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THE RELATIONSHIP BETWEEN MANUFACTURING PRODUCTION AND DIFFERENT BUSINESS SURVEY SERIES IN SWEDEN

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Abstract

The Relationship Between Manufacturing Production and Different Business Survey Series in Sweden.

by

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The relationship between production in Total manufacturing measured as an ordinary volume series and various barometer series from the Swedish Business Tendency Surveys is investigated using data from the period 1968-1990. Models are constructed using a systematic strategy aiming at parsimonious models within the Autoregressive-Distributed Lag (ADL) class. Autoprojective models that serve as a baseline in the comparisons are estimated. The performance of these models is compared with models that include barometer series.

In the main seasonally unadjusted series are used and models formulated both in terms of quarter-to-quarter and annual changes are considered. As regards immediate ease of interpretation, the latter have an advantage, but there is not much difference between the quality of the two types of models. The best barometer series is found to be volume of production and a model including this series is a significant improvement on the best autoprojective model. There is a close relationship between the barometer production series and the annual change in the volume series. About twenty-five other barometer series are also considered, but they are not found to provide additional information.

In order to come closer to a forecasting model, ex ante variables are also considered. The connection between each ex ante and the corresponding ex post variable is investigated including a study of possible lagged and seasonal effects. Finally models based on the information set available at time-point "t-1" are obtained.

1. Introduction.[1]

Business surveys have now been in use for some considerable time in many countries. Business survey (barometer) data are typically qualitative with very few scale steps.The most common situation is questions with three possible alternatives of the type "increase", "no change" and "decrease". Questions with two alternatives of the type yes/no also occur frequently. As used in practice, the information from the trichotomous variables is often further condensed by the introduction of balances (net tendencies) which are computed as the difference between the "increase" and "decrease" alternatives.

Intuitively it seems reasonable to assume that there should be a connection between barometer type series and the corresponding ordinary quantitative series for e.g. production. Using specific assumptions regarding the basic distributions of the variables considered, when an "unchanged" answer is given etc , it is possible to obtain the connection between the quantitative and qualitative series (see e.g. Theil 1966).

A number of studies of the connection between qualitative and quantitative series have been performed. Just a few examples are Klein (1983),Yaun (1983), Teräsvirta (1984) and (1985) and Öller (1989), (1990). The Finnish studies discuss methodological issues to a considerable extent and these studies have influenced the methodology employed in the present study. Without going into details regarding the results of previous studies one gets the impression that the connection between qualitative and quantitative series is not always strong.

In Sweden The National Institute of Economic Research (NIER) - Konjunkturinstitutet (KI)- has conducted the Business Tendency Survey (BTS), Konjunkturbarometern, since the 1950s. The BTS has been described and studied from various points of view by among others Lönnqvist (1959),Virin (1968) and (1973), Persson (1983) and Knudsen & Norlin (1990).

[1] I am grateful to Konjunkturinstitutet and particularly Roger Knudsen and Pekka Kääntä for putting data at my disposal. I also wish to thank Ann-Sofi Lönnquist and Anders Sundström for help with the collection of further data and preliminary analyses. The research reported in this paper has been supported by Ekonomiska Rådet at the NIER.

The purpose of the present paper is to study the connection between production in the manufacturing industry and the production series in the Business Tendency Survey. We are also going to study whether other BTS series have explanatory value for production. In addition to ex post series we shall also look at ex ante series. This analysis includes a study of the connection between ex ante and ex post series. The volume series will be analyzed both in the form of quarter-to-quarter changes and as annual changes. We shall limit ourselves to the use of the BTS series as balances in the present paper , although it has been found in some cases that use of the full trichotomous scale can be more efficient.

The remainder of the paper is organized as follows. Manufacturing production during the study period (1968-1990) is described in section 2, followed by a brief description of the Business Tendency Survey in section 3 and an outline of the modelling strategy used in section 4. Sections 5-8 deal with models for the annual change in production, while section 9 gives similar results for the quarterly change in production. In both cases autoprojective models are compared with models that include BTS variables. Section 10 includes a comparison between the models based on annual and quarterly changes. Section 11 compares ex post and ex ante variables and in section 12 models with ex ante variables are estimated.

2. Manufacturing Production 1968-1990

For the production volume, we have used two different series.One is the production index computed by Statistics,Sweden (Statistiska Centralbyrån, SCB) and regularly published in Statistiska Meddelanden (SM), series I.We have used monthly index values adjusted for irregularities of the calendar (normalmånadskorrigerade indextal) as available in the databank at the NIER at the end of 1990. From the monthly index figures in the form of integers, quarterly index figures have been computing by averaging the monthly figures. These values without rounding to integers have been used in the analysis of the quarterly data.

As the rate of change is of central importance in our analyses, the accuracy of the index figures may cause some concern. A change from e.g. 106 to 107 could in reality mean anything from no change at all to an increase of 1.9%.

In the long run the rounding errors will of course cancel, but we have also considered a direct volume series in fixed prices based on the quarterly national account statistics. Here, too, the series adjusted for calendar effects (dagkorrigerade värden) have been used. The two production series were reasonably similar. In the following we just report results based on the index series.

An inspection of the original production index series, which we denote M, immediately shows that the series is dominated by the seasonal variability (Figure 1). This variability is so large that it is difficult to discern the trend and cyclical component, although some of the larger cyclical swings can be seen. The seasonal variability is remarkably stable over the period. On the basis of seasonal adjustment by the X-11 procedure, we find that the second quarter effect has been close to 1.08 during the whole period. The fourth quarter effect has slowly increased from 1.065 to 1.10. This increase is compensated by a decrease in the first quarter effect, from 1.025 to 1.000. The third quarter effect is fairly stable at 0.82.

The seasonally adjusted series is much easier to interpret, as shown in Figure 2. Here we can for example see the effects of the labour market conflict in 1980. To see the trend-cyclical development even more clearly we can use the Henderson smoothed curve in the figure. Disregarding minor fluctuations, we find a long period with increasing production, which ends in 1974:3 at a level 34 % above that in 1968:1. During this period, there is a minor trough in 1971. From the peak in 1974, there is an almost uninterrupted decrease in production until 1978:1, when the level is 12 % below that in 1974:3. During this period there is a minor recovery in 1976.

The upturn after the trough in 1978:1 is short and fairly small,the following peak arriving already in 1979:3 and only 10 % above the level of the previous trough. The downturn after this peak lasts for three years, the trough in late 1982 being 6 % below the level of the previous peak. The remaining part of the 1980s has seen an almost uninterrupted increase in production. Already in 1985:3 a level 16 % above that of the previous trough is reached. In 1989:1, which seems to be the latest peak, the level has increased further but only by about 6 %. The period after 1985, characterized by a general increase in production, also includes short periods when production has decreased (1986 and 1988).

Several of the important variables in the BTS are formulated in terms of changes. Consequently the development of production measured as (percentage) change is of considerable interest. Fig 3 and 5 show the variables $\Delta m = \log M - \log M_{-1}$ and $\Delta 4m = \log M - \log M_{-4}$ respectively. These variables are of course basically the quarterly and annual relative changes in production. The quarterly change is completely dominated by the seasonal variation and the series is more or less useless as an instrument for direct business cycle analysis. Quarterly changes based on seasonally adjusted series, Fig.4, are easier to interpret, but the random variation is large. This series reflects the cyclical variation rather less strongly than might perhaps have been expected.

The series showing the annual changes, on the other hand, is more regular and shows a marked cyclical pattern, although considerable random variation can also be found. Peaks can be observed in 1973, 79 and 84. As expected they all occur 1-2 years before the peak in the level series and the annual rate of change is 8-10 % at the peak. The development during the latter half of the 1980s is more irregular. Thus the annual growth rate dropped from 3.5 to -2.1 % in 1988:3, then rapidly increased again to 6.8 % in 1989:1.

From the discussion above we conclude that the series in the form of annual changes is most suitable for business cycle analysis. Use of quarterly changes requires a correct modelling of the seasonal effects. However the barometer questions in general refer to quarterly changes and not annual changes, which is a strong argument for the consideration of quarterly changes as the dependent variable. In view of this we are going to consider models with both the quarterly and the annual change as the dependent variable. It is obvious that the production series both in the form of quarterly and annual changes is stationary. Thus the assumption of stationarity should cause no difficulty in the cases when such an assumption is required.

During the period under consideration a major labour market conflict occurred during the second quarter of 1980. Dummy variables denoted D802 and D812 equal to 1 in 1980:2 and 1981:2 respectively are used to capture the effects of this conflict.

3. The Business Tendency Survey (BTS)

The Business Tendency Survey contains six groups of questions according to the lay-out of the questionnaire. As shown in Table 1, the first eight questions (B101-B108) refer to the situation during the present quarter as compared with that of the previous quarter with an instruction that seasonal effects shall be disregarded when the answer is given. All these questions have three alternatives of the type "larger than", "unchanged" and "smaller than". In the presentation of results so called "net tendencies" or "balances" are most commonly used. These are obtained as the difference between the first and the third alternative. Of specific interest among the questions of the first group is B101, which refers to the volume of production.

The second group of questions (B201-B213, B215-B218) have a heading of the type "The situation around December 15". In most cases they refer to the situation at the time of answering, e.g. whether there is a shortage of skilled workers. Despite the heading, all questions do not really refer to the situation two weeks before the end of the quarter. Some of them concern changes compared with the beginning of the quarter (B202, B204, B205, B210 and B212). Thus they are really of the same type as the questions in the first group. Several of the questions have alternatives of the yes/no type and the proportion of yes answers is the most commonly used figure in these cases.

The third group of questions (B301-B308) concerns the expected situation one quarter ahead compared with the present quarter. They are ex ante questions exactly corresponding to the ex post questions in group one. The fourth group of four questions deals with the expected situation at the end of the following quarter compared with the present-day situation (April 1 compared with Dec 15 in our example).

Finally there are two groups of questions described as "Other" and "Extra". In the present paper, we are going to use only variables from the first three groups of questions and use only the net tendencies (or corresponding measures). It has been found that the original alternatives may contain information not reflected in the net tendencies (Teräsvirta, 1985) and a separate analysis in line with this will be performed later.

The BTS figures are published regularly in Konjunkturbarometern. We have used the data as given in the data bank at the NIER, which in some cases means minor differences compared with the published series. In some cases these differences are due to revisions caused by changes in the sample of firms, in other cases the reason for small differences has not been possible to establish.

4. General Modelling Strategy

Loosely speaking we are interested in the connection between the ordinary production volume series and the barometer series. In particular we want to see whether barometer series can explain the development of the volume series and if other barometer series than the basic production series provide additional information to this series or perhaps are superior to this series.

It is obvious that we have a large number of series to choose among. In addition we have to consider lags, which means that the number of possible alternative models is very large indeed. Thus some sort of overall modelling strategy should be employed.

We are going to restrict ourselves to the case where the volume series is the dependent one, although the reverse regression might also provide valuable information. In principle we want to see whether barometer series can explain the development of the production volume series.

However, we also want to see if models which include barometer data are an improvement on various naive and not so naive models. In particular we want to see whether we can improve on an autoprojective model that uses only the development of the dependent variable at earlier time points as explanatory variables.

The modelling will be performed within the general framework of the Autoregressive Distributed Lag (ADL) model, thus excluding for example transfer function models based on the Box-Jenkins methodology. The ADL model is a flexible class of models, which is fairly easy to work with. The basic ADL model can be written

$$y_t = \beta_0 + \beta_1 y_{t-1} + .. + \beta_k y_{t-k} + \gamma_0 x_t + \gamma_1 x_{t-1} + ... + \gamma_r x_{t-r} + \varepsilon_t \qquad (1)$$

in the special case of just one explanatory variable. The residual is assumed to be white noise.

Given this general framework we first have to decide the optimal lag length of the dependent and independent variables. As regards the dependent variable we are first going to estimate an optimal AR model fixing the maximum lag and possibly deleting unnecessary intermediate lags.

For the explanatory variable of main interest, B101, a model without lags of the dependent variables will also be obtained.

Using results from these preliminary modelling exercises we then estimate the full ADL model with B101 as the explanatory variable. We then consider the relationship between other barometer variables and production volume, finally testing whether these other barometer variables have additional explanatory power in the presence of B101.

In general we start with models with a very general lag structure and then test down towards more parsimonious models that incorporate the main features of the data. In the comparison of different models we employ the Schwarz information criterion (BIC) as a basic tool. The BIC criterion is defined as

$$BIC = \log \hat{\sigma}^2 + (k/T) \log T \qquad (2)$$

where $\hat{\sigma}^2$ is the ML estimate of the residual variance, k the number of estimated parameters and T the number of observations.

Like other information criteria it penalizes a model for the inclusion of extra parameters. Use of the BIC criterion emphasizes parsimony and leads to more parsimonious models than e.g the maximum $\bar{R}^2$ criterion.

Several diagnostic tests are performed. Results of the LM-test for residual autocorrelation and the Chow test for parameter stability will be reported. In the former case χ^2 values are given in the tables, with P-values based on the F-form of the test also shown.

5. Autoprojective Models

An aim of the present study is to see to what extent it is possible to explain the behaviour of the quantitative production series by means of the variables in the Business Tendency Survey. To obtain a baseline for the comparisons we are going to estimate autoprojective models that are only based on the series itself in the past. In order to get a more genuine test of the models, we use data up to the end of 1987 for estimation and save the 11 observations from 1988:1 onwards for predictive testing. Although this is a common strategy and the period is a reasonably long one compared with many other prediction periods used in the literature, it is obvious that the results of this predictive testing will be fairly uncertain. Therefore we are also going to consider models based on data to the end of 1981 and use 1982:1- 90:3 as a very long prediction period. This is a much more severe test of the models obtained than is usually performed. It should be pointed out that when the basic structure obtained from the longer estimation period is employed this is not predictive testing according to a very strict definition.

When selecting the models, we make two choices, viz.

1. The optimal lag length.
2. Which lags to include given the optimal lag length.

When estimating AR models, it is known that often quite a large number of lags is necessary to obtain white noise residuals (for an example see Engle et al 1990).

In view of this, the maximum lag considered is as long as 12. The estimation period is 1972:1-87:4 throughout to make comparisons possible. Results are shown in Table 2. In the initial model with 12 lags included, lags 1,2,4 and 8 are significant. Consequently elimination of the longest lags improves the model. The increase in the estimated standard deviation of the residual, $\hat{\sigma}$, is small until we eliminate lag 4, remaining around 2.7%[2] with a slight increase as the model becomes more parsimonious. The BIC criterion shows a marked decrease as we delete lags, reaching a minimum at lag length four.

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[2]The correct expression would be percentage points, but to shorten the presentation we will use % in the following.

The residuals are random during the whole process . The elimination of lag 4, however, leads to a sharp deterioration in the randomness of the residuals. The Chow-test for parameter constancy does not reveal major changes between the estimation and prediction period, although there is a tendency towards larger F-values for more parsimonious models.

Having fixed the lag length at four does not necessarily complete the modelling exercise. It may be suitable to eliminate certain of the first four lags too. It is in fact found that elimination of lag 3 substantially decreases the BIC score, without any negative effects. Thus we end up with a model that includes lags 1,2 and 4 and where all three parameters are strongly significant. The standard deviation of the residuals in the estimation period is 2.69% and the RMSE in the prediction period is 3.34%.

6. Models with B101 as the Only Explanatory Variable

Fig 5 shows the development of the BTS series B101, the barometer series that by definition is closest to the change in production measured as a volume series. We can discern a fairly regular series with peaks in 1969, 1974, 1979/80, 1985 and "at some time" during the latter part of the 1980s. There are troughs in 1971, 1976, 1978, 1981 and 1986. The peaks and troughs are fairly sharply defined except during the latter part of the 1980s, when the peak level was sustained for a considerable time. The time pattern of the B101 series is remarkably similar to that of $\Delta 4m$ as shown in the figure.

One interpretation of this similarity is that the respondents in reality give information on the situation as compared with the same quarter the previous year. One reason for this might be that this is easier than a comparison with the previous quarter, where the seasonal variation must be accounted for.

The part of the observation period where the similarity is less striking is the latter part of the 1980s, where e.g. we see no correspondence in the barometer series to the low value of $\Delta 4m$ in 1988:3. The turning-points of the two series occur at about the same time, although there is a tendency for B101 to lead $\Delta 4m$ in 1978 and 1979.

The maximum lag length considered in the models with B101 as the explanatory variable is five. From Table 4, it is clear that an improved model is obtained if lags 1, 2 and 5 are deleted. The model thus obtained has a lower residual standard deviation than the earlier autoprojective model. There are clear signs of autocorrelation in the residuals, however, and the Chow-test is close to significance. Although the RMSE of the residual is larger in the period 1988:1-90:3 than in the estimation period, it is still smaller than for the autoprojective model.

A model with B101 in unlagged form as the only explanatory variable produces a parameter estimate of 0.00262 with a standard error of 0.00019. The constant term is almost exactly 0, while $R^2 = 0.7188$ and $\hat{\sigma} = 2.38\%$.

With the long prediction period 1982:1-1990:3, we find that the estimated parameters are not much influenced by the reduction in the sample period. The estimated residual standard deviation in that period is 2.07 %, while the RMSE in the prediction period is 2.33%. The 1980 labour market conflict dummies are not quite significant and do not change the results very much, although the tendency towards autocorrelation is reduced.

7. ADL Models with the BTS Variable B101

The general strategy has again been to start with a general model and then simplify this model with the BIC criterion an important tool in the choice between models. For the dependent variable, we have used lags up to the order 5, while for B101 the maximum lag length considered is 4. Table 6 shows some important results. A lag length for the dependent variable of four, which would be consistent with the autoprojective results does not produce a substantially different fit compared with the lag length 5 shown in the table. A major difference is, however, that serial correlation is introduced if lag 5 is dropped from the model. This lag is in general strongly significant. Consequently it has been included in the models.

Lags 2-4 of B101 can be deleted without much discussion. Lag 1 is more doubtful. The estimated parameter is about half that of the unlagged variable and the t-value 1.61 does not imply significance. The BIC criterion chooses the model without lag 1.

Inclusion of conflict dummies produces only a marginal improvement. The individual conflict parameters are not quite significant, but of similar size. The prediction properties of the model are not much influenced by an inclusion or exclusion of the conflict dummies.

The Chow test based on the short prediction period is clearly significant, with larger errors in the period 1988:1-1990:3 than in the pre-1988 period. The RMSE for this period is 3.14% compared with a standard deviation of residuals in the estimation period of 1.86%. There are two large errors during the prediction period that explain a large part of the RMSE. The error in 1988:3 is +5.1 percentage points and that in 1989:1 - 6.0 percentage points. The RMSE excluding these quarters is 2.28%, not much larger than in the estimation period.

With the longer prediction period, the Chow-test is not significant (P=0.10). Again a large part of the error is explained by the two quarters mentioned above. Exclusion of these reduces the RMSE to 2.03%.

A comparison with the results of the autoprojective models shows that for the shorter prediction period inclusion of B101 leads to an improvement, while this is not so for the longer prediction period. In the estimation period on the other hand the superiority of the model that includes B101 is very clear, which agrees with the fact that B101 is strongly significant (t=7.53) even in the presence of lagged dependent variables for the longer estimation period.

8. The Explanatory Value of Other BTS Variables

Table 8 shows some basic results. All variables except B108 in the first group have positive mean values. As they refer to changes, this implies that the basic variables on the average have a positive trend in the period studied. Not surprisingly this tendency is most pronounced for the price variables. For a variable such as B201 describing the situation at a given time the mean value 48.5 implies that on the average 48.5 % of the firms have had full capacity utilization during the period.

In many cases the variables are lagged relative to each other. Knudsen & Norlin (1989) contains a detailed analysis of this time structure relative to industrial production measured as a volume series. In the following we will compare various BTS series with the change in our production index series. As we are working with the annual change in production, the time pattern of the different BTS series relative to that of the Δ4m-series is important. The figures in the Appendix show the BTS series and it is obvious that they in general are trend-free.

Table 9 shows the correlation between Δ4m and barometer series lagged various quarters. The lag that produces the maximum correlation is indicated. In most cases this lag is 0, but there are examples of a few series that lead the change in production series as well as series which lag this series. The highest correlation shown by any series is that of B101.

It was mentioned in the description of the BTS that some of the series describe the situation at a certain point in time. As our volume series of basic interest reflects changes, an argument can be put forward for a consideration of these barometer series as changes.

Table 10 shows results of a use of changes in barometer series. A general impression is that the series in the form of changes are more irregular than the original series, and consequently has lower correlations with Δ4m. Another striking feature is that the maximum correlation has moved to the left in the table. Thus these series lead the change-in-production series by three quarters in several cases, a result that might be of interest in the search for leading indicators.

As our aim is not primarily to find series with a maximum lead relative to the change in production and in view of the lower correlation than with the original barometer series, we are not going to consider the barometer series in change-form further in the present context. In the further analysis, we have considered the following BTS variables in addition to B101: B102-B108, B201-B213, B215-B218.

A description of the variables is given in Table 8. Most of the variables are also shown in the Appendix. It is obvious that quite a few of the variables reflect the cyclical activity in a way that is similar to that of B101. Therefore it is quite possible that the model obtained so far may be improved, if other variables are added to the model.

To gain some insight into the relationship between the variables, we start by looking at the correlation between the variables. Many of the variables are highly correlated with B101. There are 12 variables with a correlation coefficient (positive or negative) of at least 0.7. Not unexpectedly the lowest correlation is shown by the two price variables.

Another way to illustrate the interrelationship between the explanatory variables is to compute principal components. The first principal component accounts for 58.3 % of the total variability and the first five explain 88.3 % of the variability.

Table 11 shows results for the individual variables. With each variable included as a current period variable only, we find that all variables are significant at the 5 % level. Five of the variables are negatively correlated to the annual change in production. The production variable B101 is clearly the best variable with $\hat{\sigma}$ = 2.37 %. The second best variable is B107 (purchases of raw materials) with $\hat{\sigma}$ = 2.79 %.

Inclusion of lagged values of the BTS variables has two purposes. One is to possibly improve the model by the incorporation of lagged effects of variables in cases where the main effect is from the current variable. The other is to see if there are variables that lead the change in production, which would show up as significant lagged effects. Most of the significant effects that we find are associated with lag 4 and have a sign that is opposite to that of the variable with lag 0. This is a consequence of the differencing procedure and not too much should be read into it.

In many cases the residual standard deviation is considerably reduced by the inclusion of lags. It would be possible to analyze the optimal representation of each variable in detail, thus in general perhaps finding that certain lags can be deleted. However, as they stand, the models of type (1) and (2) in Table 11 are not satisfactory as they contain autocorrelated errors in many cases. They can be improved by inclusion of lagged values of the dependent variable but we will not perform any further analyses of these models.

When the lags of the dependent variable are introduced, we use the lag structure of Δ4m obtained in the case of B101, otherwise repeating the analysis performed above.

A number of variables do not provide significant information in addition to the autoprojective model. However, seventeen of the variables are still significant. The production variable B101 is again the best variable, the $\hat{\sigma}$ now being 1.86 %. The parameter of the variable has been reduced in size, the estimate now implying an effect of a 10-unit change in B101 of 1.7%. The second best variable is still B107 (purchases of raw materials) with a $\hat{\sigma}$ of 2.16 %.

Addition of up to four lags of each BTS variable in very few cases reveals further significant variables. Even in the few cases, where significant results are obtained the improvement in the model is not large. This means that a detailed analysis of the optimal representation of each variable on the basis of e.g. the BIC criterion is unnecessary. It is sufficient to consider each variable in unlagged form.

The final part of the analysis consists of estimation of models with each of the variables B102-B218 added to the optimal model including B101 as obtained earlier. The results are very conclusive. In each case the additional variable is insignificant, while B101 retains it significance. Thus the basic BTS production variable B101 contains all relevant information in the BTS regarding change in production measured at the annual rate.

9. Models for the Quarterly Change in Production

We have noticed before, that it is difficult to discern the trend/cyclical development on the basis of the quarterly changes in the production series. Nor is it easy to see, whether there is any connection between the quarterly changes and the barometer series. Nevertheless, it is still possible that a suitable modelling directly in terms of Δm might reveal such connections.

Table 12 shows results of an autoprojective modelling exercise. In the largest model with 12 lags, there are two significant variables in addition to the seasonal terms. These are the lags at 1 and 7. A reduction of the number of lags substantially decreases the BIC criterion. The finally chosen model includes just one lag with a negative parameter. The residual standard deviation of this model is slightly larger than that of the corresponding autoprojective model in the annual change case.

Models with just B101 are in general found to have strong serial correlation in the residuals. The chosen model includes B101and $B101_{-1}$. This model has a lower estimated σ than the best autoprojective model.

The general ADL modelling leads to quite a parsimonious model with three lags of the dependent variable and B101 in current forms as the variables finally included. The estimates of all lagged variables of the quarterly change in production are negative, while a 10-unit increase in B101 leads to an increase in the quarterly growth rate by 1.69 percentage points, a figure close to that obtained in the model for annual changes. The $\hat{\sigma}$ of the model is 1.78%, which is slightly better than the 1.86 % of the model for the annual change. In terms of R^2 with the logarithm of M as the dependent variable, the selected models imply 0.9819 for the quarterly change model and a slightly lower figure of 0.9798 for the annual change model.

Table 18 shows results for the other BTS variables in relation to the quarterly change in production. As a baseline, we can use a model with just seasonal dummies, which produces a $\hat{\sigma}$ of 2.70 %, which can be seen as the standard deviation of the quarterly changes after adjustment for the seasonal effects. With B101 included in current form only, this figure is reduced to 2.38 %. B101 is clearly the best of the BTS variables, the second best variable being B105 (domestic orders received). The significance of the BTS variables is weak compared with the annual change case. This is also illustrated by the much greater reduction in the standard deviation of the dependent variable in the annual change case, (from 4.43% to 2.37% after the inclusion of B101).

Addition of lags of the BTS variables in general produces few significant results and no great changes in the $\hat{\sigma}$ of the equation. The effects are much

With each BTS variable in current form added to a model with three lags of the dependent variable, we are able to reduce the $\hat{\sigma}$ in the case of B101 to 1.76 %. An improvement in the estimated equation is obtained for many other variables, too. None of the variables is close to B101 in explanatory power, however, the second best variables being B105 and B107.

What is extremely interesting is, however, a comparison between these models and the corresponding models in the annual changes case. We obtain very similar results both as regards the size of the ß-parameter, the significance of the estimate of this parameter and the standard deviation of the residual. The significance of the β estimates is in fact in general stronger in the quarterly case.

Addition of lagged values of the BTS variables in few cases produces noticeable effects. As a consequence of this, it seems to be sufficient to consider only the current form version of each of the other variables, when we test if they add anything to a model that already includes B101. This exercise ends in the same results as in the annual change case. We do not obtain significance in one single case out of the 24 considered and the parameter of B101 is changed to a very small extent. The conclusion again is that the other variables contain no extra information in addition to B101 regarding quarterly changes in production.

10. A Comparison of the Δm-and Δ4m-Models

So far we have developed two models which do not seem to differ much with regard to within-sample accuracy. As regards ease of interpretation the differences are large, on the other hand. As the models stand a more direct comparison is not easy due to the different dependent variables. If, however, we recognize that the fundamental variable in both models is m, it is possible to consider both models as restrictions of the same general model. This is the following model

$$m_t = \beta_0 + \beta_1 m_{t-1} + \beta_2 m_{t-2} + \dots + \beta_9 m_{t-9} + \beta_{10} B101_t + \beta_{11} Q_{1t} + \\ + \beta_{12} Q_{2t} + \beta_{13} Q_{3t} + \varepsilon_t \qquad (3)$$

The annual change model can be rewritten in the following way

$$m_t = \beta_0 + \beta_1 m_{t-1} + \beta_2 m_{t-2} + (1+\beta_4)m_{t-4} + (\beta_5 - \beta_1) m_{t-5} - \\ - \beta_2 m_{t-6} - \beta_4 m_{t-8} - \beta_5 m_{t-9} + \beta_{10} B101_t + \varepsilon_t \qquad (4)$$

while the quarterly change model is equivalent to

$$m_t = \beta_0 + (1 + \beta_1) m_{t-1} + (\beta_2 - \beta_1)m_{t-2} + (\beta_3 - \beta_2)m_{t-3} - \beta_3 m_{t-4} + \\ + \beta_{10}B101_t + \beta_{11}Q_{1t} + \beta_{12}Q_{2t} + \beta_{13}Q_{3t} + \varepsilon_t \qquad (5)$$

Thus model (4) implies an assumption that the parameters β_{11} - β_{13} are all equal to 0 as well as β_3 and β_7 (m_{t-7} is in fact part of neither (4) nor (5) which means that it could be dropped from the general model. As the estimated parameter is small and insignificant we have not imposed this restriction on the general model). Model (4) further implies a number of restrictions between parameters. Thus it is e.g. assumed that the sum of the parameters of m_{t-4} and m_{t-8} is 1.

Model (5) similarly assumes that the parameters of all variables corresponding to lags larger than 4 are 0 and also that the sum of the parameters of the variables with lags 1-4 is 1.

In the comparison of the models we start by looking at the restrictions imposed, Table 19. Comparing the Δm-model with the general model, we find that the parameters which are restricted to be 0 in general are small and insignificant. There are two exceptions to this, lags 6 and 8 where the estimates are just significant at the 5 % level. For the first few lags and B101 the estimated parameters in the restricted model are close to those of the general model. A test of the restrictions imposed gives $F(6,57)=1.42$, which is insignificant. Thus the Δm model is a reasonable representation of the data compared with the general model.

The two parameters which the Δ4m-model restrict to be 0 are small and insignificant in the general model. The estimates of the remaining parameters are also similar in the restricted and the general (without seasonal dummies) model. That the restricted model is an adequate representation of the data compared with the general model without seasonal dummies is confirmed by the F-test which gives $F(5,60)=0.71$.

If we compare the general model with and without seasonal dummies we notice that Q3 is significant, which indicates that the annual differencing does not completely capture the seasonal effects. This is confirmed by a significant F-value of $F(3,57)=3.35$. If however, we compare the Δ4m-model with the general model including deterministic seasonal effects, we obtain $F(8,57)=1.75$, which implies that the restricted Δ4m-model is an acceptable representation of the data.

11. Ex Ante and Ex Post Variables

Before we analyze the information content of the ex ante variables B301-B308[3], we investigate the relationship between ex post and ex ante variables.

Table 20 gives some descriptive results. When the ex ante and ex post variables are compared, a couple of features can be noticed. There is not much difference between the mean values, which means that the ex ante values on the average are about the same as the ex post values. The standard deviation of each ex ante variable on the other hand is smaller than that of the corresponding ex post variable with one exception. The difference is particularly large for the variables 05-08, where the standard deviations of the ex ante variables are 28-37% smaller. These results confirm the often noticed tendency of those responsible for making forecasts to be cautious, which results in a smaller variability in the forecasts than in the outcome values.

Table 21 shows the results of an analysis with each prognostic variable as the dependent variable and only the current form of the true BTS variable as the explanatory variable using models of the type

$$B301_t = \alpha + \beta B101_t + \gamma_1 Q_{1t} + \gamma_2 Q_{2t} + \gamma_3 Q_{3t} + \varepsilon_t \qquad (6)$$

[3] The time index "t" for the ex ante variables $B301_t$ - $B308_t$ denotes the time-point, which the information refers to. This means that the information was gathered in "t-1".

where Q1 - Q3 are seasonal dummies.

With one exception all constant terms are positive (significantly so with one further exception). In every single case the ß parameter is smaller than 1. In the case of variables 05-08, the difference is considerable. The results mean that we have an example of what is sometimes called "the flat slope syndrome". Thus for small values of the true variable the predicted value is too large, the net effect of the positive constant term and the smaller-than-one slope being larger than the true value of the variable. For large values, we obtain the opposite result, the positive constant having been more than compensated for by the smaller-than-one slope. To give just one example, the equation for export orders (variable 06) for the reference quarter 4 implies a forecast of 8.04 when the true value is 0 and a forecast of 23.16 at the true value 30. The forecast is correct on the average at the value 16.

A remarkable feature is that we obtain significant seasonal effects in several cases. The first quarter forecast quite often seems to be low. We find a large effect of the labour market conflict in 1980 for the basic production variable 01. Otherwise there is little sign of this conflict. There is positive autocorrelation in most of the equations (the critical Durbin-Watson value is about 1.65 with our large sample size).

To further elucidate the connection between the ex post and the ex ante values, we have also analyzed distributed lag models, which allow for delayed effects. Table 22 shows results with the ex ante variables as the dependent ones for models of the type

$$B301_t = \alpha + \beta_0 B101_t + \beta_1 B101_{t-1} + \dots + \beta_4 B101_{t-4} + + \gamma_1 Q_{1t} + \gamma_2 Q_{2t} + \gamma_3 Q_{3t} + \varepsilon_t \qquad (7)$$

Four lags of the ex post variable are included. It is clear that many lags are significant and there is a delayed response in general. For the production variable 01 the mean delay is 0.98 quarters. The orders received variables (05 and 06) show the most pronounced delay in the sense that the largest parameter is not associated with the true variable in current form but with the variable lagged one quarter.

12. Forecasting Models Based on the Information Set Available at "t-1"

So far we have analyzed the connection between the change in production and BTS variables in the form of ex post variables. This means that the models estimated are not real forecasting models in the sense that forecasts can be made before the start of the given quarter. However, even with this form of the model, results can be obtained before the true production figures are published as one of the advantages of barometer data is fast availability.

To obtain an even greater lead time it is possible to use the ex ante questions B301-B308 (forecasts of the variables B101-B108). The correlation between B301 and B101 is close to 0.9 with little indication of any effect of lagged values of the ex ante variable on the ex post variable. The significant seasonal effects found indicate that seasonal dummies should be included in the model.

In the estimation of the prognostic model our starting point was the earlier established model in Table 7. No lags of B301 provide significant information in contrast to seasonal terms. For the longer estimation period 70:2-87:4, there is a significant first quarter effect of 1.65%. The lagged values of the dependent variable remain significant and are of the same size as before. The ex ante variable B301 is strongly significant and the size of the parameter even larger than that of the ex post-variable B101. A change in B301 by 10 units is associated with an increase in the annual rate of change of production by 2.2 percentage points. The accuracy of the model in terms of $\hat{\sigma}$ is 1.95%, a figure which is somewhat larger than for the model with the ex post variable. The accuracy in the shorter period 70:2-81:4 is basically the same.

Is there any prognostic value in other ex ante variables than B301? To answer this question, the variables B302-B308 have been added to the model just discussed. The parameters of the added variables are all insignificant. Only one t-ratio is numerically larger than 1, that of B302 and the sign of the corresponding parameter is negative. The parameter estimates of the original variables are not greatly changed, that of B301 being 0.00221. Although the standard error has increased to 0.00072, the estimate is still clearly significant. The standard deviation of the residual increases from 1.95 to 2.00%. Thus we can conclude that all the prognostic information in the ex ante variables B301-308 is included in the variable B301.

In the construction of prognostic models, we are of course not limited to the use of ex ante variables. We can also use ex post variables referring to time points "t-1" or earlier. We have seen that there is considerable correlation between lagged values of e.g. B101 and the annual change in production. This makes it reasonable to investigate whether use of lagged values of B101 can improve the forecasting models based on B301.

We start by looking at a model corresponding to the prognostic model based on B301 but with B101 lagged one quarter included instead of B301, no seasonal dummies but both the conflict dummies D802 and D812. As shown in Table 23 this model is almost equivalent to the model based on the ex ante variable. The standard deviation of the residual is 1.92%, which is a very slight improvement. There are indications that lags 1 and 5 of the dependent variable are no longer necessary.

In models which include both B301 in current form and B101 lagged one quarter, it is indeed found that the lags of the dependent variable at 1 and 5 can be deleted. Seasonal dummies do not improve the model, but the strike dummies are significant. What is most interesting, however, is that both barometer variables are significant.The significance of the lagged B101 is in fact stronger than that of B301 as shown by t-values of 5.68 and 2.63 respectively. The standard deviation of the residual has been further reduced to 1.82%. The performance of the model in the prediction period is slightly less good than the model based on B301.

13. Conclusions

The relationship between manufacturing production and different series from the Swedish Business Tendency Survey (BTS) is investigated for the period 1968-1990. Manufacturing production is considered both in the form of quarterly and annual changes using seasonally unadjusted data. For ease of interpretation the annual changes are superior, the quarterly changes being totally dominated by seasonal factors. There is a fairly close direct connection between the annual change in production and the BTS series for production volume, B101.

Autoprojective models and models in the ADL class of models which include BTS variables are estimated. Addition of the BTS production series B101 to the best autoprojective model leads to significantly improved models both when the volume series is considered in the form of annual and quarterly changes. In neither case does inclusion of other BTS variables improve the model. The quality of the models obtained in the two cases are compared and the differences found are not large in spite of the dramatic differences in the simple descriptive properties of the two representations of the variables.

The relationship between ex post and ex ante variables is also investigated. A tendency for the ex ante variables to lag behind is found. Forecasting models based on the information set available at time point "t-1" are obtained. The series B101 lagged one quarter is found to contain significant information even in the presence of the ex ante production variable, B301. Other ex ante variables contain no extra information.

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Sambandet mellan produktionen inom tillverkningsindustrin och olika variabler i Konjunkturbarometern.

På basis av data från perioden 1968-90 analyseras sambandet mellan produktionen inom tillverkningsindustrin mätt som en traditionell volymserie och olika variabler i Konjunkturbarometern. Mera precist studeras hur mycket av variationen i volymserien som kan förklaras med hjälp av barometerserier och då speciellt serierna B101 (produktionen innevarande kvartal jämfört med föregående) och B301 (beräknad produktion nästa kvartal jämfört med innevarande). Barometerserierna behandlas enbart i form av nettotal.

Barometerserierna är i allmänhet formulerade i termer av förändringar. En jämförelse med volymserien kräver därför att denna uttrycks på motsvarande sätt. Två olika alternativ används, nämligen procentuella förändringen jämfört med föregående kvartal och procentuella förändringen jämfört med samma kvartal föregående år. De kvartalsvisa förändringarna domineras helt av de säsongsmässiga variationerna och denna serie lämpar sig inte för direkt analys av konjunkturförlopp i motsats till serien över årliga förändringar där konjunkturmönstret framträder mycket klart.

En jämförelse mellan ex ante serien B101 och den årliga förändringstakten i volymserien visar på en mycket god samvariation mellan serierna speciellt under tiden fram till 1985. Huvuddelen av modelleringsarbetet sker därför med volymserien i form av årlig förändringstakt som beroende variabel.

Den grundläggande modell som används vid analyserna är den s k ADL modellen, som relaterar den årliga förändringstakten till laggade (tidsförskjutna) värden på den beroende variabeln och barometerserier. Även barometerserierna kan förekomma i laggad form. Som standard används en s k autoprojektiv (i detta fall autoregressiv) modell, där enbart laggade termer av serien själv ingår. Sedan analyseras i vilken utsträckning barometerserier kan förklara den återsående variabiliteten.

Det visar sig att barometerserien B101 leder till en klar förbättring av den bästa autoregressiva modellen. Givet att man har med serien B101 i modellen finns det sedan inget ytterligare förklaringsvärde i de övriga ex ante serierna, i den meningen att ingen av dessa serier får en signifikant parameter då den adderas till den bästa ADL modellen med B101.

Modeller baserade på kvartalsvisa förändringar analyseras också med samma grundläggande metodik. Det visar sig då att resultaten i viss mening blir likartade med de som erhölls vid analysen baserad på årliga förändringar, trots att serierna ser så olika ut rent deskriptivt. Även i detta fall visar sig serien B101 ha ett stort förklaringsvärde beträffande utvecklingen av industriproduktionen. Både modellerna baserade på årliga differenser och kvartalsdifferenser kan ses som specialfall av en mera generell modell. De restriktioner på den generella modellen som leder till specialfallen testas och visar sig på det hela taget väl vara förenliga med data.

De hittills behandlade modellerna är inte prognosmodeller i egentlig mening, eftersom de baseras på barometerserier från samma kvartal. Modeller som utnyttjar ex ante serier kan dock betraktas som prognosmodeller eftersom de baseras på information som är tillgänglig vid tidpunkten "t-1". Som en förberedelse till konstruktionen av prognosmodeller analyseras sambandet mellan ex ante och ex post variablerna. Det visar sig då att samvariationen mellan prognosen i ex ante variabeln och utfallet i ex post variabeln i allmänhet är hög, men att ex ante variablerna tenderar att "släpa efter", vilket visar sig genom att inte bara ex post variabeln vid samma tidpunkt påverkar ex ante variabeln utan också laggade värden av ex post variabeln har betydelse. Det tycks också finnas vissa systematiska säsongeffekter i ex ante variablerna relativt ex post variablerna.

Prognosmodeller har konstruerats genom att ersätta variabeln B101 i de tidigare utvecklade ADL modellerna med variabeln B301. Det visar sig då att även B301 har ett stort förklaringsvärde, även om förklaringsvärdet blir något lägre än om B101 används. Ingen av de övriga ex ante variablerna B302-B308 har någon information att tillföra en modell som innehåller B301. Om vi däremot beaktar en annan variabel från den informationsmängd som är tillgänglig vid tidpunkten "t-1" blir resultatet ett annat. Variabeln B101 laggad en period blir nämligen signifikant i en modell som innehåller B301. Båda dessa variabler är signifikanta i en sådan modell.

TABLE 1

Definition of variables in the Business Tendency Survey (BTS).

L=larger, H=higher, U= unchanged, S= smaller, LO= longer, SH= shorter, Y=yes, N= no, LOW= lower, CL= comparatively large, A= adequate, TS= too small, TL= too large

Ex Post Questions

A. Present Quarter Compared with Previous Quarter

		Alternatives			Data
101	Volume of production	L	U	S	64:1 - 90:3
102	Production capacity	L	U	S	64:1 - 90:3
103	Prices (domestic)	H	U	LOW	64:1 - 90:3
104	Prices (export)	H	U	LOW	64:1 - 90:3
105	Orders received (domestic market)	L	U	S	64:1 - 90:3
106	Orders received (export market)	L	U	S	64:1 - 90:3
107	Purchases of raw materials	L	U	S	64:1 - 90:3
108	Time of deliveries	LO	U	SH	64:1 - 90:3

B. Situation 15 days Before the End of the Quarter

201	Present level of production induce full utilization of capacity	Y	N		64:1 - 90:3
202	If not: Rate of not used capacity - compared to the corresponding date of the previous quarter.	L	U	S	68:1 - 90:3
203	As-of-now judgement of orderbooks	CL	A	TS	64:1 - 90:3
204	Number of workers employed[1]	L	U	S	64:1 - 90:3
205	Number of employees[1]	L	U	S	64:1 - 90:3
206	Shortage of: Skilled workers	Y	N		64:1 - 90:3
207	Shortage of: Other workers	Y	N		64:1 - 90:3
208	Shortage of: Technical employees	Y	N		64:1 - 90:3
209	Shortage of: Other employees	Y	N		64:1 - 90:3
210	Stocks of raw materials[1]	L	U	S	64:1 - 90:3
211	As-of-now judgement of stocks of raw materials	TL	A	TS	64:1 - 90:3
212	Stocks of finished goods[1]	L	U	S	64:1 - 90:3
213	As-of-now judgement of stocks of finished goods	TL	A	TS	64:1 - 90:3

[1]Compared with the beginning of the quarter

215	Bottleneck (primary and secondary) in demand	Y	N		68:1 - 90:3
216	Bottleneck (primary and secondary) in plant capacity	Y	N		68:1 - 90:3
217	Bottleneck (primary and secondary) in labour supply	Y	N		68:1 - 90:3
218	Bottleneck (primary and secondary) in other factors	Y	N		68:1 - 90:3

Ex Ante Questions

C. Next Quarter Compared with Present Quarter

301	Volume of production	L	U	S	64:1 - 90:3
302	Production capacity	L	U	S	64:1 - 90:3
303	Prices (domestic)	H	U	LOW	64:1 - 90:3
304	Prices (export)	H	U	LOW	64:1 - 90:3
305	Orders received (domestic market)	L	U	S	64:1 - 90:3
306	Orders received (export market)	L	U	S	64:1 - 90:3
307	Purchases of raw materials	L	U	S	64:1 - 90:3
308	Time of deliveries	LO	U	SH	64:1 - 90:3

TABLE 2 AR Models for Δ4m. Estimation Period 1972:1 - 87:4
Prediction Period 1988:1 - 90:3

Lag length	R^2	$\hat{\sigma}_\varepsilon$	BIC	LM-test $\chi^2(5)$	LM-test P	Chow-test F	Chow-test P
12	.7134	.0265	-6.6444	6.03	.45	1.03	.43
11	.7121	.0263	-6.7049	6.50	.39	1.05	.42
10	.6963	.0267	-6.7164	4.24	.64	1.02	.44
9	.6929	.0266	-6.7704	4.79	.56	0.99	.46
8	.6819	.0269	-6.8002	5.18	.50	1.12	.36
7	.6732	.0270	-6.8382	4.10	.63	1.47	.17
6	.6712	.0268	-6.8972	3.56	.69	1.50	.16
5	.6708	.0266	-6.9610	3.03	.76	1.52	.15
4	.6535	.0271	-6.9748	6.14	.35	1.38	.21
3	.5394	.0310	-6.7549	17.81	.0025	1.17	.33
Lags included							
1,2,4	.6510	.0269	-7.0324	5.87	.36	1.47	.17
1,4	.5302	.0310	-6.8002	19.52	.0008	1.01	.45

TABLE 3 The Selected AR-model. Parameter Estimates with Standard Errors in Parenthesis.

Variable	72:1-87:4	70:1 - 81:4	
Constant	0.0062 (0.0036)	0.0045 (0.0045)	0.0043 (0.0041)
$\Delta 4m_{-1}$	0.4907 (0.1064)	0.5379 (0.1254)	0.6043 (0.1130)
$\Delta 4m_{-2}$	0.5651 (0.1240)	0.4903 (0.1454)	0.4484 (0.1298)
$\Delta 4m_{-4}$	-0.4652 (0.0979)	-0.4332 (0.1098)	-0.3697 (0.0997)
D802			-0.0934 (0.0266)
D812			0.0348 (0.0266)
$\hat{\sigma}_\varepsilon$	0.0269	0.0289	0.0257
$\hat{\sigma}_F$	0.0334	0.0243	0.0244

TABLE 4 Models with B101 as the Only Explanatory Variable.
Dependent Variable: Δ4m. Estimation period 1969:2 - 87:4.
Prediction Period 1988:1 - 90:3.

Lags	R^2	$\hat{\sigma}_\varepsilon$	BIC	LM-test $\chi^2(6)$	LM-test P	Chow test F	Chow test P
0 - 5	.8072	.0205	-7.4743	22.06	.0011	1.84	.06
0 - 4	.8059	.0204	-7.5255	23.04	.0006	1.82	.07
0,1,3,4	.8044	.0203	-7.5754	23.26	.0004	1.91	.052
0,3,4	.7988	.0204	-7.6043	15.68	.0155	1.93	.049

TABLE 5 The Selected Model with B101 only.

Variable	69:2 - 87:4	69:2 - 81:4	
Constant	-0.216 (0.277)	-0.212 (0.336)	-0.324 (0.335)
B101	0.00210 (0.00019)	0.00203 (0.00022)	0.00201 (0.00023)
$B101_{-3}$	0.00157 (0.00033)	0.00170 (0.00040)	0.00161 (0.00041)
$B101_{-4}$	-0.00078 (0.00031)	-0.00087 (0.00037)	-0.00065 (0.00038)
D802			-3.50 (2.13)
D812			4.16 (2.15)
$\hat{\sigma}_\varepsilon$	0.0204	0.0207	0.0197
$\hat{\sigma}_F$	0.0295	0.0233	0.0236
LM $\chi^2(6)$	15.68	11.16	9.31

TABLE 6 ADL Models with B101 as Explanatory Variable. Dependent Variable Δ4m. Estimation Period 1970:2 - 87:4. Prediction Period 1988:1 - 90:3.

Δ4m	B101	R^2	$\hat{\sigma}_\varepsilon$	BIC	LM-test $\chi^2(5)$	LM-test P	Chow-test F	Chow-test P
1 - 5	0 - 4	0.8400	0.0187	-7.4696	7.51	0.28	2.12	0.0324
1 - 5	0 - 3	0.8395	0.0185	-7.5268	7.11	0.30	2.60	0.0087
1 - 5	0 - 2	0.8382	0.0185	-7.5789	5.85	0.41	2.63	0.0081
1 - 5	0 - 1	0.8365	0.0184	-7.6285	5.71	0.42	2.61	0.0083
1,2,4,5	0 - 1	0.8354	0.0183	-7.6815	5.40	0.44	2.77	0.0053
1,2,4,5	0	0.8288	0.0186	-7.7024	5.90	0.38	2.73	0.0058

TABLE 7 The selected ADL model.

Variable	70:2 - 87:4		70:2 - 81:4	
Constant	-0.0014	-0.0010	-0.0023	-0.0018
	(0.0026)	(0.0026)	(0.0030)	(0.0031)
$\Delta 4m_{-1}$	0.2817	0.3086	0.3760	0.3995
	(0.0847)	(0.0846)	(0.0988)	(0.1006)
$\Delta 4m_{-2}$	0.3399	0.3454	0.2370	0.2477
	(0.0890)	(0.0866)	(0.0999)	0.0979)
$\Delta 4m_{-4}$	-0.4359	-0.3631	-0.5101	-0.4340
	(0.0906)	(0.0962)	(0.1087)	(0.1233)
$\Delta 4m_{-5}$	0.2319	0.1588	0.3587	0.2808
	(0.0767)	(0.0820)	(0.0937)	(0.1068)
B101	0.00172	0.00159	0.00176	0.00163
	(0.00023)	(0.00024)	(0.00026)	(0.00028)
D802		-0.0396		-0.0366
		(0.0200)		(0.0207)
D812		0.0320		0.0221
		(0.0204)		(0.0220)
$\hat{\sigma}_\varepsilon$	0.0186	0.0180	0.0187	0.0182
$\hat{\sigma}_F$	0.0314	0.0312	0.0240	0.0233

TABLE 8 Descriptive Data Original BTS Series. Sample Period 1964:1 - 90:3 (1968:1 - 90:3 for B202 and B215-218)

Variable	Mean	SD
B101	8.5	13.5
B102	7.0	5.4
B103	19.4	14.2
B104	20.0	19.6
B105	1.4	13.8
B106	6.7	18.4
B107	6.6	15.8
B108	-4.7	13.1
B201	48.5	14.9
B202	0.1	10.5
B203	-23.0	25.3
B204	-1.4	12.3
B205	-3.6	8.7
B206	40.3	15.8
B207	15.4	12.1
B208	16.1	11.0
B209	4.1	3.8
B210	-2.7	6.3
B211	16.5	8.1
B212	-0.4	11.0
B213	19.6	15.6
B215	63.1	19.3
B216	17.3	8.1
B217	15.6	11.7
B218	4.8	3.3

TABLE 9
Correlation Between the Current Value of Δ4m and BTS Series at Different Lags.
Time Period 1969:1 - 89:3.

Variable	Lag -4	Lag -3	Lag -2	Lag -1	Lag 0	Lag 1	Lag 2	Lag 3	Lag 4
B101	.327	.602	.726	.813	.821	.644	.495	.280	.087
102	.141	.320	.464	.588	.679	.661	.647	.575	.404
103	-.109	-.037	.114	.250	.296	.349	.256	.171	.038
104	-.072	.146	.306	.382	.460	.382	.293	.115	-.081
105	.409	.603	.725	.757	.688	.509	.283	.046	-.213
106	.514	.628	.652	.592	.495	.267	.042	-.219	-.425
107	.224	.463	.643	.741	.763	.644	.489	.286	.038
108	.382	.542	.668	.718	.649	.563	.367	.136	-.118
201	.023	.176	.343	.489	.617	.683	.712	.686	.594
202	-.408	-.578	-.710	-.720	-.607	-.424	-.157	.023	.238
203	.044	.255	.446	.604	.707	.753	.735	.633	.491
204	.046	.282	.516	.669	.759	.753	.684	.589	.431
205	-.266	-.053	.187	.413	.605	.669	.715	.705	.628
206	-.230	-.041	.147	.309	.429	.521	.579	.584	.530
207	-.128	.040	.235	.360	.465	.529	.541	.487	.391
208	-.064	.019	.119	.224	.315	.354	.382	.388	.326
209	-.045	.101	.242	.346	.450	.498	.515	.472	.386
210	-.110	.096	.275	.474	.576	.619	.555	.461	.310
211	-.172	-.392	-.575	-.650	-.650	-.599	-.466	-.301	.594
212	-.474	-.602	-.654	-.654	-.539	-.426	-.260	-.071	.161
213	-.076	-.305	-.488	-.651	-.715	-.723	-.683	-.558	-.402
215	.036	-.184	-.380	-.550	-.666	-.719	-.721	-.643	-.519
216	.114	.315	.484	.646	.732	.757	.676	.572	.409
217	-.171	.020	.201	.338	.457	.525	.576	.547	.481
218	-.019	.156	.329	.484	.551	.583	.585	.495	.377

TABLE 10 Correlation Between the Current Value of Δ4m and the First Difference of BTS Series which Refer to the Situation 15 Days Before the End of the Quarter.

Variable	-4	-3	-2	-1	Lag 0	1	2	3	4
B201	.368	.487	.531	.466	.407	.202	.057	-.122	-.325
203	.486	.617	.573	.479	.314	.128	-.078	-.338	-.440
206	.326	.509	.518	.468	.357	.268	.147	.-020	-.183
207	.320	.412	.489	.329	.280	.147	-.007	-.189	-.272
208	.236	.284	.343	.360	.311	.150	.100	.020	-.221
209	.177	.228	.223	.166	.162	.075	-.043	-.141	-.166
211	-.401	-.420	-.345	-.140	.009	.119	.270	.310	-.325
215	-.482	-.642	-.561	-.491	-.326	-.107	.047	.295	.403
216	.406	.464	.382	.353	.194	.039	-.195	-.270	-.381
217	.282	.486	.455	.348	.298	.127	.072	-.136	-.213
218	.278	.271	.266	.214	.095	.034	.004	-.131	-.178

TABLE 11 $\Delta 4m$ in Relation to Different BTS Variables. Parameter Estimates Multiplied by 100.

1. Current Period only of BTS Variable
2. Current Period and Four Lags of BTS Variable
3. Current Period of BTS Variable and $\Delta 4m_{-1}$, $\Delta 4m_{-2}$, $\Delta 4m_{-4}$, $\Delta 4m_{-5}$
4. Current Period and Four Lags of BTS Variable and $\Delta 4m_{-1}$, ...$\Delta 4m_{-5}$

Vari-able	(1) 69:1 - 87:4			(2) 69:1 - 87:4		(3) 70:2 - 87:4			(4) 70:2 - 87:4 (71)	
	β	t	$\hat{\sigma}_\varepsilon$	Sign lags	$\hat{\sigma}_\varepsilon$	β	t	$\hat{\sigma}_\varepsilon$	Sign lags	$\hat{\sigma}_\varepsilon$
B101	0.2618	14.01	0.0237	0, 3, 4	0.0203	0.1717	7.53	0.0186	0	0.0185
B102	0.5654	8.60	0.0320	0, 4	0.0301	0.2659	3.05	0.0237	0	0.0237
B103	0.0985	2.64	0.0433	0, 4	0.0405	-	-		-	
B104	0.1057	4.45	0.0402	0, 4	0.0384	-	-	0.0251	4	0.0244
B105	0.2203	8.81	0.0316	0	0.0261	0.1315	4.87	0.0217	0	0.0217
B106	0.1133	5.04	0.0390	0	0.0313	0.0603	3.10	0.0237	0	0.0236
B107	0.2032	11.00	0.0279	0	0.0272	0.1124	4.97	0.0216	0	0.0220
B108	0.2212	7.97	0.0332	0	0.0295	0.0915	2.91	0.0239	-	
B201	0.1995	7.47	0.0342	0	0.0271	0.1049	2.81	0.0240	0	0.0229
B202	-0.2625	-6.97	0.0351	0, 2	0.0266	-0.1508	-4.25	0.0225	0	0.0221
B203	0.1301	10.37	0.0289	0, 4	0.0263	0.0865	4.07	0.0227	0	0.0224
B204	0.2657	10.89	0.0281	0, 4	0.0247	0.1736	4.87	0.0217	0	0.0207
B205	0.3068	6.59	0.0359	0	0.0287	0.1721	2.76	0.0240	0, 3	0.0218
B206	0.1432	4.70	0.0397	4	0.0319	-	-		-	
B207	0.2011	5.18	0.0388	0	0.0353	-	-		-	
B208	0.1331	3.01	0.0427	0	0.0385	-	-		-	
B209	0.5580	4.57	0.0399	0	0.0400	-	-		-	
B210	0.4188	6.55	0.0360	0, 4	0.0322	0.1274	2.10	0.0246	0, 4	0.0234
B211	-0.3488	-7.74	0.0336	-	0.0330	-0.1187	-2.52	0.0242	-	
B212	-0.2177	-5.95	0.0372	-	0.0316	-0.0954	-3.13	0.0237	-	
B213	-0.2094	-10.11	0.0293	4	0.0275	-0.1126	-3.82	0.0229	-	
B215	-0.1630	-8.90	0.0314	0, 4	0.0279	-0.0876	-3.01	0.0238	-	
B216	0.4100	10.47	0.0287	0, 1, 4	0.0257	0.2257	4.23	0.0225	0	0.0220
B217	0.1971	5.10	0.0389	0, 4	0.0346	-	-		-	
B218	0.7346	5.97	0.0372	0	0.0376	-	-		-	-

TABLE 12 AR Models for Δm Including Seasonal Dummies
Estimation Period 1971:2 - 87:4
Prediction Period 1988:1 - 90:3

				LM-test		Chow-test	
Lag length	R^2	$\hat{\sigma}_\varepsilon$	BIC	$\chi^2(5)$	P	F	P
12	0.9872	0.0254	-6.6161	11.76	0.10	0.91	0.54
8	0.9870	0.0246	-6.8513	3.65	0.72	1.17	0.33
4	0.9848	0.0257	-6.9504	11.30	0.07	0.87	0.58
2	0.9845	0.0255	-7.0572	3.58	0.68	0.92	0.53
1	0.9839	0.0258	-7.0810	4.33	0.56	0.83	0.61

TABLE 13 The Selected AR-model.

Variable	71:2 - 87:4
Const	0.1717 (0.0305)
Δm_{-1}	-0.3817 (0.1159)
Q1	-0.1345 (0.0617)
Q2	-0.1297 (0.0242)
Q3	-0.4041 (0.0386)
$\hat{\sigma}_\varepsilon$	0.0258
$\hat{\sigma}_F$	0.0246

TABLE 14 Models with B101 and Seasonal Dummies as the Only Explanatory Variables. Dependent Variable Δm. Estimation Period 1969:2 - 87:4. Prediction Period 1988:1 - 90:3.

Lags	R^2	$\hat{\sigma}_\varepsilon$	BIC	$\chi^2(5)$	P	F	P
0 - 5	0.9872	0.0237	-7.0499	34.91	<0.0001	1.18	0.32
0 - 3	0.9871	0.0234	-7.1581	35.15	<0.0001	1.20	0.30
0, 1	0.9871	0.0231	-7.2730	35.04	<0.0001	1.25	0.27
0	0.9858	0.0241	-7.2337	30.11	<0.0001	1.51	0.15

TABLE 15 The Selected Model.

Variable	1969:2 -87:4
Constant	0.2628 (0.0055)
B101	0.00169 (0.00036)
$B101_{-1}$	-0.00094 (0.00035)
Q1	-0.3229 (0.0079)
Q2	-0.2060 (0.0079)
Q3	-0.5255 (0.0075)
$\hat{\sigma}_\varepsilon$	0.0231
$\hat{\sigma}_F$	0.0269

Table 16 ADL Models with B101 as Explanatory Variable. Dependent Variable Δm. Estimation Period 1969:3 - 87:4. Prediction Period 1988:1- 90:3.

Lags Δm	B101	R^2	$\hat{\sigma}_\varepsilon$	BIC	$\chi^2(6)$	P	F	P
5	0 - 4	0.9932	0.0180	-7.4278	10.45	0.20	1.51	0.15
5	0 - 2	0.9931	0.0178	-7.5354	7.49	0.40	1.59	0.13
3	0 - 2	0.9929	0.0178	-7.6194	5.75	0.56	1.46	0.17
3	0, 1	0.9929	0.0177	-7.6759	5.59	0.57	1.48	0.16
3	0	0.9927	0.0178	-7.7044	3.97	0.76	1.36	0.21

TABLE 17 The Selected ADL Model with Δm as Dependent Variable.

Variable	69:3 - 87:4	69:3 - 81:4
Constant	0.0858 (0.0236)	0.1249 (0.0303)
Δm_{-1}	-0.6890 (0.0963)	-0.5563 (0.1163)
Δm_{-2}	-0.4047 (0.1113)	-0.5063 (0.1236)
Δm_{-3}	-0.3199 (0.0945)	-0.2321 (0.1124)
B101	0.00173 (0.00021)	0.00167 (0.00023)
Q2	-0.0508 (0.0442)	-0.1494 -0.1494)
Q3	-0.0484 (0.0350)	-0.0320 (0.0402)
Q4	-0.2484 (0.0384)	-0.3218 (0.0512)
$\hat{\sigma}_\varepsilon$	0.0178	0.0175
$\hat{\sigma}_F$	0.0214	0.0248

Table 18 Δm in Relation to Different BTS Variables. Parameter Estimates Multiplied by 100. Seasonal Dummies Always Included.

1. Current Period Only of BTS Variable
2. Current Period and Four Lags of BTS Variable
3. Current Period of BTS Variable and Δm_{-1}, Δm_{-2}, Δm_{-3}
4. Current Period and Four Lags of BTS Variable and Δm_{-1}, Δm_{-2}, Δm_{-3}

	(1) 68:2 - 87-4			(2) 68:2 -87:4		(3) 69:1 - 87:4			(4) 69:1 - 87:4	
Variable	$\hat{\beta}$	t	$\hat{\sigma}_\varepsilon$	Sign lags	$\hat{\sigma}_\varepsilon$	$\hat{\beta}$	t	$\hat{\sigma}_\varepsilon$	Sign lags	$\hat{\sigma}_\varepsilon$
B101	0.0892	4.80	0.0238	0	0.0232	0.1723	8.98	0.0176	0	0.0180
B102	0.1609	3.08	0.0256	0	0.0250	0.2682	4.50	0.0228	0	0.0216
B103	-		0.0272		0.0266	-	-		-	0.0211
B104	-		0.0268	1, 2	0.0246	0.0372	2.02	0.0252	2	0.0233
B105	0.0736	3.80	0.0249		0.0252	0.1186	5.60	0.0215	-	0.0211
B106	0.0406	2.74	0.0259		0.0263	0.0557	3.67	0.0237	0	0.0233
B107	0.0560	3.36	0.0253	3	0.0251	0.1109	5.72	0.0213	0	0.0215
B108	0.0538	2.44	0.0262	0, 1, 2	0.0241	0.1037	4.03	0.0233	1	0.0225
B201	0.0411	1.99	0.0265	0	0.0255	0.0675	2.71	0.0247	0	0.0216
B202	-0.0662	-2.35	0.0262		0.0260	-0.1387	-4.48	0.0228	-	0.0223
B203	0.0277	2.44	0.0262		0.0255	0.0610	4.09	0.0233	0	0.0216
B204	0.0643	2.88	0.0258	0, 3	0.0241	0.1380	5.05	0.0221	0, 3	0.0196
B205			0.0268	0, 3	0.0246	-	-		0	0.0225
B206	-		0.0270		0.0259	-	-		-	
B207	-		0.0269		0.0261	-	-		-	
B208	-		0.0271		0.0272	-	-		-	
B209	-		0.0267	0, 1, 2	0.0251	0.1770	2.05	0.0252	0, 1	0.0243
B210	-		0.0266	0	0.0260	0.1508	2.42	0.0249	0	0.0242
B211	-0.1016	-2.97	0.0257		0.0259	-0.1643	-4.31	0.0230	-	0.0235
B212	-0.0769	-2.89	0.0258		0.0260	-0.1094	-3.86	0.0235	-	0.0227
B213	-0.0507	-2.78	0.0259	0	0.0254	-0.1014	-4.46	0.0228	-	0.0215
B215	-0.0326	-2.12	0.0264		0.0259	-0.0641	-3.27	0.0241	-	0.0222
B216	0.0919	2.60	0.0260		0.0255	0.1994	4.44	0.0229	0	0.0211
B217	-		0.0269		0.0260	-	-		4	0.0234
B218	-		0.0268		0.0272	-	-		-	0.0250

Table 19 ADL Models with m as the Dependent Variable.
Estimation Period 1970:2 - 87:4

Variable	(1)	(2)	Parameters implied by Δm-model	Parameters implied by Δ4m-model
Const	0.2663 (0.1601)	0.2118 (0.1671)	0.0858	-0.0013
m_{-1}	0.2867 (0.1045)	0.2255 (0.0995)	0.3173	0.2817
m_{-2}	0.3313 (0.1117)	0.3078 (0.0939)	0.2918	0.3399
m_{-3}	0.0677 (0.1198)	0.0621 (0.1014)	0.0749	
m_{-4}	0.3370 (0.1207)	0.5602 (0.0939)	0.3160	0.5641
m_{-5}	0.0950 (0.1203)	-0.0288 (0.0991)		-0.0498
m_{-6}	-0.2340 (0.1175)	-0.3288 (0.0919)		-0.3399
m_{-7}	-0.0742 (0.1217)	-0.0582 (0.1008)		
m_{-8}	0.2303 (0.1108)	0.4212 (0.0936)		0.4359
m_{-9}	-0.0800 (0.0937)	-0.2075 (0.0884)		-0.2319
B101	0.001679 (0.000231)	0.001793 (0.000240)	0.001752	0.001717
Q1	-0.0776 (0.0602)		-0.0504	
Q2	-0.0661 (0.0531)		-0.0520	
Q3	-0.1861 (0.0611)		-0.2494	
$\bar{R}^2$	0.9809	0.9787		
$\hat{\sigma}_\varepsilon$	0.0178	0.0188	0.0181	0.0186

Table 20 Descriptive Characteristics of Ex Post- and Ex Ante-Questions. Sample Period 1964:1 - 90:3 (1964:2 - 90:3 for B302).

Variable	Mean	SD	Range	Variable	Mean	SD	Range
B101	8.5	13.5	54	B301	10.4	11.6	54
B102	7.0	5.4	29	B302	8.4	5.7	31
B103	19.4	14.2	81	B303	21.4	13.7	73
B104	20.0	19.6	87	B304	22.1	18.1	92
B105	1.4	13.8	60	B305	3.3	10.0	44
B106	6.7	18.4	98	B306	10.5	12.4	60
B107	6.6	15.8	77	B307	4.7	10.7	49
B108	-4.7	13.1	54	B308	-6.0	8.3	38

TABLE 21 Relationship Between B3 - B1-Type Variables. Only Significant Seasonal Dummies Shown. Estimation Period 1964:1 - 90:3.

	α	β	Q1	Q2	Q3	D802	$\bar{R}^2$	DW
B301	5.68	0.727	-5.78				0.8096	1.22
	(1.06)	(0.037)	(1.39)					
	5.44	0.751	-5.69			17.03	0.8277	1.17
	(1.01)	(0.036)	(1.33)			(4.99)		
B302	3.23	0.885					0.6705	1.38
	(0.75)	(0.064)						
B303	3.05	0.819	5.18				0.8377	1.59
	(1.20)	(0.042)	(1.69)					
B304	4.26	0.828					0.8234	1.49
	(1.57)	(0.040)						
B305	3.21	0.557	-6.84				0.7650	1.58
	(0.95)	(0.034)	(1.33)					
B306	8.04	0.504	-9.69	4.60			0.6797	1.78
	(1.38)	(0.037)	(1.94)	(1.93)				
B307	1.00	0.597	-2.72				0.8007	1.18
	(0.96)	(0.029)	(1.31)					
B308	-1.43	0.539					0.8063	1.37
	(0.76)	(0.028)						

TABLE 22 Relationship Between B3- and B1-Type Variables. Estimation Period 1965:1 - 90:3.
In cases where no standard errors are shown, the variables are not significant at the 5% level.

Dependent variable	α	β_0	β_1	β_2	β_3	β_4	Q1	Q2	Q3	$\bar{R}^2$	DW
B301	5.14	0.419	0.173	0.168	0.113	-0.021	-7.79			0.8931	1.81
	(0.88)	(0.057)	(0.073)	(0.074)			(1.21)				
B302	1.05	0.350	0.367	0.161	0.138	0.088				0.8250	1.41
	(0.60)	(0.081)	(0.091)								
B303	3.58	0.559	0.196	0.177	-0.211	0.214				0.8912	1.94
	(1.70)	(0.064)	(0.081)	(0.081)	(0.079)	(0.062)					
B304	3.82	0.518	0.277	0.193	-0.186	0.119				0.8851	1.65
	(1.90)	(0.062)	(0.083)	(0.083)	(0.082)						
B305	1.57	0.216	0.344	0.117	-0.013	-0.102	-5.34	6.20	2.62	0.8331	1.55
	(0.87)	(0.058)	(0.077)				(1.21)	(1.30)	(1.23)		
B306	7.64	0.231	0.378	-0.053	0.025	-0.088	-7.29	3.97		0.7551	1.45
	(1.32)	(0.060)	(0.080)				(1.88)	(1.88)			
B307	1.23	0.300	0.171	0.236	0.020	-0.097	-3.72			0.8907	1.57
	(0.77)	(0.051)	(0.071)	(0.070)			(1.03)				
B308	-3.21	0.278	0.245	0.050	0.056	-0.094	-4.38			0.8379	1.44
	(0.88)	(0.061)	(0.087)				(1.14)				

TABLE 23 ADL Models with B301 as the Explanatory Variable. Dependent Variable $\Delta 4m$. Estimation Period 1970:2 - 87:4. Prediction Period 1988:1 - 90:3.

					LM-test		Chow-test	
$\Delta 4m$	B301	R^2	$\hat{\sigma}_\varepsilon$	BIC	$\chi^2(5)$	P	F	P
1, 2, 4, 5	0 - 4	0.7989	0.0213	-7.1215	7.03	0.34	1.71	0.0947
1, 2, 4, 5	0, 1	0.7947	0.0210	-7.2806	3.00	0.78	1.94	0.0507
1, 2, 4, 5	0	0.7946	0.0208	-7.3404	3.06	0.77	2.06	0.0367

TABLE 24 Selected Models. Seasonal Dummies and D802 Included in Model (1). D802 and D812 Included in Model (2) and (3).

Variable	70:2-81:4	70:2-87:4		
		(1)	(2)	(3)
Constant	-0.0133	-0.0091	0.0013	-0.0018
	(0.0066)	(0.0056)	(0.0026)	(0.0027)
$\Delta 4m_{-1}$	0.3279	0.2647	0.1027	
	(0.1152)	(0.0999)	(0.1156)	
$\Delta 4m_{-2}$	0.2170	0.3468	0.4130	0.3910
	(0.1062)	(0.0952)	(0.0901)	(0.0836)
$\Delta 4m_{-4}$	-0.5545	-0.4765	-0.3425	-0.2797
	(0.1139)	(0.0947)	(0.1043)	(0.0663)
$\Delta 4m_{-5}$	0.3374	0.2005	0.0414	
	(0.1004)	(0.0817)	(0.0885)	
B301	0.002353	0.002160		0.000842
	(0.000449)	(0.000401)		(0.000321)
$B101_{-1}$			0.001841	0.001580
			(0.000329)	(0.000278)
$\hat{\sigma}_\varepsilon$	0.0193	0.0195	0.0192	0.0182
$\hat{\sigma}_F$	0.0245	0.0315		0.0334

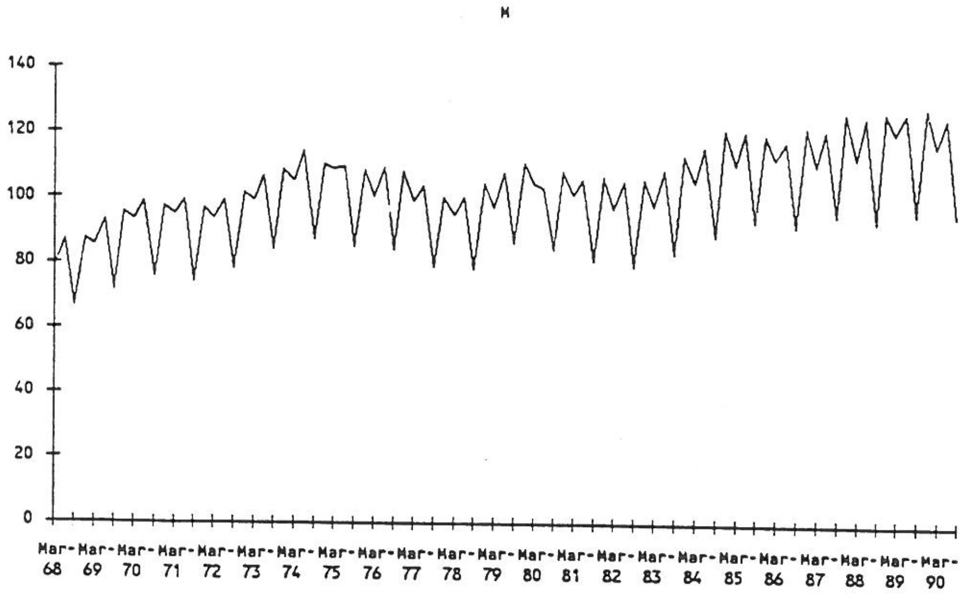


Fig. 1 Manufacturing production 1968 - 90 according to the production index M = I30

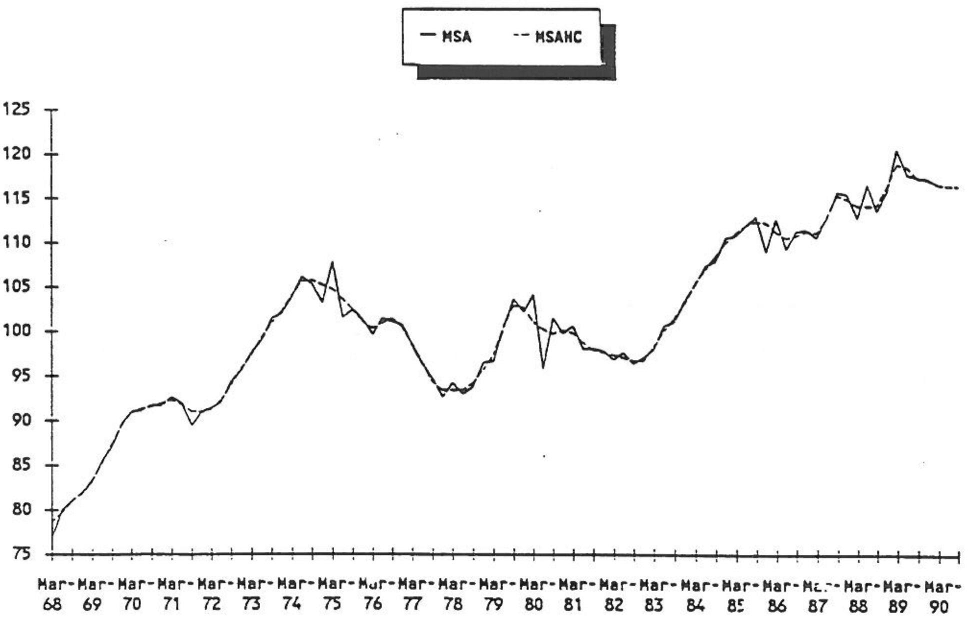


Fig. 2 Manufacturing production in seasonally adjusted form (MSA) and the trend-cycle curve for M (MSAHC) 1968 - 90.

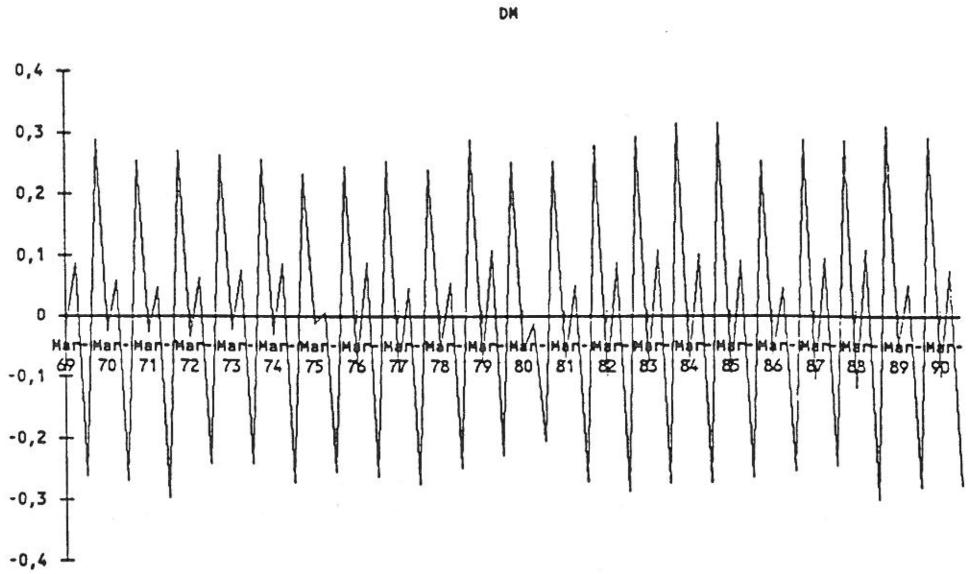


Fig. 3 Quarter-to-quarter change in M (Δm) 1968 - 90.

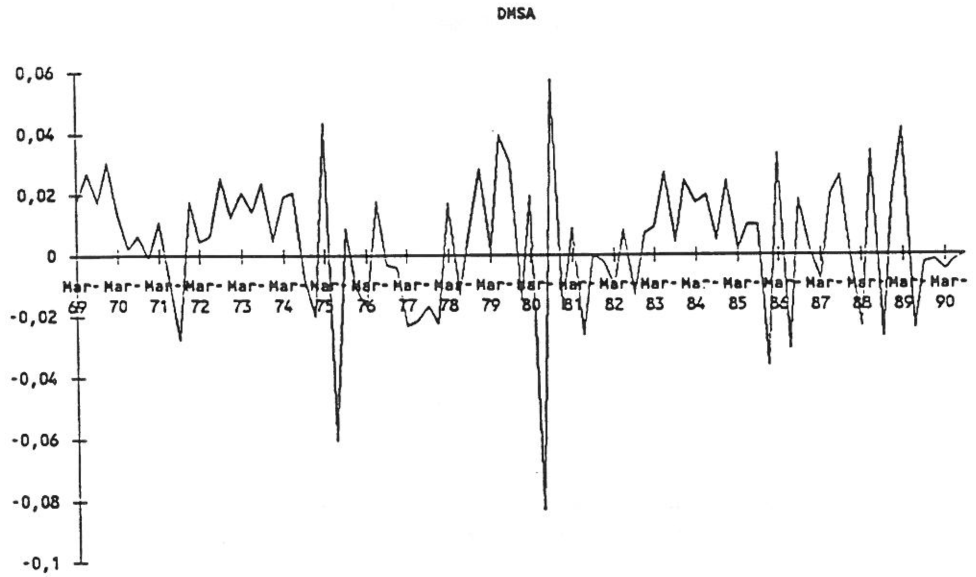


Fig. 4 Quarter-to-quarter change in seasonally adjusted M 1968 - 90.

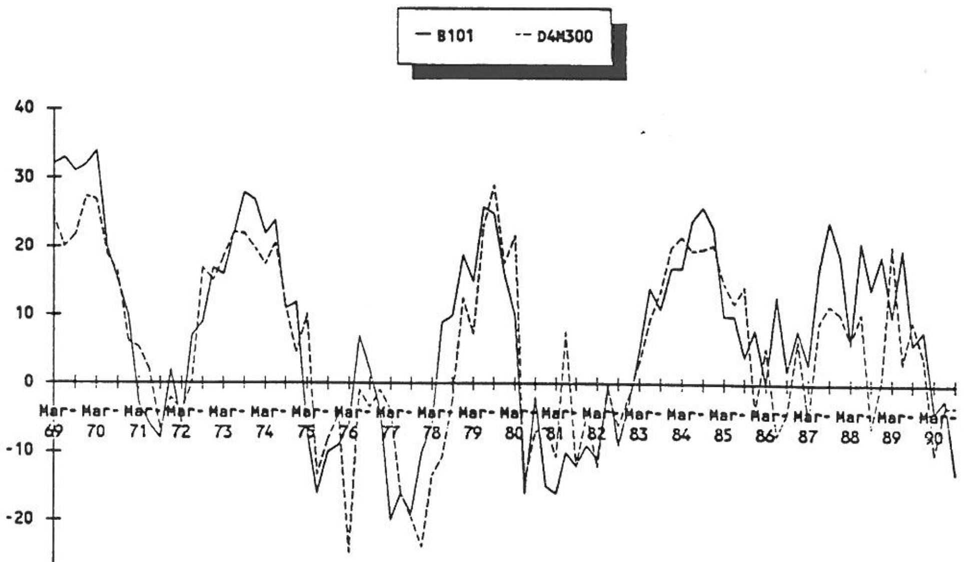
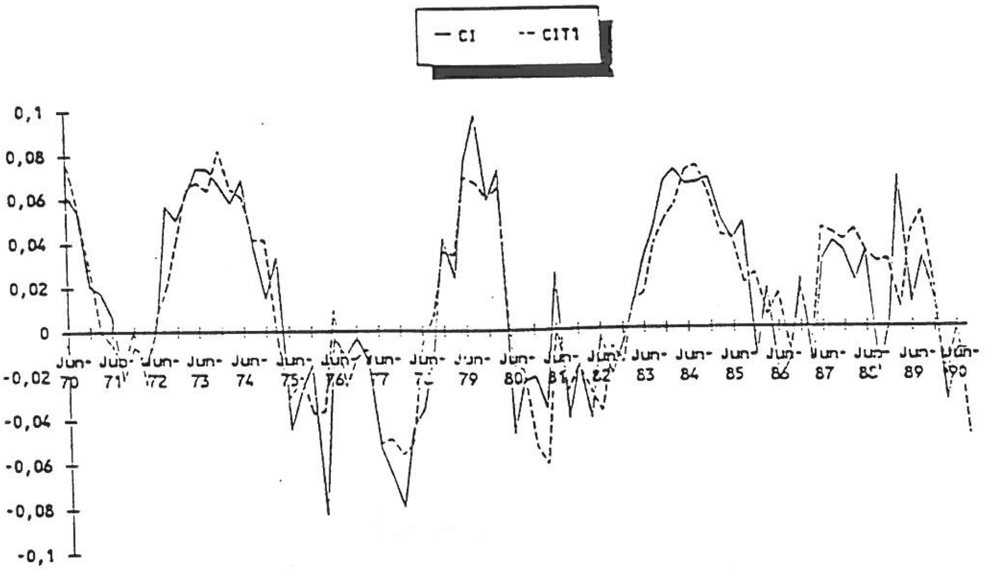


Fig. 5 The BTS series B101 and the annual change in M (Δ4m) (the latter multiplied by 300) 1969 - 90.



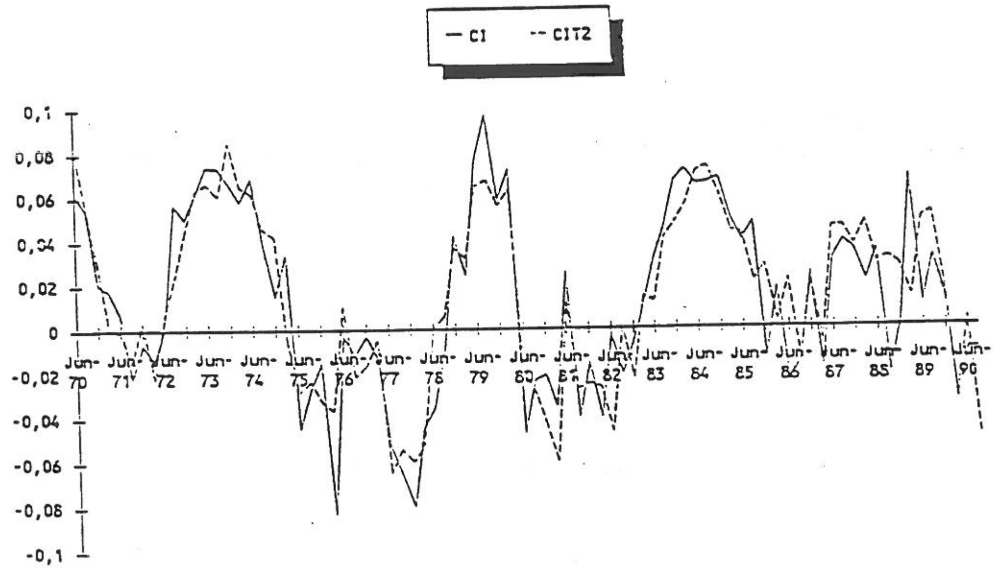
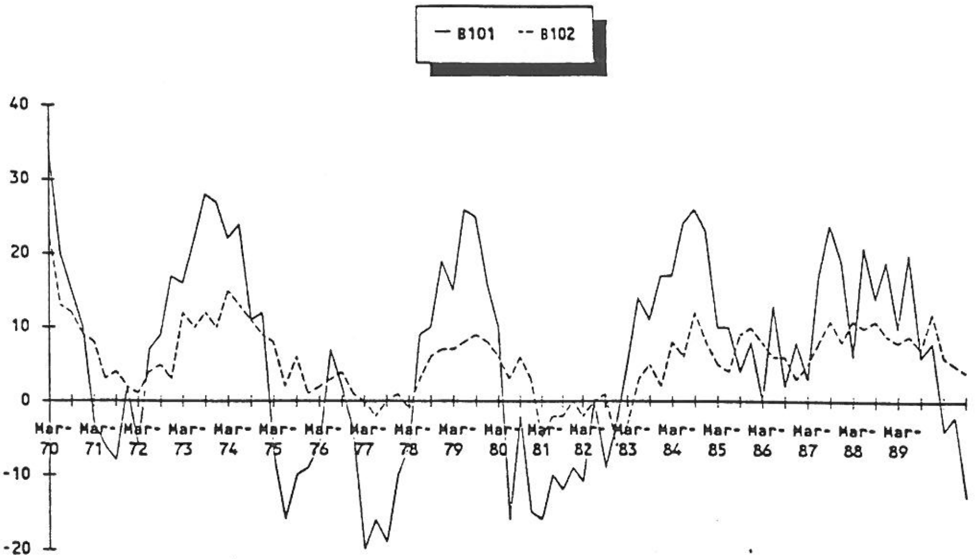
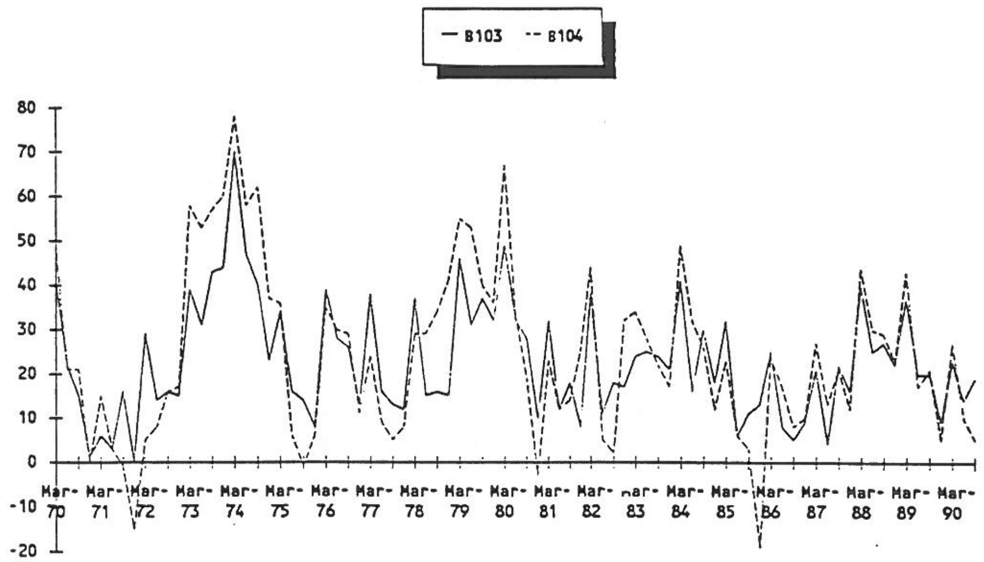


Fig. 6 Observed values of Δ4m (CI) and values from the selected ADL model (without conflict dummies).

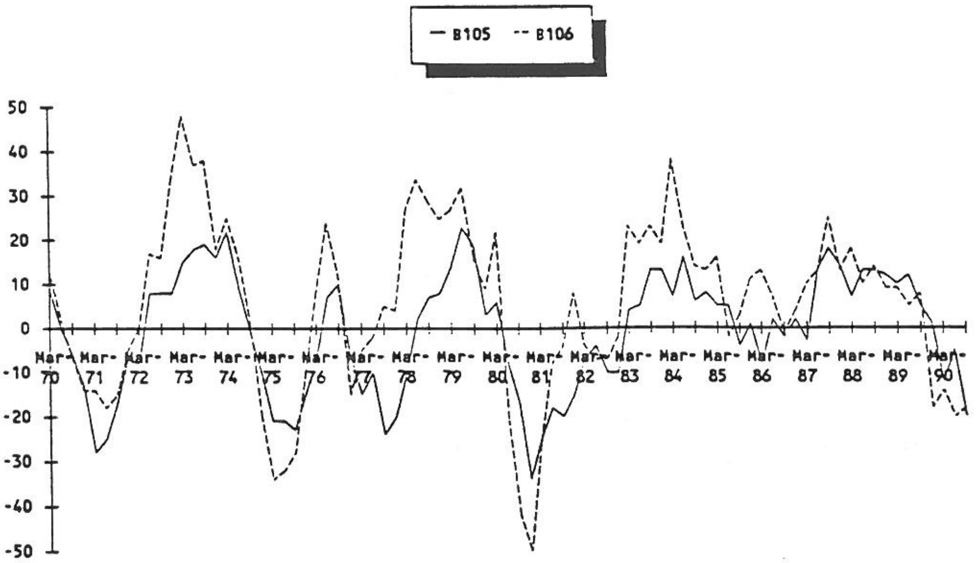
CIT1: Estimation period 70:2 - 87:4
Prediction period 88:1 - 90:3
CIT2: Estimation period 70:2 - 81:4
Prediction period 82:1 - 90:3

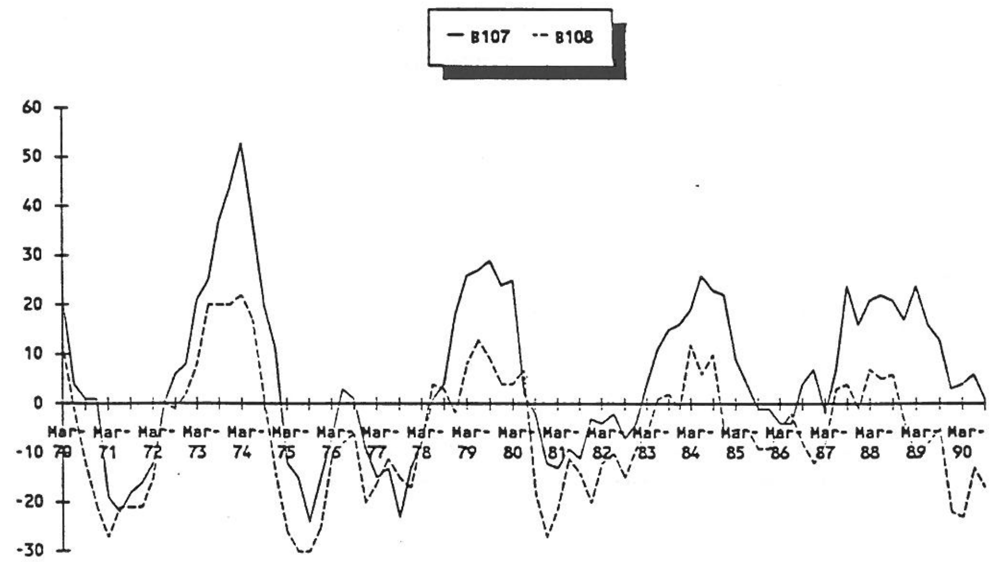


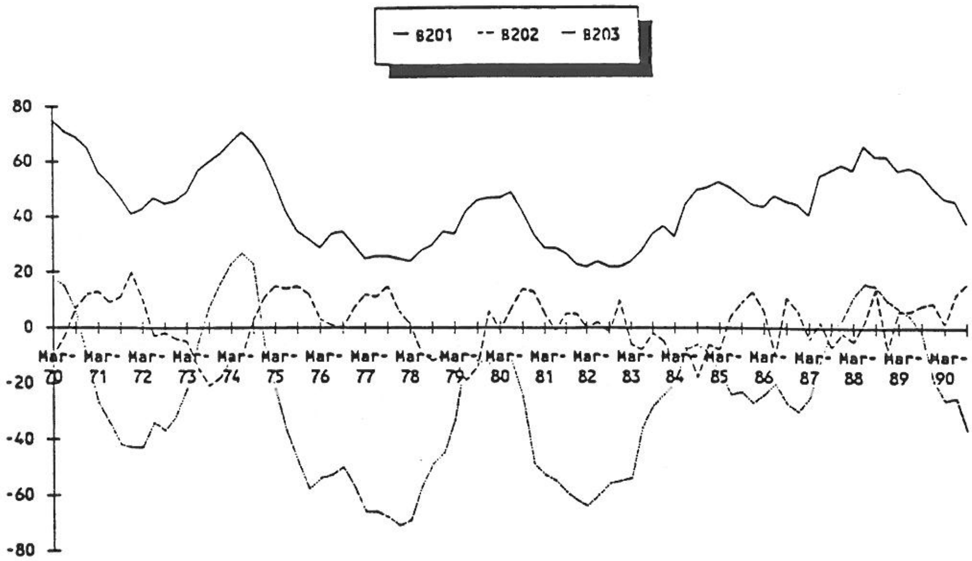
— B101 -- B102
40
30
20
10
0
-10
-20
Mar- 70
Mar- 71
Mar- 72
Mar- 73
Mar- 74
Mar- 75
Mar- 76
Mar- 77
Mar- 78
Mar- 79
Mar- 80
Mar- 81
Mar- 82
Mar- 83
Mar- 84
Mar- 85
Mar- 86
Mar- 87
Mar- 88
Mar- 89

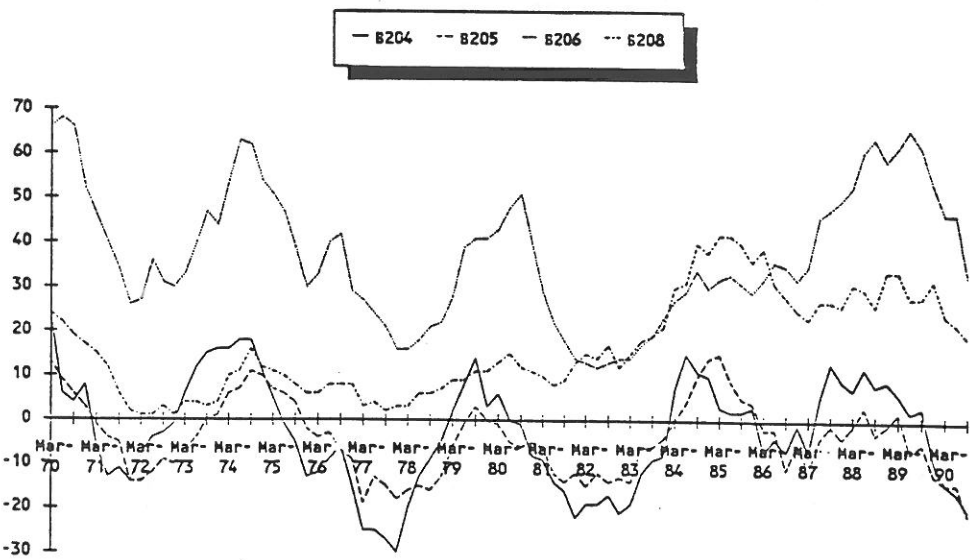


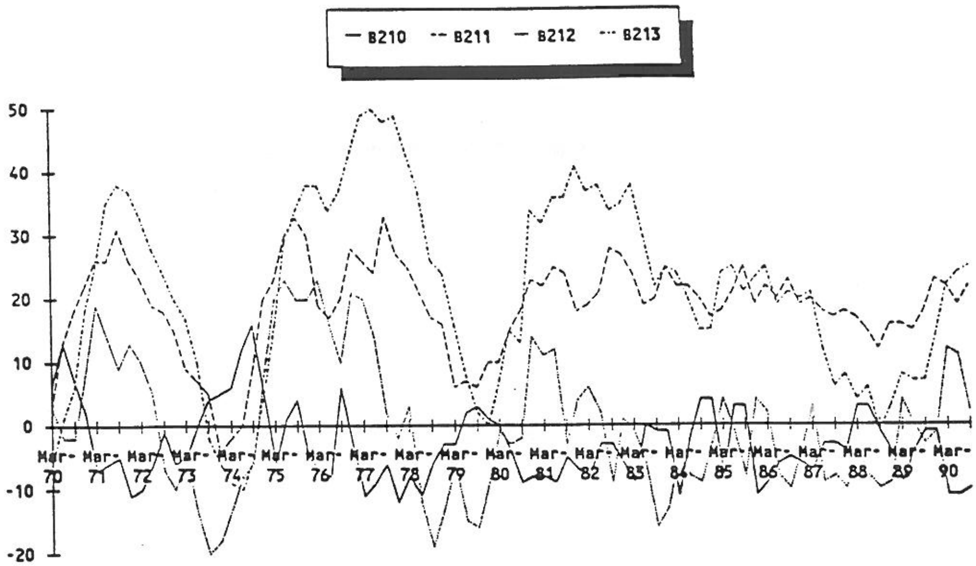
— B103 -- B104
80
70
60
50
40
30
20
10
0
-10
-20
Mar- 70
Mar- 71
Mar- 72
Mar- 73
Mar- 74
Mar- 75
Mar- 76
Mar- 77
Mar- 78
Mar- 79
Mar- 80
Mar- 81
Mar- 82
Mar- 83
Mar- 84
Mar- 85
Mar- 86
Mar- 87
Mar- 88
Mar- 89
Mar- 90


— B105 -- B106
50
40
30
20
10
0
-10
-20
-30
-40
-50
Mar- 70
Mar- 71
Mar- 72
Mar- 73
Mar- 74
Mar- 75
Mar- 76
Mar- 77
Mar- 78
Mar- 79
Mar- 80
Mar- 81
Mar- 82
Mar- 83
Mar- 84
Mar- 85
Mar- 86
Mar- 87
Mar- 88
Mar- 89
Mar- 90


— B107 -- B108
60
50
40
30
20
10
0
-10
-20
-30
Mar- 70
Mar- 71
Mar- 72
Mar- 73
Mar- 74
Mar- 75
Mar- 76
Mar- 77
Mar- 78
Mar- 79
Mar- 80
Mar- 81
Mar- 82
Mar- 83
Mar- 84
Mar- 85
Mar- 86
Mar- 87
Mar- 88
Mar- 89
Mar- 90


B201
B202
B203
80
60
40
20
0
-20
-40
-60
-80
Mar-70 Mar-71 Mar-72 Mar-73 Mar-74 Mar-75 Mar-76 Mar-77 Mar-78 Mar-79 Mar-80 Mar-81 Mar-82 Mar-83 Mar-84 Mar-85 Mar-86 Mar-87 Mar-88 Mar-89 Mar-90


B204
B205
B206
B208
70
60
50
40
30
20
10
0
-10
-20
-30
Mar-70 Mar-71 Mar-72 Mar-73 Mar-74 Mar-75 Mar-76 Mar-77 Mar-78 Mar-79 Mar-80 Mar-81 Mar-82 Mar-83 Mar-84 Mar-85 Mar-86 Mar-87 Mar-88 Mar-89 Mar-90


B210
B211
B212
B213
50
40
30
20
10
0
-10
-20
Mar-70
Mar-71
Mar-72
Mar-73
Mar-74
Mar-75
Mar-76
Mar-77
Mar-78
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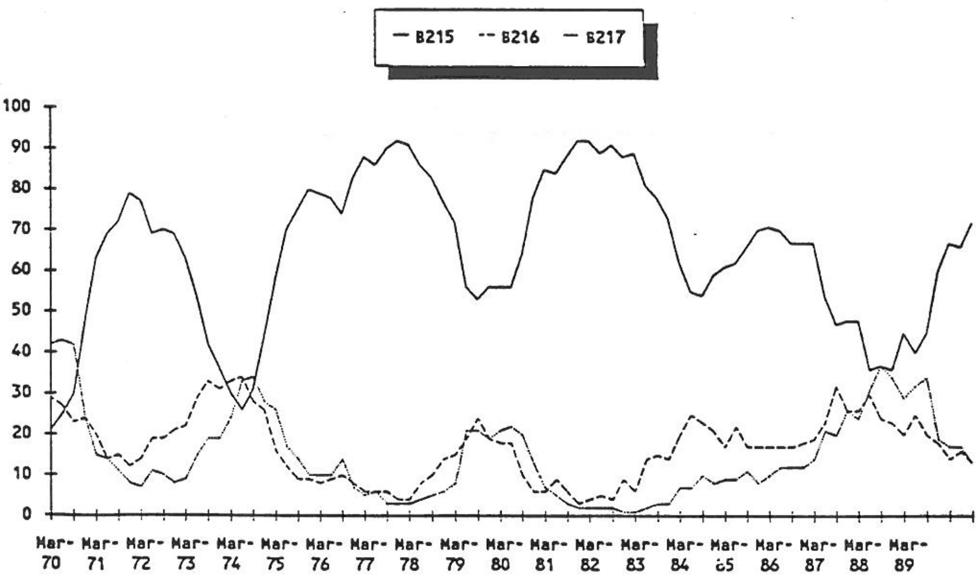
Mar-84
Mar-85
Mar-86
Mar-87
Mar-88
Mar-89
Mar-90


B215
B216
B217
100
90
80
70
60
50
40
30
20
10
0
Mar-70
Mar-71
Mar-72
Mar-73
Mar-74
Mar-75
Mar-76
Mar-77
Mar-78
Mar-79
Mar-80
Mar-81
Mar-82
Mar-83
Mar-84
Mar-85
Mar-86
Mar-87
Mar-88
Mar-89

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