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Seasonal adjustment and smoothing of manufacturing investments series from the quarterly Norwegian national accounts

Introduction

Norwegian quarterly time series of investments behave rather erraticly. This makes seasonal adjustment a challenging topic since the seasonal factors are rather unstable. In this paper focus is on seasonal adjustment of time series for investments in the manufacturing industries from the Norwegian quarterly national accounts. We consider data for 16 manufacturing industries and investments in two types of capital, that is (i) Buildings and structure and (ii) Machinery and transport equipment. Furthermore, the investment variables are both in fixed and current values. In this paper we distinguish between total investments and investments in new capital goods. The difference is made up by net purchase of used capital goods. These latter time series do not have any evident seasonal pattern. In light of this it seems natural to concentrate on seasonally adjusting the time series for investments in new capital goods and then, under indirect seasonal adjustment, obtain seasonally adjusted time series for total investment by just adding time series for seasonally adjusted time series for investments in new capital goods and the unadjusted time series for net purchase. This is opposed to the current practice employed by Statistics Norway in which such a decomposition is not utilized. Seasonal adjustment and smoothing are carried out by using X-12-ARIMA. When seasonally adjusting the individual time series we mainly perform multiplicative seasonal adjustment. Since calendar effects are not believed to have any influence, such effects are not included. Allowance is made for intervention effects. However, only to a limited extent we are able to find significant intervention effects using the default critical values. Although we allow for intervention effects, for many of the time series none of the 5 built-in ARIMA-models are accepted using the default critical values. In spite of the rather poor properties of the ARIMA-models we proceed by imposing an ARIMA-model. Some of the investment series for buildings contain values of zeros. These time series may be seasonally adjusted using the additive method, but no significant seasonal pattern is revealed. We investigate, by using the sliding span method, whether aggregated investment in the manufacturing sector should be seasonally adjusted by the indirect or the direct method. As the analysis will show we do not find that any of the two methods dominate the other. In X-12-ARIMA many of the default criterias are based on transatlantic experiences. Since US is a much larger country than Norway their time series tend to be a lot smoother. Thus it is not evident that the critical values used for US also should be used for Norway. In the paper we will several times return to this feature.

Seasonal adjustment: different approaches

Seasonal adjustment of economic time series is based on the idea that it is meaningful to decompose series in unobserved components. Traditionally it has been two different approaches. One has been the model approach in which time series analysis plays an important role. This approach seems well suited when one is faced with a few time series such that a substantial amount of time can be devoted to each time series. As representants of this tradition one could mention the structural time series approach by Harvey (1989) and the approach taken by Gòmez and Maravall (2001). Software is available for both these two model based approaches to seasonal adjustment. The other tradition, pursued by data producing institutions such as Statistics Norway, is the model-free method which makes it possible to adjust a huge amount of series over a limited time period. X11 was the first program in this tradition. A basic problem with this program was the socalled end-point problems. In the middle of the series X11 relied on symmetric filters for the seasonal and the trend component. This could not be used at the end of the series where one was left to asymmetric filters. When new observations become available substantial revisions in the estimated components emerged. The development of X-11-ARIMA aimed at reducing the size of such revisions. ARIMA models were taken into use to obtain forecasting models with good properties such that the revisions could be substantially reduced, increasing the value of the adjusted series for the user. The introduction ox X-12-ARIMA[1] has

[1] For an overview of X-12-ARIMA cf. Findley et al. (1998a). The article was discussed by Cleveland (1998), Ghysels (1998), Hylleberg (1998), Maravall (1998), Morry and Chhab (1998) and Wallis (1998). A reply was given by Findley et al. (1998b).

decreased the difference between the model free and the model based approach. Seasonal time series are often characterized by calendar components which, as seasonal components, must be removed in order to be informative for the user. The same goes for special events which potentially can contaminate the estimated components. Corrections for this two types of effects can be done by Reg-ARIMA modeling in X-12-ARIMA. Corrections for calendar effects was also done by X11-ARIMA, but the approach was different since in this case the calendar effects was obtained from the preliminary estimate of the irregular component. As Chen and Findley (1998) argue the procedure pursued by X-12-ARIMA has superior properties.

Reg-Arima models

In X-12-ARIMA reg-ARIMA models are used for forecasting and for correction of time series prior to seasonal adjustment and smoothing. The reg-ARIMA model is a regression model with ARIMA errors and is given by

$$(1)\phi_p(B)\Phi_P(B^s)(1-B)^d(1-B^s)^D\left(y_t-\sum_{i=1}^{r}\beta_i x_{i,t}\right)=\theta_q(B)\Theta_Q(B^s)a_t\,,$$

where B is the backward operator, s is the seasonal period (4 in our case) and a_t is assumed to be a sequence of independent variables with mean 0 and variance σ_α^2. The four lag-polynomials are given by

$$(2a)\,\phi_p(z)=1-\phi_1 z-\phi_2 z^2-\ldots-\phi_p z^p,$$
$$(2b)\,\Phi_P(z)=1-\Phi_1 z^s-\Phi_2 z^{2s}-\ldots-\Phi_P z^{Ps},$$
$$(2c)\;\theta_q(z)=1-\theta_1 z-\theta_2 z^2-\ldots-\theta_q z^q \text{ and}$$
$$(2d)\,\Theta_Q(z)=1-\Theta_1 z^s-\Theta_2 z^{2s}-\ldots-\Theta_Q z^{Qs}.$$

These polynomials are constrained such that the zeros of $\theta_q(z)$ and $\Theta_Q(z)$ have magnitudes greater than or equal to 1, and so that the zeros of $\phi_p(z)$ and $\Phi_P(z)$ have magnitudes greater than 1. In (1) x_{1t}, x_{2t}, ...,x_{rt} are r different deterministic variables. Broadly we can distinguish between two types of variables. The first set concerns calendar effects, for instance trading day effects and the effect of easter, whereas the other concerns automatic outlier treatment. X-12-ARIMA contains five in-built multiplicative ARIMA-models. In the notation of Box and Jenkins (1976) a general model (disregarding the x-variables) is denoted as log (p,d,q) $(P,D,Q)_4$, where p denotes the order of the lag-polynomial in (2a), d is the ordinary difference (cf. (1)), q is the order of the lag-polynomial in (2c), P is the order of the lag-polynomial in (2b), D is the seasonal difference operator and Q is the order of the lag-polynomial in (2d). The subscript 4 denotes the data frequency, that is quarterly data. The in-built models are log (0,1,1) $(0,1,1)_4$, log (0,1,2) $(0,1,1)_4$, log (2,1,0) $(0,1,1)_4$, log (0,2,2) $(0,1,1)_4$ and log (2,1,2) $(0,1,1)_4$. The first model is often referred to as the "airline model".[2]
Fixed seasonality may also be dealt with within the class of Reg-Arima models. Equation (1) then simplifies to

$$(3)\;\phi_p(B)(1-B)^d\left(y_t-\sum_{j=1}^{k}\beta_i x_{i,t}\right)=\theta_q(B)a_t\,,$$

where $x_{1,t}$, $x_{2,t}$, ...,$x_{k.t}$ now also cover dummy-variables taking account of deterministic seasonality. This model is relevant in a situation where one is facing seasonal overdifferencing. Since it is hard to

[2] In the rest of this paper we omit the term log for convenience when referring to different models.

find an argument for calendar effects in investments series, we do not include such effects in the reg-Arima models. We consider two types of outliers: additive outliers and level shifts. An additive outlier at time t_0 is captured by defining the following dummy variable

$$(4)\, AO_t^{(t_0)} = \begin{cases} 1 \text{ for } t = t_0 \\ 0 \text{ for } t \neq t_0 \end{cases}.$$

A level shift at time t is correspondingly defined as

$$(5)\, LS_t^{(t_0)} = \begin{cases} -1 \text{ for } t < t_0 \\ 0 \text{ for } t \geq t_0 \end{cases}.$$

In X-12-ARIMA there are two ways of dealing with outlier effects. One is the automatic outlier treatment in which is a stepwise regression procedure based on Chang and Tiao (1983). The other and may be more realistic case is based on the user classifying and dating interventions. Thus this variant is based on some type of prior information.

Seasonal adjustments of manufacturing investments time series

We decompose 64 time series of investments running X-12-ARIMA in a default fashion. Since we find it difficult to incluce calendar effects from a substantial part of view we do no allow for such effects. For 60 of the time series we use multiplicative seasonal adjustment. For two of the industries there are zero values of investments in buildings in some periods, which leads us to the additive methods. We utilize the automatic intervention detection. Tables 2-5 contain information with respect to the automatic selection of ARIMA-models. The criteria take account of within sample forecasting for the three last years in the estimation period, residual autocorrelation and non-seasonal over-differencing. Using the default values we are able to obtain models which pass all the three criteria for only a few time series. For buildings none of the five build-in models pass all the criteria, whereas for a couple of the investment series the "airline model" fulfills all the criteria. Looking at each of the three tests, we see that non-seasonal overdifferencing is never a problem. The main problem seems to be the bad forecasting properties as revealed by the figures in the second column of the tables. For some of the time series we also find a systematic pattern in the irregular component. For all time series we have used the "airline model", either because this satisfies all the criteria or because none of the five build-in models pass the criteria, in which case we impose the 'airline' model as the default model. The lesson learnt from the Reg-ARIMA exercise is that the irregular component is very dominant in these time series, which makes it difficult to fit models with good forecasting properties. Allowing for intervention effects, cf. Tables 7 and 8, does not improve the forecasting behaviour in a substantial way. For all the time series we find identifiable seasonality, and hence we have not included any table related to this. In Table 6 we report the estimated value of the ARIMA parameters and the associated standard errors. For many of the time series the occurrence of seasonal overdifferencing is evident. This points to the fact that fixed seasonality may be a suitable simplification in these cases.

In Tables 9-12 we report diagnostics associated with the decomposition of the time series, cf. Lothian and Morry (1978) and Scott (1992). According to the default criteria the weighted averages of the statistics, which are tabulated in the last column of these tables, should not exceed 1. However it is also important to inspect the individual measures. The high reported values of M01 again emphasize the dominant role played by the irregular component. Lothian and Morry (1978) provide the formula for how this diagnostic is calculated within an additive decomposition framework, whereas Ladiray and Quenneville (2001) explains how a corresponding diagnostic is constructed in the multiplicative case. Since calendar effects are assumed absent, the following three tables in X-12-ARIMA are involved: D10 (The final seasonal factors), D12 (The final trend-cycle) and E3 (The modified irregular component). Let us correspondingly label the time series in these tables S_t , T_t and I_t^* . We define for an arbitrary variable M_t the mean of the absolute value of the percentage changes from the previous period as

$$(6)\, aM_t = \frac{1}{N-1}\sum_{j=1}^{N}\left|100\frac{(M_t - M_{t-1})}{M_{t-1}}\right|,$$

where N denotes the number of observations. The formula for M01 is now given by

$$(7)\ M01 = 10\frac{aI_t^{*2}}{aS_t^2 + aT_t^2 + aI_t^{*2}}\ .$$

Thus diagnostic M01 measures the contribution of the irregular component in the variation of percentage changes in the original data when no respect is paid to sign. When the irregular component is dominant M01 takes on a high value. It should however be emphasized that it is possible to argue against a cutoff value by 1 for Norwegian time series. Since Norway is a small country time series will tend to be more erratic than for instance compared to those of the US. We see from Tables 7-10 that the M07 diagnostics, which are informative on whether seasonality is identified is not, never exceeds unity. Thus we will assert that seasonal adjustment of these time series are meaningful even if M01 often takes on a high value.

Appendix A contains 64 graphs. Figures 1-16 are for the volume series of Machinery, Figures 17-32 are for the value series of Machinery. Corresponding graphs for Buildings are numbered 33-64. With exception of 4 non-adjusted series for Buildings each graph contains the original data, the seasonally adjusted time series and the trend of the time series. The graphs emphasize the erratic feature of the data, which makes decomposition a rather complicated task.

Seasonal adjustments of aggregates: The indirect vs. the direct method

Focus is often on seasonal adjustment and smoothing of composite time series. In our setting this means investments in the manufacturing sector which consist of 16 industries. There are two approaches when it comes to seasonal adjustment of aggregate time series. One is the indirect method and the other is the direct method. Under the indirect method one carries out seasonal adjustment of each individual time series and then aggregate the seasonally adjusted time series to obtain the seasonally adjusted aggregate series. In this way one can give special treatment to each individual series. For instance there may be time series with no seasonality which hence does not need to be seasonally adjusted. Such series are therefore represented by their unadjusted series in the aggregate. However, a clear drawback with the indirect method is that it may involve a lot of time series such that with resource constraints within the data producing institution limited efforts are devoted to each time series. When using the direct method the latter problem is not present since one in this case aggregates the unadjusted series and then carries out seasonal adjustment of the aggregate original time series. Under the latter approach it is also easier to use model-based seasonal adjustment which is more satisfactory from a scientific point of view, cf. Otranto and Triacca (2002). However, this method has the weakness that no special treatment is given to the individual series. This may not be a severe problem if the time series share a common seasonal pattern. Besides if the irregular component is dominant, which is the case for the investment series aggregation may reduce the relative contribution from this component. It can be shown that under additive seasonal adjustment combined with some additional requirements the indirect and the direct method yield the same results. Under multiplicative seasonal adjustment, which generally is the most relevant method for economic time series, there is no such relationship. If the two approaches result in substantially different seasonally adjusted series the question then naturally arise: which method should be chosen? The usual approach is to compare the two methods with respect to the obtained stability of the seasonal component. This may also be done using the sliding spans technique, cf. Findley et al. (1990).

In Appendix B, containing Figures 65-76, we provide graphs of seasonally adjusted and trend values based on the direct and indirect method, respectively. Each figure consists of two graphs. In the left graph seasonally adjusted values based on the two methods for decomposition of composite time series are plotted together with the original data. In the right graph we correspondingly plot the extracted trend based on the two methods together with the original data. Generally the discrepancy between the two methods seems to be larger for Buildings than for Machinery.

Sliding span analysis

To study the stability of the seasonal adjustment we perform sliding span analyses as outlined by Findley et al. (1990). The idea behind this procedure is that estimates of the components should not be substantially changed due to small changes in the amount of data. We will explain how the analysis is carried out in the current setting. All our time series are of the same length i.e. from 1978Q1 to 2002Q4. For the series, for which the 3×5 seasonal filter is used, four spans of length 8 years are used in the sliding span analysis. The four spans, k=1,…,4, are 1992Q1-1999Q4, 1993Q1-2000Q4, 1994Q1-2001Q4 and 1995Q1-2002Q4. For the subsequent analysis we need to define different sets. Let N_t denote the set of the spans occurring in period t, $N1_t$ the set of the spans which are present in period t as well as in the previous quarter and $N4_t$ the set of the spans present in period t as well as in the same quarter the previous year. The definition of these sets over the sample period is given in Table 13 below. We are only occupied with the periods for which the different sets contain at least two elements. For N_t the relevant period is 1993Q1-2001Q4, for $N1_t$ 1993Q2-2001Q4 and for N4 1994Q1-2001Q4. Hence the number of periods are 36, 35 and 32, respectively. Let us now define some span-specific symbols. Let $S_t(k)$ and $A_t(k)$ be, respectively, the seasonal factor and the seasonal adjusted value in period t corresponding to span k. Furthermore we can define the following two changes in the seasonal adjusted value according to span k:

$$(8)\, QQ_t = \frac{A_t(k) - A_{t-1}(k)}{A_{t-1}(k)} \text{ and}$$

$$(9)\, YY_t = \frac{A_t(k) - A_{t-4}(k)}{A_{t-4}(k)}.$$

We are now able to define the sliding span diagnostics. First we define the maximum relative difference between the seasonal factors over the spans, i.e.

$$(10)\, S_t^{max} = \frac{\max_{k\in N_t} S_t(k) - \min_{k\in N_t} S_t(k)}{\min_{k\in N_t} S_t(k)};\ t = 1993Q1,\ldots,2001Q4.$$

The seasonal factor of month t is according to Findley et al. (1990) viewed as unreliable if $S_t^{max}>0.03$. Let S(%) denote the percentage of quarters in which the seasonal factor is unreliable. This diagnostic is reported in the first row for each industry in Table 14. Next we consider the seasonally adjusted values. We define the largest difference in the quarter-to-quarter relative change in the seasonally adjusted value over the spans as

$$(11)\, QQ_t^{max} = \max_{k \in N1_t} QQ_t(k) - \min_{k \in N1_t} QQ_t(k)\text{; t = 1993Q2,…,2001Q4.}$$

This quantity is considered unreliable if QQ_t^{max} >0.03. Let QQ(%) denote the number of quarters in which QQ_t^{max} is considered unreliable. This diagnostic is reported in the second row for each industry in Table 14. Let us furthermore define the largest difference in the relative annual change in the seasonally adjusted value over the spans

$$(12)\, YY_t^{max} = \max_{k \in N4_t} YY_t(k) - \min_{k \in N4_t} YY_t(k)\text{; t = 1993Q2,…,2001Q4.}$$

Again the quantity is considered unreliable if it exceeds 0.03. Let YY(%) denote the number of quarters in which YY_t^{max} is considered unreliable. This diagnostic is reported in the third row for each industry in Table 14. It is argued that the three diagnostics at least should not be exceeding 25%, 40% and 10%, respectively. From Table 14 it is however seen that for many of the series the calculated values are much higher than the above limits. Thus again one has to ask how relevant these critical terms are for a small country like Norway in which the time series behaves more erraticly than time series for a large country exemplified by the US. Is there no gain in the seasonal adjustment?

As mentioned above the sliding span analysis can also be applied to compare seasonal adjustment of aggregates by the direct and indirect method. Table 15 contains the results for different aggregates. We consider both series involving only new capital objects as well as series which in addition involve net purchases of used capital. Since we find no evidence of seasonality in the latter series they enter the seasonally adjusted aggregate unadjusted under the indirect method. The results shows that none of the two models is generally superior to the other one.

Conclusions

In this paper we have considered seasonal adjustment of quarterly time series of investments in manufacturing industries. As opposed to the current practice we have used decomposition in which a distinction has been made between purchase of new capital goods and net purchase of old capital object. In the latter type of series a clear seasonal pattern is not evident, hence it may be fruitful to focus on seasonal adjustment of investment in new objects. However, also these latters series behaves rather erratic, making it difficult to extract the seasonal component. Two types of capital are considered, Machinery and Buildings. Especially for Buildings it is hard to obtain well-specified Reg-ARIMA models even after corrections for intervention effects. A fundamental question is whether seasonal adjustment should be performed at all? Are the adjusted series easier to interpret than the unadjusted ones? Using the default criteria literally very few of the time series should have been adjusted. However, since these to a large extent have been influenced by transatlantic experiences, we have found it fruitful to seasonally adjust the series even if the criteria are not fulfilled.

A comparison of direct and indirect seasonal adjustments of composite time series has been carried through by means of sliding span analysis. For instance total investment in volume has been adjusted directly and indirectly. Under indirect adjustment seasonally adjusted series of Machinery and Buildings have been added to unadjusted series of net purchase of old capital objects. We are not able to draw the conclusion that one of the methods performs better than the other.

A natural extension of the analysis in this paper would be to compare the results to those obtained by the method currently employed by Statistics Norway when seasonally adjusting investment series from the quarterly national accounts.

References

Box, G. E. P. and G. M. Jenkins (1976): "*Time Series Analysis: Forecasting and Control*", Revised ed., San Fransisco: Holden-Day.

Chen, B. and D.F. Findley (1998): Comparison of X-11 and regARIMA Easter Holiday Adjustments. Mimeo. Statistical Research Division, U.S. Census Bureau.

Cleveland, W.P. (1998):"New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program: Comment", Journal of Business and Economic Statistics, 16, 153-155.

Findley. D.F., Monsell, B.C., Bell, W.R., Otto, M.C., and B.-C. Chen (1998a): "New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program, *Journal of Business and Economic Statistics*, 16, 127-152.

Findley. D.F., Monsell, B.C., Bell, W.R., Otto, M.C., and B.-C. Chen (1998b): "New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program: Reply, *Journal of Business and Economic Statistics*, 16, 169-177.

Findley. D.F., Monsell, B.C., Shulman, H.B. and M.G. Pugh (1990): "Sliding Spans Diagnostics for Seasonal and Related Adjustments, *Journal of the American Statistical Association*, 85, 345-355.

Ghysels, E. (1998): New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program: Comment, *Journal of Business and Economic Statistics*, 16, 165-167.

Gòmez, V. and A. Maravall (2001): Seasonal Adjustment and Signal Extraction in Economic Time Series. Chapter 8 in Peña, D. G. C. Tiao and R. S. Tsay (Eds.): *A course in time series analysis*. New York: John Wiley and Sons, 202-246.

Harvey, A. C. (1989): *Forecasting, Structural Time Series Models and the Kalman Filter*. New York: Cambridge University Press.

Hylleberg, S. (1998): New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program: Comment, *Journal of Business and Economic Statistics*, 16(2), 167-168.

Ladiray, D. and B. Quenneville (2001): *Seasonal Adjustment with the X-11 Method*. Heidelberg: Springer.

Lothian, J. and M. Morry (1978): A Set of Quality Control Statistics for the X11ARIMA seasonal Adjustment program, Research Paper, Seasonal Adjustment and Time Series Staff, Statistics Canada.

Maravall, A. (1998): New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program: Comment, *Journal of Business and Economic Statistics*, 16, 155-160.

Morry, M. and N. Chhab (1998) New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program: Comment, *Journal of Business and Economic Statistics*, 16, 161-163.

Otranto, E. and U. Triacca (2002): Measures to Evaluate the Discrepancy Between Direct and Indirect Model-Based Seasonal Adjustment, *Journal of Official Statistics*, 18, 511-530.

Scott, S. (1992): An Extended Review of the X11ARIMA Seasonal Adjustment Package, *International Journal of Forecasting*, 8, 627-633.

Wallis, K.F. (1998): New Capabilities and Methods of the X-12-ARIMA Seasonal-Adjustment Program: Comment, *Journal of Business and Economic Statistics*, 16, 164-165.

Table 1. The different manufacturing industries

Industry code	Manufacturing industry
8314	Fish and fish products
8315	Meat and diary products
8316	Other food products
8317	Beverages and tobacco
8318	Textiles, wearing
8320	Wood and wood products
8321	Pulp, paper and paper products
8322	Publishing, printing
8323	Refined petroleum
8324	Basic chemicals
8325	Chemical and mineral products
8327	Basic metals
8330	Machinery and other equipment n.e.c.
8335	Building and repairing of ships
8336	Oil platforms and modules
8337	Furniture and other manufacturing n.e.c.

Table 2. ARIMA-model acceptance criteria.[a] Investments in Machinery. Volume

Industry code[b]	Statistics			Are all the three selection criteria satisfied?
	Average absolute percentage error in within-sample forecasts last three years[c]	Chi Square Probability[d]	Sum of non-seasonal MA-parameter estimates[e]	
8314	35.97	29.24	0.693	No
8315	14.30	13.99	0.489	Yes
8316	17.63	29.72	0.552	No
8317	51.65	24.22	0.748	No
8318	27.18	33.99	0.444	No
8320[f]	15.19	50.62	0.607	Yes
8321	25.07	54.01	0.448	No
8322	47.94	48.40	0.471	No
8323	56.39	82.04	0.130	No
8324	27.04	13.86	0.220	No
8325	25.69	46.56	0.368	No
8327	20.38	54.07	0.064	No
8330	13.86	20.21	0.422	Yes
8335	29.80	25.23	0.628	No
8336	33.04	0.11	0.582	No
8337	20.27	19.91	0.515	No

[a] Results based on "airline model" unless explicit stated.
[b] For industry code cf. Table 1.
[c] According to the default value in X-12-ARIMA this value should not exceed 15 per cent.
[d] According to the default value in X-12-ARIMA the significance probability should exceed 5 per cent.
[e] According to the default criterion in X-12-ARIMA the sum of non-seasonal MA-parameters should not exceed 0.9. Using the "airline model" this criterion involves only one parameter.
[f] The applied ARIMA-model is (0 1 2) (0 1 1).

Table 3. ARIMA-model acceptance criteria.[a] Investments in Machinery. Value

	Statistics			
Industry code[b]	Average absolute percentage error in within-sample forecasts last three years[c]	Chi Square Probability[d]	Sum of non-seasonal MA-parameter estimates[e]	Are all the three selection criteria satisfied?
8314	38.20	29.11	0.739	No
8315	13.11	16.47	0.508	Yes
8316	18.61	24.68	0.554	No
8317	55.08	35.35	0.738	No
8318	29.60	31.15	0.382	No
8320	14.66	28.03	0.493	Yes
8321	26.36	43.26	0.439	No
8322	50.18	33.45	0.449	No
8323	56.81	78.67	0.053	No
8324	26.84	12.56	0.208	No
8325	24.82	41.98	0.391	No
8327	19.69	51.18	0.040	No
8330	16.42	20.53	0.431	No
8335	29.68	40.98	0.634	No
8336[f]	25.39		-0.168	
8337	18.83	14.37	0.475	No

[a] Results based on '"airline model" unless explicit stated.
[b] For industry code cf. Table 1.
[c] According to the default value in X-12-ARIMA this value should not exceed less than 15 per cent.
[d] According to the default value in X-12-ARIMA the significance probability should exceed 5 percent.
[e] According to the default criterion in X-12-ARIMA the sum of non-seasonal MA-parameters should not exceed 0.9. Using the "airline model" this criterion involves only one parameter.
[f] The applied ARIMA-model is (2 1 2) (0 1 1).

Table 4. ARIMA-model acceptance criteria.[a] Investments in Buildings. Volume

Industry code[b]	Statistics			Are all the three selection criteria satisfied?
	Average absolute percentage error in within-sample forecasts last three years[c]	Chi Square Probability[d]	Sum of non-seasonal MA-parameter estimates[e]	
8314	42.50	17.95	0.531	No
8315	29.11	99.70	0.491	No
8316	51.09	54.92	0.402	No
8317[f]				
8318	65.37	4.70	0.489	No
8320	35.62	1.39	0.202	No
8321	106.81	40.44	0.084	No
8322	75.85	62.06	0.362	No
8323[f]				
8324	37.06	3.75	0.208	No
8325	28.78	90.67	0.604	No
8327[g]	40.89	10.81	-0.057	No
8330	39.13	65.09	0.468	No
8335	32.91	65.35	0.325	No
8336	39.14	81.55	0.256	No
8337	37.68	88.69	0.397	No

[a] Results based on the "airline model" unless explicitly stated.
[b] For industry code cf. Table 1.
[c] According to the default value in X-12-ARIMA this value should not exceed 15 per cent.
[d] According to the default value in X-12-ARIMA the significance probability should exceed 5 per cent.
[e] According to the default criterion in X-12-ARIMA the sum of non-seasonal MA-parameters should not exceed 0.9. Using the "airline model" this criterion involves only one parameter.
[f] The time series for this industry are not seasonally adjusted.
[g] The applied ARIMA-model is (0 1 2) (0 1 1).

Table 5. ARIMA-model acceptance criteria.[a] Investments in Buildings. Value

Industry code[b]	Statistics: Average absolute percentage error in within-sample forecasts last three years[c]	Statistics: Chi Square Probability[d]	Statistics: Sum of non-seasonal MA-parameter estimates[e]	Are all the three selection criteria satisfied?
8314	42.39	14.88	0.537	No
8315	28.98	99.66	0.463	No
8316	52.09	56.17	0.387	No
8317[f]				
8318[g]	70.98	19.40	0.601	No
8320[g]	25.68	9.79	0.683	No
8321	105.96	36.90	0.087	No
8322	73.63	56.60	0.343	No
8323[f]				
8324	37.01	4.87	0.202	No
8325	28.12	92.24	0.585	No
8327[g]	41.20	11.28	-0.065	No
8330	39.69	71.57	0.442	No
8335	33.35	64.55	0.317	No
8336	38.53	78.84	0.266	No
8337	38.25	90.30	0.394	No

[a] Results based on "the airline" model unless explicitly stated.
[b] For industry code cf. Table 1.
[c] According to the default value in X-12-ARIMA this value should be less than 15 per cent.
[d] According to the default value in X-12-ARIMA the significance probability should exceed 5 per cent.
[e] According to the default criterion in X-12-ARIMA the sum of non-seasonal MA-parameters should not exceed 0.9. Using the "airline model" this criterion involves only one parameter.
[f] The time series for this industry are not seasonally adjusted.
[g] The applied model is (0 1 1) (0 1 2).

Table 6. Estimates of ARIMA-parameters[a, b]

	Machinery				Buildings			
Ind.	Volume		Value		Volume		Value	
code[c]	θ_1	Θ_1	θ_1	Θ_1	θ_1	Θ_1	θ_1	Θ_1
8314	0.6932	0.9243	0.7389	0.9292	0.5307	0.9978	0.5368	0.9992
	(0.0740)	(0.0541)	(0.0704)	(0.0533)	(0.0817)	(0.0491)	(0.0813)	(0.0513)
8315	0.4888	0.9999	0.5078	0.9999	0.4906	0.8803	0.4627	0.8828
	(0.0872)	(0.0609)	(0.0833)	(0.0881)	(0.0870)	(0.0646)	(0.0883)	(0.0630)
8316	0.5523	0.8043	0.5541	0.7939	0.4017	0.9825	0.3869	0.9859
	(0.0818)	(0.0647)	(0.0838)	(0.0669)	(0.0900)	(0.0473)	(0.0905)	(0.0473)
8317	0.7483	0.8527	0.7383	0.8525				
	(0.0683)	(0.0551)	(0.0694)	(0.0539)				
8318	0.4437	0.8923	0.3814	0.8920	0.4884	0.9093		
	(0.0885)	(0.0512)	(0.0909)	(0.0521)	(0.0945)	(0.0532)		
8320			0.4926	0.8599	0.2024	0.8323		
			(0.0872)	(0.0555)	(0.1019)	(0.0772)		
8321	0.4478	0.9991	0.4394	0.9994	0.0845	0.9983	0.0873	0.9982
	(0.0857)	(0.0513)	(0.0854)	(0.0522)	(0.0960)	(0.0496)	(0.0960)	(0.0496)
8322	0.4410	1.0000	0.4490	0.9999	0.3617	0.9587	0.3433	0.9592
	(0.0864)	(0.0648)	(0.0862)	(0.0594)	(0.0912)	(0.0471)	(0.0919)	(0.0468)
8323	0.0689	0.8326	0.0526	0.8393				
	(0.1007)	(0.0620)	(0.1007)	(0.0617)				
8324	0.2203	0.9097	0.2080	0.9041	0.2084	0.0933	0.2018	0.9997
	(0.0959)	(0.0453)	(0.0951)	(0.0458)	(0.9993)	(0.6042)	(0.0934)	(0.0533)
8325	0.3684	0.9997	0.3911	0.9998	0.0516	0.0786	0.5853	0.9267
	(0.0894)	(0.0560)	(0.0879)	(0.0568)	(0.9315)	(0.0451)	(0.0800)	(0.0455)
8327	0.0638	0.9633	0.0401	0.9403				
	(0.0995)	(0.0492)	(0.1000)	(0.0491)				
8330	0.4216	0.9998	0.4309	0.9997	0.4683	0.9320	0.4416	0.9458
	(0.0871)	(0.0581)	(0.0870)	(0.0555)	(0.0880)	(0.0520)	(0.0892)	(0.0507)
8335	0.6047	0.8865	0.6342	0.9435	0.3252	0.9996	0.3174	0.9997
	(0.0810)	(0.0617)	(0.0776)	(0.0542)	(0.0911)	(0.0531)	(0.0912)	(0.0542)
8336	0.5823	0.9996			0.2552	1.0000	0.2638	1.0000
	(0.0801)	(0.0526)			(0.0927)	(0.0664)	(0.0926)	(0.0693)
8337	0.4180	0.9406	0.4748	0.9995	0.3972	0.8959	0.3939	0.9069
	(0.0900)	(0.0488)	(0.0840)	(0.0530)	(0.0912)	(0.0598)	(0.0910)	(0.0591)

[a] The "airline model" is used for all variables in this table.
[b] Standard errors in parenthesis.
[c] For industry code cf. Table 1.

Table 6 (Continued). Estimates of ARIMA-parameters[a]

Ind. code[c]	Vol./Val.	Cap. type	ϕ_1	ϕ_2	θ_1	θ_2	Θ_1
8318	Value	Buildings	0.410	0.191	0[a]	0[a]	0.919
			(0.104)	(0.105)			(0.051)
8320	Volume	Machinery	0.367	0.241	0[a]	0[a]	0.942
			(0.094)	(0.095)			(0.049)
8320	Value	Buildings	0.296	0.387	0[a]	0[a]	0.867
			(0.094)	(0.098)			(0.068)
8327	Volume	Buildings	0.281	-0.338	0[a]	0[a]	0.913
			(0.093)	(0.096)			(0.052)
8327	Value	Buildings	0.278	-0.343	0[a]	0[a]	0.918
			(0.093)	(0.095)			(0.051)
8336	Value	Machinery	0.208	-0.376	0.725	-0.320	1
			(0.316)	(0.148)	(0.324)	(0.237)	(0.070)

[a] Standard errors in parenthesis.
[b] Restricted to zero a priori.
[c] For industry code cf. Table 1.

Table 7. Estimated intervention effects[a]. Investments in Machinery

Industry code[b]	Volume		Value	
	Additive outlier	Level shift	Additive outlier	Level shift
8314				
8315				
8316				
8317		01:3		01:3
8318	91:2; 93:3		91:2; 93:3	
8320	97:1[c]		97:1	94:1
8321				
8322	00:2		00:2	
8323	87:1;91:4;01:2	91:2;96:2	87:1;91:4;01:2	91:2;96:2
8324		95:1		95:1
8325				
8327	95:4		95:4	
8330				
8335				
8336	78:1		78:1	
8337	90:1			

[a] Results based on the "airline model" unless explicitly stated.
[b] For industry code cf. Table 1.
[c] Based on model (0 1 2) (0 1 1).

Table 8. Estimated intervention effects. Investments in Buildings

Industry code[a]	Volume		Value	
	Additive outlier	Level shift	Additive outlier	Level shift
8314				
8315				
8316				
8317				
8318		02:1		02:1
8320				
8321				
8322	92:4;93:2;95:4		92:4;93:2;95:4	
8323				
8324		99:1		99:1
8325				
8327				
8330				
8335	96:4;00:1	90:3	96:4;00:1	90:3
8336	95:2	79:1;88:3	95:2	79:1;88:3
8337		99:1		99:1

[a] For industry code cf. Table 1.

Table 9. Monitoring and quality assessment statistics[a]. Investments in Machinery. Volume

Industry code[b]	Statistics											
	M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	Q
8314	3.000	0.491	1.058	1.176	0.889	0.655	0.600	0.953	0.582	1.607	1.607	1.106
8315	1.014	0.632	1.125	1.548	0.930	0.816	0.289	0.376	0.081	0.295	0.276	0.685
8316	1.850	0.886	1.784	1.176	1.044	0.872	0.305	0.671	0.363	0.735	0.588	0.937
8317	3.000	3.000	1.858	0.991	1.462	0.730	0.870	0.982	0.539	0.702	0.702	1.528
8318	1.238	0.686	0.767	1.084	0.760	0.686	0.457	0.864	0.343	0.497	0.449	0.719
8320[c]	1.127	0.401	0.722	1.269	0.623	0.063	0.289	0.951	0.259	0.950	0.865	0.615
8321	1.448	0.413	0.880	0.805	0.896	0.548	0.367	0.801	0.186	0.678	0.519	0.679
8322	1.134	0.547	0.764	0.991	0.738	0.135	0.247	0.780	0.102	0.856	0.833	0.598
8323	1.306	0.674	0.213	0.619	0.366	0.187	0.668	1.214	0.710	1.546	1.394	0.707
8324	1.030	0.746	0.827	0.805	0.681	0.666	0.268	0.666	0.372	0.646	0.571	0.643
8325	0.965	0.325	0.585	0.805	0.733	0.292	0.261	0.749	0.179	0.916	0.904	0.550
8327	0.918	0.151	0.484	0.712	0.346	0.077	0.264	1.029	0.096	0.835	0.739	0.449
8330	0.963	0.201	0.912	1.176	0.945	0.893	0.286	0.521	0.169	0.688	0.414	0.641
8335	2.498	0.366	1.066	1.455	0.863	0.181	0.526	1.337	0.455	0.930	0.854	0.918
8336	1.864	0.801	0.945	1.269	0.935	0.726	0.455	0.507	0.147	0.280	0.275	0.804
8337	1.617	0.432	0.944	1.362	0.756	0.192	0.350	1.132	0.184	1.418	1.304	0.779

[a] "Airline model" used unless stated explicitly.
[b] For industry code cf. Table 1.
[c] Statistics based on model (0 1 2) (0 1 1).

Table 10. Monitoring and quality assessment statistics.[a] Investments in Machinery. Value

Industry code[b]	Statistics											
	M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	Q
8314	3.000	0.979	1.108	1.176	0.866	0.696	0.614	0.888	0.610	1.518	1.518	1.161
8315	0.819	0.567	1.038	0.898	0.941	0.714	0.304	0.778	0.035	0.625	0.557	0.654
8316	1.768	1.086	1.692	0.805	1.086	0.671	0.305	0.708	0.358	0.770	0.650	0.903
8317	3.000	3.000	1.602	0.805	1.326	0.706	0.842	1.562	0.488	2.092	1.657	1.516
8318	1.257	0.726	0.663	1.269	0.707	0.513	0.439	0.863	0.363	0.514	0.407	0.704
8320	1.116	0.946	0.917	0.991	0.739	0.122	0.284	0.920	0.204	0.944	0.858	0.682
8321	1.446	0.442	0.864	0.619	0.871	0.566	0.367	0.796	0.191	0.605	0.454	0.659
8322	1.817	0.788	0.912	1.176	0.778	0.219	0.244	0.790	0.136	0.749	0.693	0.728
8323	1.227	0.572	0.174	0.619	0.318	0.211	0.677	1.202	0.732	1.597	1.468	0.688
8324	1.326	1.279	0.923	0.712	0.694	0.716	0.276	0.638	0.384	0.603	0.533	0.737
8325	1.148	0.459	0.749	0.712	0.763	0.541	0.254	0.760	0.171	0.839	0.826	0.613
8327	0.911	0.177	0.474	0.991	0.291	0.101	0.259	0.998	0.115	0.793	0.726	0.465
8330	0.951	0.324	0.802	1.176	0.925	0.867	0.284	0.474	0.187	0.695	0.482	0.638
8335	2.661	0.643	1.092	1.641	0.872	0.187	0.519	1.304	0.451	0.795	0.628	0.965
8336[c]	1.864	0.784	0.771	0.991	0.872	1.220	0.452	0.539	0.294	0.254	0.254	0.761
8337	1.233	0.451	0.656	1.362	0.741	0.084	0.435	1.319	0.160	1.501	1.393	0.735

[a] Diagnostics based on "airline model" unless otherwise stated.
[b] For industry code cf. Table 1.
[c] The applied ARIMA-model is (2 1 2) (0 1 1).

Table 11. Monitoring and quality assessment statistics[a]. Investments in Buildings. Volume

Industry code[b]	Statistics											
	M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	Q
8314	3.000	0.873	0.759	1.084	0.796	0.580	0.622	1.250	0.401	1.259	1.223	1.031
8315	2.033	0.799	1.230	1.084	0.815	0.511	0.417	1.106	0.496	1.489	1.489	0.948
8316	0.641	0.379	0.614	0.991	0.775	0.025	0.284	0.743	0.185	0.827	0.826	0.516
8317[c]												
8318	3.000	1.879	0.844	0.712	0.764	0.709	0.917	1.134	0.347	1.303	1.217	1.224
8320	1.452	0.586	0.683	1.269	0.559	0.230	0.290	0.848	0.395	1.244	1.166	0.700
8321	1.931	0.259	0.378	0.898	0.446	0.633	0.481	1.014	0.368	1.250	1.166	0.724
8322	2.173	0.512	0.851	0.712	0.861	0.264	0.537	1.199	0.370	1.312	1.312	0.848
8323[c]												
8324	1.963	2.138	0.600	0.991	0.760	1.104	0.777	0.632	0.139	0.973	0.973	1.029
8325	1.968	0.782	0.951	0.712	0.897	0.849	0.509	0.700	0.289	0.503	0.415	0.812
8327[d]	0.903	0.141	0.642	1.084	0.680	0.612	0.350	0.691	0.257	1.394	1.289	0.629
8330	1.193	0.390	0.858	0.619	0.859	0.152	0.290	0.765	0.289	0.761	0.571	0.586
8335	2.320	0.812	0.886	0.712	0.799	0.363	0.361	1.176	0.139	1.396	1.377	0.859
8336	2.684	3.000	0.777	0.898	0.773	1.481	0.462	0.442	0.121	0.315	0.220	1.085
8337	3.000	1.010	1.222	1.269	0.860	0.549	0.536	1.263	0.394	1.619	1.293	1.113

[a] "Airline model" used unless stated explicitly.
[b] For industry code cf. Table 1.
[c] The time series for this industry are not seasonally adjusted.
[d] The applied ARIMA-model is (0 1 2) (0 1 1).

Table 12. Monitoring and quality assessment statistics.[a] Investments in Buildings. Value

Industry code[b]	Statistics											
	M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	Q
8314	2.389	0.720	0.756	1.084	0.802	0.545	0.623	1.252	0.429	1.339	1.339	0.960
8315	2.021	0.667	1.213	1.084	0.797	0.529	0.412	1.100	0.493	1.467	1.467	0.927
8316	0.538	0.255	0.583	0.991	0.761	0.019	0.285	0.728	0.182	0.836	0.834	0.487
8317[c]												
8318[d]	3.000	1.648	0.818	0.248	0.791	0.769	0.925	1.510	0.411	1.533	1.275	1.160
8320[d]	1.418	0.523	0.643	1.269	0.534	0.208	0.292	0.835	0.389	1.233	1.155	0.679
8321	1.916	0.259	0.372	0.898	0.436	0.638	0.486	1.012	0.374	1.256	1.166	0.722
8322	2.766	0.796	0.788	0.712	0.840	0.250	0.537	1.187	0.359	1.304	1.304	0.927
8323[c]												
8324	2.169	1.528	0.604	0.805	0.754	1.073	0.749	0.666	0.136	0.989	0.989	0.959
8325	1.767	0.571	0.928	0.712	0.892	0.822	0.516	0.705	0.288	0.520	0.431	0.764
8327[d]	0.898	0.135	0.663	0.898	0.665	0.680	0.348	0.710	0.257	1.392	1.290	0.621
8330	1.185	0.345	0.818	0.619	0.834	0.194	0.286	0.749	0.283	0.761	0.563	0.576
8335	2.267	0.944	0.895	0.898	0.788	0.385	0.360	1.178	0.136	1.459	1.421	0.889
8336	2.687	3.000	0.766	0.898	0.773	1.480	0.464	0.434	0.120	0.311	0.222	1.084
8337	3.000	1.012	1.177	1.269	0.859	0.555	0.540	1.300	0.402	1.681	1.340	1.118

[a] "Airline model" used unless stated explicitly.
[b] For industry code cf. Table 1.
[c] The time series for this industry are not seasonally adjusted.
[d] The applied ARIMA-model is (0 1 2) (0 1 1).

Table 13. Sliding span analysis. Definitions of the sets N_t, $N1_t$ and $N4_t$ over 1992Q1-2002Q4

Period	N_t	$N1_t$	$N4_t$
1992Q1	{1}	∅	∅
1992Q2	{1}	{1}	∅
1992Q3	{1}	{1}	∅
1992Q4	{1}	{1}	∅
1993Q1	{1,2}	{1}	{1}
1993Q2	{1,2}	{1,2}	{1}
1993Q3	{1,2}	{1,2}	{1}
1993Q4	{1,2}	{1,2}	{1}
1994Q1	{1,2,3}	{1,2}	{1,2}
1994Q2	{1,2,3}	{1,2,3}	{1,2}
1994Q3	{1,2,3}	{1,2,3}	{1,2}
1994Q4	{1,2,3}	{1,2,3}	{1,2}
1995Q1	{1,2,3,4}	{1,2,3}	{1,2,3}
1995Q2	{1,2,3,4}	{1,2,3,4}	{1,2,3}
1995Q3	{1,2,3,4}	{1,2,3,4}	{1,2,3}
1995Q4	{1,2,3,4}	{1,2,3,4}	{1,2,3}
1996Q1	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1996Q2	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1996Q3	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1996Q4	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1997Q1	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1997Q2	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1997Q3	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1997Q4	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1998Q1	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1998Q2	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1998Q3	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1998Q4	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1999Q1	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1999Q2	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1999Q3	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
1999Q4	{1,2,3,4}	{1,2,3,4}	{1,2,3,4}
2000Q1	{2,3,4}	{2,3,4}	{2,3,4}
2000Q2	{2,3,4}	{2,3,4}	{2,3,4}
2000Q3	{2,3,4}	{2,3,4}	{2,3,4}
2000Q4	{2,3,4}	{2,3,4}	{2,3,4}
2001Q1	{3,4}	{3,4}	{3,4}
2001Q2	{3,4}	{3,4}	{3,4}
2001Q3	{3,4}	{3,4}	{3,4}
2001Q4	{3,4}	{3,4}	{3,4}
2001Q1	{4}	{4}	{4}
2001Q2	{4}	{4}	{4}
2001Q3	{4}	{4}	{4}
2001Q4	{4}	{4}	{4}

Table 14. Results from the sliding span analysis of individual time series

Industry code[a]	Diagnostics	Machinery		Buildings	
		Volume	Value	Volume	Value
8314	S(%)	83.3	85.4	77.8	80.6
	QQ(%)	89.4	95.7	97.1	97.1
	YY(%)	2.3	2.3	40.6	46.9
8315	S(%)	33.3	27.8	83.3	77.8
	QQ(%)	57.4	54.3	85.7	88.6
	YY(%)	0.0	6.2	31.2	31.2
8316	S(%)	61.1	55.6	61.1	52.8
	QQ(%)	82.9	77.1	71.4	71.4
	YY(%)	12.5	21.9	9.4	6.2
8317	S(%)	83.3	88.9	[b]	[b]
	QQ(%)	93.6	94.3	[b]	[b]
	YY(%)	31.8	65.6	[b]	[b]
8318	S(%)	75.0	63.9	87.5	85.4
	QQ(%)	91.4	82.9	95.7	95.7
	YY(%)	21.9	18.8	40.9	43.2
8320	S(%)	72.2	75.0	77.8	77.8
	QQ(%)	80.0	80.0	71.4	74.3
	YY(%)	18.8	37.5	25.0	31.2
8321	S(%)	69.4	77.8	88.9	88.9
	QQ(%)	85.7	85.7	88.6	88.6
	YY(%)	40.6	43.8	40.6	40.6
8322	S(%)	50.0	52.8	83.3	83.3
	QQ(%)	80.0	77.1	82.9	82.9
	YY(%)	25.0	21.9	31.2	34.3
8323	S(%)	94.4	94.4	[b]	[b]
	QQ(%)	88.6	88.6	[b]	[b]
	YY(%)	62.5	62.5	[b]	[b]
8324	S(%)	55.6	61.1	89.6	89.6
	QQ(%)	68.6	62.9	87.2	87.2
	YY(%)	18.8	21.9	15.9	18.2
8325	S(%)	61.1	58.3	75.0	75.0
	QQ(%)	82.9	85.7	87.2	87.2
	YY(%)	6.2	6.2	6.8	9.1
8327	S(%)	83.3	86.1	72.2	77.8
	QQ(%)	91.4	94.3	88.6	85.7
	YY(%)	40.6	31.2	25.0	28.1
8330	S(%)	44.4	41.7	72.2	72.2
	QQ(%)	68.6	74.3	82.9	82.9
	YY(%)	6.2	9.4	21.9	25.0
8335	S(%)	91.7	94.4	80.6	80.6
	QQ(%)	100.0	94.3	94.3	94.3
	YY(%)	59.4	50.0	40.6	40.6
8336	S(%)	58.3	58.3	75.0	77.1
	QQ(%)	85.1	72.3	78.7	80.9
	YY(%)	11.4	4.5	15.9	15.9
8337	S(%)	55.6	61.1	88.9	86.1
	QQ(%)	82.9	82.9	91.4	94.3
	YY(%)	28.1	25.0	56.2	56.2

[a] For industry code cf. Table 1.

[b] These time series are not seasonally adjusted.

Table 15. Sliding span diagnostics of aggregate series

	SS(%)		QQ (%)		YY(%)	
Aggregates	Ind.	Dir.	Ind.	Dir.	Ind.	Dir.
Machinery investments (new objects). Volume	13.9	11.1	40.0	34.3	3.1	0.0
Machinery investments (new objects). Value	11.1	13.9	34.3	45.7	3.1	0.0
Building investments (new objects). Volume	8.3	27.8	37.1	45.7	6.2	6.2
Building investments (new objects). Value	8.3	27.8	40.0	42.9	6.2	9.4
Investments (new objects). Volume	5.6	2.8	22.9	28.6	0.0	0.0
Investments (new objects). Value	5.6	2.8	20.0	22.9	0.0	0.0
Machinery investments. Volume	13.9	11.1	40.0	34.3	3.1	0.0
Machinery investments. Value	11.1	16.7	34.3	34.3	0.0	3.1
Building investments. Volume	8.3	44.4	37.1	65.7	6.2	3.1
Building investments. Value	8.3	50.0	40.0	71.4	6.2	18.8
Investments. Volume	5.6	22.9	0.0	5.6	22.9	0.0
Investments. Value	5.6	13.9	20.0	22.9	0.0	0.0

Appendix A. Seasonally adjusted and trend series for all manufacturing industries

Machinery, volume

Fig. 1: Fish and fish products

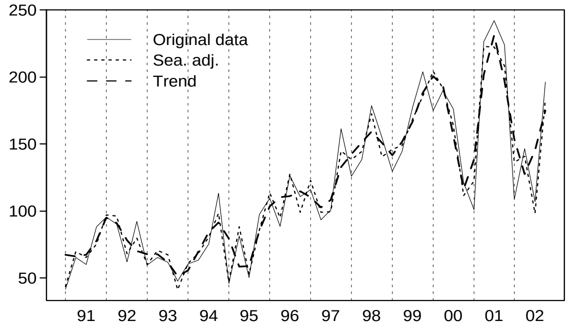


Fig. 2: Meat and diary products

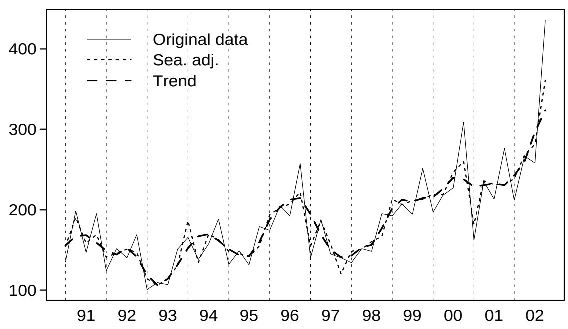


Fig. 3: Other food products

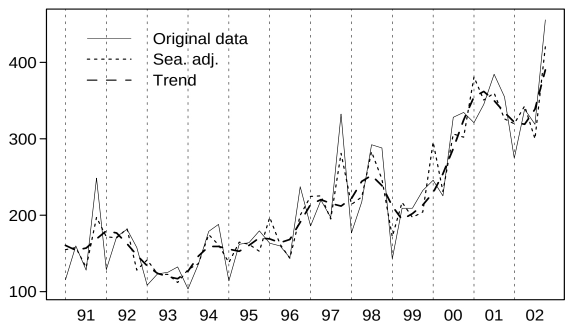


Fig. 4: Beverages and tobacco

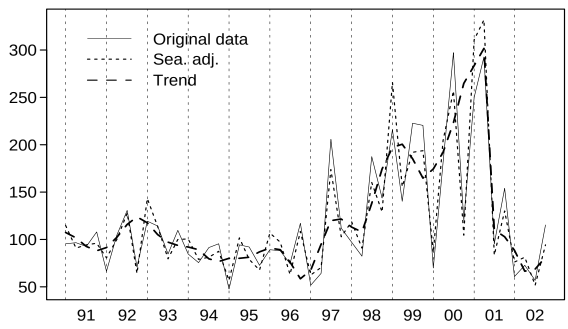


Fig. 5: Textiles, wearing

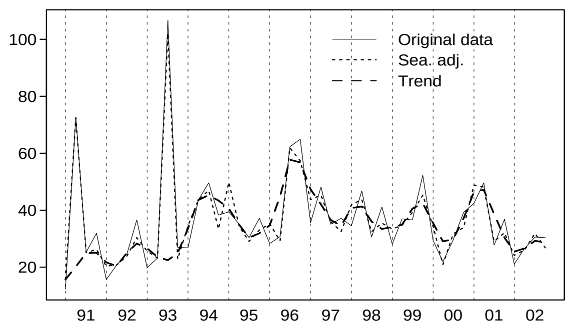
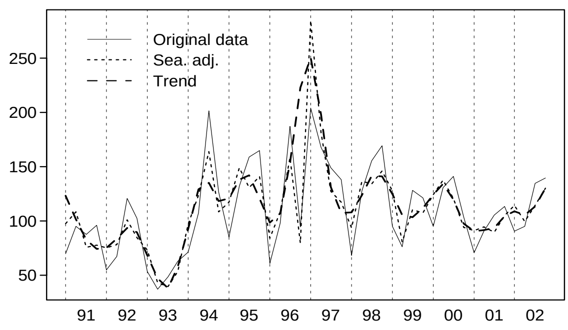


Fig. 6: Wood and wood products



Fig, 7: Pulp, paper and paper products

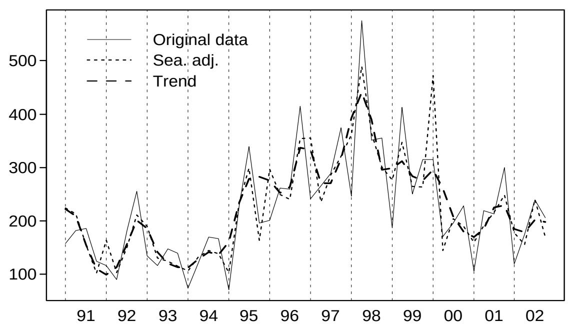


Fig. 8: Publishing, printing

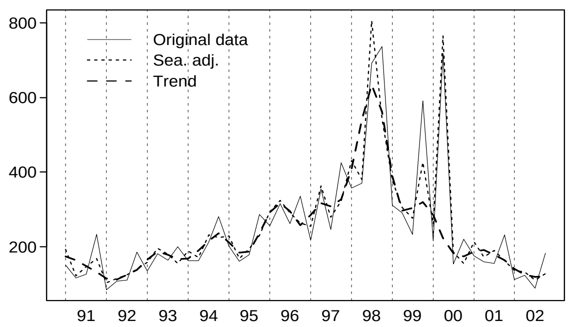


Fig. 9: Refined petroleum

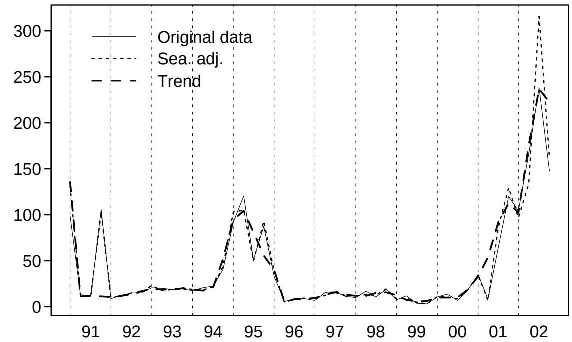


Fig. 10: Basic chemical

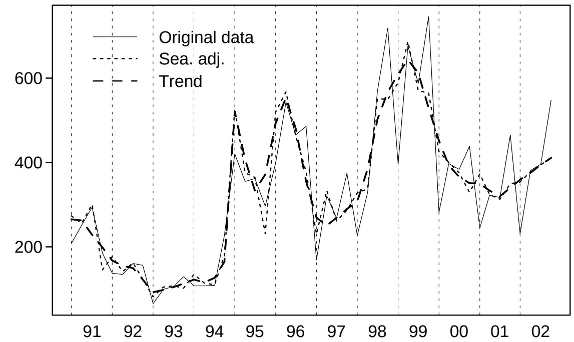


Fig. 11: Chemical and mineral products

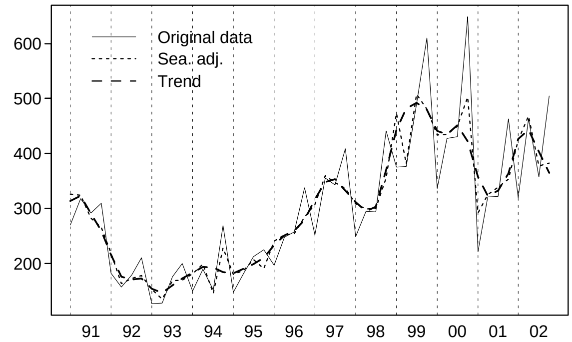


Fig. 12: Basic metals

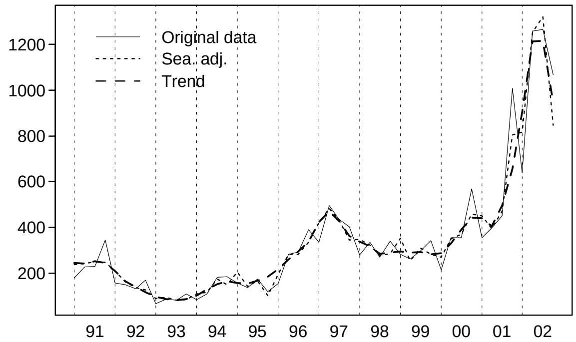


Fig. 13: Machinery and other equipment n.e.c

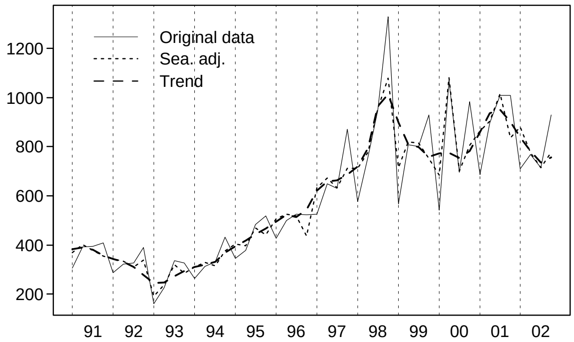
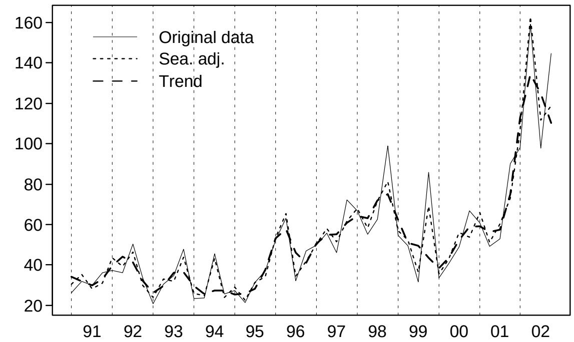


Fig. 14: Building and repairing of ships



Fig, 15: Oil plattforms and modules

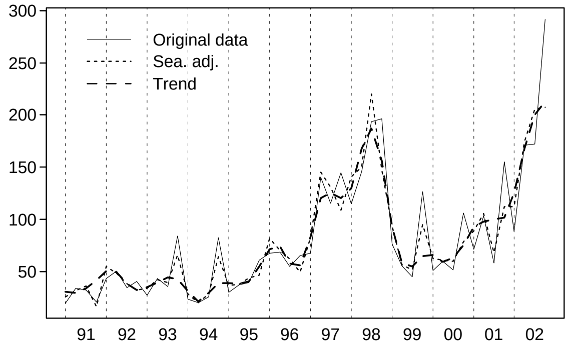
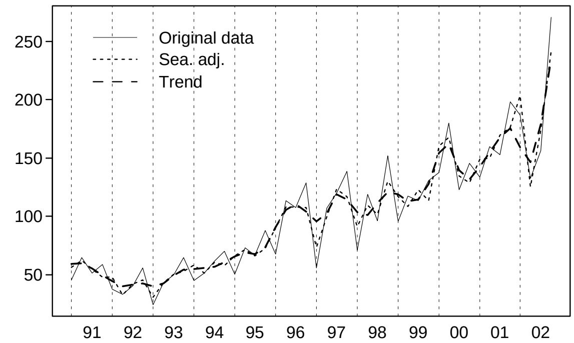


Fig. 16: Furniture & other manufacturing n.e.c



Machinery, value

Fig. 17: Fish and fish products

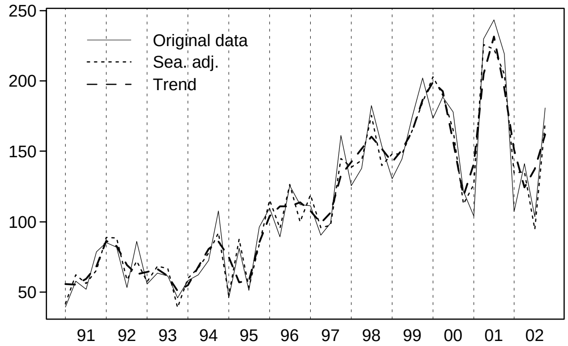


Fig. 18: Meat and diary products

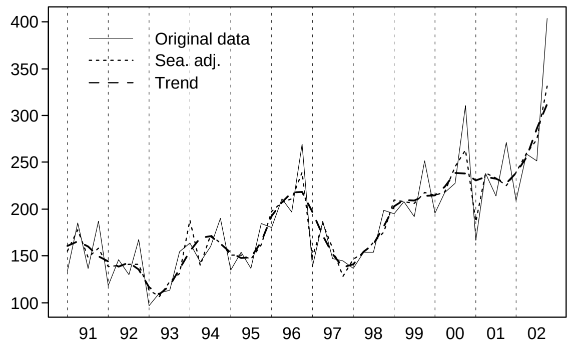


Fig. 19: Other food products

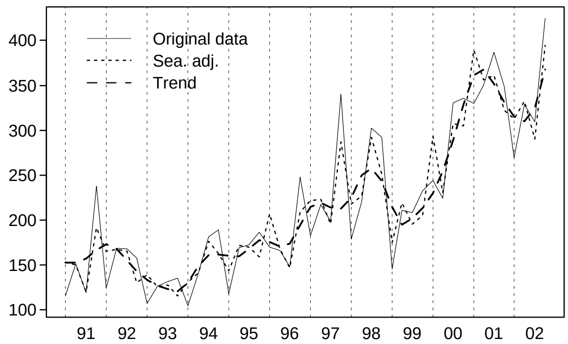


Fig. 20: Beverages and tobacco

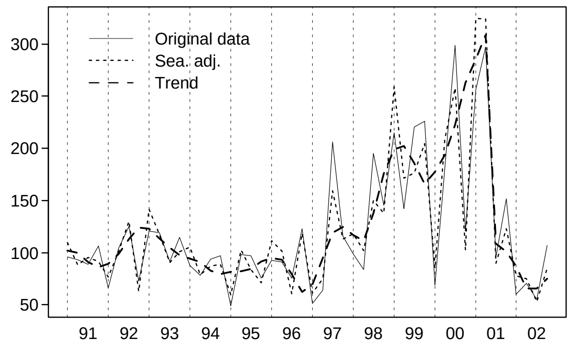


Fig. 21: Textiles, wearing

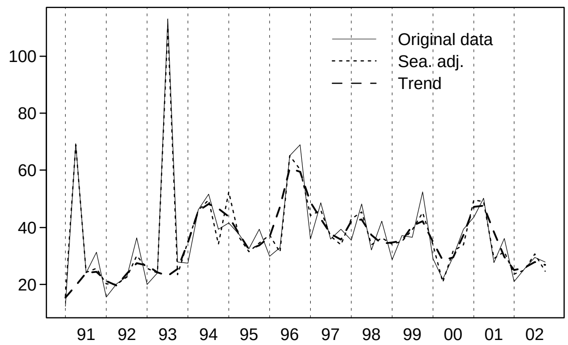


Fig. 22: Wood and wood products

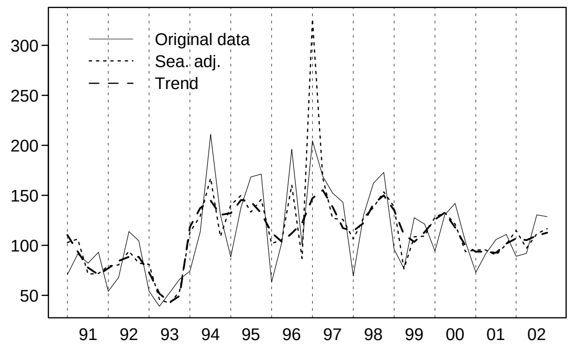


Fig. 23: Pulp, paper and paper products

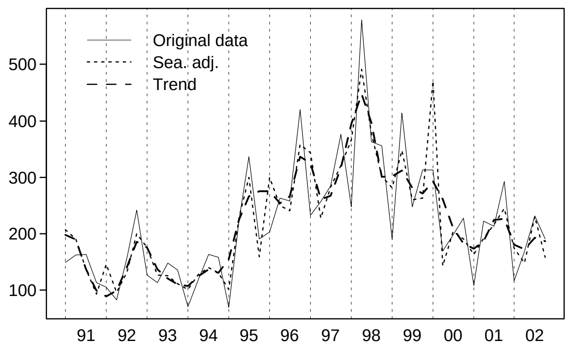


Fig. 24: Publishing, printing

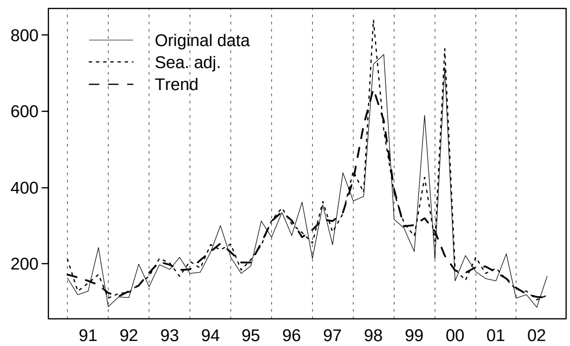


Fig. 25: Refined petroleum

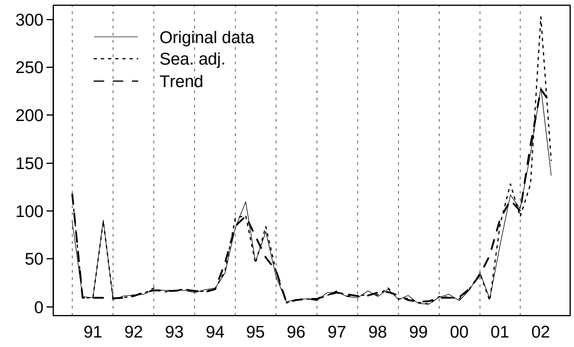


Fig. 26: Basic chemical

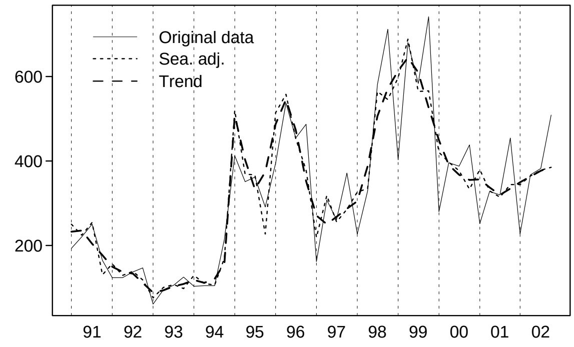


Fig. 27: Chemical and mineral products

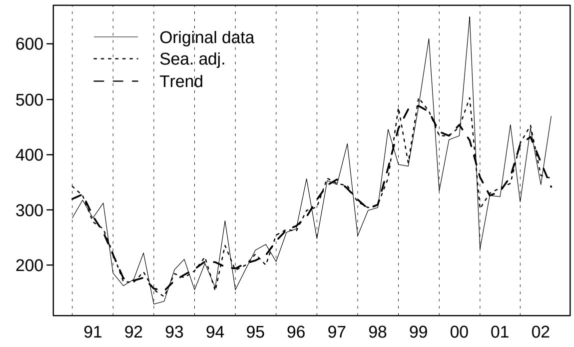


Fig. 28: Basic metals

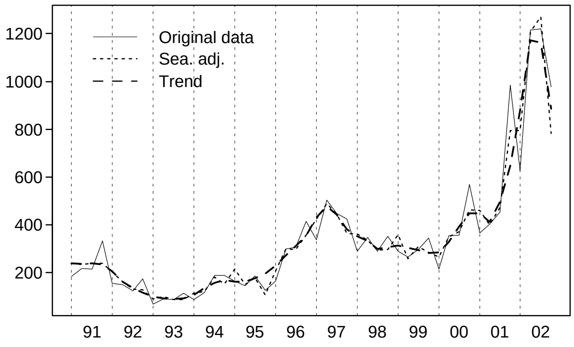


Fig. 29: Machinery and other equipment n.e.c

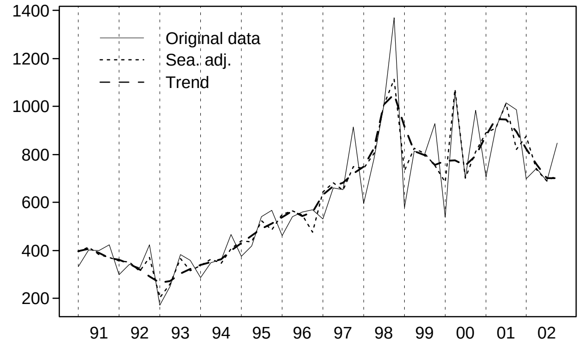
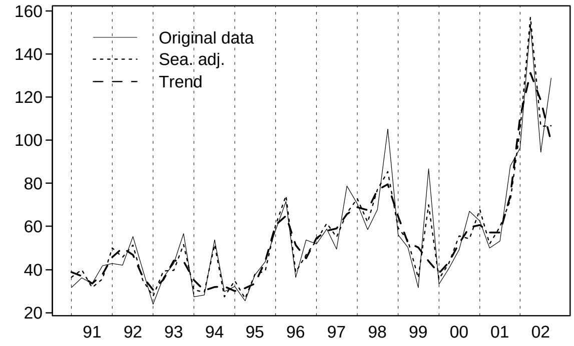


Fig. 30: Building and repairing of ships



Fig, 31: Oil plattforms and modules

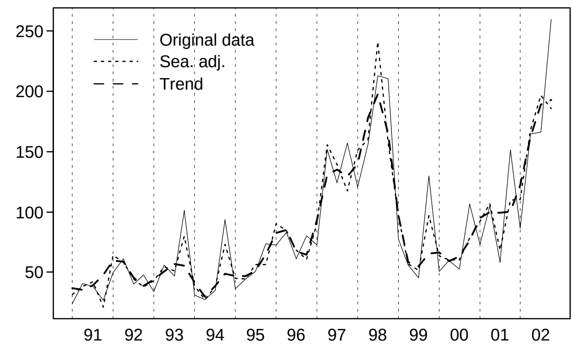
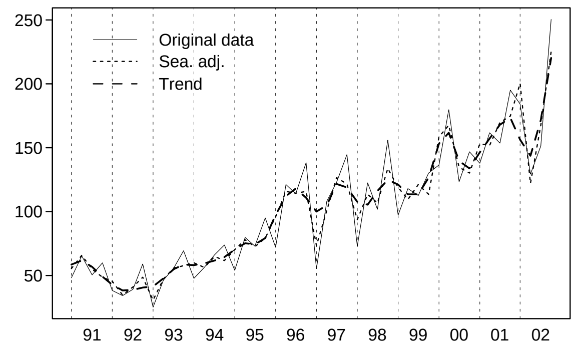


Fig. 32: Furniture & other manufacturing n.e.c



Buildings, volume

Fig. 33: Fish and fish products

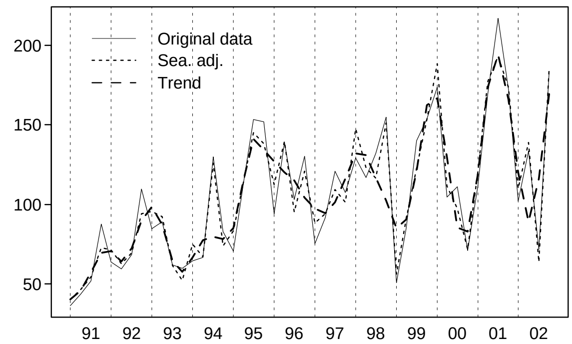


Fig. 34: Meat and diary products

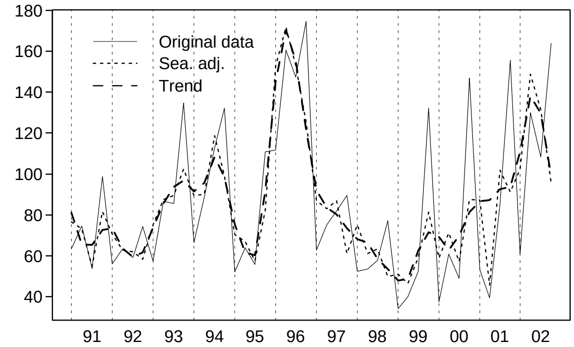


Fig. 35: Other food products

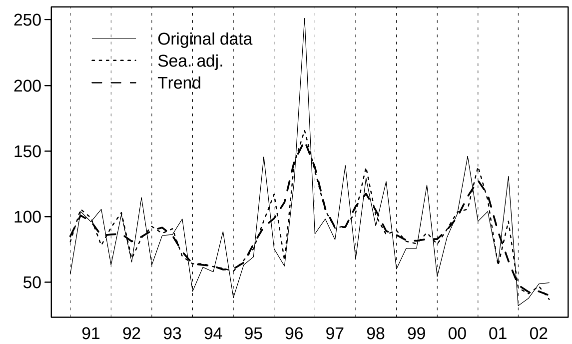


Fig. 36: Beverages and tobacco

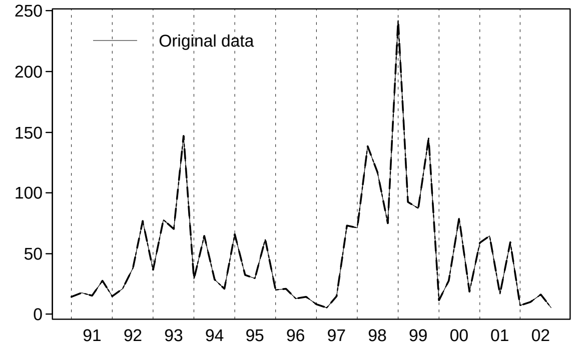


Fig. 37: Textiles, wearing

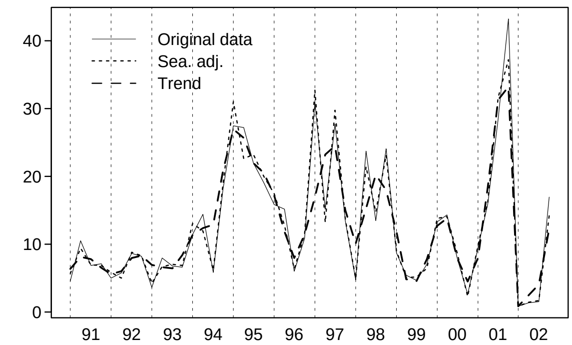
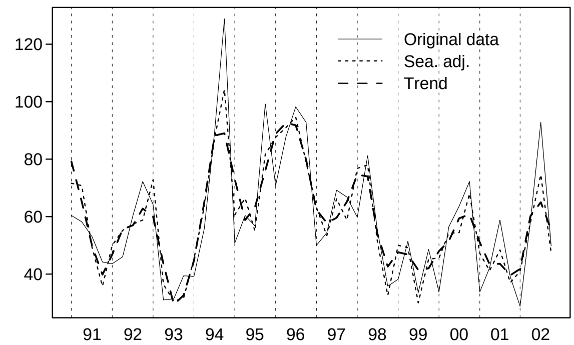


Fig. 38: Wood and wood products



Fig, 39: Pulp, paper and paper products

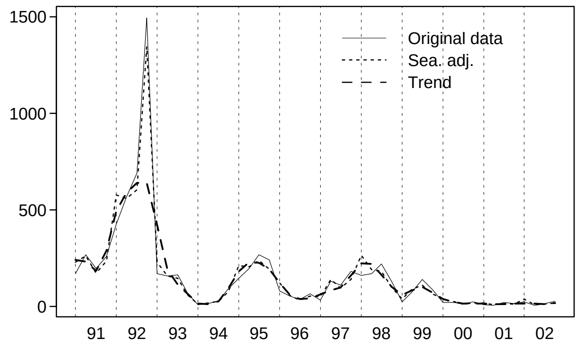


Fig. 40: Publishing, printing

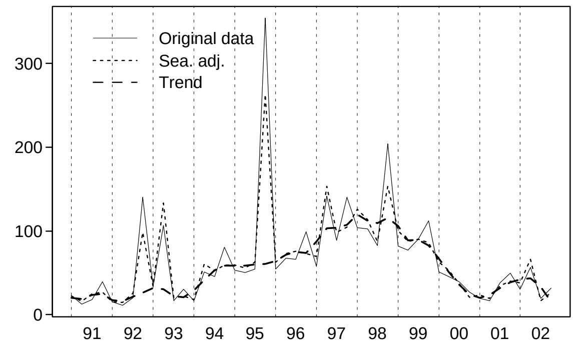


Fig. 41: Refined petroleum

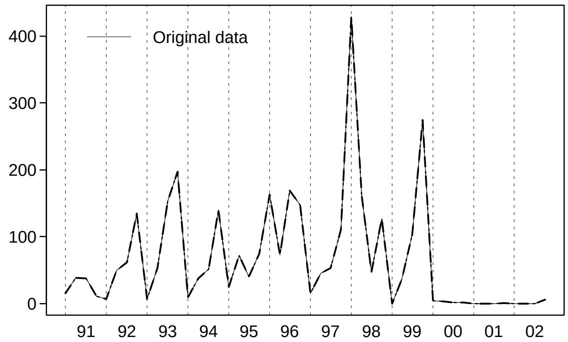


Fig. 42: Basic chemical

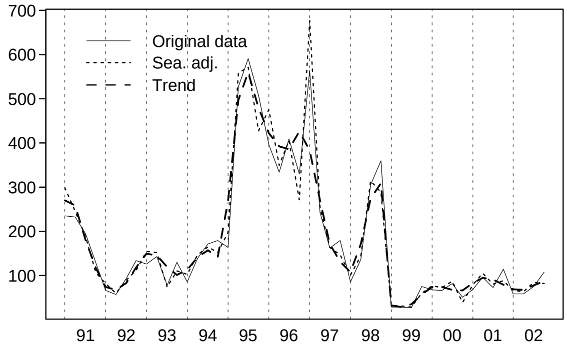


Fig. 43: Chemical and mineral products

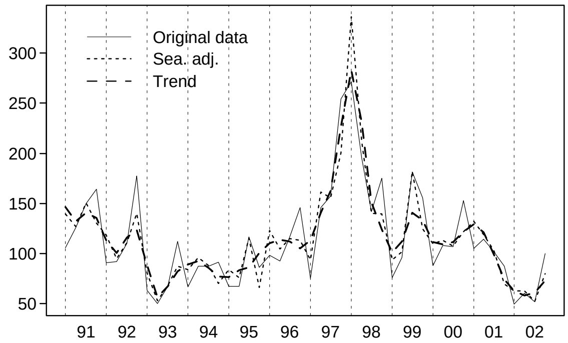


Fig. 44: Basic metals

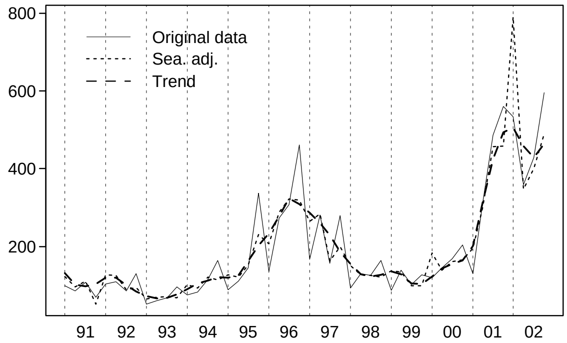


Fig. 45: Machinery and other equipment n.e.c

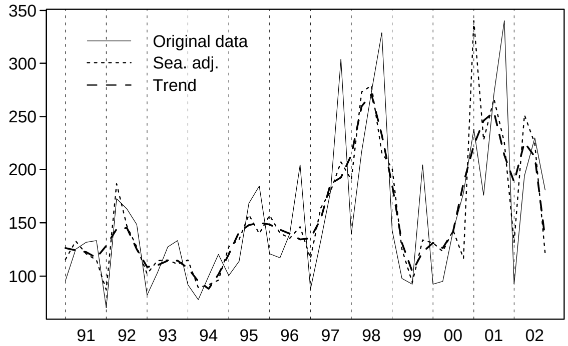


Fig. 46: Building and repairing of ships

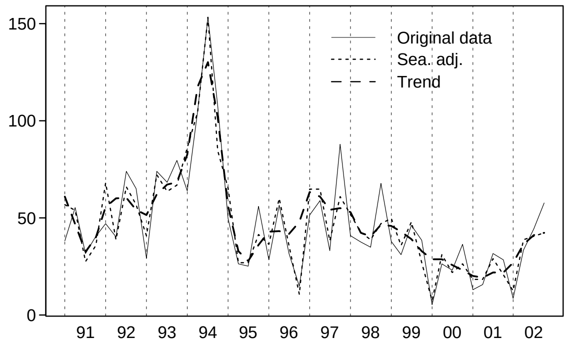


Fig. 47: Oil plattforms and modules

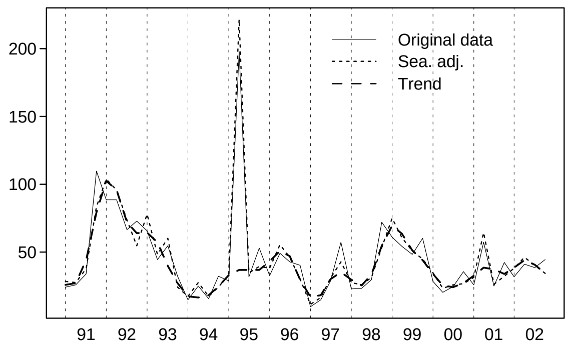
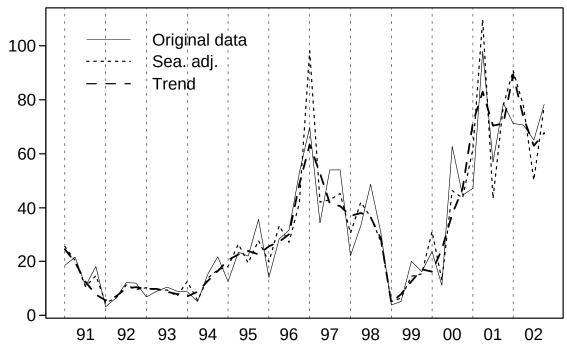


Fig. 48: Furniture & other manufacturing n.e.c



Buildings, value

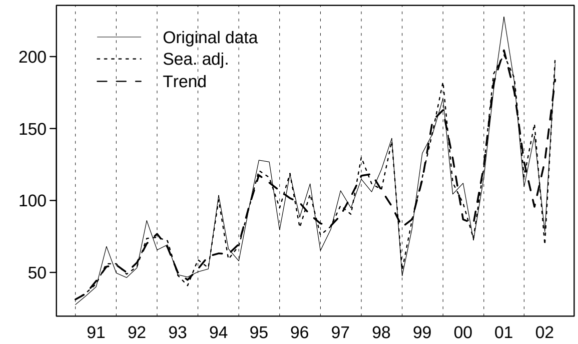


Fig. 49: Fish and fish products

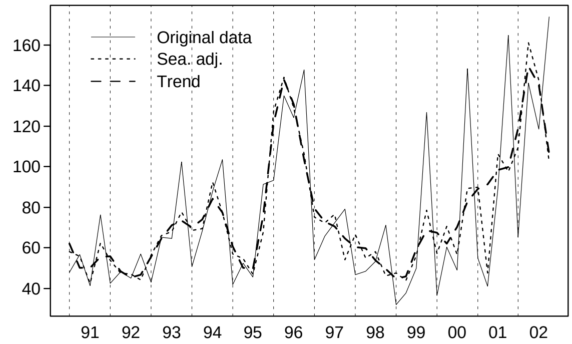


Fig. 50: Meat and diary products

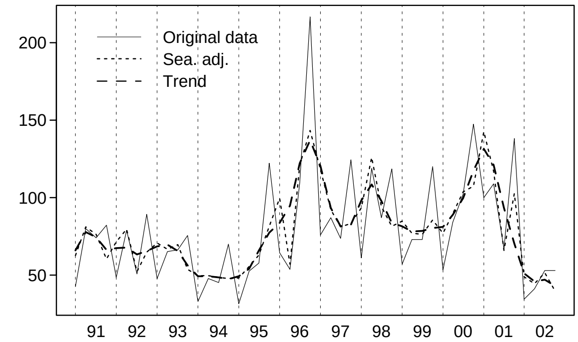


Fig. 51: Other food products

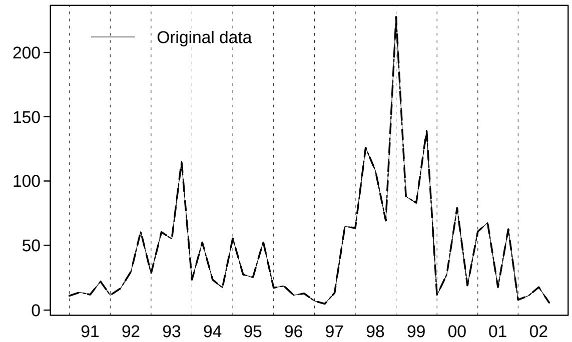


Fig. 52: Beverages and tobacco

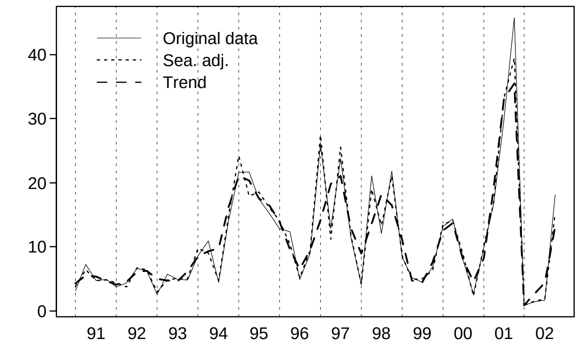


Fig. 53: Textiles, wearing

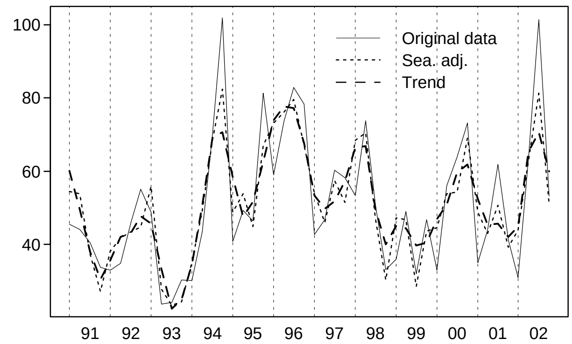
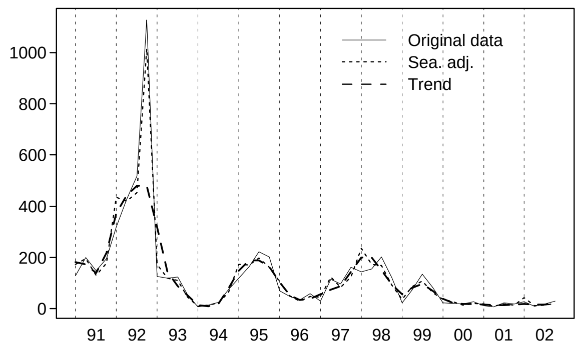


Fig. 54: Wood and wood products



Fig, 55: Pulp, paper and paper products

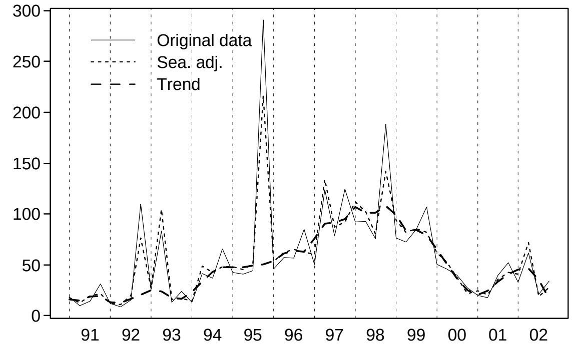


Fig. 56: Publishing, printing

Fig. 57: Refined petroleum

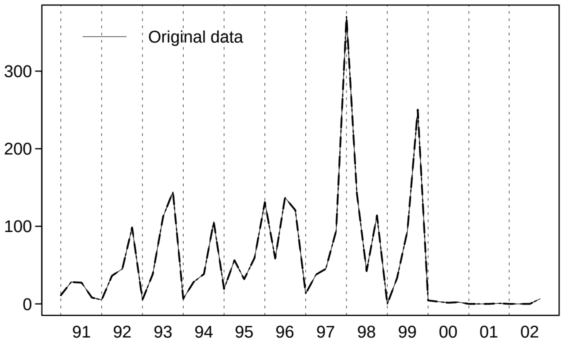


Fig. 58: Basic chemical

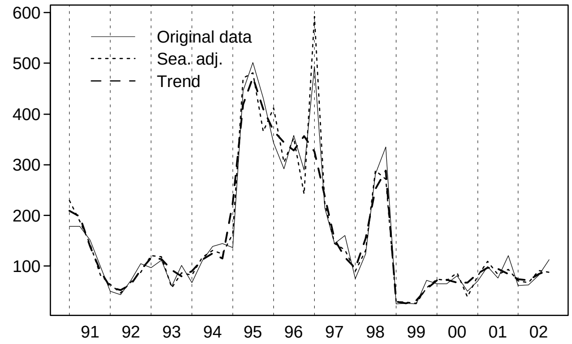


Fig. 59: Chemical and mineral products

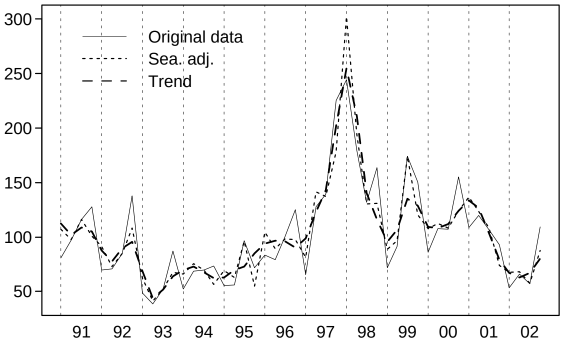


Fig. 60: Basic metals

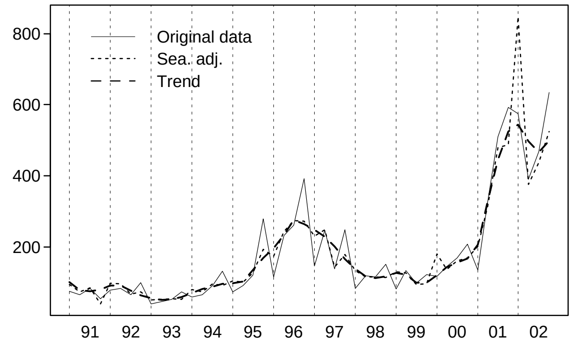


Fig. 61: Machinery and other equipment n.e.c

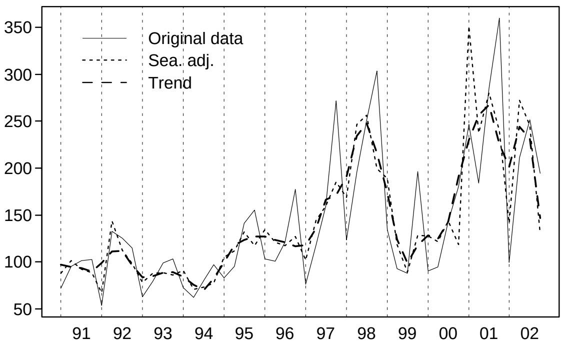
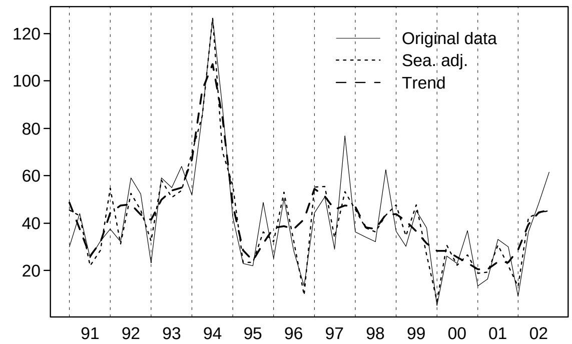


Fig. 62: Building and repairing of ships



Fig, 63: Oil plattforms and modules

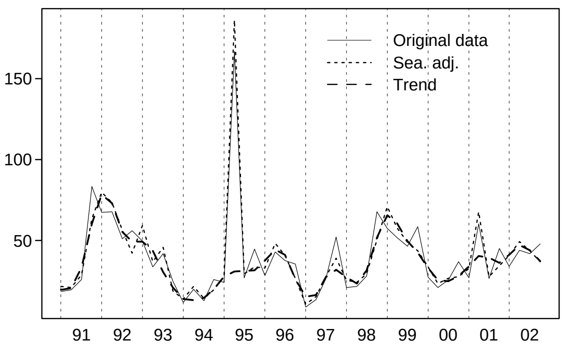
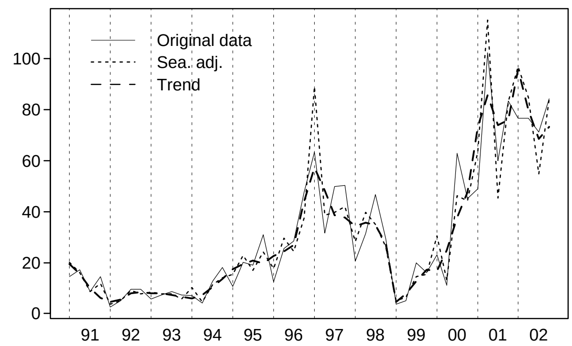


Fig. 64: Furniture & other manufacturing n.e.c



Appendix B. Seasonally adjusted and trend series of composite time series using the indirect and direct method

Fig. 65: Machinery inv. (new objects). Volume

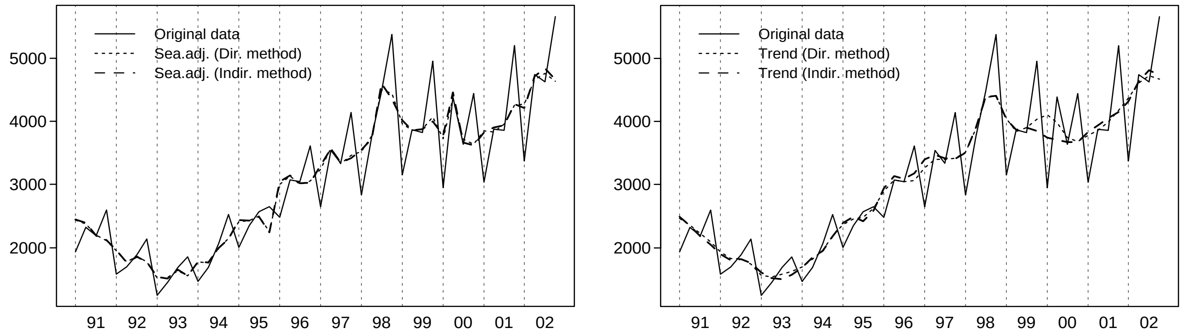


Fig. 66: Machinery inv. (new objects). Value

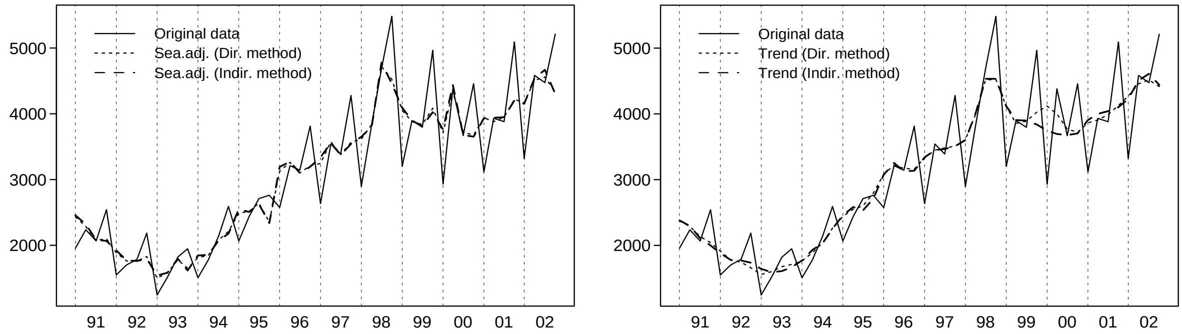


Fig. 67: Buildings inv. (new objects). Volume

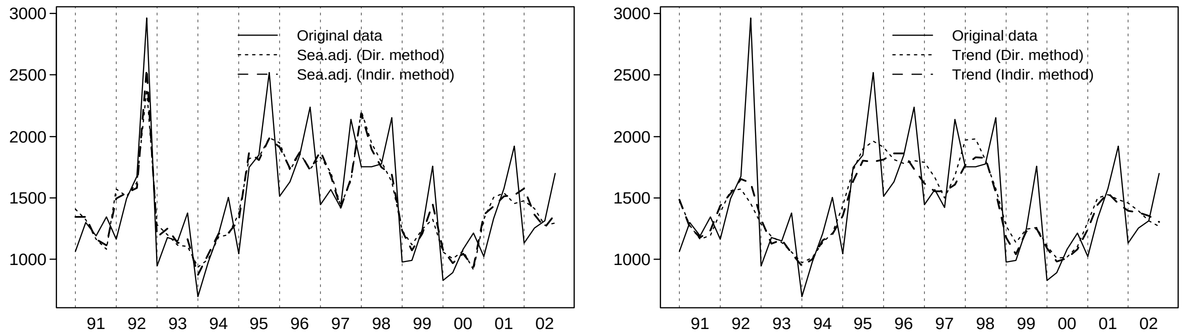


Fig. 68: Buildings inv. (new objects). Value

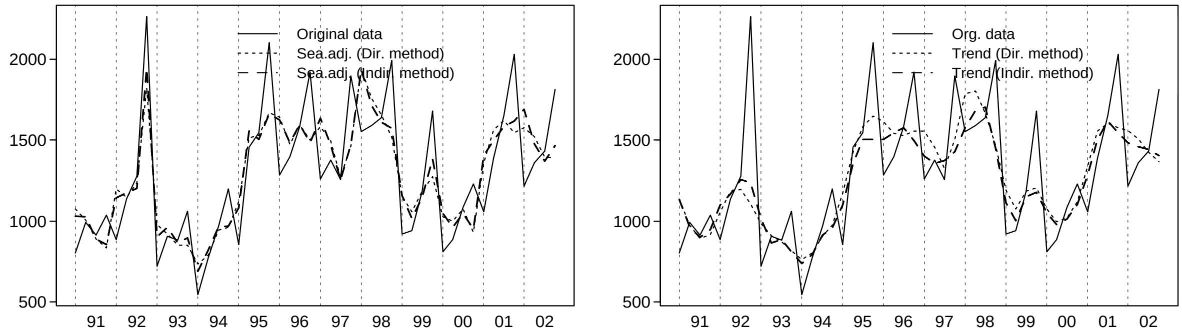


Fig. 69. Machinery investments. Volume

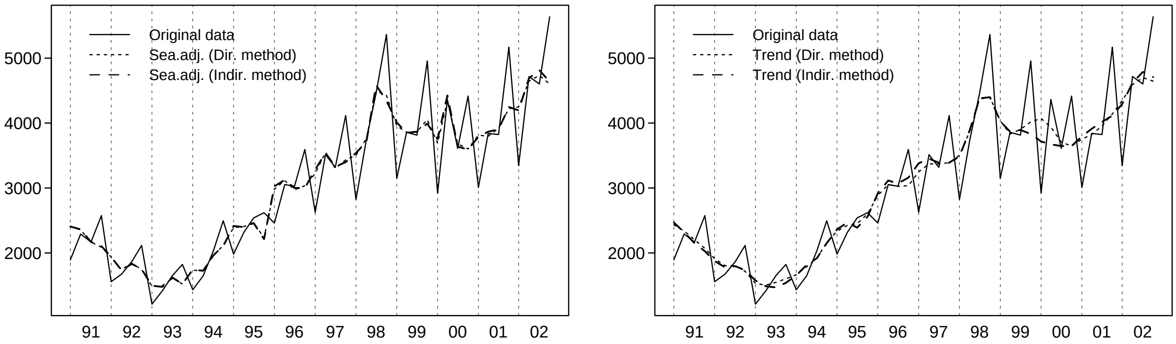


Fig. 70. Machinery investments. Value

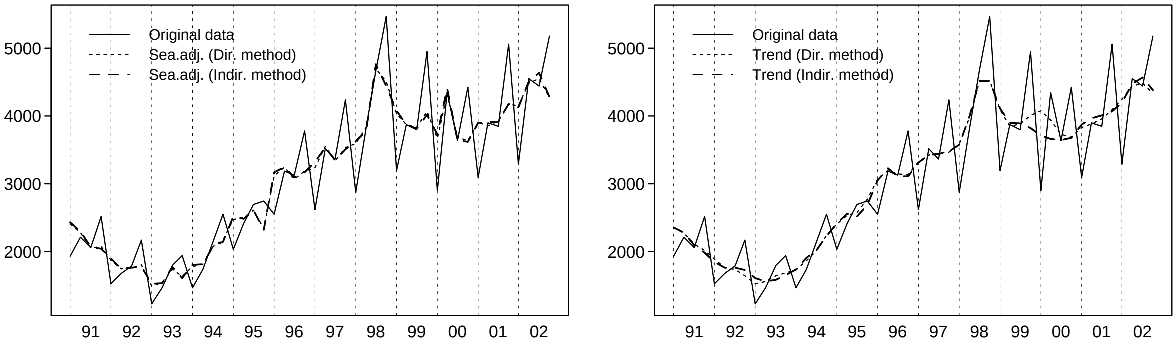


Fig. 71. Buildings investments. Volume

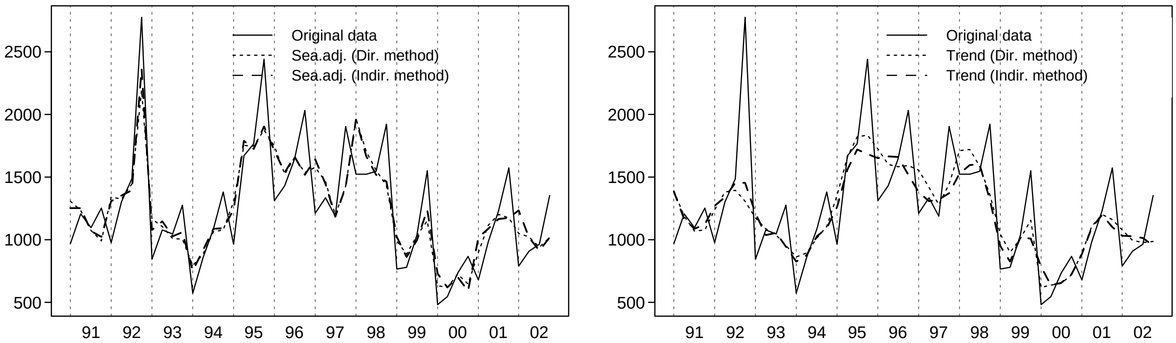


Fig. 72. Buildings investments. Value

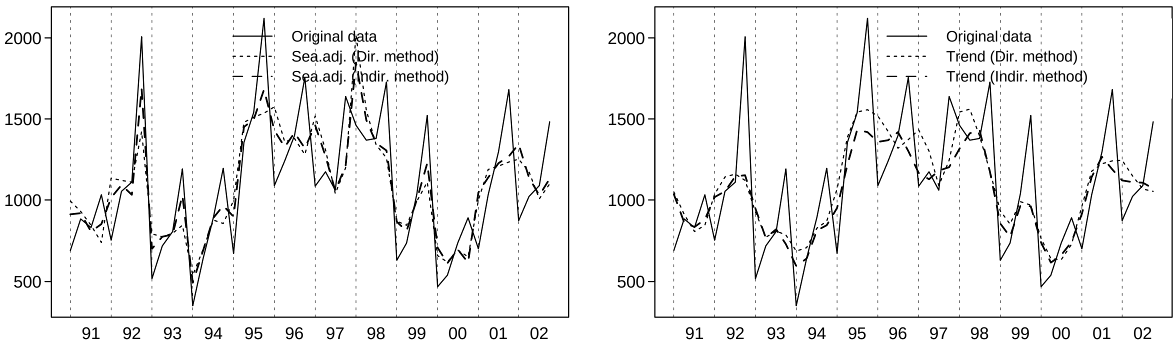


Fig. 73. Investments (new objects). Volume

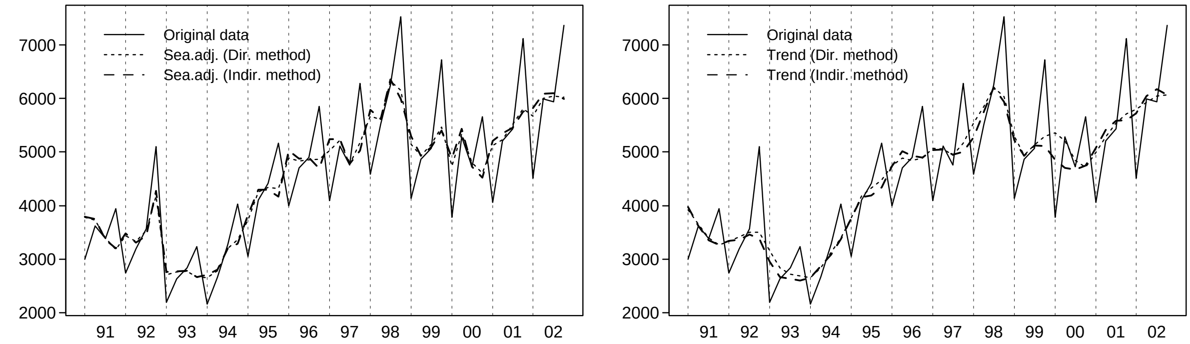


Fig. 74. Investments (new objects). Value

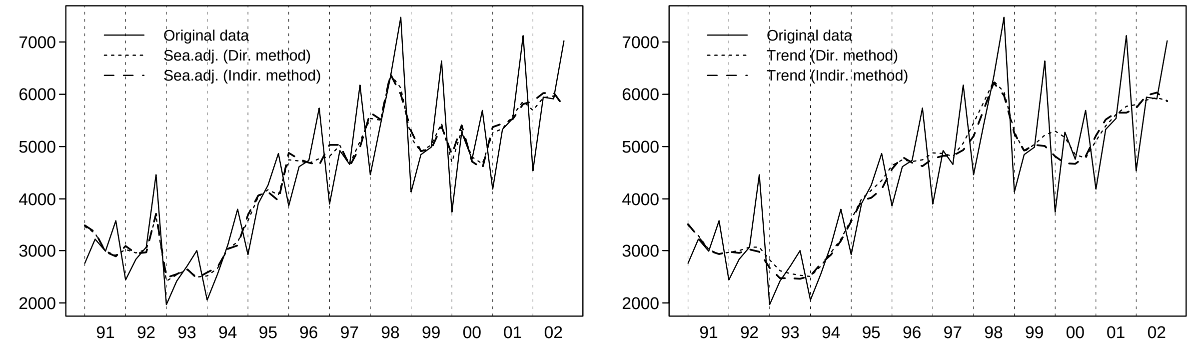


Fig. 75. Investments. Volume

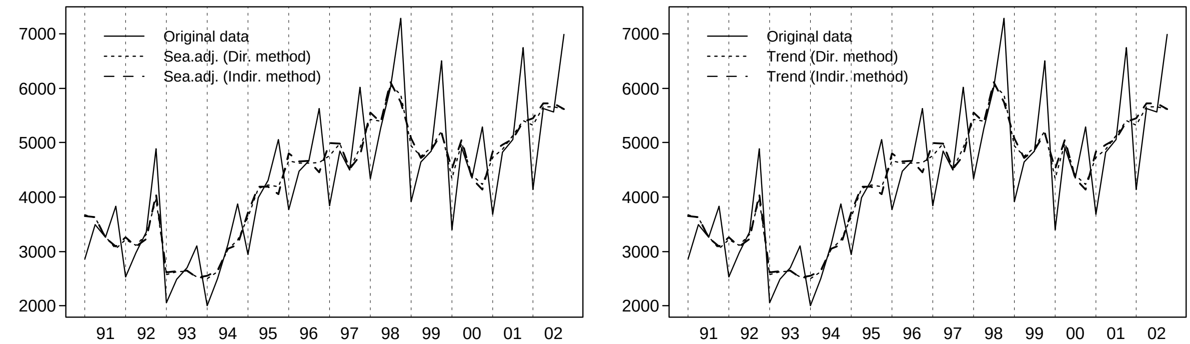
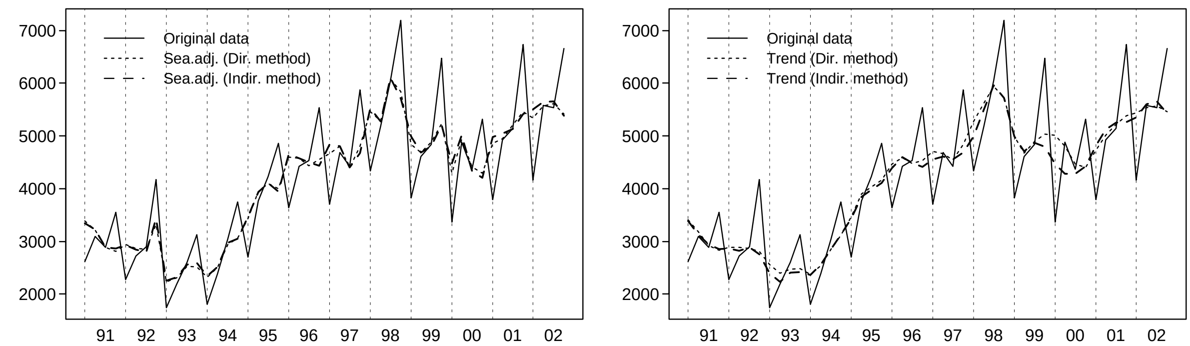


Fig. 76. Investments. Value



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