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SEMINAR ON BALANCING PRINCIPLES OF PROFESSIONAL AUTONOMY AND  
ACCOUNTABILITY WITH THE MANDATE TO PRODUCE POLICY RELEVANT DATA

SESSION II: BEYOND THE PRODUCTION OF OFFICIAL STATISTICS: CREATING  
SYNERGIES, AVOIDING CONFLICT

**FORECASTING AND POLICY ANALYSES IN A STATISTICAL AGENCY:  
THE NORWEGIAN EXPERIENCE**

Note by Statistics Norway

*Summary*

The Conference of European Statisticians selected in June 2008 (ECE/CES/74) the topic “Balancing principles of professional autonomy and accountability with the mandate to produce policy relevant data” for a seminar to be held at its 2009 plenary session. The Bureau, acting on behalf of the Conference, approved the outline for the seminar at its February 2009 meeting (ECE/CES/2009/2) and requested the United Nations Economic Commission for Europe to prepare a note to provide basis for the discussion.

Research is an obligation for Statistics Norway according to the Statistics Act and the government has allocated many applied research areas to the statistical agency. The note describes how Statistics Norway is meeting the challenge of combining freedom of expression and publishing for the researcher while maintaining the credibility of statistics.

## I. ABSTRACT

1. Research is an obligation for Statistics Norway according to the Statistics Act. In Norway the government has allocated many applied research areas to its statistical agency. Some of these allocations were motivated by synergies but not all. National accounting involves forecasting as an integral element of accounting. It is in this area where most of the synergies are present today. Combining freedom of expression and publishing for the researcher while maintaining the credibility of the statistics is a challenge. So far, this has proved possible in Norway.

## II. INTRODUCTION

2. The Norwegian Statistics Act of 1989 states that research is an obligation for Statistics Norway (SN). According to paragraph 3-1 of the Act, SN should "...develop statistical methods and exploit statistics for analysis and research." The research activities in SN did not, however, start as a result of the Statistics Act of 1989. Rather, the act codified an established practice that had developed over many decades. The research department of SN dates back to 1950 but research activities had begun even earlier. The reasons for setting up a research department within SN were both internal and external and to some degree even motivated by decisions in the Parliament.<sup>1</sup> To some extent, synergies between statistics and research were an argument in the early days of national accounting. The data needs of national accounts were important for economic statistics in the early days two generations ago, and still are. For other areas of research, the possible synergies are more limited.

3. The research objectives of the department are to:

(a) Provide empirically based information about the Norwegian economy and society in general;

(b) Develop and maintain analytical tools for policy analyses in government as well as for the Parliament;

(c) Analyse statistics as part of the quality control and develop statistical methods for producing and presenting statistics.

4. Of these three general objectives, the second one concerning modeling is perhaps the most unusual one to assign to a statistical agency. There are a few other statistical agencies that have similar activities (in Europe, the French INSEE and the Danish Danmarks Statistik have similar activities) but it is more common to set up government financed research institutes outside the statistical agency as is the case in the Netherlands (Central Plan Bureau) and in Sweden (Konjunkturinstitutet), to take two examples in Northern Europe. One reason why modeling activities were located in a research department in SN had to do with the central role of national

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<sup>1</sup> Just after World War II all parties in Parliament had agreed upon the establishment of a research body to carry out research on tax issues and public finance more generally. It was soon decided to place this body within SN and this decision was part of the reason why the research department was established in 1950. Another reason was the need to allocate resources for establishing national accounts. The national accounts office was part of the research department in SN from 1950 to 1991.

accounts with fully integrated annual supply and use tables both for Norwegian statistics in general as well as for macro-econometric modeling.

5. The next section gives a brief presentation of the research activities in SN and tries to interpret why these activities have been located here. Section IV discusses economic modeling and forecasting in more detail while Section V discusses synergies between statistics and research.

6. Section VI concludes with a discussion of problems related to the combination of research and statistics within the same agency.

### **III. A HISTORICAL OVERVIEW OF RESEARCH ACTIVITIES IN STATISTICS NORWAY**

7. SN has a long tradition in analyzing the structure and development of the Norwegian economy based on the statistical material produced. Starting with an annual survey of the economic situation in 1922, these surveys became more frequent in the early 1950s. Partly due to the downturn in Europe in 1957/58, SN began monthly surveys of international economic developments and the staff was increased with extra funds allocated by parliament. This survey was initially circulated only within the central government administration until it was published regularly in the monthly statistical bulletin from 1960 (from 1976 as a separate publication). From 1985 onwards, when SN resumed the production of quarterly national accounts (QNA) figures, after having produced no QNA-figures for 15 years, the analyses have been focused on interpreting economic development according to the QNA.

8. SN has a modeling tradition that goes back to the 1950s. The research department in SN was initially set up to carry out research on national accounts, tax policy and business cycles. Input-output tables (or supply and use tables) were fully integrated into the national accounts in Norway almost from the start. This formed the empirical basis for building disaggregated economic models of the input-output type in the spirit of Frisch and Leontief. Thus, in the first years of the department, most resources were allocated to construction and extending the national accounts. Capital stocks were calculated and used for studies of production functions in the spirit of the Solovian growth model, cf. Aukrust and Bjerke (1958). The department launched its first macro-econometric model in 1960 that initiated a long-lasting tradition in economic modeling, see Sevaldson (1964). At the same time, researchers assisted Professor L. Johansen in establishing the database for the first large scale computable general equilibrium model cf. Johansen (1960).

9. Social and demographic research was an established activity at SN even before the research department was set up in 1950. The first employee of SN to receive a doctorate was J. Backer in 1938 and her theme was on mortality, health and social living conditions. Later on, the first forecasting model for population projections was established and population projections have been published regularly by SN since 1969. Initially, this activity did not receive very much attention outside government circles but in recent years, and due to large scale immigration, population forecasts have become much debated in newspapers and other media.

10. Economic modeling became the most important research activity of the Research Department during the 1970s with more resources allocated by the Ministry of Finance explicitly to econometric modeling. One of the projects that were started was establishing a quarterly macro-econometric model. To some extent, this project addressed problems related to forecasting at a time when the international economy suffered from the first OPEC shock and Norway was building up its capacity for producing crude oil and natural gas. A more formal analysis of business cycles was in demand not only by the public and implicitly the Ministry of Finance that sponsored the efforts, but also by the team that produced the economic surveys. This team had previously been using mostly short term indicators (monthly and quarterly statistics) but, as already mentioned, when these indicators were integrated into a system of quarterly national accounts (QNA) the obvious step was to use the QNA data for modeling just like the annual data had been the main source of data in earlier modeling efforts. This issue will be looked at in more detail below.

11. During the 1970s, the interest in resource and environmental economics increased considerably. In SN there was an attempt to construct resource accounts as an extension to the national accounts. A limited version of these accounts is still being produced. More importantly however, was the establishment of statistical information on emissions and waste. With the traditional disaggregated models of SN, it proved to be fairly straightforward to link emissions and waste to economic activities in various parts of the economy. This activity has become a standard part of the applied economist's toolbox in environmental economics. Forecasting Kyoto gases is now an important aspect of modeling and forecasting in SN. This document does not go into details here but will focus instead on standard short and medium macroeconomic forecasting.

#### **IV. ACCOUNTING, MODELING AND FORECASTING**

12. There is a long-standing controversy in business cycle analysis about how to combine measurement and theory. Since SN already had long experience in business cycle analysis, although not based on formal models, the decision to use econometric models as an integral part of this analysis was considered quite logical. Previously, the analysis had mainly consisted of commenting on the changes in short run economic indicators and combining them in order to produce summary statistical indicators of the different phases of the business cycle. Parts of this exercise were considered as being quite problematic. In many circumstances it proved difficult to establish precisely the "causes" and turning points of the cycle without using statistical methods or a model. Although an econometric model does not solve the problem of causality in itself, it is nevertheless a very useful tool for an economist when explaining and understanding what goes on in the economy. When providing a narrative of what is going on in the economy, economists use models either implicitly or explicitly. This is particularly relevant when the underlying pattern of the cycle is changing because of structural changes in the economy due to i.e. new emerging industries. A disaggregated model is more conducive to integrating new sectors into a study of the national economy. Thus a model is not only useful for forecasting, it is also useful for the analysis of previous cycles. In the second half of the 1990s, SN completed a large model-based project that focused on the history of Norwegian business cycles since 1973 when the oil sector gradually became one of the main sectors in the Norwegian economy.

13. There is no obvious connection between applied economic research and forecasting. One could easily have imagined a research group within SN that was not concerned with building models for forecasting. However, there is a very close relationship between econometric modeling and forecasting that follows from statistical theory. In certain econometric schools, in particular the so-called London School of Economic (LSE)-school in econometrics cf. Hendry (1995), out-of-sample prediction performance is regarded as an integral part of the evaluation of econometric models. This is simply because if the parameters of a model are not fairly constant over time, there is little reason to believe that the model can be used either for forecasting or for policy analysis (cf. the so-called Lucas-critique). Consequently, an econometric model-builder should use the forecasting performance of his model as one of a number of design criteria. Thus forecasting tests, although strictly relevant mainly for the structural equations of the model, can be extended to the model as a whole, because the user needs to take into account both the simultaneity and the non-linear aspects of the model. Since the research department in SN has been building models for the Ministry of Finance for decades, it would seem strange not to gain experience in using the models in “real life”. No car manufacturer would ever release a new car model without thorough testing including a driving test! For this reason, it was not difficult for the Ministry to appreciate the usefulness of some forecasting experience within SN itself that could improve its ability to construct models for use by the Ministry.

14. Another argument for using models when analyzing business cycles is that models are useful as a check of data consistency. For most national accounts data this is not necessary as these data are produced by means of a model with basically the same structure as the model used for forecasting. However, with econometric modeling based on historical QNA data as well as other information (employment, financial flows, etc.), additional structural information becomes available which can be used to modify the national accounts figures in areas where the traditional statistical indicators are missing or considered to be less reliable. In some ways the in-house use of statistical data serves as a quality control and should therefore be considered as the final stage in the production process of statistics within SN.

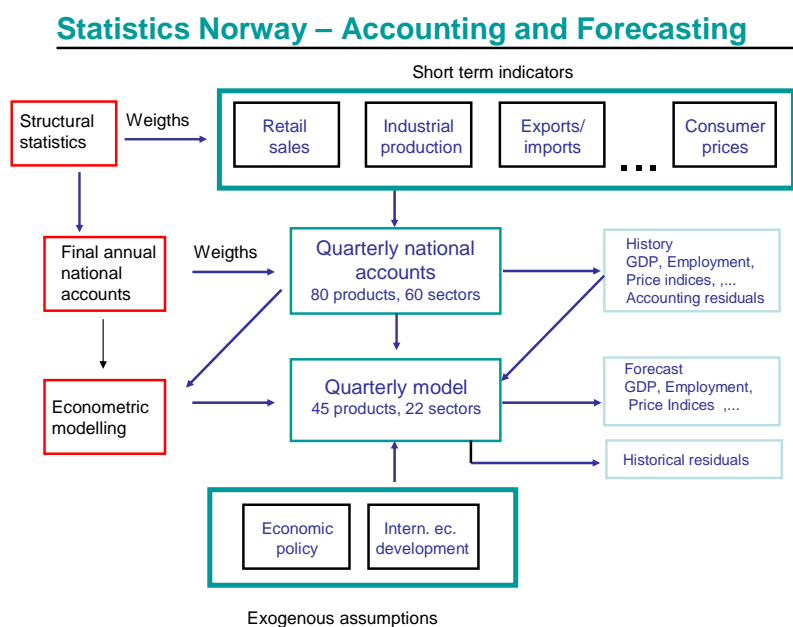
15. This document will now turn to a more detailed discussion on the relationship between national accounting and forecasting in SN. In order to do so, reference is made to Figure 1 below that tries to illustrate some of the discussion. Starting with the upper left hand of Figure 1, there are two boxes (in red for those who can print in colors) which illustrate the core activities of economic statistics, called “structural statistics”, that are used as the main information source for the final annual national accounts. In Norway, most structural statistics are based on information in business registers, population registers and tax registers. These data are available one or sometimes nearly two years after the end of the calendar year. This means that the final version of the annual national accounts is published with a 23 month delay (final 2006-data was published in November/December 2008). The first national accounts data covering the whole of 2006 were published by the end of February 2007. These data were based on the QNA system that is placed in the centre of Figure 1. This first estimate of Gross Domestic Product (GDP), employment etc. based on the QNA (cf. the box called “history” on the right hand side of Figure 1) can be considered as a forecast of the final data published nearly two years later.

16. The QNA system that produces this forecast of final national accounts uses an accounting framework identical to that of the final accounts but much more aggregated (80 products instead of 1900 products in the final accounts). The data sources are monthly and quarterly short term

indicators (the box at the top of Figure 1). These data can be considered as “leading indicators” of the final structural statistics. It is clear from the revision process of the national accounts (NA)-data that sometimes these short term indicators are poor proxies for the final accounts. In recent years, the production index for output in manufacturing has significantly underestimated the growth in gross production according to the structural statistics. It is not a biased sample of establishments that is the cause of the problem, but rather that these establishments are engaged in production activities that the short term indicator does not fully pick up. So instead of using the growth rate according to a short term indicator as the estimate of the growth rate in the final accounts, one might consider a more general statistical model to capture possible systematic biases in the short term indicators. The reason for elaborating this point is simply to emphasize that the model SN uses to produce QNA data can be considered a forecasting model for the final national accounts data. Many of the standard econometric techniques one would consider when constructing a macro-econometric model for forecasting purposes are just as relevant for studying how the QNA model works as a forecasting model for the final accounts.

Figure 1

### Accounting and forecasting in Statistics Norway



17. Many institutions have in recent years been somewhat frustrated over the lack of timeliness and precision in the “flash” estimates of GDP that some statistical agencies produce. Statistical agencies have therefore been under pressure to produce “flash” estimates of GDP at an early date and soon after the end of the quarter. In particular, monetary policy authorities who make interest rate decisions at frequent intervals (often twice each quarter) base their decisions on assessments of current and future developments using incomplete and preliminary data. Thus it is important to estimate the current-quarter GDP, inflation and other variables and this is something to which central banks devote a considerable amount of resources. Also when forecasting with standard macro-econometric model, an updated estimate of the current economic situation is very helpful, cf. Sims (2002). This has led to the development of nowcasting as a supplement to standard

accounting models. In fact, nowcasting models that combine monthly and quarterly time series can be useful for accounting models such as the QNA model in Figure 1.

18. Another line of research relevant for accounting is dynamic factor models or more specifically diffusion index models, cf. Forni et al (2000). These models could help improve the timeliness of the QNA data by forecasting monthly or quarterly series that currently are forecasted using simple univariate models before being entered into the QNA model so that a complete QNA dataset can be produced. The upshot of all this is simply to say that national accounting is closely linked to forecasting; the preliminary annual figures from the QNA are estimates of similar figures in the final annual accounts. Because of the need to produce early estimates of quarterly data, forecasting methods are already in use in combination with short term indicators and accounting in most statistical agencies. Thus, current practice in national accounting involves forecasting in many respects.

19. When people think of economic forecasts they normally do not consider those features that have been discussed up to now. Forecasts are thought of mainly as estimates of future growth rates of GDP, inflation, employment and so forth. Regarding this activity in SN: when SN started its publication of forecasts there was only one model-based forecaster in Norway, the Ministry of Finance, which used the models developed by SN. Some large Norwegian companies sponsored an attempt by Chase Econometrics to establish a Norwegian econometric model in the mid 1980s, but the attempt proved unsuccessful and the model was never really operational. Thus there was clearly a demand for services from an independent forecaster from the public. Based on the tradition in SN for business cycle analysis and economic modeling, it was only a small step further for SN to become a forecaster as well. While forecasts are provided free of charge just like statistics, tailor-made model-based analyses have been provided to the public on a marginal cost basis since the late 1980s.

20. Until 1986, no regular economic forecasting activity using econometric models took place in SN. However, models were used on some occasions to study specific events or to illustrate points made in business cycle analyses. Models developed in SN were used only in government bodies for forecasting purposes and the Ministry of Finance was by far the most important user of models for forecasting and policy analysis. From 1986 onwards, a quarterly macro econometric model (KVARTS) has been in use when preparing quarterly economic surveys. For a few years the forecasts were presented only graphically but, from 1988 onwards, tables with forecasts have been published quarterly by SN. The forecasts usually cover a horizon of two to four years ahead.

21. Referring again to Figure 1, the forecasting process can be described as follows. First, the forecasting model (KVARTS) is roughly half the size in detail (products and industries) compared to the QNA model. The accounting framework is the same except for level of aggregation between the two models and the software used to simulate the models are also the same (TROLL). In fact, both models have been designed on the basis of earlier work on disaggregated models in SN. The QNA model was constructed roughly at the same time as the quarterly forecasting model was developed. When a historical dataset has been constructed based on the QNA model, these data are aggregated and the quarterly model is calibrated (both the accounting framework as well as the econometric equations) in order to replicate the historical data exactly. Due to the fact that the two models are so similar and use the same software, this

whole calibration exercise takes only a few minutes. This is important for the forecasters as they work with the forecast at the same time as the QNA is made. Each quarter there are four or five major simulation rounds using the QNA model. The QNA data are released a few days earlier than the forecasts because the forecasters need some time to work on the forecast based on the final QNA data, and to discuss assumptions with regard to policy and international economic factors (cf. the box at the bottom of Figure 1) as well as to write their story and present it to the public. The forecasts as well as the QNA data are presented at a press conference every quarter where the press and economists from private banks and ministries take part. At least once a year a specific seminar is hosted by SN where the economic situation is discussed and outside economists are able to use the quarterly forecasting model without any fee in order to present alternative forecasts to those made by SN.

## **V. POLICY ANALYSES**

22. When forecasts are made conditional on economic policy, there is only a thin line between this activity and a policy analysis. Alternative policy assumptions result in different outcomes for macroeconomic variables of interest. SN conducts policy studies on a regular basis in many areas related to its research. Going back to one of the research areas that motivated the set up of the research department in SN - tax analyses and tax policy studies - SN carries out policy analyses quite intensively in this area and has been doing so for a very long time, before it started publishing macroeconomic forecasts. Simulation of alternative tax policies is carried out for the Ministry of Finance as well as for the opposition parties in parliament. In every annual budget round, the tax detailed structure proposed by the government is made available to the opposition who can construct their own alternatives. These are simulated on SN's tax models and tax revenues and income distribution effects are presented. In 1991 this use of the models in SN was extended to the macroeconomic models so the opposition can also study a range of economic policy alternatives. In this respect, Norway has more or less copied the Dutch tradition where Statistics Netherlands has been studying the economic consequences of political party programs for a long time.

23. Policy analyses are undertaken in a wide range of subjects in SN. Applied general equilibrium studies using Computational General Equilibrium (CGE)-models are used in long range analyses of fiscal sustainability, environmental and resource issues. Policy alternatives are studied intensively and results communicated both to the public in a popularized form as well as in academic papers in journals. To a large extent, this research is funded by the Research Council of Norway but also by various ministries again with the Ministry of Finance as the main customer.

## **VI. SYNERGIES BETWEEN RESEARCH AND STATISTICS AT STATISTICS NORWAY**

24. A statistical agency needs research activities in order to carry out its main duty of producing statistical information for society. Normally, one would consider mathematical statistics as the most relevant area for research in a statistical agency. SN has, of course, a group of researchers with that training and focus but they have never been part of the research department. The research department in SN has been mostly concerned with economic research

but also with demographic and sociological research. Forecasting and policy studies have been an integrated part of the research for decades.

25. 60 years ago the development of national accounting from a theoretical area to an applied research subject was the main focus of the research department. In the 1980s the development and integration of a model-based quarterly national accounting system is another example of how the research department has been involved in core activities of SN. At that time some of those who were engaged in developing the macro econometric model were also involved in developing the national accounting model that was going to be used when producing the quarterly national accounts on a regular basis. Thus the infrastructure for data production and analysis were literally developed hand in hand. In this case it is fairly easy to identify the synergies between the two activities.

26. With reference to the discussion in section IV earlier and Figure 1, the synergies can be identified as follows. The QNA model was based on the input-output structure of existing macroeconomic models at the time. Thus from research there was a knowledge base that could be easily used for producing statistics. The level of disaggregation of the QNA system was partly influenced by the needs of the researchers but of course also by available statistics. Missing short term indicators at the time when regular publication of QNA figures was resumed, was forecasted using methods that are standard in research. Missing data also provided a work plan for extending the scope of short term indicators in budget prioritizations. The database used by researchers for constructing and updating the macro econometric models was made available to other users both nationally (the central bank and universities) and internationally.<sup>2</sup> The model software (TROLL) that had been in use for model work for a decade in SN was used for programming the QNA model. The skills for doing so were already in place within the research department and for many years the actual updating of the QNA model was done by people working on the macro models. By using software that was already central to the macro modelers, the whole environment became more robust to changes in personnel and improved cost efficiency.

27. More generally, the in-house research activities give SN a possibility to contact users of data in an easy way. Problems with interpretation of data could be discussed with access to users who would not disclose any unpublished material. This takes place today in a formalized way in some instances and on an ad hoc basis in many subjects. In some areas of statistics where SN has no research, the statisticians complain about the lack of access to competent researchers with whom they can discuss.

28. Closeness to data was earlier a clear advantage to those involved in research. Before dissemination of data on the web became standard, it was a clear advantage for research to be able to access data easily. Problems related to definition and interpretations of data could easily be solved by talking to colleagues within SN. The researchers could even influence what kind of

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<sup>2</sup> In a seminar in 2007 at Statistics Denmark that discussed the future of the Danish macroeconomic model ADAM, many Danish modellers stressed the importance of the ADAM-group for their own work in that this group maintained a very detailed and updated version of the annual national accounts in a consistent set of long time series useful both for research as well as economic analyses in general. A similar experience is also the case for Statistics Norway.

data should be collected. Today, these synergies are no longer important. Data should be made available to everybody and metadata are on the website of SN. What kind of data to collect are partly determined by Eurostat, and national statistical agencies have less influence given budget constraints.

29. These synergies could have been achieved using institutional arrangements other than those in Norway. Clearly, in most countries some of the activities that the research department carries out are handled by extending the staff in ordinary statistical departments. It is not easy to argue that the way these activities have been organised in SN is better than the alternatives.

## VII. CONCLUSIONS

30. Two historical traditions in SN - business cycle analysis and economic research in general combined with economic modeling – ensured that the step to publish economic forecasts was a small one. The author believes that credibility for a statistical bureau is mainly a problem related to its role as a producer of statistics and not of its forecasts. The public has few problems in separating these two activities. Perhaps more important for a statistical agency is the fact that the credibility of its statistics have not been damaged by in-house forecasting and policy analyses. There have been instances where SN's data (and research) have been seriously questioned, but in these cases it is not SN's forecasting activity per se that has been regarded as problematic. Many users of SN's preliminary national accounts data have recognized that these data are in some sense forecasts of SN's final national accounts. Thus the difference between a standard macroeconomic forecast and preliminary QNA data is not that great. It is much more problematic for a statistical agency if it turns out that the QNA data does not pick up important short run changes in the economy. After all, QNA summarize a substantial amount of all short run (monthly and quarterly) economic indicators produced by SN. If SN is unable to produce reliable data on the state of the economy for the policy makers, there are good reasons indeed for questioning SN's priorities. In some sense publication of forecasts serves to underline the care with which one should interpret statistical information.

31. There are instances long before SN started forecasting when preliminary statistical information and assessments made were misleading (well-known episodes are analysis of the short run consequences of a tax reform that increased the down-turn in 1958, the boom of the mid 1970s where short term statistics on consumer spending proved to severely underestimate growth in GDP). Forecast errors are unavoidable of course but SN's forecasts should at least be better than naïve ones, and they are. SN presents annually an update and summary of its historical forecasting performance.

32. Economic research can be controversial because political disputes that take place are often more about realities (positive economics) than priorities (normative economics). To retain credibility in this area, solid documentation of research and models are a must. Therefore a forecast is usually less controversial than an analysis of a specific policy change. When politicians discuss effects of different policies, it is the marginal properties of models that are controversial and not global or forecasting properties.

33. SN's forecasts filled (and still fill) a gap in the sense that no private model supplier or "market" existed at the time. The Ministry of Finance has stated (not officially of course) on

numerous occasions that SN's activity in this area is very useful. It is also worth mentioning that, since 1990, SN has provided the parties in parliament with model-runs so they can assess the macroeconomic effects of their budget proposals (cf. the Dutch tradition).

34. On some occasions during this long period, the staff of SN published some quite open-minded or frank statements on economic-political issues. These have mainly appeared in one specific chapter of the economic survey of the proceeding year (called "Perspectives"). Some of these statements were seen as being in direct opposition to the views of the government at the time. It should of course be added that this applied to views of governments of different "colours". The published material was often not based on model forecasts or simulations, but on research and more general assessments. Thus SN's experience suggests that it is not forecasting per se that may be controversial but rather the fact that a statistical bureau publishes assessments of economic developments based on its own statistics. To balance the freedom of publishing research and the need to preserve credibility and impartiality of statistical information is an ongoing discussion within SN.

35. With 20 years of experience as a forecaster, SN is in a position to reject at least some of the arguments against its forecasting practice. SN's close relation to other government bodies and the Ministry of Finance in particular (as its "principal", so to speak) has not been damaged. In spite of some unofficial criticism initially from some colleagues in the Ministry, SN's forecasting activities are now regarded as useful, partly because the users of the model in the Ministry have a more competent model builder to communicate with. The fact that the ministry uses a model developed by what is regarded as an institution independent from party politics, and one that has no role as a policy advisor or policy maker (such as the central bank), may even add credibility to the forecasts and policy analysis of the Ministry.

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