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FLASH GROWTH ESTIMATES USING CALENDAR INFORMATION

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In 1991 Statistics Netherlands introduced their early flash estimates of the Quarterly National Accounts. In this article we examine a new, faster flash estimate, some three to four weeks earlier. The gain is made by using a simple regression technique and incomplete data. To compensate for the lack of data, information on the number of working days and shopping days was added to the regression. The inclusion of these calendar aspects significantly affect GDP growth: 0.30 percent point extra GDP growth for one extra working day, and 0.17 percent point for one extra shopping day.

The cost of an earlier estimate is a decrease of reliability. The probability of a forecast error of over 0.5 percent point will be about 26 percent, compared to 12 percent for the official flash estimate.

INTRODUCTION

Since 1986 Statistics Netherlands has published Quarterly National Accounts with a delay of some seventeen weeks. To meet the need for earlier indicators of economic performance flash estimates were introduced in 1991, which provide an assessment of macro-economic performance seven weeks after the reference quarter (Reininga, Zijlmans, and Janssen, 1992; Algera and Janssen, 1994). We now introduce a new, even faster estimate of quarterly GDP growth, to be released three to four weeks before the official first flash estimate. Before presenting the new estimate, we will shortly review the issue of decomposing time series.

SEASONAL EFFECTS AND OCCASIONAL EVENTS

Economic performance is generally affected by four phenomena: trend, business cycle, seasonal effects and occasional events. The current Quarterly National Accounts figures are adjusted for seasonal effects and research is being done on how to correct the figures for occasional events.

Although the impossibility for seasonal adjustment procedures to meet all theoretic requirements at the same time is well documented (see Lovell, 1963), in practice many seasonal adjustment procedures seek to approximate the seasonal component in time series. However, Den Butter and Fase (1987) show that none of the procedures for seasonal adjustment they investigated, could identify the known seasonal pattern of a simulated time series.

Consequently, the adjusted time series may still contain seasonal elements. In that case a judgement of the business cycle on the basis of the inadequately adjusted series can be a hazardous task.

Note: The views expressed in this paper are those of the authors and do not necessarily reflect the views of Statistics Netherlands or the Netherlands Bureau for Economic Policy Analysis.

Here, GDP growth is calculated as the growth rate between a certain quarter and the corresponding quarter one year before. In this way the seasonal component is eliminated implicitly. Only shifts in seasonal patterns, for example because of technological changes and changing customs, will appear in the figures.

Having eliminated several seasonal effects in this way, occasional events remain a serious impediment to the analysis of the business cycle by GDP figures. Such events, like changes in the number of working days, weather conditions, strikes, influenza epidemics and floods, may have a large impact on GDP growth. Therefore a quantitative assessment of the occasional component would greatly increase the relevance of GDP growth figures as an indicator of cyclical fluctuations. Removing both seasonal and occasional components from GDP growth figures enables the construction of so-called "business cycle" relevant growth figures. Such a series may serve as an optimal reference series for leading indicators as well as tendency indicators.

In examining the new faster estimate of GDP growth we found that adding information on the number of working days and shopping days to the rather limited amount of statistical information improved our results in terms of reliability. Apparently, the assessment of the average effect of these "calendar effects" can be used for forecasting purposes together with information on the number of working days and shopping days in the reference quarter readily at hand. Moreover, the quantification of these calendar effects can be used to construct an experimental time series of the "business cycle" relevant GDP growth.

A New Fast Estimate of GDP Growth

We aim to present fast estimates of GDP growth by means of simple regression techniques. However, in order to mimic the estimation procedure of the official flash estimate as closely as possible, our new fast estimate is bound to the same limitations with respect to the choice of underlying data. Therefore the estimate is to be constructed from observations on facts and not from expectations and assumed relationships between expectations and realizations.

Part of the gain of time is due to the use of simple regression techniques, which enables us to skip the laborious statistical compilation process, which is typical for the production of statistics. However, it also prohibits the use of the expert knowledge and intuition of the specialists who compile the flash and regular estimates. Therefore regression techniques are expected to yield less reliable results than those used to compile the flash estimates. Only a substantial increase in speed will warrant this change in technique. The goal is set at the presentation of (econometric) estimates within four weeks of the reference quarter. This implies a fast estimate, three to four weeks earlier than the original flash estimate. This in turn leads to rather stringent demands concerning the early availability of external variables to be used. Our analysis has to be restricted to monthly and quarterly data with a delay of four weeks at the most.

GDP can be estimated by three different methods: according to income, expenditure and output, all of which should yield the same result. In reality persistent problems in the compilation process of statistics cause severe deviations of this theoretical outcome. Consequently, balancing procedures have developed which, at least partly, combine income, expenditure and output information, and these seem to offer the most promising results as far as reliability of the estimates of (real) GDP is concerned.

In principle, our econometric equation should reflect this insight from traditional statistical methods. However, the required delay of four weeks or less cannot be met by income data. Therefore, the econometric equation only contains output and expenditure variables that are assumed to be relevant indicators of GDP.

An econometric estimate of GDP growth on the basis of the output method would ideally imply the use of separate data on real output growth in every industry. However, the availability of data in The Netherlands precludes such an "ideal" regression.

Fortunately, a monthly output index of the manufacturing industry is available. Seven weeks after the reference month this so-called production index (PI) offers information on the output in this sector. This means that four weeks after a reference quarter output information on the first two months of a quarter is available. Moreover, long time series going back to the early sixties are available.

Alongside the manufacturing PI we also have a PI of the construction industry at our disposal. Although this particular branch of industry accounts for only 5.7 percent of GDP (in 1993), its output is affected by bad weather conditions. Consequently, this index might prove to be of particular interest to approximate the overall impact of occasional events, such as lengthy periods of cold weather, on real economic growth. The speed of this index is similar of that of the manufacturing industry PI. Unfortunately, the construction PI is only available for 1988/I to 1994/II.

As early output data for other parts of the economy are lacking, the two indices are the only variables reflecting the output method. This might seriously deteriorate the reliability of the results of the econometric method as the contribution of the two industries to GDP is only 25 percent (1993).

To improve the estimate of GDP growth by means of output variables we decided to add an overall indicator of economic performance to the equation. In spite of problems due to a possible time lag between changes in employment and changes in GDP, total employment might be a very suitable indicator in this respect. However, data on total employment are not available in time. On the other hand, data on unemployment are published three weeks after a reference quarter. Therefore, although it is a less suitable indicator of overall economic performance than employment, due to possible disturbances from the supply side of the labour market, it is the only one which can be used.

As far as expenditure data are concerned monthly figures on household consumption and exports of goods and services are made available fairly quickly. These two expenditure categories account for over 75 percent of total expenditure in The Netherlands (1993). Information on consumption and exports is available eight weeks after a reference month.[1]

[1]Due to the liberalisation of the intra-EC trade in 1993, Statistics Netherlands was forced to redesign its observation of imports and exports of goods and services. This change has led to a significant delay in the publication of trade statistics and a loss of reliability. It is expected that in the next years the foreign trade statistics will regain their accuracy and timeliness.

Preliminary Econometric Results

The first stage of our analysis was to arrive at a basic specification of the regression equation. The choice of variables was limited by those (partly) available within four weeks of the end of the reference quarter. However, where available, it was assumed that the time series of a variable could be founded on data on all three months of a quarter. The actual situation, that in general only data on the first and second month were available, was addressed in the second stage of our analysis. At this latter stage the choice of variables, which was decided on before, remained unchanged. In a third stage new variables were added to compensate for calendar effects and the impact of bad weather conditions.

Our assessment of the econometric results is not only based on the traditional indicators of the so-called "fit" of the regression. As our goal is to estimate economic growth within four weeks after the reference quarter, the reliability of the estimates in a retrospective simulation process also plays an important role, especially in stages two and three of our analysis. Moreover, in the third stage they are considered even more important than the traditional indicators.

The reliability of the new flash estimate can be evaluated in terms of deviations from the first regular Quarterly National Accounts as well as in terms of variance. A good summary indicator, which takes both into account, is the probability that the "forecast" error exceeds a predetermined reliability standard. In the evaluation of the flash estimate an error of 0.5 percent point was considered to be the maximum to be tolerated. The initial evaluation of our fast econometric estimate is based on this standard. As the official release of the flash estimate started in 1991/II, our retrospective simulation period is from 1991/II to 1994/IV.

In the first stage of our analysis it was assumed that the available variables were founded on data on all three months of a quarter. We had time series on industrial output, construction, unemployment, household consumption and exports at our disposal. No significant relation between construction and GDP was found, probably due to the short length of the time series. All time series are expressed in relative changes (percentages) with respect to the corresponding quarter one year before. The result was:

$$\text{gdp} = 0.10 + 0.31\ \text{pi} + 0.50\ \text{cons} - 0.12\ \text{unempl} + 0.09\ \text{exp}$$
$$(t\text{-value})\quad (0.3)\quad (5.2)\quad (4.4)\quad (-1.2)\quad (1.8)$$

R^2 (adj.) = 0.75
Durbin–Watson Statistic = 2.03
Estimation period: 1982/I–1994/IV

gdp = gross domestic product
pi = production index of industrial output (manufacturing)
cons = household consumption
unempl = unemployment
exp = exports

Despite a strong multicollinearity between the production index, unemployment and consumption, the t-values for their respective coefficients are relatively high. Therefore, it was decided not to drop any of them.

In contrast with the assumption above, full information on the production index, household consumption and exports was not available: data on the last month of the last quarter is lacking. There are three ways to accommodate this lack of information. First, one may assume that the data on the first two months of a quarter are representative for the quarter as a whole. This assumption does not allow for a continuous growth or decline during a quarter as the third month will always be an average of the first two. Secondly, one may declare the second month as representative. This assumption, however, does not allow for a cyclical change within a quarter. Thirdly, one may introduce a time lag, assuming a kind of autoregressive trend within a time series.

The decisions taken were not only based on the t-values and R^2, but also on the performance on the retrospective simulation. It turned out that in general the use of the second month of a quarter led to more satisfactory results than the use of all information available. Further it was found that for exports a time lag of two months was to be preferred, although, it is uncertain whether this result will hold for many years. The value of the regression coefficient and its significance very much depends on the length of the time series. If longer time series become available another solution might have to be found for the lack of information on the third month. The result of the second stage was:

gdp	$= 1.16 +$	$0.11\ \text{pi2} +$	$0.26\ \text{cons2} -$	$0.039\ \text{unempl} +$	$0.079\ \text{exp}_{-2}$
(t-value)	(3.8)	(3.3)	(2.8)	(−4.1)	(1.6)

R^2 (adj.) = 0.69
Durbin–Watson statistic = 1.94
Estimation period: 1982/I t/m 1994/IV

gdp = gross domestic product
pi2 = production index of industrial output (manufacturing), second month
cons2 = household consumption, second month
unempl = unemployment
exp = exports

The retrospective simulation over the period 1991/II–1994/IV enables us to assess the reliability of the econometric estimates vis-à-vis the regular flash estimates of Statistics Netherlands. The probability of our estimate exceeding the preset reliability standard of 0.5 percent point is approximately 30 percent, whereas for the flash estimate this probability is only some 12 percent. For this stage it may be concluded that the faster estimate is obtained at the cost of a considerable loss of reliability.

Improving the Preliminary Results

As mentioned above changes in GDP are due to cyclical, seasonal, structural and occasional factors. The occasional factor partly consists of so-called "calendar effects." The number of working days in the reference quarter may differ from the number of working days in the same quarter of the previous year. This will affect the output growth of manufacturing and construction, for example. Similarly, the number of shopping days will affect household expenditure. Normally, these effects are already implicitly included in the right-hand side variables of the regression equation. In our case, however, the exogenous variables refer to only a part of the reference quarter. Therefore, the included calendar effects may differ from the real calendar effect of the quarter as a whole. Correcting for these differences may improve the result of the previous section.

The time series to correct for calendar effects were calculated as the difference of the quarterly growth rate of the number of working days or shopping days and the corresponding growth rate of the second month of the quarter.[2,3] The inclusion of calendar effects led to the following result.

$$\begin{aligned} \text{gdp} &= \underset{(2.4)}{0.69} + \underset{(5.8)}{0.30}\,\text{pi2} + \underset{(4.2)}{0.40}\,\text{cons2} - \underset{(-3.3)}{0.028}\,\text{unempl} \quad (t\text{-value}) \\ &\quad + \underset{(0.67)}{0.028}\,\text{exp}_{-2} + \underset{(2.8)}{0.13}\,\text{tdays} + \underset{(3.8)}{0.19}\,\text{wdays} \end{aligned}$$

R^2 (adj.) = 0.78
Durbin–Watson statistic = 1.96
Estimation period: 1982/I t/m 1994/IV

gdp = gross domestic product
pi2 = production index of industrial output (manufacturing), second month
cons2 = household consumption, second month
unempl = unemployment
exp = exports
tdays = correction for the number of shopping days
wdays = correction for the number of working days

Inclusion of a correction for the number of working and shopping days significantly improved the results. Although the coefficient of exports no longer differs from zero, we decided not to drop this variable as retaining this variable very much improved the results of the retrospective simulation. However, it strengthens our reservations with respect to the specification of this variable. The probability of a forecast error of over 0.5 percent point improved to about 26 percent. The forecast errors of this regression are shown in Figure 1.

An alternative approach to compensate for lack of data is to use calendar information to predict the value of the missing observations on the production index, household consumption and exports, thus completing the time series of the exogenous variables. Then the first mentioned regression specification can be used to arrive at an estimate of GDP growth. This method should be preferred to the

[2]The number of working days is calculated assuming five working days per week. Church and public holidays are not counted as working days. The average number of working days per quarter is 64.

[3]The number of shopping days is the weighted sum of the number of days. The weighting scheme is 0.51 (Mondays), 0.68 (Tuesdays), 0.74 (Wednesdays), 1.14 (Thursdays), 1.55 (Fridays), 1.38 (Saturdays) and 0.00 (Sundays). The weights are based on daily data on household expenditure. The average number of shopping days per quarter is 77.

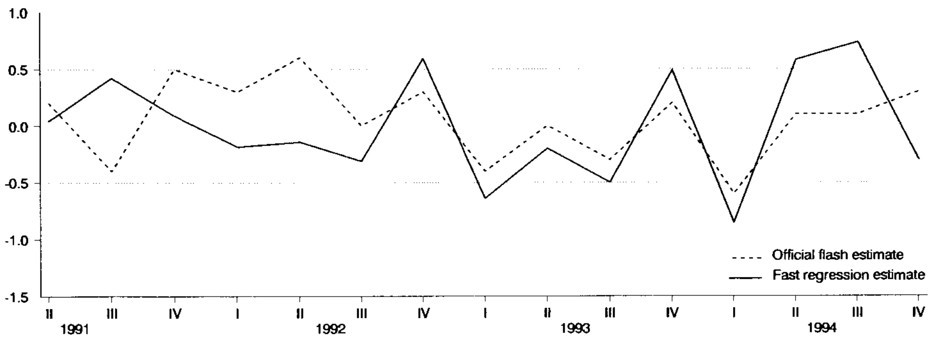

Figure 1. The Forecast Errors of the Official Flash Estimate and the Fast Regression Estimate of GDP Growth, 1991/II 1994/IV

one presented before, as it makes use of all data available. The results in terms of R^2 and t-values were very good. Its performance on the retrospective simulation, however, was very bad, with a probability of exceeding the preset standard of over 40 percent.

Like calendar effects, the proxies for the quarterly changes in the output of manufacturing and household consumption do not fully account for the impact of extreme weather conditions. Yet it is almost certain that such conditions, for example long periods of cold weather or excessive rainfall, affect economic growth. The construction and agriculture industries are particularly susceptible to adverse influence from the natural environment. Unfortunately we could not satisfactorily include such effects in our analysis, despite much daily, monthly and quarterly data on rain and snow, temperature, sunshine etc.

As far as construction is concerned detailed data on the number of working days lost because of bad weather conditions are available. This indicator seemed appropriate to evaluate the weather effect on output in the construction industry, and consequently, on real GDP growth. Again we did not find any significant contribution of these data to the explanation of changes in economic growth. This result may be caused by the rather short time series available (1986/I–1994/II) but may also reflect the fact that, at least on a macro level, weather conditions do not affect real growth as much as was thought in advance.

No attempt was made to correct for occasional events like floods, as in the analysis period, serious occasional events did not happen. Moreover, in general statistical information to model the impact of these kind of incidents is lacking.

A "Business Cycle" Relevent Time Series of GDP Growth

In addition to improving forecast results, the explicit introduction of calendar effects enables the quantitative assessment of their impact on real GDP growth. It can be calculated from the estimated coefficient for the correction for the number of working days that one extra working day accounts for an average of 0.30

percent extra real GDP growth.[4] One extra shopping day accounts for an average extra GDP growth of about 0.17 percent.[5] This rather low additional effect of an extra shopping day might be explained by an offsetting movement in changes in stocks in retail trade as a consequence of this extra day. Using the above results it is possible to construct an experimental "business cycle" relevant time series of GDP growth. The result is shown in Figure 2.

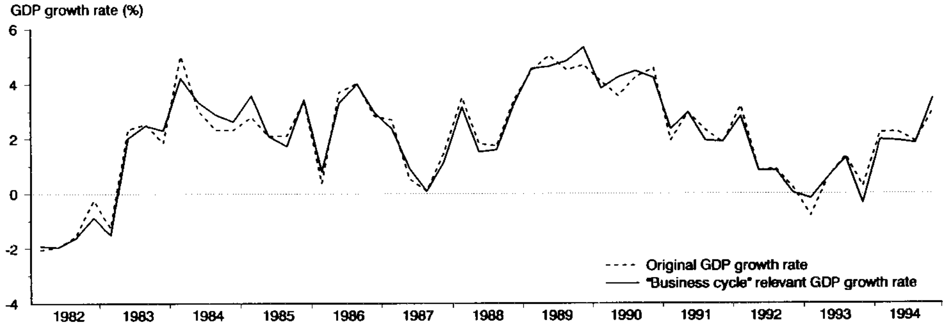

Figure 2. Experimental "Business Cycle" Relevant GDP Growth, 1982–94

The experimental "business cycle" relevant time series of quarterly GDP growth and the original time series show significant differences. The average absolute difference between both series is almost 0.3 percent point. One quarter of all observations in the original time series have changed by over 0.4 percent point.

Conclusions

We have shown that it is possible to arrive at a first estimate of quarterly economic growth three to four weeks before the official first flash estimate, which is published some seven weeks after the reference quarter. This gain is made by using a simple regression technique and incomplete data, at the cost of decreased reliability. The probability of a forecast error of over 0.5 percent point will be about 26 percent, compared with 12 percent for the official flash estimate.

However, if speed is considered more important than accuracy, and a forecast error of 0.7 percent point is acceptable, the probability of the fast regression estimate exceeding this standard is only 12 percent. Coincidentally, this probability equals the probability that the current official flash estimate exceeds its 0.5 percent point standard. As real GDP growth figures are very important indicators of overall economic performance the costs in terms of loss of reliability are considered too high. More research is needed to improve the reliability of the fast estimate,

[4] The average effect of one extra working day is 1.56 percent (1 divided by the average number of working days in a quarter, see footnote 2) multiplied by 0.19 (the coefficient in the regression equation).

[5] The average effect of one extra shopping day is 1.30 percent (1 divided by the average number of shopping days in a quarter, see footnote 3) multiplied by 0.13 (the coefficient in the regression equation).

for example by combining the regression-based estimation process with elements of the compilation process of the official flash estimate.

Finally, our efforts towards a first (econometric) assessment of calendar effects on real GDP growth indicate a rather important impact of working day fluctuations. The experimental "business cycle" relevant time series of GDP growth, which we were able to construct, shows significant differences from the original time series. This indicates that further research on eliminating calendar effects to enable the publication of calendar day corrected Quarterly National Accounts will benefit our insight into real economic performance.

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