NATIONAL BANK OF SLOVAKIA

USING BUSINESS TENDENCY SURVEYS TO ESTIMATE THE DEVELOPMENT OF INDUSTRIAL PRODUCTION IN THE SR

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The views and positions presented in this paper
do not necessarily correspond to those of the NBS.

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INTRODUCTION

One of the prerequisites for making proper monetary decisions is a minimum delay in ascertaining the actual status and current trends in the economy and a good estimate of its future development made with a sufficient lead time. Incomplete information and insufficient foresight may cause inadequate monetary decisions and increase the costs of establishing and maintaining monetary stability.

The presented paper aims to analyse the possibilities for using a business tendency survey to estimate development ***in the industry*** in a current month and to estimate the direction its development will take in the nearest period (of 1 to 3 months). The focus on industry is a result of the recognition of its relevance for the economy. Despite its decreasing share in GDP, industry still represents a branch of economy that significantly contributes to GDP creation, and constitutes an important employer. In the past, employees dismissed from industrial plants were a source of working force for other branches, especially the service sector and, at present, add to the growth in unemployment. Industry is an important importer and a decisive exporter. Understanding trends of industrial producer prices is important for the assessment of cost-related inflationary pressures, and the knowledge of industrial capacity utilisation rate helps to ascertain the so-called output-gap, which is the difference between a potential and actual economic output.

Answers given by enterprises in a business tendency survey represent their assessment of the development in a current month or an expected development, as ascertained prior to the end of the current month. This is the reason why they must, by necessity, be estimations. Moreover, the data is soft by its nature, being affected by a subjective element in judging the situation. A question therefore arises, as to whether the results obtained in this way have any bearing on the data acquired through other statistical procedures - the so-called actual values. In this paper the term ”estimation” will be used to refer to the data from business tendency surveys and that of ”actuals” to denote the data from commonly used quantitative statistics.

The following types of questions occur:

- Is it possible, on the basis of results from business tendency surveys for the industry, which represent qualitative ”soft” data, to estimate the development of quantitative industrial indicators acquired through other statistical inquiries? What accuracy do such estimations have?
- How are the subjective assessments of the development in a current month made under business tendency surveys?
- How are the expectations and subjective forecasts formed in the course of business tendency surveys and what is their economic impact?

At this stage, our main interest lies in a business tendency balance for industrial production. Such data from business tendency surveys could in the future help to make the estimates of industrial production more precise.

Presented is one a series of papers focusing on the utilisation of results from business tendency surveys for estimating the status and short-term development of the economy. It is envisaged that other papers, in addition to further specifying the findings and estimations of

industrial trends, will extend similarly oriented analyses, estimations and forecasts on construction and internal (retail) trade.

The research conducted along these lines should ultimately result in monthly releases providing estimations of the situation for a current month and an outlook for the nearest 1 to 3 months for a selected range of indicators. The results of business tendency surveys are ready[1] before the end of a current month, which makes the respective estimations and forecasts available before the decisions of the Bank Board on Interest Rates are taken.

1. BRIEF CHARACTERISTICS OF BUSINESS TENDENCY SURVEYS FOR THE INDUSTRY

The Statistical Office of the SR monitors economic trends by means of a specialised sample survey, the so-called business tendency survey. This survey is done in industrial and construction enterprises and for internal trade on a monthly basis (1), where a sample population comprises enterprises which, in the aggregate, have a significant weight on the production (industrial and construction) or retail trade turnover.

A stable sample of respondents involved in a business tendency survey for industry in 1999´ was formed of 350 enterprises with 20 or more employees, whose volume of industrial production for 1998 accounted for 62% of the total volume of industrial production and the number of employees accounted for 51% of the total industrial workforce. In order to provide for a more objective assessment of trends, a weighted arithmetic average has been applied to replies obtained from the business tendency survey. The weight used was represented by the value of industrial production[2] and when assessing the employment-related indicators, number of employees was used as a weight.

Contrary to common statistical surveys, which are targeted at quantitative features of economic activity (e.g. the volume of production, the number of employees, and the like), answers given by enterprises in a business tendency survey are a result of a choice between a small number of alternatives. An illustrative question to be answered by an enterprise would look like:
Compared to the previous month, the industrial production has:

- increased
- not (significantly) changed
- decreased

The answers of enterprises - individual alternatives - are weighted and resultant proportions (percentages) for different alternative are determined.

[1] We assume that upon the agreement with the SO SR it will be possible to get access to the results of business tendency surveys several days before they are published via INTERNET.
[2] In the past, production of goods was used as a weight.

An example of a possible result would be: The industrial production has:

- increased 62%
- not changed 5%
- decreased 33%

which means that the weight of industrial enterprises whose industrial production has increased in the month in question over the preceding month is 62%, the weight of enterprises, the industrial production of which has not "substantially" changed is 5% and the weight of enterprises with a decreased production from one month to another is 33%.

An overall assessment of trends during the course of a business tendency survey is made on the basis of the so-called ***business tendency balance.*** This is defined as the difference between the percentage of positive changes (growth) and negative changes (decline)[3]. In the given example, the business tendency balance would be:

62 - 33 = 29 (%)

Another example of a typical question is that related to insolvency (or profitability). An enterprise is only supposed to give a yes-or-no answer, depending on whether or not it is insolvent (as a result of its own primary inability to pay debts or this inability being caused by others, who default on the amounts payable to this enterprise). The result is represented by a (percentage) proportion of insolvent enterprises.

Another type of question concerns the utilisation of capacities. It is to be replied by classifying the enterprise in question to one of the intervals giving the production capacity utilisation rate for the first shift, which is done on the basis of more or less subjective judgement. The result will take the following form (May 1997):

Production capacity utilisation as %	Share of enterprises as %
up to 40	1
41 - 50	3
51 - 60	3
61 - 70	8
71 - 80	12
81 - 90	46
91 - 100	27

In addition to such distribution of enterprises by capacity utilisation rate, the average utilisation of capacities in the industry can also be derived (using the respective statistical algorithm) - which in the said example will be 82%.

[3] The balance can also be defined by assigning a positive coefficient (+1) to positive changes, a negative coefficient (-1) to negative changes and the coefficient of (0) to a neutral assessment and by summing up the determined proportions for the three alternatives.

Table 1. List of Variables Subject to Analysis

Actual	meas.unit	**Indicator**	**Designation**
Prices	index	Industrial producer prices	**PPI**
	index	1995=100	**PPI95**
Foreign trade	mn SKK	Foreign trade - imports	**MP**
	mn SKK	Foreign trade - exports FCO	**EP**
Employment	ths. person	Average number of registered unemployed	**NU**
	%	Registered unemployment rate	**U**
	ths. person	Number of vacancies	**FL**
	ths. person	PEP industry	**NEI**
Wages	SKK	Wages in industry	**WI**
Production	mil. Sk	Total production of industrial goods, current prices	**XIP**
	mil. Sk	Sales from industrial activity (since 1998)	**EIP**
Business tendency survey			
	B/S %	Volume of industrial production	**SRVXI**
Industry	B/S %	Volume of industrial production (SA)	**SRVXISA**
Assessment for a current month	B/S %	Number of employees	**SRVLI**
	B/S %	Total sales	**SRVSI**
	B/S %	Total sales (SA)	**SRVSISA**
	B/S %	Domestic sales	**SRVSID**
	B/S %	Foreign sales	**SRVSIFR**
	B/S %	Profit	**SRVZISKI**
	share%	Proportion of profit-making enterprises	**SRVQZISKI**
Current financial	B/S %	Economic situation	**SRVESI**
position of an enterprise	share %	Production capacity utilisation	**SRVCAPI**
	share %	More than sufficient production capacities	**SRVOCAPI**
	B/S %	Inventory of finished products	**SRVSTOCKI**
	B/S %	Inventory of finished products(SA)	**SRVSTOCKISA**
	B/S %	Total level of demand	**SRVDI**
	B/S %	Total level of demand	**SRVDISA**

	B/S %	Level of domestic demand	**SRVDID**
	B/S %	Level of foreign demand	**SRVDIFR**
	share %	Insolvency	**SRVPAYI**
Most important barriers	share %	- financial problems	**SRVFINI**
to production growth	share %	- low domestic demand	**SRVLDID**
	share %	- low foreign demand	**SRVLDIFR**
	share %	- uncertain economic environment	**SRVENI**
	share %	- import of competitive products	**SRVMI**
	share%	- outdated production facilities	**SRVOLDI**
Expected development	B/S %	Economic situation	**SRVESIE**
for the following 3 months	B/S %	Total demand	**SRVDIE**
	B/S %	Total demand (SA)	**SRVDIESA**
	B/S %	Domestic demand	**SRVDDIE**
	B/S %	Foreign demand	**SRVDFRIE**
	B/S %	Volume of industrial production	**SRVXIE**
	B/S %	Volume of industrial production (SA)	**SRVXIESA**
	B/S %	Number of employees	**SRVLIE**
	B/S %	Producer prices	**SRVPIE**
	B/S %	Insolvency	**SRVPAYIE**

As follows from the given list, business tendency surveys for the industry are made to find answers to four groups of questions:

- The assessment of trends in a current month. Enterprises are asked to assess changes over the previous month and their profitability;
- Current financial position of the enterprise. Enterprises are asked to assess internal parameters of their operation and externalities influencing it, as well as their insolvency status in the respective month;
- Major barriers to the growth of production. Enterprises are asked to assess financial, economic and substantive barriers to (a higher) growth of production;
- Expected development for the subsequent three months. Enterprises are to assess likely or expected trends in the development (growth, decline, no change) of selected characteristics of their economic activity. Involved are (subjective) forecasts or expectations in their own right, which frequently rely on information and findings that are not normally available outside the enterprise.

The relevance of business tendency surveys consists in that besides up-to-date information on the development in a current month, they also give the enterprises' views on expected development in the nearest (three) months.

2. RESULTS OF BUSINESS TENDENCY SURVEYS FOR A CURRENT MONTH AND QUANTITATIVE CHARACTERISTICS OF INDUSTRIAL PRODUCTION

This part of the paper will focus on giving answers to questions, which in principle strive to identify (inter-) relationships between actual development in industry and its estimation based on business tendency surveys. The designations given in the last column of Table 1 will be used, where appropriate, to denote the respective indicators referred to in the text, and in particular in the Annexes.

In ordinary statistics, the indicator of "Sales from industrial activity" (XIP) is used to characterise the industrial production (see, for example, (2)). Starting from 1998, this was replaced by the originally used indicator of "Total production of industrial goods, current prices". We are going to refer to industrial production and mean the indicator of sales by that (XIP). In business tendency surveys made for industry, the development of production is assessed by a business tendency balance referred to as "Volume of industrial production (SRVXI).

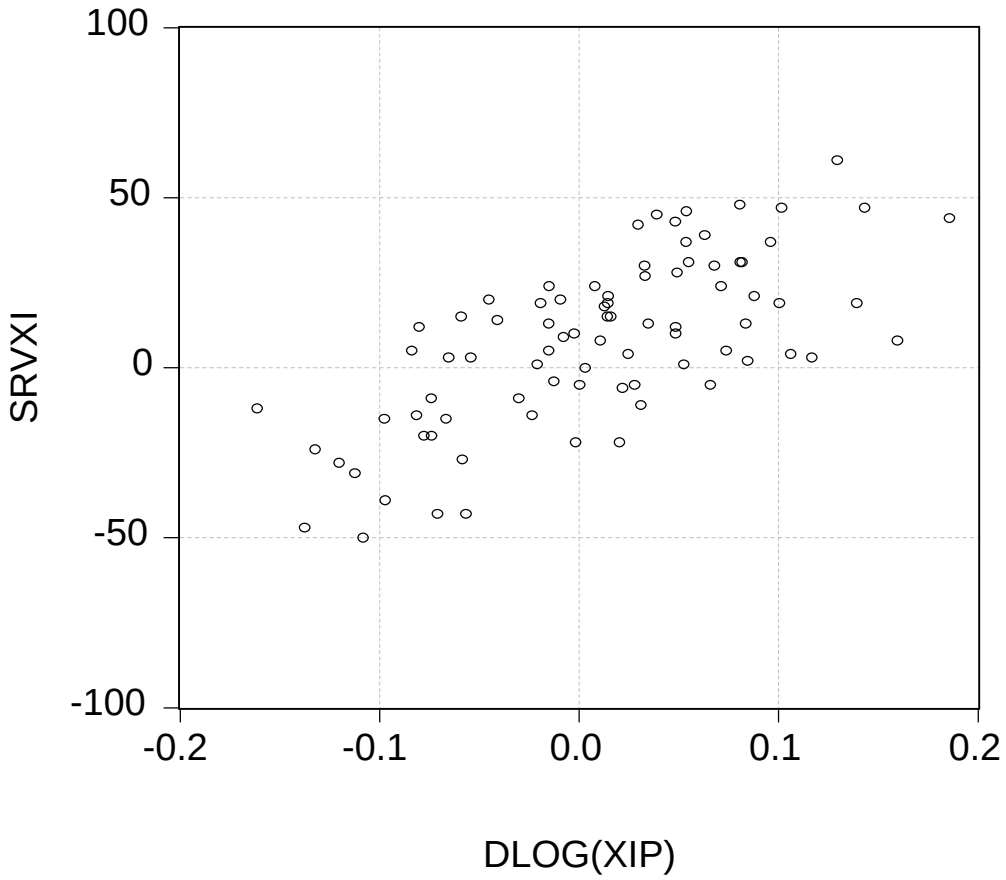
2.1. Monthly Growth Rates of Production and Business Tendency Balances

Whereas the actual production indicator (XIP) characterises the ***volume*** of production, the balance for production (SRVXI) characterises ***monthly change*** in production (growth, decline, or approximately the same level).

The following scatter shows there is a relatively close relation between the business tendency balance (SRVXI) and the monthly rate of growth of actual production (dlog(XIP))[4]. The scatter displays data the period January 1993 to December 2000. It shows that higher value in the business tendency survey (a higher business tendency balance for changes in industrial production) is closely associated with higher production growth rate, and that this relationship has been valid for 7 years already (84 months = 84 observations), that original, seasonally unadjusted data are concerned.

[4] It is common to approximate growth rate using logarithm difference:
(x-x(-1))/x(-1) = log(x)-log(x(-1))

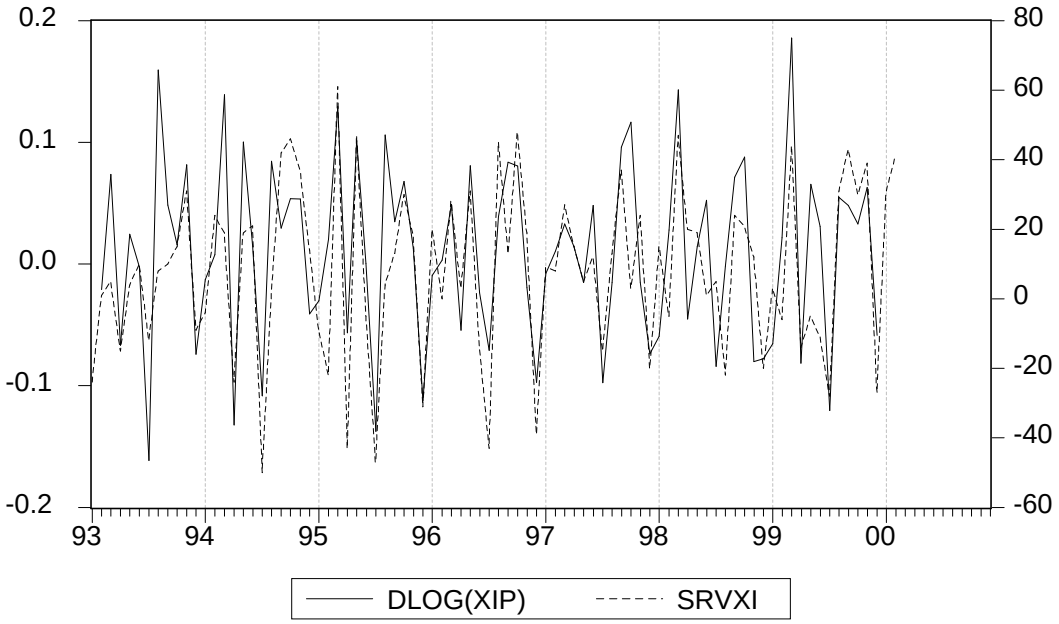
Figure 1. Scatter for monthly production growth rates in industry (dlog(XIP) - x axis) and assessment of monthly industrial production change by business tendency balances (SRVXI - y axis)



The diagram clearly shows that the business tendency balance correctly indicated the direction change in production was actually taking (growth, decline), and, ,, the monthly growth or decline rates were low (c.f. less then 10% in absolute terms).

This close relationship is also confirmed by the following graph. It is clearly visible, that for the overwhelming majority of months it is possible business tendency balance, to deduce an accelerated or slowed down monthly production growth rates which mainly reflect seasonal and calendar changes of production and its price (which are nominal variables), the impact of random shocks, gradual long-term changes in production volume (trend).

Figure 2. Monthly industrial production growth rates and assessment of monthly changes in industrial production by the business tendency balance



The graph also clearly shows that in respective months (even when disregarding the scale) developments in the compared indicators are not identical. Th means that the growth or decline assessed by the business tendency survey is ”overestimated” in some months, whilst in others the actual rates of growth or decline assessed by the business tendency survey are underestimated.

2.2. Model Relationship Between Actual Development of Production and Business Tendency Balances

Assessment based on the graphs of development of actual production and business tendency balance gives an idea of mutual coherence. A more objective assessment is statistical analysis. Simple regression analysis the production growth rate (dlog(XIP)) on business tendency balance (SRVXI) shows relatively stable long-term relationship between the two, including the relationship between seasonal fluctuations. According to this long-term relationship, estimate aproximately the monthly production growth rate (dlog(XIP)) from the business tendency balance (SRVXI) using expression:

$$dlog(XIP) = -0.7 + 0.2*SRVXI \quad (1)$$

This means that 1 percentage point increasse in business tendency balance causes an increase in monthly production growth rate of magnitude of 0.2%.

This relation may be (informally) reversed. Industrial production growth rate, assessed by the business tendency survey is linked to actual growth rate of industrial production. To put it in other words, subjective judgements reflect objective findings (although these are not known at the time when such judgements are made). The following will apply:

$$SRVXI = 3.5 + 5*dlog(XIP) \quad (2)$$

Each percentage point increase in the monthly production growth rate is manifested in the business tendency survey in such a way, that industrial production business tendency balance will increase by 5(%).

This long-term relationship (1) constitutes the basis for assessing actual industrial production growth rates using the business tendency balance for the current month. If, however, in the previous month the actual growth rate is found to differ from its value estimated on the basis of the long-term relationship, the error in the previous month can sometimes be used to ”correct” the estimate for the current period. It was shown that such an ”error-correcting” procedure (implicitly) provides basis for estimates of industrial production development using the business tendency surveys, and that the following will hold true[5]:

$$dlog(XIP) = -0.7 + 0.2*SRVXI - 0.25 * (dlog(XIP) - (-0.7 + 0.2*SRVXI))_{-1} \quad (3)$$

What makes relationship (3) different from the relationship (1) is the second term on the right ”adjusts” for errors in the preceding period - deviations the long-term relationship from the actual values, using coefficient of (-0.25). This means that **estimate for actual production growth rate on the basis of the business tendency balance in industry is given by:**

- **in the first step - estimating the production growth rate for current month on the basis of business tendency balance for current month;**
- **in the second step - (partialy) adjusting the preliminary obtained estimate by the ”error” determined for the preceding month (applying the coefficient of -0.25).**

Similar to the previous case, if this relationship is reversed, relationship (2) will result, which specifies how assessments of production growth are made in business tendency surveys. This relationship is extended with the term reflecting the process of learning based on errors made in the preceding period:

$$SRVXI = 3.5 + 5*dlog(XIP) - 0.25 * (SRVXI - (3.5 + 5*dlog(XIP)))_{-1} \quad (4)$$

[5] For detailed results of this estimation, refer to Annexes 2a, b

The assessment of monthly changes industrial production in a business tendency survey in relation to industrial production growth rate may be characterised as a learning process. It takes place so that:

- *the rate is determined on the basis of the actual growth rate using a long-term relationship (2),*
- *the assessment obtained by this way is adjusted on the basis of an error determined in the previous month (compared to the long-term relationship)*

This means that when assessing monthly production changes in business tendency surveys, a process takes place, that could be classified as learning based on past errors.

The analysis of the stability of parameters in this model has shown[6] that the error-correcting parameter (-0.25) revealed downward tendency (decreasing in absolute terms). In the past, the basic growth rate (parameter -0.7) tended to zero. Preliminary assessments of growth and decline in business tendency surveys were previously made in coincidence with actual industrial production growth and decline (they carried the same sign). However, responses to detected errors were stronger in the past (the error-correcting parameter reached value of around -0.4 compared to whole sample estimate -0.25). At present business tendency balances are shifted slightly towards the optimistic side in comparison with the actual industrial production growth rate - even in a case, when actual production growth rate, is near to zero, business tendency balances are slightly positive (approximately 3.5%). However, responses to errors in the past are weaker.

2.3. Seasonality of Production

Seasonal factors play important role in the development of industrial production, mask differences in the development of both time series. Industrial production is below the trend level at the beginning of year, during the summer holidays and Christmas, while it is markedly above the trend level in June, and, in particular, in October and November.

It is not possible to fully express large seasonal fluctuations when assessing changes in production using the business tendency balance. Qualitative evaluation (growth, decline, unchanged) and the business tendency balance derived from it has only a limited potential to capture large fluctuations. This is reflected in that large actual changes in industrial production are damped in the business tendency balances for industrial production when graphicaly represented.. Although the business tendency balance ”copies” the development of actual production growth rate relatively well, it is advisable to use a model, explicitly reflecting seasonal paterns for modelling the relationship between the production growth rate and the business tendency balance.[7]

With the explicit representation of seasonal component (using so-called seasonal filters), the parameters of the model indicating production growth rates change, even though the character of the process which generates business tendency balances is the same. Process of learning and correcting is based on a long-term relationship:

[6] For detailed results refer to Annex 2c.
[7] Annex 3. Another option would be to model the seasonally adjusted time series.

$$dlog(XIP) = seasonality + 0.0626*SRVXI \quad (5)$$

A comparison of this relationship with the original long-term relationship shows (1) that business tendency balances are not so influential - a 10% change in the business tendency balance only represents 0.6% change in the production growth rate (in the long run). Other changes in production growth rate can be characterised as seasonal. An error-correcting version of the model explicitly reflecting seasonality shows that the error-correcting parameter has changed - from the original value of -0.25 to -0.34[8]:

$$dlog(XIP) = seasonality + 0.0626*SRVXI - 0.3427*(dlog(XIP) - 0.0626*SRVXI) \quad (6)$$

A comparison of the accuracy of the two models - one explicitly including seasonal filter and the other omitting it - shows, that the model with seasonal filter is more acurate. Whereas the error (standard deviation of regression residuals) for the model without the seasonal filter exceeds 5%, similar error for the model including the seasonal filter is less than 4%.

From the point of view of practical application, the forecast of industrial production for the current month is important as the Statistical Office of Slovak Republic publishes data for actual production withaproximately one month delay.

The model without the seasonal filter has the advantage of simplicity, comprehensibility and easier application when assessing the actual production growth rate on the basis of the business tendency balance. Nevertheless, taking into account the fact that seasonality is dominant element in monthly changes of production, use of model incorporating seasonal filter is recommended.

2.4 Year-o-Year Growth Rates and Business Tendency Balances

The problem of seasonality is not so critical. As follows from the above-mentioned reflections, the analogy to the year-to-year industrial production growth rate in the business tendency survey is the twelve months moving sum of business tendency balances. Mutual relation of respective indicators is characterised on Figure 3. Although the shape of these two time series - year-to-year industrial production growth rate (YXIP) and twelve months cumulative of business tendency balance (YSRVXI) - indicates certain similarity, correlation between these two series is statistically less significant than it was for monthly changes. An error-correcting model for this relationship is given in Annex 5. As the error-correcting parameter is positive, the interpretation of this model differs from that in the previous cases - it represents so-called adaptive model. Its theoretical background can vary and will not be discussed in detail here[9].

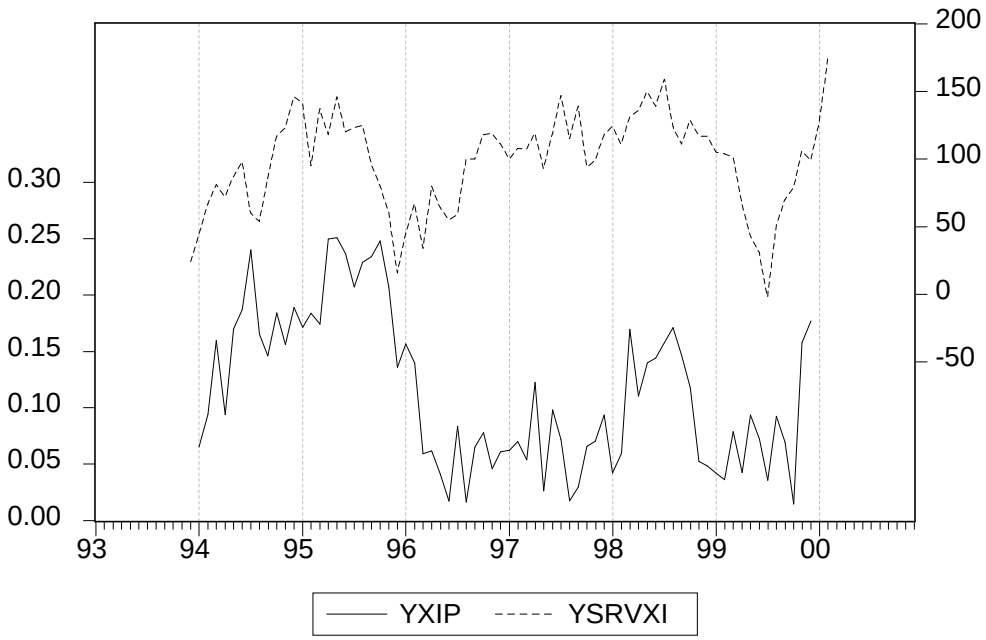
The error for the model is around 4%. Using this model it is therefore possible to predict the direction of industrial production change with sufficient reliability - if production growth rates

[8] Annex 4

[9] An overview of different approaches to modelling of subjective assessments and expectations is for example contained in (3).

are sufficiently high. From Figure 3, it follows that year-to-year industrial production growth rates (at current prices) over years tend to be lower (due to lower inflation of industrial producer prices) and that they fluctuate. Despite that - as can be seen from the actual as opposed to fitted model values (Annex 5b), the model reliably predicted industrial production growth (in current prices).

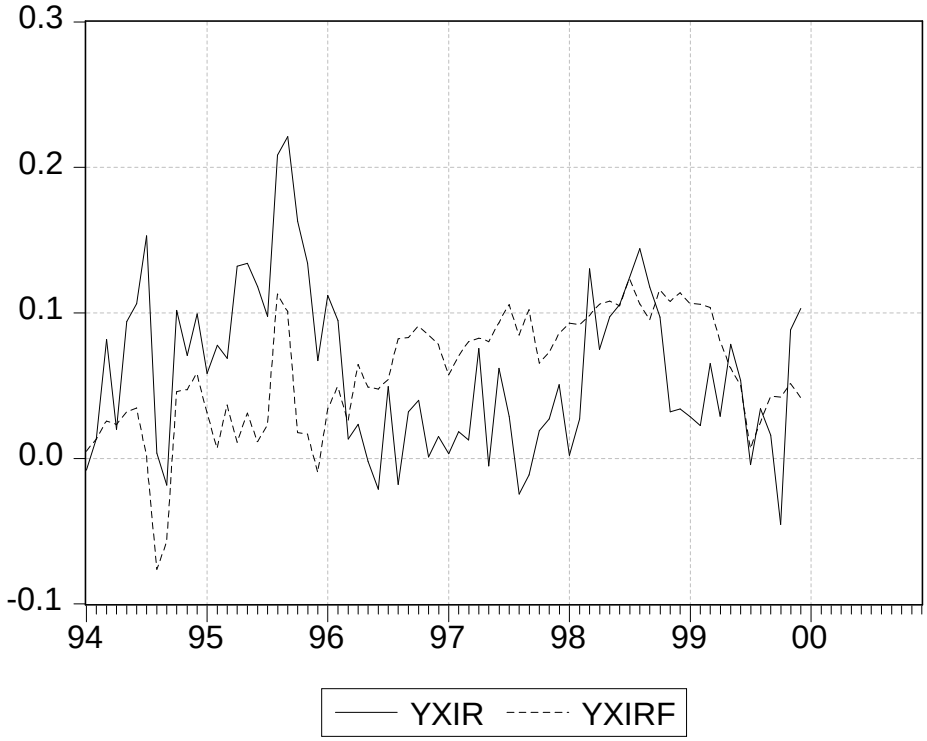
Figure 3. Year-o-year industrial production growth rates (YXIP - left axis) and cumulative yearly[10] business tendency balance of changes in the industrial production (YSRVXI - right axis)



It is evident that the accuracy of this model is not satisfactory enough to give reliable estimate for the direction of year-to-year change of industrial production at constant prices in the specific month. This follows from inspection of Figure 4, where YXIR is the actual industrial production growth rate at constant prices, and YXIRF is its estimate using the model for year-to-year growth rates.

Figure 4. Comparison of actual values and model estimates of year-to-year industrial production growth rates (constant prices)

[10] A yearly cumulative balance was determined as a 12-month sliding summation of balances for industrial production.



2.5. Industrial Production and Demand as Determined by a Business Tendency Survey

Industry is the most important exporting sector. It also plays an important role in satisfying domestic demand. Question arises, as to whether there is any connection between industrial production assessed by the business tendency survey and the assessment of sales of industrial goods in domestic and foreign markets. Not only will the answer to this question help us to judge the consistency of answers given in the business tendency survey, but it also has a deeper meaning from economic point of view. To be more specific, the question occurs in this context: which market, domestic or foreign, do enterprises attribute a higher importance in their assessments?

We have shown that the assessment of industrial production closely relates to the assessment of sales in domestic and foreign markets. Specific weights will emerge from the following estimated relationship:

$$SRVXI = -1.48 + 0.32*SRVSID + 0.68*SRVSIFR \qquad (7)$$

According to this result, the assessment of the development of industrial production relates to the assessment of sales in the domestic market (with weight of 0.32) and to the assessment of sales in foreign markets (with weight of 0.68 - weights have been normalised to 1). In conformity with the general belief, enterprises attribute substantial importance to sales in foreign markets as influencing factor of changes in production.

This relationship will become more precise when expressing seasonality. It goes without saying that production and demand are not fully synchronised in time. Formally, this discrepancy translates into inventories. It can also be expressed using seasonal term (we have not yet managed to explicitly identify the role of inventories). The following relation was obtained:

$$SRVXI = seasonality + 0.37*SRVSID + 0.63*SRVSIFR \quad (8)$$

3. Expected Industrial Production and Demand in the Business Tendency Survey

One of the strong points of business tendency surveys is that they ask for the opinion of enterprises concerning future development. The list of indicators, the future development of which is assessed by enterprises, includes basic indicators through which the business cycle can be judged. It also comprises indicators characterising expected developments in domestic (SRVDDIE) and foreign (SRVDFRIE) demand. Section 2.5 analysed the way in which demand influences the development of production in the current month. We have shown that demand also influences formation of expectations for development of production (in forthcoming 3-month period). Expected industrial production (SRVXIE) depends on expected domestic and foreign demand according to the relationship:

$$SRVXIE = 9.34 + 0.88*SRVDDIE + 0.12*SRVFRIE \quad (9)$$

When comparing model estimates for the 3-months expectations with the assessment for the current month, it becomes clear at first glance that parameters for domestic and foreign demand differ substantially, depending on whether it is an assessment of production for the current month or expectations for the nearest 3 months. Relationship (9) implies that expected domestic demand plays dominant role in the assessment of expected developments of industrial production - enterprises expect production to grow or decline depending on expected developments of domestic demand. On the other hand, domestic sales play a less important role when assessing for the current month. This could be explained as follows: there was a shift in the territorial orientation of foreign trade performed by industry during the period under review, and competitive pressures on domestic and foreign markets are important factors in its development. Many productive activities and producers have been pushed out of the domestic market. This finding from the analysis of business tendency survey may reflect the fear of losing the domestic market – ”We expect the loss of production; its decline, will be caused by the loss of the domestic market and insufficient domestic demand for our products”.

Conclusion

We believe that it is necessary to continue with the analysis of industrial development using the data from the business tendency surveys, and to compare findings derived from business tendency surveys for the industry and findings based on classical quantitative statistics.

There is a need to broaden the coverage, to include other areas for which the data from business tendency surveys are available (construction, trade).

In the future, we want to pay special attention to the analysis of inflation expectations, capacity utilisation and to the inflationary pressures in general. The ultimate goal is to use those findings for the estimation of short-term inflationary tendencies and pressures.

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Annexes

(Results of the Estimation and Parameter Stability Tests)

The results were obtained using E-views econometric software

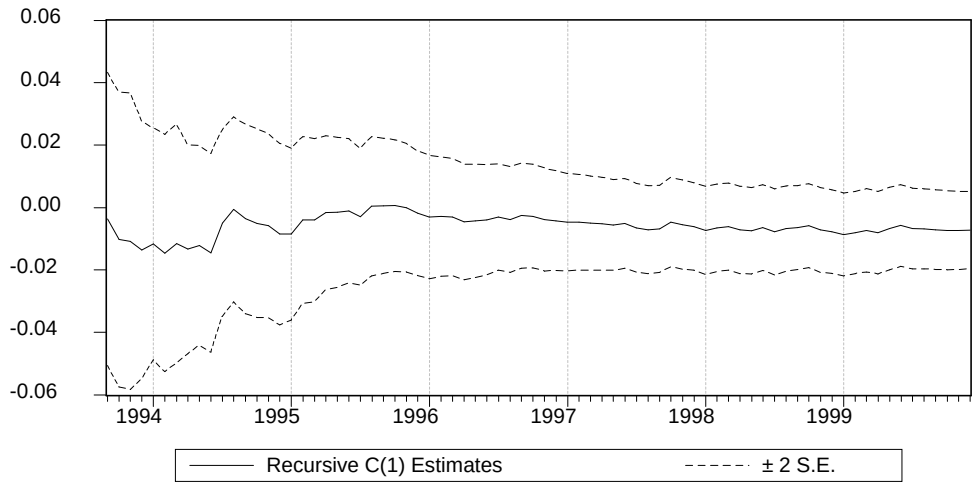
Annex 1.a A long-term relationship between the monthly industrial production growth rate and its assessment in the business tendency survey

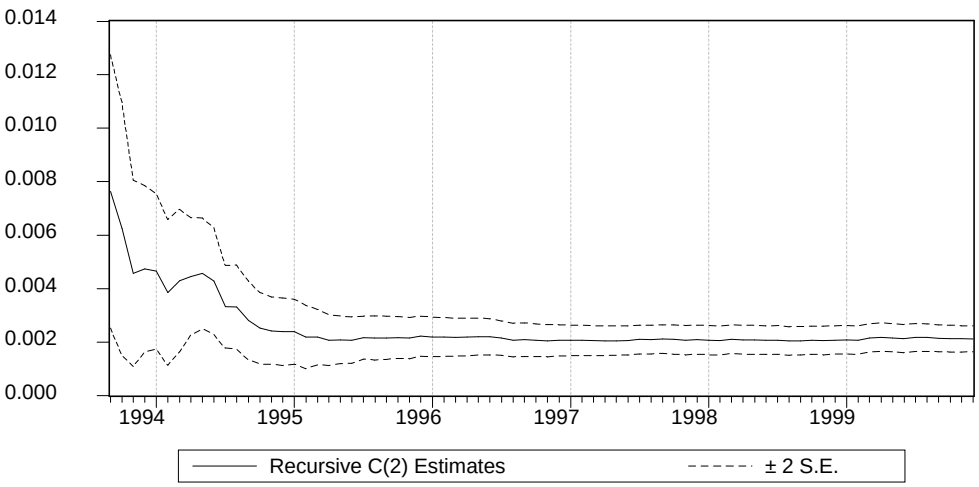
Dependent Variable: DLOG(XIP)
Method: Least Squares
Date: 02/29/00 Time: 07:38
Sample(adjusted): 1993:02 1999:12
Included observations: 83 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.007280	0.006168	-1.180152	0.2414
SRVXI	0.002118	0.000242	8.766978	0.0000

R-squared	0.486887	Mean dependent var	0.009433
Adjusted R-squared	0.480552	S.D. dependent var	0.074155
S.E. of regression	0.053446	Akaike info criterion	-2.996501
Sum squared resid	0.231372	Schwarz criterion	-2.938216
Log likelihood	126.3548	F-statistic	76.85990
Durbin-Watson stat	2.494081	Prob(F-statistic)	0.000000

Annex 1.b Stability test





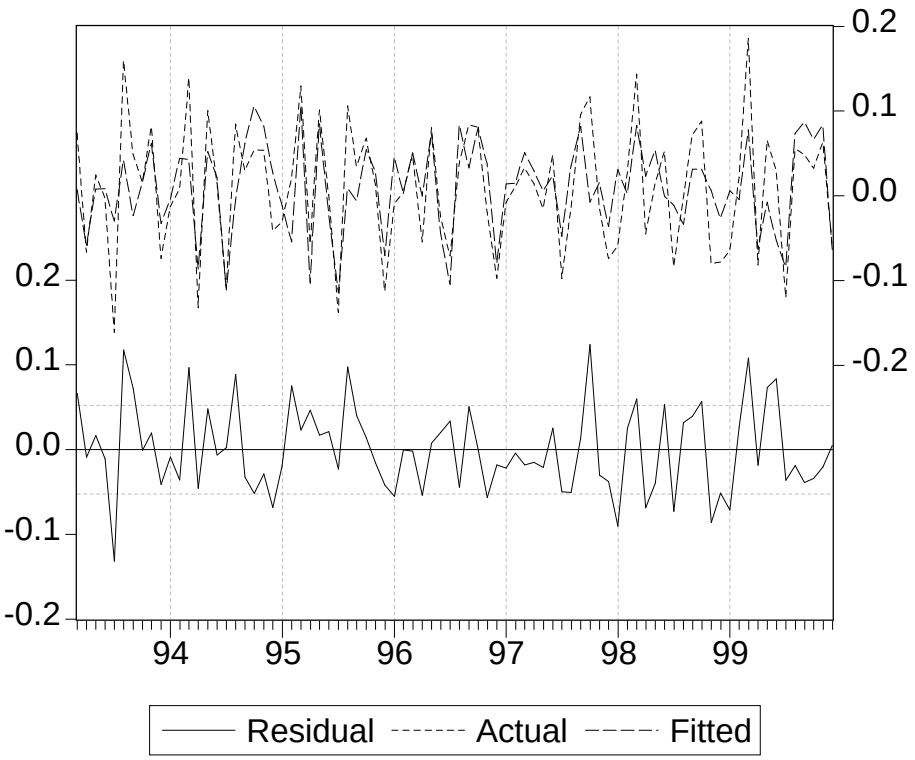
Annex 2a Error-correction relationship between the monthly industrial production growth rate and the business tendency balance for industrial production

Dependent Variable: DLOG(XIP)
Method: Least Squares
Date: 03/02/00 Time: 08:17
Sample(adjusted): 1993:03 1999:12
Included observations: 82 after adjusting endpoints

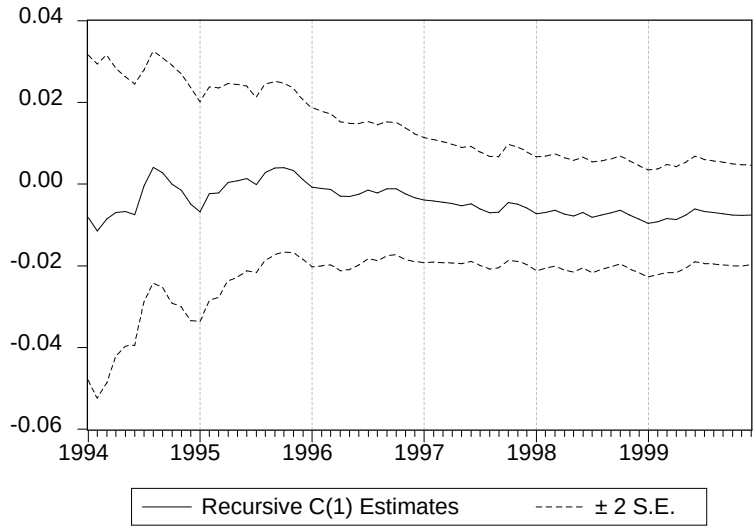
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.007590	0.006089	-1.246437	0.2163
SRVXI	0.002179	0.000238	9.136113	0.0000
DLOG(XIP(-1))+0.00728-0.002118*SRVXI(-1)	-0.250902	0.109639	-2.288433	0.0248

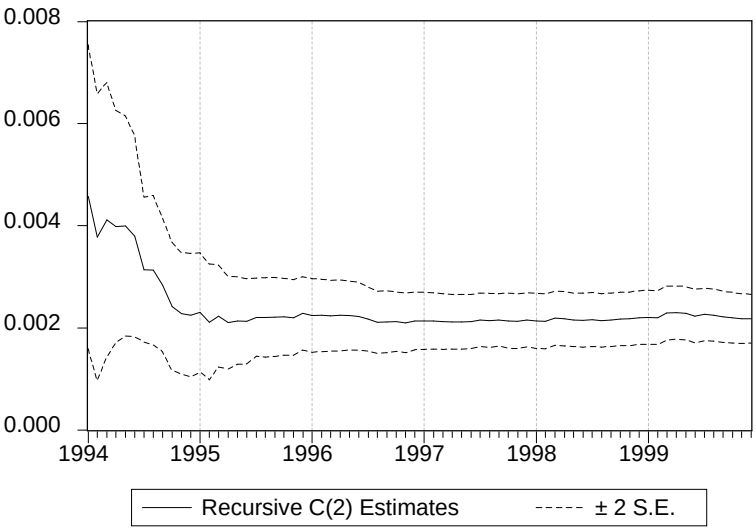
R-squared	0.518314	Mean dependent var	0.009804
Adjusted R-squared	0.506119	S.D. dependent var	0.074534
S.E. of regression	0.052380	Akaike info criterion	-3.024688
Sum squared resid	0.216749	Schwarz criterion	-2.936637
Log likelihood	127.0122	F-statistic	42.50359
Durbin-Watson stat	2.022692	Prob(F-statistic)	0.000000

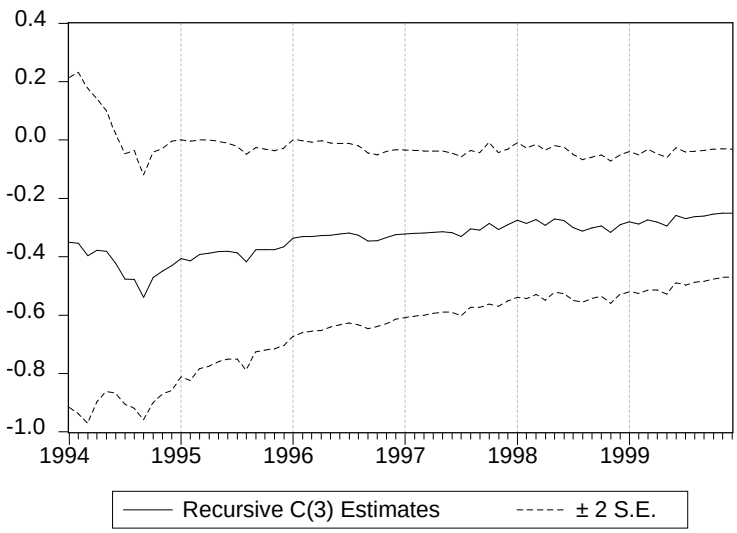
Annex 2b. Actual and fitted values, residuals



Annex 2c. Stability of model parameters


0.04
0.02
0.00
-0.02
-0.04
-0.06
1994
1995
1996
1997
1998
1999
Recursive C(1) Estimates
± 2 S.E.


0.008
0.006
0.004
0.002
0.000
1994
1995
1996
1997
1998
1999
Recursive C(2) Estimates
± 2 S.E.

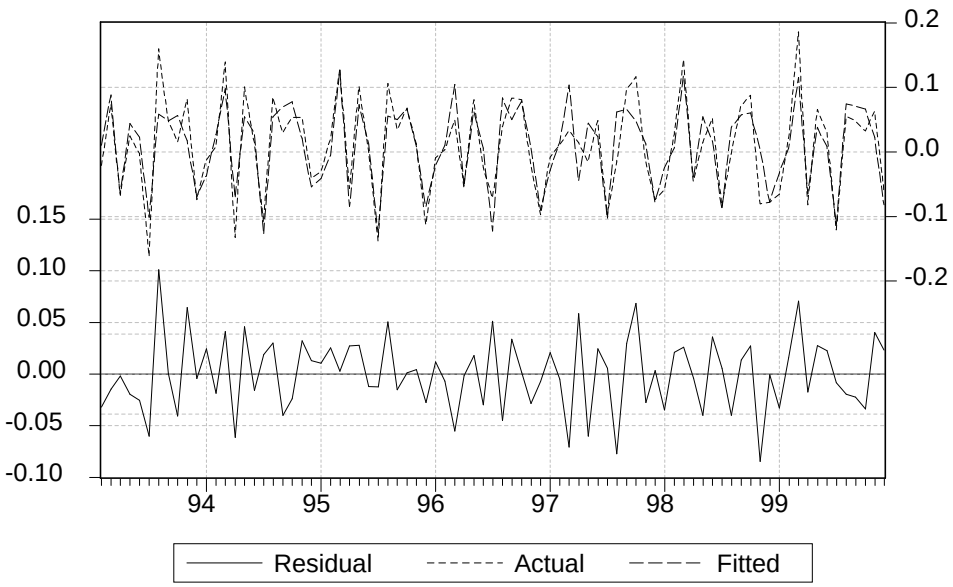

0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
1994
1995
1996
1997
1998
1999
Recursive C(3) Estimates
± 2 S.E.

Annex 3. The long-term relationship between the industrial production growth rate (dlog(XIP)) and the business tendency balance (SRVXI) (seasonal filter model)

Dependent Variable: DLOG(XIP)
Method: Least Squares
Date: 03/02/00 Time: 20:56
Sample(adjusted): 1993:02 1999:12
Included observations: 83 after adjusting endpoints
DLOG(XIP)=C(13)*SRVXI+C(1)*@SEAS(1)+C(2)*@SEAS(2)+C(3)*@SEAS(3)
+C(4)*@SEAS(4)+C(5)*@SEAS(5)+C(6)*@SEAS(6)+C(7)*@SEAS(7)
+C(8)*@SEAS(8)+C(9)*@SEAS(9)+C(10)*@SEAS(10)+C(11)*@SEAS(11)
+C(12)*@SEAS(12)

	Coefficient	Std. Error	t-Statistic	Prob.
C(13)	0.000684	0.000271	2.526606	0.0138
C(1)	-0.034666	0.015884	-2.182412	0.0324
C(2)	0.010059	0.014637	0.687229	0.4942
C(3)	0.085033	0.017147	4.959069	0.0000
C(4)	-0.054694	0.014808	-3.693522	0.0004
C(5)	0.041412	0.015355	2.696937	0.0088
C(6)	0.015826	0.014647	1.080472	0.2836
C(7)	-0.092887	0.016377	-5.671704	0.0000
C(8)	0.053073	0.014969	3.545588	0.0007
C(9)	0.040969	0.016241	2.522575	0.0139
C(10)	0.046182	0.016430	2.810916	0.0064
C(11)	-0.003847	0.016208	-0.237376	0.8131
C(12)	-0.063552	0.015502	-4.099699	0.0001

R-squared	0.767178	Mean dependent var	0.009433
Adjusted R-squared	0.727265	S.D. dependent var	0.074155
S.E. of regression	0.038727	Akaike info criterion	-3.521662
Sum squared resid	0.104984	Schwarz criterion	-3.142808
Log likelihood	159.1490	F-statistic	19.22155
Durbin-Watson stat	2.662785	Prob(F-statistic)	0.000000

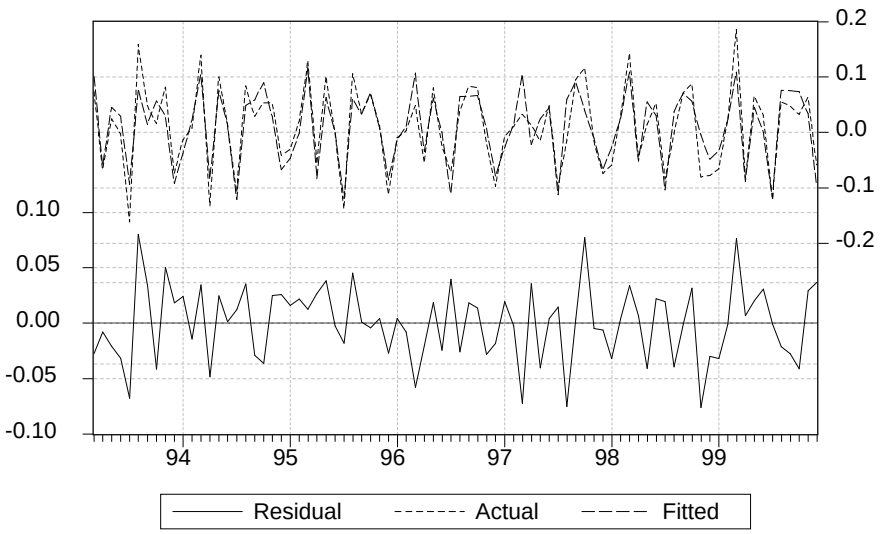


Annex 4. Error-correction relationship between the industrial production growth rate (dlog(XIP)) and the business tendency balance (SRVXI) (model with seasonal filter)

Dependent Variable: DLOG(XIP)
Method: Least Squares
Date: 03/03/00 Time: 03:30
Sample(adjusted): 1993:03 1999:12
Included observations: 82 after adjusting endpoints
Convergence achieved after 5 iterations
DLOG(XIP)=C(13)*SRVXI+C(14)*(DLOG(XIP(-1))-C(13)*SRVXI(-1))+C(1)*@SEAS(1)
+C(2)*@SEAS(2)+C(3)*@SEAS(3)+C(4)*@SEAS(4)+C(5)*@SEAS(5)
+C(6)*@SEAS(6)+C(7)*@SEAS(7)+C(8)*@SEAS(8)+C(9)*@SEAS(9)
+C(10)*@SEAS(10)+C(11)*@SEAS(11)+C(12)*@SEAS(12)

	Coefficient	Std. Error	t-Statistic	Prob.
C(13)	0.000626	0.000259	2.416089	0.0184
C(14)	-0.342710	0.113608	-3.016606	0.0036
C(1)	-0.057803	0.016883	-3.423738	0.0011
C(2)	0.003574	0.015494	0.230700	0.8182
C(3)	0.090402	0.016320	5.539492	0.0000
C(4)	-0.025377	0.017039	-1.489360	0.1410
C(5)	0.023501	0.015701	1.496759	0.1391
C(6)	0.030477	0.014812	2.057597	0.0435
C(7)	-0.089004	0.015596	-5.706944	0.0000
C(8)	0.021372	0.017558	1.217220	0.2277
C(9)	0.060903	0.016965	3.589977	0.0006
C(10)	0.062348	0.017404	3.582291	0.0006
C(11)	0.014028	0.017395	0.806450	0.4228
C(12)	-0.065455	0.014116	-4.636852	0.0000

R-squared	0.796403	Mean dependent var	0.009804
Adjusted R-squared	0.757480	S.D. dependent var	0.074534
S.E. of regression	0.036705	Akaike info criterion	-3.617546
Sum squared resid	0.091614	Schwarz criterion	-3.206643
Log likelihood	162.3194	F-statistic	20.46102
Durbin-Watson stat	2.157170	Prob(F-statistic)	0.000000



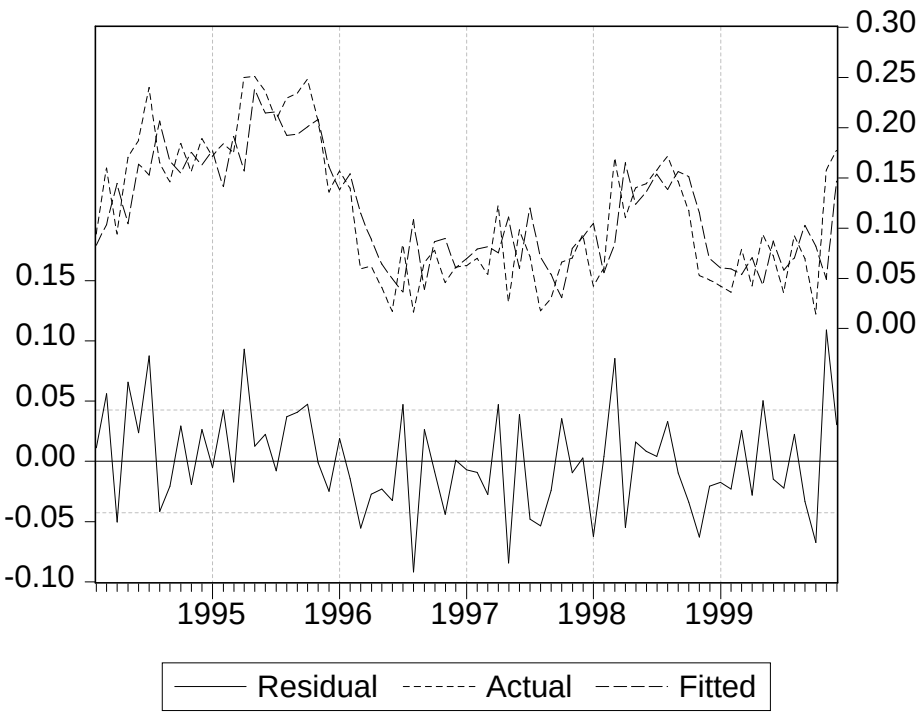
Annex 5a Error-correction relationship between the year-to-year industrial production growth rate (YXIP) and yearly (cumulative) business tendency balance for industrial production (YSRVXI)

Dependent Variable: YXIP
Method: Least Squares
Date: 03/02/00 Time: 10:14
Sample(adjusted): 1994:02 1999:12
Included observations: 71 after adjusting endpoints
Convergence achieved after 1 iterations
YXIP=C(1)+C(2)*YSRVXI+C(3)*(YXIP(-1)-(C(1)+C(2)*YSRVXI(-1)))

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.069086	0.033184	2.081889	0.0411
C(2)	0.000515	0.000236	2.186498	0.0322
C(3)	0.783085	0.077052	10.16312	0.0000

R-squared	0.620243	Mean dependent var	0.115378
Adjusted R-squared	0.609074	S.D. dependent var	0.068162
S.E. of regression	0.042618	Akaike info criterion	-3.431765
Sum squared resid	0.123506	Schwarz criterion	-3.336159
Log likelihood	124.8277	F-statistic	55.53097
Durbin-Watson stat	2.389635	Prob(F-statistic)	0.000000

Annex 5b. Actual and fitted values, residuals

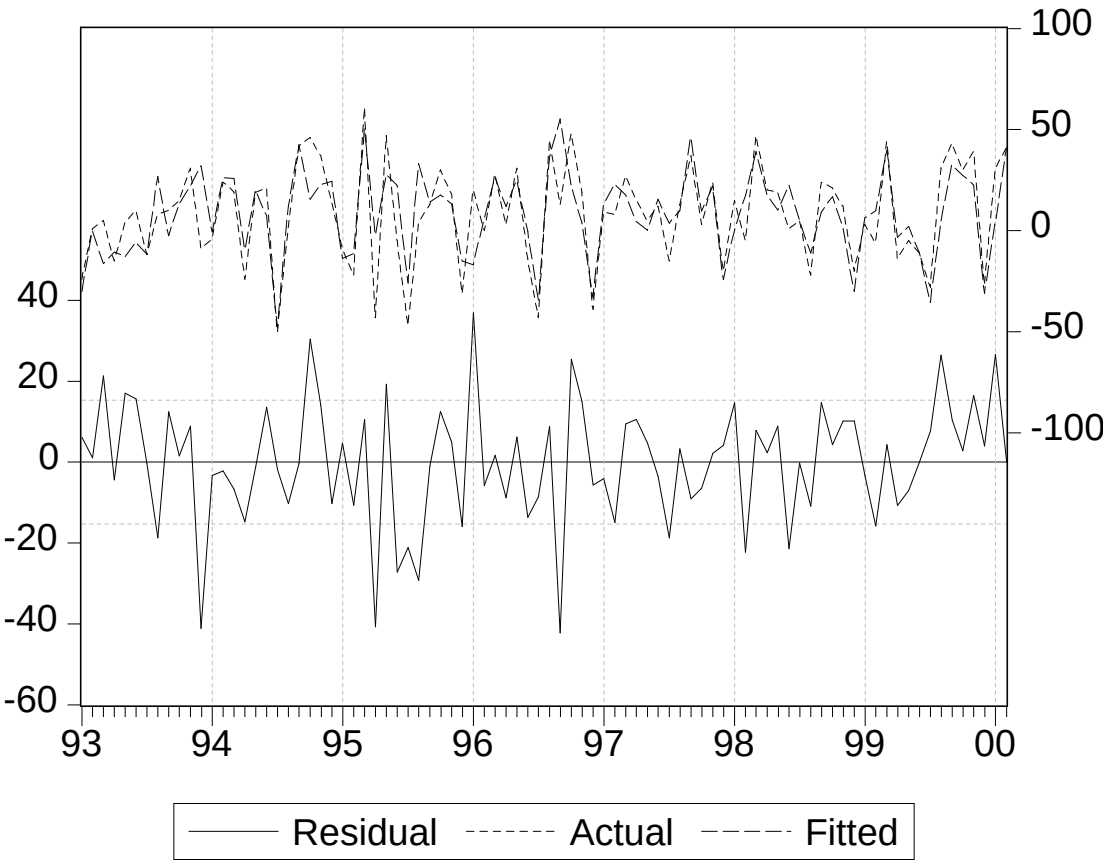


Annex 6. Relation between the assessment of the development of industrial production (SRVXI) and the assessment of the development of domestic (SRVSID) and foreign (SRVSIFR) industrial sales in the business tendency survey

Dependent Variable: SRVXI
Method: Least Squares
Date: 02/29/00 Time: 08:48
Sample(adjusted): 1993:01 2000:02
Included observations: 86 after adjusting endpoints
SRVXI=C(1)+C(2)*SRVSID+(1-C(2))*SRVSIFR

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-1.480985	1.682518	-0.880220	0.3813
C(2)	0.318314	0.088695	3.588859	0.0006

R-squared	0.620349	Mean dependent var	8.174419
Adjusted R-squared	0.615829	S.D. dependent var	24.63722
S.E. of regression	15.27052	Akaike info criterion	8.312706
Sum squared resid	19587.85	Schwarz criterion	8.369784
Log likelihood	-355.4464	F-statistic	137.2559
Durbin-Watson stat	2.250222	Prob(F-statistic)	0.000000



Annex 7. Relation between an assessment of the production (SRVXI)

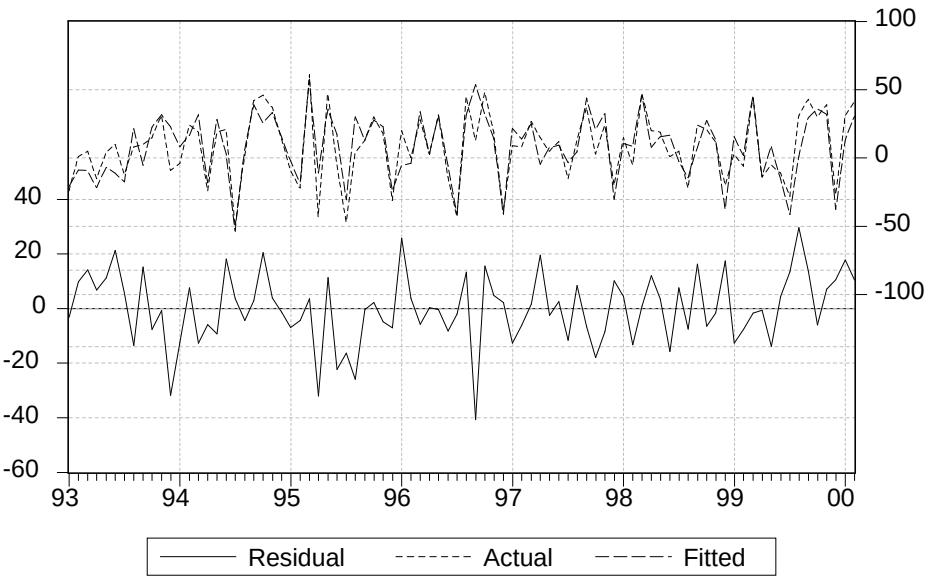
and domestic (SRVSID) and foreign (SRVSIFR) sales in the business tendency survey (model with seasonal filter)

Dependent Variable: SRVXI
Method: Least Squares
Date: 03/03/00 Time: 08:19
Sample(adjusted): 1993:01 2000:02
Included observations: 86 after adjusting endpoints
SRVXI=C(13)*SRVSID+(1-
C(13))*SRVSIFR+C(1)*@SEAS(1)+C(2)*@SEAS(2)
+C(3)*@SEAS(3)+C(4)*@SEAS(4)+C(5)*@SEAS(5)+C(6)*@SEAS(6)

+C(7)*@SEAS(7)+C(8)*@SEAS(8)+C(9)*@SEAS(9)+C(10)*@SEAS(10)
+C(11)*@SEAS(11)+C(12)*@SEAS(12)

	Coefficient	Std. Error	t-Statistic	Prob.
C(13)	0.374242	0.091305	4.098800	0.0001
C(1)	8.035228	4.976568	1.614612	0.1107
C(2)	-9.911743	4.997464	-1.983354	0.0511
C(3)	6.468180	5.556338	1.164108	0.2482
C(4)	-10.73528	5.308931	-2.022118	0.0468
C(5)	6.097402	5.423999	1.124153	0.2646
C(6)	-6.291775	5.345578	-1.177006	0.2430
C(7)	-7.907143	5.312903	-1.488290	0.1410
C(8)	-5.874675	5.295582	-1.109354	0.2709
C(9)	-2.920131	5.415664	-0.539201	0.5914
C(10)	8.730086	5.301234	1.646803	0.1039
C(11)	9.067532	5.316216	1.705636	0.0923
C(12)	-10.00801	5.426837	-1.844170	0.0692

R-squared	0.722270	Mean dependent var	8.174419
Adjusted R-squared	0.676616	S.D. dependent var	24.63722
S.E. of regression	14.01041	Akaike info criterion	8.255916
Sum squared resid	14329.29	Schwarz criterion	8.626922
Log likelihood	-342.0044	F-statistic	15.82047
Durbin-Watson stat	1.978187	Prob(F-statistic)	0.000000



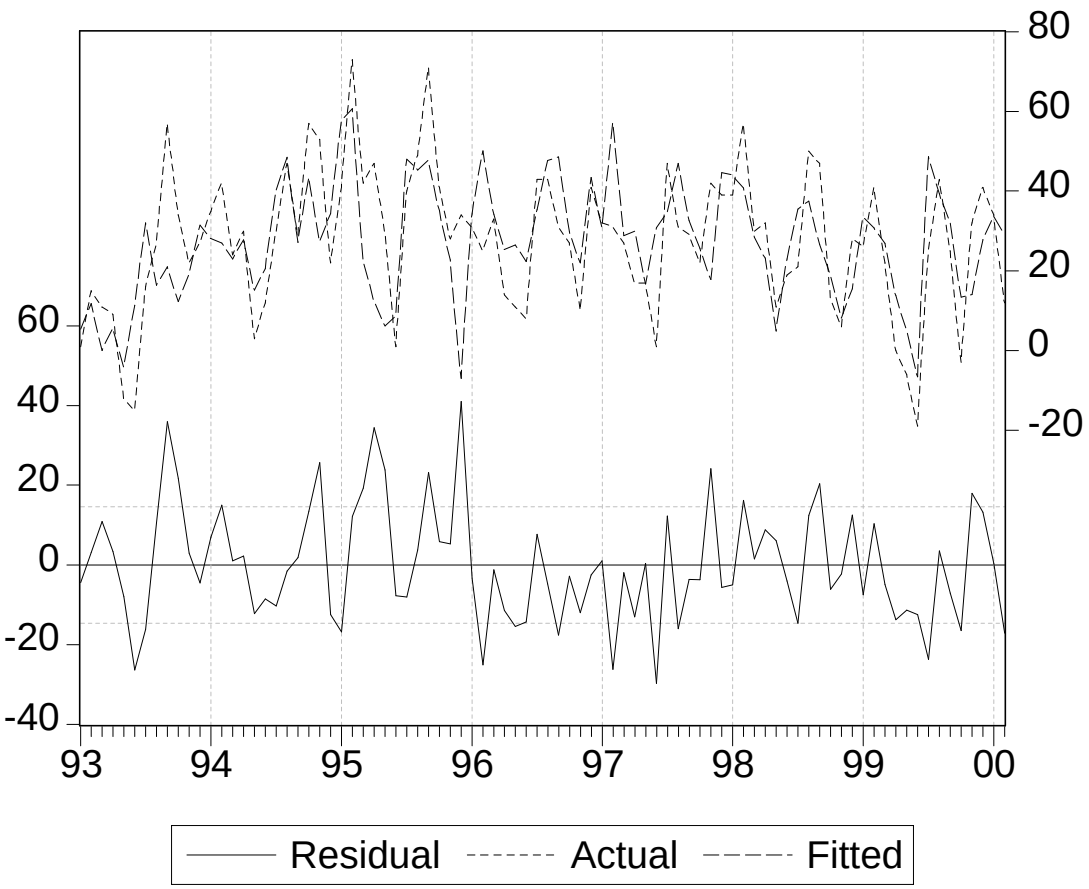
Annex 8a. Relation between the expected development of industrial

production (SRVXIE) and the expected development of domestic (SRVDDIE) and foreign (SRVFRIE) demand according to the business tendency survey.

Dependent Variable: SRVXIE
Method: Least Squares
Date: 02/29/00 Time: 08:36
Sample(adjusted): 1993:01 2000:02
Included observations: 86 after adjusting endpoints
SRVXIE=C(1)+C(2)*SRVDDIE+(1-C(2))*SRVDFRIE

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	9.340872	1.944935	4.802665	0.0000
C(2)	0.877717	0.094423	9.295554	0.0000

R-squared	0.352099	Mean dependent var	27.33721
Adjusted R-squared	0.344386	S.D. dependent var	18.06889
S.E. of regression	14.63038	Akaike info criterion	8.227058
Sum squared resid	17980.03	Schwarz criterion	8.284136
Log likelihood	-351.7635	F-statistic	45.64952
Durbin-Watson stat	1.514561	Prob(F-statistic)	0.000000



Annex 8b. Relation between the expected development of industrial production (SRVXIE) and the expected development of domestic (SRVDDIE) and foreign (SRVFRIE) demand according to the business tendency survey

Parameter stability test.