbank Economic	–0.02	–0.01	0.18	0.00	–0.26	–0.45	–0.13	–0.12	–0.19	–0.31
Swedish Research Institute of Trade	–0.01	–0.10	0.04	0.00	–0.07	–0.58	–0.43	–0.14	–0.21	–0.34
Confederation of Swedish Enterprise	–0.05	–0.07	–0.01	0.00	–0.19	–0.85	–0.63	–0.32	–0.18	–0.50
National Institute of Economic Research	0.03	–0.12	0.12	0.00	–0.05	–0.23	–0.13	–0.02	–0.22	–0.24
Swedish Federation of County Councils	–0.06	–0.12	–0.12	0.00	–0.02	–0.12	0.02	–0.33	–0.19	–0.51
Swedish Trade Union Federation	0.12	0.01	0.08	0.00	–0.26	–0.14	0.18	–0.05	–0.02	–0.07
Nordea	–0.08	–0.12	–0.14	0.00	–0.04	–0.42	–0.33	–0.39	–0.20	–0.59
OECD	0.07	–0.15	0.05	0.00	–0.07	–0.39	–0.30	–0.09	–0.12	–0.22
Sveriges Riksbank	0.08	–0.13	0.12	0.00	–0.27	–0.44	–0.13	–0.19	–0.05	–0.24
Handelsbanken	0.13	–0.12	0.12	0.00	–0.12	–0.15	0.01	0.01	–0.11	–0.10
Swedish Confederation of Professional Employees	0.01	0.13	–0.10	0.00	–0.05	–0.15	–0.05	–0.27	–0.25	–0.52

Note. The table displays the sources of the forecast error in GDP.[1] The column "Total" is the sum of columns 2–6. The last column "GDP" gives the MPE of GDP. In principle, this should equal the column "Total", but this is not the case, giving rise to a residual. When the residual is large, this implies that only a small part of the forecasting error can be accounted for. The residual most likely arises from technical reasons, such as change of base year and changes in definitions. Forecasts for net exports are not available directly from our database and have been computed by the method outlined in Appendix C.

[1] Note that the MPE for GDP in these tables may differ from those presented in the appendix. This is because the calculations in this section are based on all GPD-components for which there are fewer observations. We use the sample with fewer observations, as the purpose in this section is to decompose a given forecast error rather than obtaining the best estimate of each components' MPE.

curred for exports and imports. The errors in exports and imports mainly go in the same direction thereby yielding a net effect on GDP that is somewhat smaller. Nevertheless, the underestimation of net exports significantly contributes to the downward bias for both within-year and next-year GDP forecasts. For many forecasters the underestimation goes hand in hand with a weaker than forecasted krona. But this explanation only contributes to understanding the underestimation of exports, as the effects on imports, all other things being equal, would go in the other direction.

The largest forecasting bias for national income occurred for exports and imports.

The forecasting error in net exports is one of the most significant factors explaining the overall forecasting error in GDP-growth (see Tables 3 and 4). The error in government expenditure forecasts, by contrast, explains only a small part – both for within-year and next-year forecasts. For next-year forecasts, the error in private consumption forecasts explains a sizable part of the error in GDP-growth forecasts.

It has been argued that some of the forecasting errors in GDP can be attributed to the quality of the official statistics. There has been a debate, particularly in the Swedish

Some of the forecasting errors in GPD may be attributed to the quality of the official statistics.

Table 2. MPE 1994–2001, contribution to GDP growth, next-year forecasts
Percentage points

	Private consumption	Government expenditure	Investment	Stockbuilding	Net-exports	Exports	Imports	Total	Residual	GDP
Ministry of Finance	–0.03	–0.17	0,22	0.00	–0.15	0.09	0.34	–0.12	0.22	0.10
Swedbank Economic	0.01	–0.17	0.27	0.00	–0.32	0.29	0.42	–0.21	0.51	0.30
Swedish Research Institute of Trade	–0.12	–0.17	0.15	0.00	–0.13	–0.74	–0.46	–0.26	0.06	–0.20
Confederation of Swedish Enterprise	0.17	–0.19	–0.05	0.00	–0.89	–0.61	0.16	–0.96	0.24	–0.72
National Institute of Economic Research	0.05	–0.16	0.24	0.00	–0.23	–0.11	0.24	–0.10	0.11	0.01
Swedish Federation of County Councils	–0.07	–0.24	0.31	0.00	–0.22	–0.34	0.22	–0.23	0.06	–0.17
Swedish Trade Union Federation	0.12	–0.24	0.30	0.00	–0.55	–0.19	0.22	–0.37	0.63	0.26
Nordea	–0.07	–0.15	0.11	0.00	–0.17	–0.65	–0.41	–0.27	0.18	–0.10
OECD	–0.08	–0.11	0.17	0.00	–0.49	–0.33	0.29	–0.51	0.13	–0.38
Sveriges Riksbank	0.16	–0.09	0.23	0.00	–0.49	–0.36	0.01	–0.20	0.14	–0.05
Handelsbanken	0.10	–0.12	0.43	0.00	–0.49	–0.28	0.22	–0.08	0.23	0.15
Swedish Confederation of Professional Employees	–0.14	–0.10	0.10	0.00	–0.32	–0.31	–0.02	–0.46	0.29	–0.18

Note. See note in Table 1.

Table 3. Contribution to MSE of GDP-growth forecasts, 1994–2001, current-year forecasts
Per cent

	Private consumption	Government expenditure	Investment	Stock-building	Net-exports	Exports	Imports	Total	Residual	GDP
Ministry of Finance	0.56	0.21	0,79	0.00	0.85	5.94	6.97	2.41	0.38	2.79
Swedbank Economic	0.99	0.28	1.26	0.00	1.20	8.93	8.51	3.74	1.62	5.36
Swedish Research Institute of Trade	0.94	0.28	1.34	0.00	1.20	6.56	8.70	3.76	0.76	4.52
Confederation of Swedish Enterprise	0.32	0.38	0.73	0.00	0.73	8.11	5.48	2.16	0.91	3.07
National Institute of Economic Research	0.45	0.34	0.74	0.00	0.99	5.94	6.28	2.51	0.32	2.83
Swedish Federation of County Councils	0.57	0.34	1.51	0.00	2.75	4.68	8.53	5.17	–0.59	4.58
Swedish Trade Union Federation	0.49	0.50	1.14	0.00	1.76	9.50	8.24	3.90	0.26	4.15
Nordea	0.89	0.27	1.40	0.00	1.12	6.15	7.74	3.67	1.66	5.33
OECD	0.64	0.33	0.68	0.00	1.39	8.36	7.76	3.03	0.18	3.21
Sveriges Riksbank	0.11	0.45	0.56	0.00	1.23	6.24	3.85	2.35	0.22	2.57
Handelsbanken	0.60	0.38	1.42	0.00	0.95	5.03	5.14	3.34	0.86	4.20
Swedish Confederation of Professional Employees	0.51	0.23	0.85	0.00	0.90	5.65	7.43	2.49	1.61	4.10

Note. The table displays variance terms rather than the square roots. The unexplained part, the residual, contains both covariance terms and whatever cannot be explained from the mean prediction error. The covariance terms are not judged to be of interest here. For details, see Appendices B and C.

Table 4. Contribution to MSE of GDP-growth forecasts, 1994–2001, next-year forecasts
Per cent

	Private consumption	Government expenditure	Investment	Stock-building	Net-exports	Exports	Imports	Total	Residual	GDP
Ministry of Finance	1.59	0.47	0.82	0.00	1.33	14.77	15.26	4.22	1.36	5.58
Swedbank Economic	2.50	0.60	1.31	0.00	1.68	14.74	18.04	6.08	0.34	6.42
Swedish Research Institute of Trade	1.70	0.58	1.30	0.00	1.19	16.69	16.13	4.77	1.69	6.47
Confederation of Swedish Enterprise	2.14	0.41	1.34	0.00	2.89	18.90	20.58	6.78	2.07	8.85
National Institute of Economic Research	1.66	0.60	0.92	0.00	1.34	15.10	16.92	4.53	0.63	5.15
Swedish Federation of County Councils	2.22	0.49	1.35	0.00	1.32	12.45	12.61	5.38	–0.80	4.58
Swedish Trade Union Federation	2.20	0.47	0.80	0.00	1.97	15.60	15.89	5.44	–0.38	5.06
Nordea	2.13	0.50	0.69	0.00	1.33	16.13	17.72	4.65	–0.15	4.50
OECD	3.59	0.66	0.96	0.00	4.24	13.21	18.56	9.46	–3.07	6.39
Sveriges Riksbank	2.30	0.68	1.22	0.00	1.67	17.76	22.48	5.88	–0.03	5.85
Handelsbanken	2.56	0.44	2.23	0.00	2.29	16.38	17.63	7.52	–0.69	6.83
Swedish Confederation of Professional Employees	1.62	0.52	0.81	0.00	1.66	11.58	11.02	4.60	2.67	7.27

Note. See Table 3.

media, about whether or not the official statistics are becoming less reliable. Points raised in the debate are: financial flows do not easily match exports and imports; official industrial production and hours worked do not always go hand in hand with results obtained from other sources. See for example SOU 2001:34 or the references cited in Appendix E.

As we discussed above, the track record of forecasting errors in net exports is one of the most significant explanations of the error in GDP-growth forecasts. Moreover, there are often large revisions from the initial publication to the final numbers, making forecasting more difficult. In essence, the starting point of the forecast is part of the forecasting uncertainty.

2001, anatomy of a missed turning point

Turning points in the economy are notoriously difficult to forecast (see for example IMF (2001)). Nonetheless, they are perhaps the most important feature of forecasting. For policy makers, a missed turning point could result in unnecessarily tight or loose policy, resulting in unnecessarily large swings in GDP growth, inflation or unemployment. For private institutions, missed turning points could imply losing money, for example if an incorrect assessment of medium to long term profits in firms leads to unsound investments.

Forecasts made during 2000 for 2001 grossly underestimated inflation and overestimated growth.

Nonetheless, the importance of getting turning points right does not stand in proportion to the track record of most forecasters. The year 2001 for the Swedish economy is a case in point (see for example Schück (2002)). In this section we analyse the type of forecasting errors that were made for 2001. Although this analysis is based on a sample of one turning point only and one should be careful not to generalise to other economic downturns, it may nevertheless hold important lessons. Figures 12 and 13 succinctly show just how far off forecasts were for 2001, especially forecasts made during 2000: inflation was grossly underestimated and growth was overestimated.[9]

The GDP-growth forecasts from some institutions made during 2000 were almost 3 percentage points too high.

Table 5 and Figure 14 show the mean prediction error of GPD-growth forecasts for 2001 decomposed into its components: Table 5 displays an average of forecasts made dur-

[9] If the GDP-forecasts had been closer to the actual outcome for 2001, many institutions would probably have had even lower forecasts for inflation – resulting in even more underestimation of inflation.

Figure 12. GDP forecasts for 2001 and outcome

Annual percentage changes

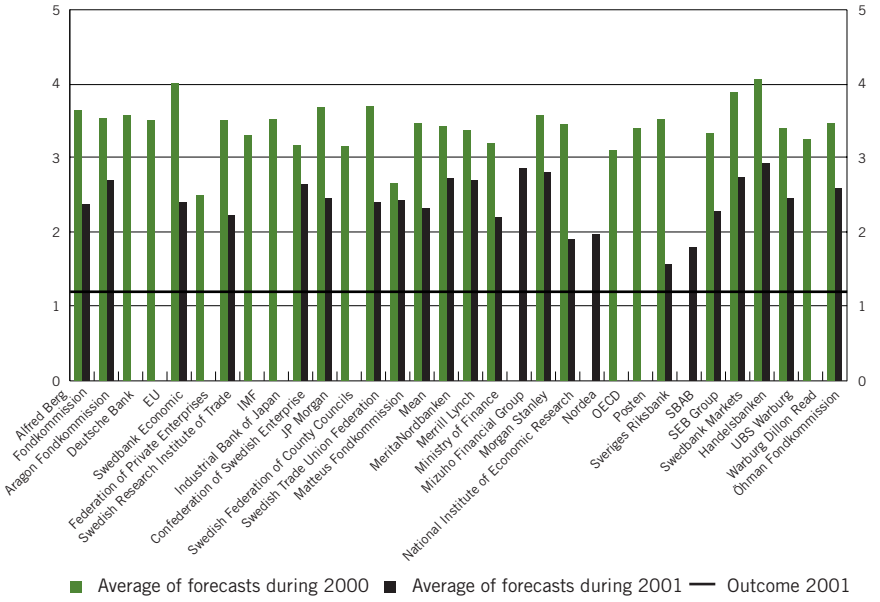


Figure 13. Inflation forecasts for 2001 and outcome

Annual percentage changes

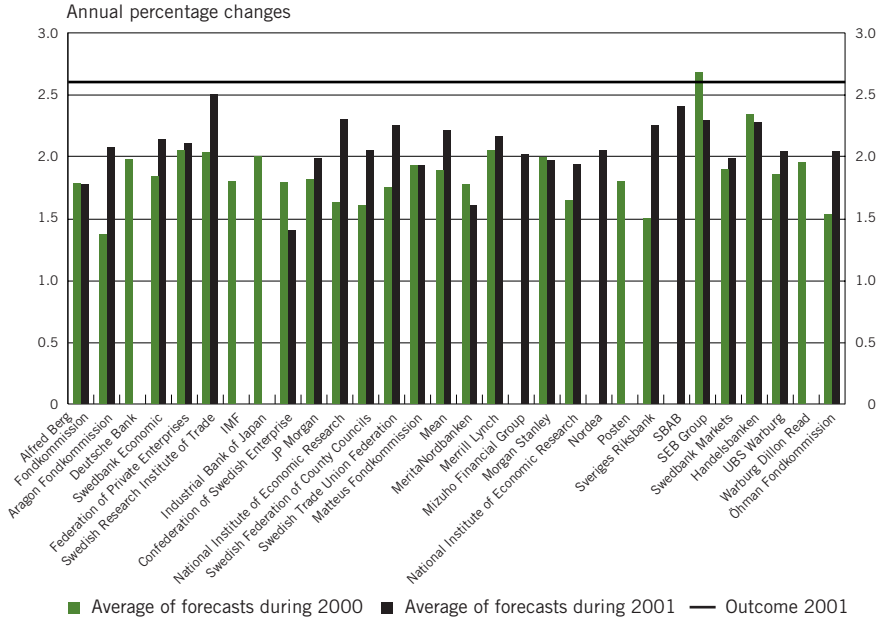
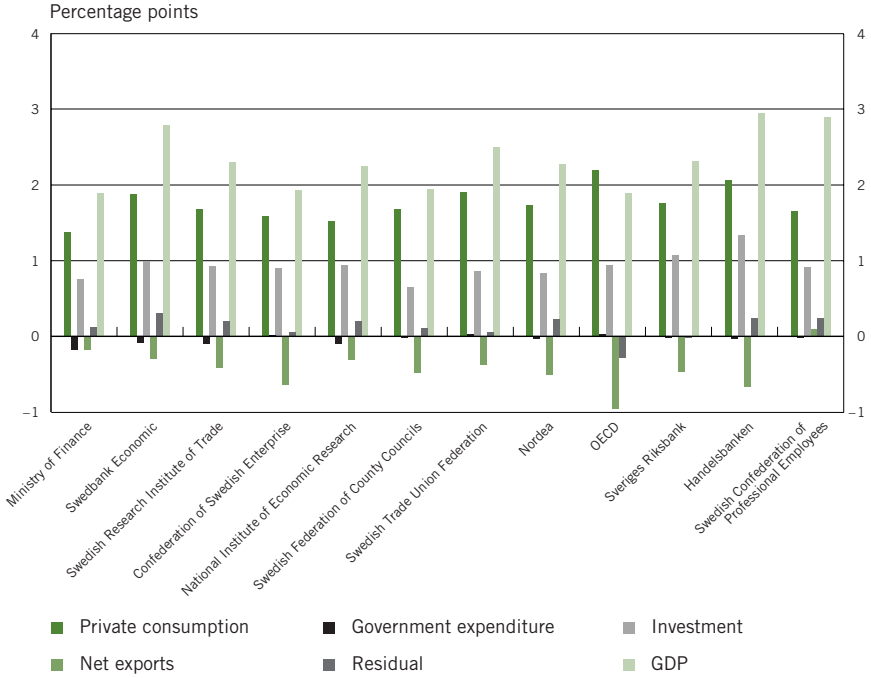


Table 5. MPE for 2001 from an average of forecasts made during 2000 and 2001, contribution to GDP growth
Percentage changes

	Private consumption	Government expenditure	Investment	Stock-building	Net-exports	Exports	Imports	Total	Residual	GDP
Ministry of Finance	1.19	–0.12	0.72	0.00	–0.28	3.21	3.75	1.51	0.02	1.53
Swedbank Economic	1.44	–0.07	0.80	0.00	–0.32	3.57	4.19	1.86	0.14	1.99
Swedish Research Institute of Trade	1.19	–0.07	0.62	0.00	–0.61	2.34	3.30	1.12	0.30	1.42
Confederation of Swedish Enterprise	1.07	–0.07	0.60	0.00	–0.51	2.36	3.18	1.09	0.02	1.11
National Institute of Economic Research	1.11	–0.09	0.74	0.00	–0.35	2.90	3.53	1.41	0.06	1.47
Swedish Federation of County Councils	1.23	–0.03	0.39	0.00	–0.86	2.61	3.93	0.74	0.55	1.29
Swedish Trade Union Federation	1.40	–0.03	0.72	0.00	–0.35	3.21	3.86	1.75	0.10	1.84
Nordea	1.30	–0.05	0.60	0.00	–0.44	2.70	3.44	1.41	0.11	1.52
OECD	1.57	–0.03	0.57	0.00	–0.62	2.66	3.71	1.49	–0.10	1.39
Sveriges Riksbank	1.27	–0.07	0.75	0.00	–0.45	3.09	3.88	1.49	–0.05	1.44
Handelsbanken	1.49	–0.07	0.85	0.00	–0.46	2.91	3.69	1.81	0.19	1.99
Swedish Confederation of Professional Employees	0.97	–0.12	0.41	0.00	–0.12	2.58	2.85	1.14	0.12	1.26

Figure 14. MPE for 2001 from forecasts made during 2000 only, contribution to GDP growth
Percentage points



ing 2000 and 2001, while Figure 14 displays forecasts made during 2000 only. Both show essentially that the large overestimation occurred primarily for private consumption and, to some lesser extent, for investment. The GDP-growth forecasts from some institutions made during 2000 were too high by almost 3 percentage points (see Figure 14). This is about three times as much as the average forecasting error for the many institutions reported in Blix et al. (2002). The error would have been even larger had it not been somewhat mitigated by underestimation of government expenditure and net exports.

Forecasters tend to make similar forecasting mistakes particularly when it comes to turning points.

Even though it is important to consider whether there are wider lessons that can be drawn from the downturn in 2001, we believe this necessitates further research. One lesson, however, does emerge. It seems that most forecasters tend to make similar forecasting mistakes and this is particularly evident for the above turning point. Is this evidence of herd behaviour among forecasters?

Herd behaviour in revision of GDP and inflation forecasts

Forecasts seldom differ by more than a few tenths of a percentage point.

Forecasters have access to a large number of different data and news sources. The wide variety of information and the multitude of models that are available might lead one to presume that different forecasters would have widely different views of the economy. Nevertheless, apart from a few rare exceptions, this does not appear to be the case. It may be that the arguments in the presentation of forecasts differ widely, but in the end forecasts seldom differ by more than a few tenths of a percentage point. This raises the question of potential herd behaviour in the markets. Are forecasters unduly influenced by other forecasters and do they avoid departing "too far" from the consensus mean or mainstream?

Blix et al. (2001) found some evidence to support the existence of herd behaviour. However, the available methods make it difficult to distinguish between herd behaviour and "legitimate" revisions arising from new data pointing in the same direction.

The last section above gives more corroborating indication of herd behaviour, since forecasters missed the turning point in the economy 2001. Had they been subject to a standard normal distribution, at least some of them would have predicted the downturn.

We have used a model-based approach to investigate potential herd behaviour.

In this section we use a new approach to investigating potential herd behaviour that is more model-based. It is based on the following argument. Although forecasters may have widely different models for inflation forecasts, one common approach is to assume that the difference between potential output and actual output gives a measure of the degree of "free" resources in the economy, a measure often denoted as the output-gap. The output-gap is presumed to indicate the inflation pressure in the economy. This relationship can be written as

$$(1) \qquad \pi_{t+1} = \beta_0 + \beta_1 (y_t - y_t^*) + \varepsilon_{t+1}$$

where, in the usual notation, π_{t+1} is inflation, y_t is output, y_t^* is potential output, β_0, β_1 are parameters and ε_{t+1} is an unpredictable shock. Forecasters may have widely different views on the parameters of the model and of potential output, and hence the model cannot be used directly. However, by taking first differences of (1) we obtain

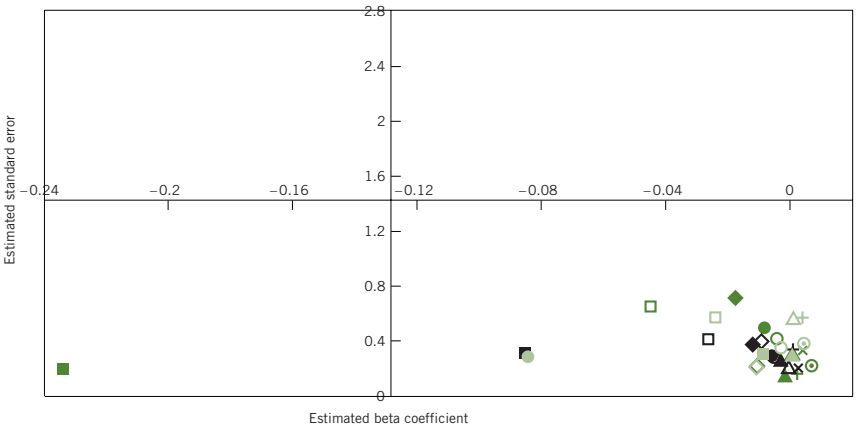
$$(2) \qquad \Delta\pi_{t+1} = \beta_1 \Delta y_t + \Delta\varepsilon_{t+1}, \ \sigma^2 = E[\Delta\varepsilon_{t+1}^2],$$

if $y_t^* = y_s^* \ \forall t, s$. In other words, if we assume that potential output is constant over the time period concerned, we can reduce the number of unobserved variables by one. Even though many forecasters believe potential output changes over time (2) may still be a sensible approximation as long as it moves "sufficiently" slowly over time, which may not be an unreasonable assumption. Although there are of course many reasons to revise the inflation forecast, equation (2) holds that the GDP-growth forecast should be of help in forecasting the revision in the inflation forecast.

Figure 15 shows a plot of ordinary least squares (OLS) estimates of different institutions' β_1 and σ^2 based on their *forecasts* of GDP-growth and (the revision in) inflation on a yearly frequency. In a sense, this is akin to assigning the same model to all forecasters but allowing them to have different views of the parameters that guide the relationship. The *origin* of Figure 15 represents the estimates of σ and β_1 based on *actual* GDP and inflation data. Thus, if there were no herd behaviour, one would expect the different institutions' estimates to be clustered around the origin.

The figure shows that this is not the case; instead almost all the institutions are clustered together in the lower right-hand quadrant, indicating a systematic

Figure 15. A plot of actual estimated parameters as origin and implied coefficients by the institutions' GDP and inflation forecast revisions, annual data, 1993–2001



- Deutsche Bank
- IMF
- ITEM Club
- Industrial Bank of Japan
- Swedish Research Institute of Trade
- Confederation of Swedish Enterprise
- MIzuho Financial Group
- Mean
- Aragon Fondkommission
- Handelsbanken
- Alfred Berg Fondkommission
- Volvo Group Finance
- Hagströmer & Qviberg
- Swedbank Economic
- Swedish Trade Union Federation
- Swedbank Markets
- Warburg Dillon Read
- Öhman Fondkommission
- Merrill Lynch
- Sveriges Riksbank
- UBS Warburg
- National Institute of Economic Research
- Finanskonsult
- Swedish Confederation of Professional Employees
- UBS Limited
- JP Morgan
- Nordea
- Matteus Fondkommission
- Ministry of Finance
- Swedish Federation of County Councils
- SEB Group

The forecast revisions tend to be fairly correlated.

overestimation of β_1 and a systematic underestimation of σ. In other words, the forecast revisions tend to be fairly correlated and not display the patterns one would expect if the forecast errors were uncorrelated and normally distributed. A similar result (not displayed) is obtained if we use quarterly frequency instead.

There may of course be other potential explanations for this pattern. For example, forecasters may use an entirely different model than (1). But if this were the case, one would expect a much more heterogeneous distribution of parameter outcomes for β_1 and σ in relation to the actual outcomes. Another potential explanation, as discussed above, may be problems with and large revisions of the official GDP-statistics.

The pattern could also be due to a structural shift in the relationship between inflation and output, an argument frequently made in, for instance, the "new economy" debate. Since it may take time to discover such a shift this may explain part of the pattern. But note that almost all institutions have made a similar type of mistake, which would be unlikely to happen if there were no herd behaviour. Altogether, the evidence while not conclusive, again points to the most likely explanation being herd behaviour.

Altogether, the evidence points to the most likely explanation being herd behaviour.

Conclusions

In this paper we find that having a special interest in some particular variable does not necessarily lead to good forecasts. We also find that some of the best forecasters for Sweden are those that have the most resources devoted to forecasting, such as the NIER and the Riksbank. However, Öhmans has little resources devoted to forecasting and yet is among the top forecasters. It therefore seems, as concluded in Blix et al. (2001), that amount of resources devoted to forecasting is not connected to superior forecasts in an obvious way.

Even institutions with little resources for forecasting can compete with large institutions.

We also find more evidence of herd behaviour among forecasters. The differences in forecasts often amount to only a few tenths of a percentage point and often tend to go in the same direction. The rhetoric tends to be much larger than the real differences among forecasters.

We also find more evidence of herd behaviour.

The largest forecasting errors from all institutions are for exports and imports. The error in net exports is one of the most important explanatory factors in the GDP-growth forecast error. The error is made somewhat less, however, by some of the error in exports being compensated for by error in imports. Private consumption, due to its large share of GDP, also contributes significantly to the error for next-year GDP-growth forecasts.

The largest forecasting errors are for exports and imports.

Appendix A: RMSE and MPE for different forecast variables

Table A1. GDP; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	1.10	22	1.57	17	19	–0.58	–0.56
Deutsche Bank	1.24	24	1.14	1	14	–0.58	0.04
Swedbank Economic	1.02	16				–0.18	
Swedish Research Institute of Trade	1.05	18	1.45	16	18	–0.19	–0.09
IMF	1.01	15	1.35	11	13	–0.23	–0.05
Industrial Bank of Japan	0.83	7	1.31	8	7	–0.23	0.29
JP Morgan	0.84	8	1.44	15	8	0.03	0.53
Swedish Federation of County Councils	1.00	12	1.32	9	11	–0.22	–0.09
Swedish Trade Union Federation	1.01	14	1.30	6	9	–0.38	–0.06
Matteus Fondkommission	1.05	19	1.71	22	23	–0.37	–0.87
Mean	1.08	20	1.58	19	21	–0.32	–0.30
Merrill Lynch	0.80	6	1.15	2	3	0.13	–0.02
Ministry of Finance	0.70	4	1.37	13	6	0.07	0.13
Morgan Stanley	1.01	13	1.36	12	10	0.29	0.73
National Institute of Economic Research	0.59	1	1.33	10	2	0.04	0.07
Nordea	1.12	23	1.23	4	12	–0.40	0.05
OECD	0.85	9	1.59	20	15	–0.13	0.00
Sveriges Riksbank	0.67	3	1.31	7	4	–0.06	0.16
SEB Group	0.93	11	1.59	21	16	–0.07	0.17
Swedbank Markets	1.09	21	1.38	14	17	–0.09	0.44
Handelsbanken	1.03	17	1.57	18	20	0.03	0.10
Swedish Confederation of Professional Employees	0.85	10	1.83	23	22	–0.55	–1.10
UBS Warburg	0.61	2	1.24	5	1	0.14	0.14
Öhman Fondkommission	0.78	5	1.23	3	5	0.09	0.23
Average	0.93		1.41				

Table A2. CPI; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	0.52	20	1.30	12	11	0.20	0.72
Deutsche Bank	0.37	9	1.38	14	14	0.19	0.90
Swedbank Economic	0.12	1				–0.02	
Swedish Research Institute of Trade	0.42	13	1.26	11	12	0.24	0.87
IMF	0.81	23	1.50	18	22	0.42	0.83
Industrial Bank of Japan	0.55	22	1.62	21	21	0.40	1.08
JP Morgan	0.44	16	1.67	22	20	0.15	1.03
Swedish Federation of County Councils	0.52	21	1.02	2	8	0.17	0.48
Swedish Trade Union Federation	0.44	17	1.45	17	18	0.07	1.11
Matteus Fondkommission	0.42	12	1.17	10	10	0.15	0.52
Mean	0.43	14	1.34	13	15	0.19	0.82
Merrill Lynch	0.44	15	1.12	8	9	0.23	0.74
Ministry of Finance	0.35	8	1.10	7	6	0.17	0.53
Morgan Stanley	0.34	5	1.03	3	3	0.11	0.49
National Institute of Economic Research	0.28	2	0.88	1	1	–0.03	0.20
Nordea	0.45	18	1.39	15	17	0.14	0.87
Sveriges Riksbank	0.30	3	1.09	6	4	0.01	0.28
SEB Group	0.33	4	1.52	19	13	0.13	1.06
Swedbank Markets	0.38	10	1.53	20	16	0.14	0.97
Handelsbanken	0.50	19	1.42	16	19	0.24	0.99
Swedish Confederation of Professional Employees	0.34	7	1.07	5	5	0.21	0.73
UBS Warburg	0.39	11	1.06	4	2	0.13	0.51
Öhman Fondkommission	0.34	6	1.17	9	7	0.06	0.58
Average	0.41		1.28				

Table A3. Private consumption; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	1.01	15	1.91	17	15	–0.25	–0.41
Deutsche Bank	0.80	6	1.56	3	3	–0.42	0.11
Swedbank Economic	0.95	12				0.02	
Swedish Research Institute of Trade	1.08	19	1.40	2	7	–0.17	–0.31
Industrial Bank of Japan	0.67	2	1.76	12	6	–0.42	–0.14
JP Morgan	0.82	8	1.60	4	5	0.20	0.36
Swedish Federation of County Councils	0.93	11	1.86	14	17	–0.15	–0.01
Swedish Trade Union Federation	0.71	4	1.27	1	1	–0.40	–0.07
Matteus Fondkommission	1.27	23	2.54	22	22	–0.34	–0.91
Mean	1.02	16	1.72	9	16	–0.28	–0.33
Merrill Lynch	0.81	7	1.73	10	9	0.00	–0.12
Ministry of Finance	0.92	10	1.69	8	10	–0.09	–0.17
Morgan Stanley	0.86	9	1.88	15	11	0.17	0.52
National Institute of Economic Research	0.68	3	1.69	7	4	0.07	0.03
Nordea	1.05	17	1.67	5	13	–0.34	–0.28
OECD	1.09	20	2.13	20	21	–0.20	–0.26
Sveriges Riksbank	0.75	5	1.79	13	8	0.18	0.32
SEB Group	1.15	22	2.16	21	20	0.01	–0.22
Swedbank Markets	1.06	18	1.74	11	14	–0.08	–0.02
Handelsbanken	1.09	21	1.91	18	19	0.11	–0.13
Swedish Confederation of Professional Employees	0.60	1	1.68	6	2	–0.39	–1.18
UBS Warburg	0.98	14	1.97	19	12	0.15	0.17
Öhman Fondkommission	0.96	13	1.89	16	18	0.01	0.04
Average	0.92		1.80				

Table A4. Investment; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	3.15	7	4.64	14	9	–0.22	–0.13
Deutsche Bank	4.42	23	3.49	1	14	–0.83	0.30
Swedbank Economic	3.46	13				0.46	
Swedish Research Institute of Trade	3.98	19	4.74	15	17	0.78	0.35
Industrial Bank of Japan	3.00	4	3.90	6	4	0.23	1.47
JP Morgan	3.38	12	4.63	13	15	0.27	1.04
Swedish Federation of County Councils	2.71	3	4.10	8	3	–0.19	1.88
Swedish Trade Union Federation	4.09	21	4.85	18	18	–0.15	–0.11
Matteus Fondkommission	3.29	11	4.80	17	16	–0.28	–2.03
Mean	4.33	22	5.10	19	20	0.07	–0.39
Merrill Lynch	3.47	15	3.68	4	7	0.73	0.04
Ministry of Finance	3.15	8	4.35	10	10	1.31	0.49
Morgan Stanley	4.07	20	5.36	20	19	1.53	3.21
National Institute of Economic Research	3.00	5	4.01	7	5	0.90	0.64
Nordea	3.50	16	3.53	2	6	–0.21	0.19
OECD	3.20	9	4.55	12	11	0.71	–0.07
Sveriges Riksbank	2.68	1	3.86	5	2	0.67	1.18
SEB Group	3.26	10	4.79	16	13	0.38	1.28
Swedbank Markets	3.06	6	4.51	11	8	0.57	1.75
Handelsbanken	3.87	18	5.97	21	21	1.25	1.73
Swedish Confederation of Professional Employees	3.47	14	8.31	22	22	–0.68	–4.07
UBS Warburg	2.70	2	3.56	3	1	0.92	0.50
Öhman Fondkommission	3.64	17	4.12	9	12	1.43	1.67
Average	3.43		4.58				

Table A5. Industrial production; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	3.31	18	4.20	15	16	–2.17	–1.49
Swedbank Economic	2.88	13				–0.65	
Swedish Research Institute of Trade	2.75	10	3.52	5	7	–2.00	–1.38
Industrial Bank of Japan	2.14	1	3.21	4	1	–1.40	0.34
JP Morgan	2.88	14	3.80	10	12	–1.12	0.46
Swedish Trade Union Federation	2.55	5	4.03	14	10	–1.65	–1.58
Matteus Fondkommission	3.17	17	3.84	11	15	–1.76	–1.32
Mean	3.07	16	4.42	16	17	–1.31	–1.47
Merrill Lynch	2.58	6	2.95	2	3	–0.06	–0.68
Ministry of Finance	2.24	2	3.58	6	4	–0.54	–0.08
National Institute of Economic Research	2.59	7	3.74	8	8	–0.76	–0.61
Nordea	2.73	9	3.69	7	9	–1.49	–0.80
OECD	4.26	19	4.56	18	18	–2.43	–2.03
Sveriges Riksbank	2.42	3	3.77	9	6	–0.86	–0.43
SEB Group	2.88	12	4.44	17	14	–0.72	–0.13
Swedbank Markets	2.85	11	3.89	12	11	–0.51	1.05
Handelsbanken	2.70	8	4.01	13	13	–0.34	–0.39
UBS Warburg	2.89	15	2.97	3	5	–0.89	–1.08
Öhman Fondkommission	2.55	4	2.92	1	2	–0.44	0.36
Average	2.81		3.75				

Table A6. Wages; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	1.25	17	0.52	8	17	0.52	0.28
Industrial Bank of Japan	0.76	13	0.46	7	6	0.26	0.05
JP Morgan	0.91	16	0.42	5	12	0.33	0.28
Swedish Federation of County Councils	0.21	1	0.32	1	1	0.04	–0.07
Swedish Trade Union Federation	0.51	7	0.88	16	14	–0.25	–0.46
Matteus Fondkommission	0.58	8	0.74	14	10	0.35	0.49
Mean	0.74	11	0.55	9	8	0.20	0.24
Merrill Lynch	0.30	3	0.98	17	7	0.00	0.62
Ministry of Finance	0.45	5	0.87	15	11	–0.27	–0.46
National Institute of Economic Research	0.29	2	0.42	4	3	0.01	0.30
Nordea	0.75	12	0.61	12	13	0.14	0.10
Sveriges Riksbank	0.30	4	0.34	2	2	–0.08	0.20
SEB Group	0.88	15	0.56	10	16	0.44	0.35
Swedbank Markets	0.71	10	0.45	6	5	–0.01	0.10
Handelsbanken	0.82	14	0.61	11	15	0.16	0.06
UBS Warburg	0.64	9	0.68	13	9	–0.35	–0.07
Öhman Fondkommission	0.49	6	0.41	3	4	0.02	0.15
Average	0.62		0.58				

Table A7. Exports; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	3.74	12	6.54	13	13	–2.67	–2.21
Deutsche Bank	3.76	13	5.30	4	9	–2.53	–1.52
Swedbank Economic	2.73	4				–0.87	
Swedish Research Institute of Trade	3.34	8	5.63	9	8	–1.67	–1.94
Swedish Federation of County Councils	2.66	3	5.68	11	3	0.10	–1.26
Swedish Trade Union Federation	3.64	11	5.50	6	10	–2.27	–1.95
Mean	3.55	10	5.40	5	7	–1.65	–1.78
Ministry of Finance	3.38	9	5.83	12	11	–0.87	–1.02
National Institute of Economic Research	3.27	7	5.64	10	6	–1.06	–0.99
Nordea	2.99	5	5.03	3	2	–1.92	–0.37
OECD	3.80	14	4.89	2	5	–1.57	–1.81
Sveriges Riksbank	3.82	15	5.56	8	12	–1.12	–0.95
SEB Group	2.15	1				–0.65	
Handelsbanken	3.09	6	5.52	7	4	–1.47	–1.11
Swedish Confederation of Professional Employees	2.48	2	3.91	1	1	–1.53	–2.73
Average	3.23		5.42				

Table A8. Imports; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	3.37	5	7.43	13	3	–2.13	–0.88
Deutsche Bank	4.37	15	5.86	2	5	–2.72	–0.87
Swedbank Economic	3.59	6				–0.31	
Swedish Research Institute of Trade	4.37	14	6.66	6	12	–1.60	–2.04
Swedish Federation of County Councils	4.18	12	6.52	4	7	0.10	0.63
Swedish Trade Union Federation	2.98	3	6.17	3	2	–2.45	–1.54
Mean	4.17	11	6.57	5	8	–1.38	–1.46
Ministry of Finance	3.86	9	7.13	11	11	–0.78	–1.36
National Institute of Economic Research	3.72	8	7.07	10	9	–1.10	–0.35
Nordea	3.62	7	6.75	7	6	–1.57	–0.23
OECD	4.03	10	6.77	8	10	–1.49	–0.98
Sveriges Riksbank	4.26	13	7.28	12	13	–0.54	–0.29
SEB Group	2.68	2				0.15	
Handelsbanken	3.34	4	6.86	9	4	–1.19	–0.63
Swedish Confederation of Professional Employees	2.64	1	5.78	1	1	–1.18	–3.13
Average	3.68		6.68				

Table A9. Government expenditure; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	1.42	11	1.40	2	5	–0.26	0.03
Deutsche Bank	1.31	7	1.75	12	10	–0.34	–0.58
Swedbank Economic	0.70	1				–0.07	
Swedish Research Institute of Trade	1.22	4	1.69	9	7	–0.51	–0.68
Swedish Federation of County Councils	1.47	12	1.04	1	1	–0.62	–0.37
Swedish Trade Union Federation	1.72	15	1.61	7	13	–0.59	–1.16
Mean	1.25	5	1.51	5	4	–0.50	–0.47
Ministry of Finance	1.02	2	1.70	10	3	–0.26	–0.47
National Institute of Economic Research	1.38	10	1.72	11	11	–0.61	–0.47
Nordea	1.10	3	1.48	4	2	–0.56	–0.46
OECD	1.26	6	1.63	8	6	–0.67	–0.40
Sveriges Riksbank	1.35	9	1.84	13	12	–0.49	–0.37
SEB Group	1.58	14				–0.53	
Handelsbanken	1.51	13	1.41	3	8	–0.59	–0.38
Swedish Confederation of Professional Employees	1.32	8	1.61	6	9	–0.87	–0.28
Average	1.31		1.57				

Table A10. Unemployment; RMSE, rank and MPE

	RMSE					MPE	
Institute	Within-year	Rank within-year	Next-year	Rank next-year	Overall rank	Within-year	Next-year
Confederation of Swedish Enterprise	0.50	15	0.91	12	11	–0.02	0.64
Deutsche Bank	0.26	6	0.81	6	4	0.03	0.10
Swedbank Economic	0.17	3				–0.02	
Swedish Research Institute of Trade	0.34	12	0.85	9	9	–0.04	0.00
Swedish Federation of County Councils	0.31	9	0.85	8	7	0.00	–0.17
Swedish Trade Union Federation	0.32	10	0.88	10	10	–0.13	–0.41
Mean	0.30	7	0.81	5	6	–0.04	0.06
Ministry of Finance	0.45	14	0.90	11	12	–0.22	–0.30
National Institute of Economic Research	0.21	4	0.72	2	2	0.04	0.22
Nordea	0.30	8	0.80	4	5	0.12	0.23
OECD	0.23	5	0.59	1	1	–0.06	0.21
Sveriges Riksbank	0.33	11	0.75	3	3	0.07	0.31
SEB Group	0.12	1				0.07	
Handelsbanken	0.35	13	0.84	7	8	–0.07	0.08
Swedish Confederation of Professional Employees	0.16	2				–0.04	
Average	0.29		0.81				

Appendix B: Decomposing the MPE:s of GDP-growth

Tables 1 and 2 in the paper are calculated from the expression

$$(1)\quad T^{-1}\sum_{t=1}^{T}\hat{Y}_t = T^{-1}\sum_{t=1}^{T}\sum_{i=1}^{n}\alpha_{i,t-1}\left(\hat{X}_{i,t}-X_{i,t}\right) + T^{-1}\sum_{t=1}^{T}\delta_t,$$

where $\hat{Y}_t$ is the forecast error in GDP, $\hat{X}_{i,t} - X_{i,t}$ is the forecasting error in the ith component, n is the number of GDP components, and $\alpha_{i,t-1}$ is its corresponding weight as share of GDP. Note that the weight needs to be from the previous period for the decomposition to be mathematically correct.

We also use (1) as starting point when calculating root mean square errors (RMSE) presented in Tables 3 and 4. Define

$$\tilde{\alpha}_{t,i} = \frac{\alpha_{t,i}}{\sqrt{\alpha_{t,1}^2 + \cdots + \alpha_{t,n}^2}}$$

so that the new weights sum to one. The MSE can thus be expressed as

$$T^{-1}\sum_{t=1}^{T}\hat{Y}_t^2 = T^{-1}\sum_{t=1}^{n}\sum_{i=1}^{n}\hat{\alpha}_{i,t-1}^2\left(\hat{X}_{i,t}-X_{i,t}\right)^2 + \text{“covariance terms”} + T^{-1}\sum_{t=1}^{n}\delta_t^2$$

The covariance terms are omitted from the tables as we do not judge them to be of particular interest here as there is no structural interpretation and we have not identified the shocks.

Appendix C: Forecasts for net exports

Forecasts for net exports are not available directly in our data base; they have to be computed from the forecasts for imports and exports. Let x_t and m_t denote the level of exports and imports respectively. Let r_t^x and r_t^m denote the growth rates, for the year exports and imports respectively. Let hats denote forecasts for respective variable. Then we have that net exports for within year forecasts are given by

$$\widehat{nx}_t = \frac{x_{t-1}\left(1+\hat{r}_t^x\right) - m_{t-1}\left(1+\hat{r}_t^m\right)}{x_{t-1} - m_{t-1}}.$$

Replacing growth forecasts with actual growth rates of imports and exports gives the actual percentage growth of net exports. The difference between the actual and the forecast is displayed in the tables 1 and 2. It is measured in percentage points. For next year forecasts, we have that

$$\widehat{nx}_{t+1} = \frac{x_{t-1}\left(1+\hat{r}_t^x\right)\left(1+\hat{r}_{t+1}^x\right) - m_{t-1}\left(1+\hat{r}_t^m\right)\left(1+\hat{r}_{t+1}^m\right)}{x_{t-1}\left(1+\hat{r}_t^x\right) - m_{t-1}\left(1+\hat{r}_t^m\right)}.$$

The actual outcome and the forecast error are obtained in the same way as for within-year forecasts. Notice that next-year forecasts are dependent on the within-year forecasts. It is also possible to evaluate the above expression with the actual outcomes in the denominator in which case the forecast error from the first period does not affect the forecast error for the next period. We have chosen not to do this, primarily as we view the forecast as a path rather than as point estimates only.

Appendix D: A note on the data

All raw data on forecasts is from the NIER and Consensus Forecasts, the number of forecasts in the database are displayed in Table D1. The actual outcomes are from the official statistics published by Statistics Sweden.

Table D1. Number of observations

	Within-year	Next-year	Total
GDP	1 460	1 439	2 899
CPI	1 428	1 408	2 836
Private consumption	1 440	1 419	2 859
Investment	1 432	1 410	2 842
Industrial production	1 234	1 218	2 452
Wages	1 187	1 171	2 358
Exports	535	531	1 066
Imports	534	530	1 064
Government expenditure	533	529	1 062
Unemployment	533	525	1 058
Total	**10 316**	**10 180**	**20 496**

Some institutions have changed names during the evaluation period. We have chosen to use the current name for ease of exposition. Nordea includes forecasts from Nordbanken and MeritaNordbanken. Forecasts for the Confederation of Swedish Enterprise come from the Confederation of Swedish Employers (SAF) and the Federation of Swedish Industries.

For the Riksbank's forecasts, we have chosen to treat forecasts published close to an "evaluation month" as belonging to that month: the forecast from 1996-07-01 is treated as being made in June 1996; 1997-09-23 as October 1997; 1998-09-28 as October 1998; 2001-05-31 as June 2001.

For wages, as there is no official outcome for the overall total from Statistics Sweden, we have used an average of NIER's and the Riksbank's as outcomes.

For the calculation of RMSE and MPE, we use the same method as discussed in Appendix A2 of Blix et al. (2001) to filter out institutions for which there are "too few" forecasts to obtain robust results.

Appendix E: A selection of references about the quality of statistics in Sweden

Affärsvärlden, (2000-08-15), ”Missvisande statistik styr räntan” (Misleading statistics govern the interest rate).

Affärsvärlden, (2000-08-30), ”SCB famlar och fabulerar” (Statistics Sweden fumbles and invents facts).

Affärsvärlden, (2001-10-03), ”SCB: Goda nyheter för pessimister” (Statistics Sweden: Good news for pessimists).

Fager, J., (2001-01-31), ”Statistiken blir osäkrare” (Statistics are becoming more uncertain), *Finanstidningen*.

Munkhammar, V., (2000-10-28), ”Amerikaner ska lära SCB att räkna” (Americans to teach Statistics Sweden how to count), *Dagens Industri*.

Munkhammar, V. & Örn. G., (2000-10-27), ”SCB underskattade Sveriges tillväxt” (Statistics Sweden underestimated growth in Sweden), *Dagens Industri*.

SOU 2001:34, ”Behovet av ekonomisk statistik” (The need for economic statistics).

Svanström, S., (2001-03-15), ”Värdelöst vetande” (Worthless knowledge), *Finanstidningen*.

Svanström, S., (2001-03-22), ”Tidspress ger osäkra BNP-siffror” (Pressure of time leads to uncertain GDP figures), *Finanstidningen*.

Törnqvist, A., (2001-01-31), ”För låg tillväxt” (Growth too low), *Finanstidningen*.

Öberg, S., (2000-11-08), ”Obetydlig underskattning av BNP-tillväxt” (Insignificant underestimate of GDP growth), *Dagens Industri*.

Örn, G., (2000-11-08), ”Det får vi väl se” (We’ll just have to wait and see), *Dagens Industri*.

References

Batchelor, R., (1997), "How useful are the forecasts of intergovernmental agencies? The OECD and IMF versus the Consensus", Working paper, City University Business School, London, UK.

Blix, M., Wadefjord, J., Wienecke, U. & Ådahl, M., (2001), "How good is the forecasting performance of major institutions?" *Sveriges Riksbank Economic Review*, 2001:3, pp. 37-67.

Gavin, W. T. & Mandal, R. J., (2000), "Forecasting inflation and growth: do private forecasts match those of policymakers?", Federal Reserve Bank of St. Louis, Working Paper No. 2000-026A.

IMF, (2001), World Economic Outlook 2001, "Box 1.1 How well do forecasters predict turning points?", pp. 6-8.

National Institute of Economic Research, (2002), " Underlag för utvärdering av penningpolitiken 1999-2001" (Assessing the monetary policy), 2002-03-26.

OECD, Economic Outlook, (1991-2002).

Schück, J., (2002), "Fiasko för prognosmakare" (Forecasters' failure), *Dagens Nyheter*, 2002-03-16.

Öller, L-E. & Barot, B., (2000), "The accuracy of European growth and inflation forecasts", Working Paper No. 72, *National Institute of Economic Research*, Stockholm, Sweden.