COMPOSITE LEADING INDICATORS FOR THE HUNGARIAN ECONOMY

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SUMMARY

In most developed countries, the method of leading indicators is widely used for very short-term forecasting purposes.

The first part of this paper provides a summary about the theoretical foundations and the methodology of the computation of the leading indicators. The second part presents an application: a composite leading indicator for the Hungarian industrial production is derived. At the end of the paper we can see present forecast based on the constructed leading indicator, and a short evaluation about the behaviour of this composite leading indicator is also provided.

KEYWORDS: Business cycles; Leading indicators; Forecasting.

The method of using leading indicators in forecasting is well known and widely used all over the world. Since the first leading indicators were computed in the United States, almost all developed countries and also numerous international organisations calculate composite indicators for their short-term forecasts.

1. Concept and history

In the following introductory chapter the basic concept and a short history of leading indicators will be outlined. However, the history of leading indicators goes back to the 30s in the United States, in this paper we deal only with the history of constructing leading indicators in Hungary. Further historical details are given by *Reiff*, *Sugár* and *Surányi* (1999).

1.1 Business cycles definition and leading indicators

One of the first attempts to give an exact definition of business cycles was made by *Wesley C. Mitchell* in 1947 (quoted in *Lahiri* and *Moore* 1991 and in an OECD study).[4]

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[4] OECD leading indicators and business cycles in member countries 1960–1985. Sources and methods. **39**, 1987.

'Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organise their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own.'

In brief, a business cycle consists of exactly one (general) expansion and exactly one (general) contraction, and contains no minor cycle that is near of the same length as itself. It has to be noted that the term cycle may be misleading: in everyday terms it represents something regular. According to Mitchell's definition, however, it is not regular: neither in length, nor in amplitude.

Mitchell's business cycle definition should not be connected to the other well-known business cycle theories either. Probably the most prominent alternative business cycle theory is that of Kondratief's, which suggests that western economies exhibit forty- to sixty-year cycles; these business cycle theories, however, define the length of the successive cycles, which is not the case in Mitchell's definition.

Traditionally, business cycles were analysed using 'pure' time series, in the sense that absolute expansions and absolute contractions were determined. But this method could hardly be used after the 2nd World War, when most economies and therefore most time series were quickly and consistently growing, and no contraction phases (in absolute terms) could be detected. It seemed to be quite obvious that most series exhibited a long-term time trend, and that the fluctuations in these time series could be measured as fluctuations around the trend. Most statisticians accepted this view, and the traditional business cycle analysis was converted into a trend-cycle analysis. In this context the expansion means that the time series is growing relative to its long-term trend; that is closely related to an increased growth rate. Similarly, a contraction does not have to be understood in absolute terms; it is only a relative slowdown compared to the long-term time trend.

Most time series can therefore be characterised by their cycles; this gives the possibility to compare the cycles of different series.

There may exist certain series whose cycles are more or less consistently leading the cycles of the business activity; these series (known as leading indicators) can be used to forecast the business activity. The series by which the cycles of the business activity are identified are called reference series. (Possible candidates for the reference series are GDP, total industrial production, production of an influential industry etc.; for more details, see Section 3.)[5]

The cyclical properties of the reference series can therefore be compared to the cyclical properties of many other time series. It is possible that we find some series whose cycles turn consistently a fixed number of months before the turns in the reference series. Based on this, we can state that a specific series has, say approximately a 6-month lead relative to our reference series.

Furthermore, if we find more than one series whose turns are leading the turns of the reference series, we can improve our turning point forecasts. If we identify ten series that

[5] Not only leading, but coinciding and lagging indicators can also be defined this way.

can be used as leading indicators, each of which has a turn with a fairly high probability before the turns of the reference series, we can reasonably expect that most of the indicator series will have a turn before the turn in the reference series; therefore their (weighted) average will almost certainly forecast the turns in our reference series. This is called *composite leading indicator*, and can eliminate some of the statistical noise that can influence the original series. However, the different components of our composite indicator should capture different economic aspects.

Many researchers have tried to capture the economic rationale behind the existence of the leading indicators. For the summary of theoretical foundations see de *Leeuw* (1991). For an alternative probability model-based leading indicator computation see *Gregoir* and *Lenglart* (1998), *Neftci* (1991) and *Stock* and *Watson* (1991).

1.2. Leading indicator computations in Hungary

The first attempts to construct a composite leading indicator system for Hungary began in 1994, with the financial help from the European Union PHARE/TACIS Foundation.[6] The research was led by a group in the Hungarian Ministry of Finance, with the co-operation of some experts from the National Bank of Hungary (NBH) and the Hungarian Central Statistical Office (HCSO).[7]

This research group chose the industrial production as a reference series; this was available from 1980 on a monthly basis. They examined almost 30 time series to identify those which could be used as leading indicators. The series under examination were selected on the basis of the OECD-experience. The quantitative data were supplied by the Hungarian Central Statistical Office (HCSO) and the National Bank of Hungary, while the business survey data came from the KOPINT-DATORG (Social Research Center in Hungary).

The research has found that the following series could be used as leading indicators:

– expectations about future production (BS),[8]
– current stock levels (BS),
– household savings, deflated by the consumer price index,
– consumer prices (inverted,[9] monthly changes),
– credit rates for the firms (inverted, within one year).

(The researchers have also identified coinciding and lagging indicators; see *Hoós*, *Muszély* and *Nilsson*, 1996.)

However, these attempts had to face some very serious problems: as in the middle of the 1990s, Hungary was only about five years after a major transition, there were no long

[6] The preparation for the research is documented in *Hoós* (1994) and in *Hoós* and *Muszély* (1996).

[7] The researchers obtained technical help from the OECD Statistics Directorate Transition Economic Division, under the CCET (Centre for Co-operation with Economies in Transition) program. The initial research began in 1995, and the first results were achieved in 1996. Among the Central-Eastern-European countries Hungary was the first (together with Poland, see *Kkudrycka, 1995*) where leading indicator system has been established similar to those in the developed countries (for a detailed description see *Hoós, Muszély and Nilsson,* 1996).

[8] BS stands for Business Survey series.

[9] Inverted means that the series is transformed in such a way that the original peaks become troughs and vica versa. For example, the average of our indicator series is 100; so when we invert a series, we obtain each element of the inverted series by dividing 10 000 by the original element of the series. This way the average of the inverted series remains approximately 100.

enough time series upon which the computations could be based. Although the data of these nine years available are hardly ideal today, it can be still regarded as sufficient to make initial computations. Also, today we have a much more stable economic situation in Hungary; the well-known mechanisms from developed countries can be observed better nowadays than four years ago. This provides a chance to obtain more stable leading indicators.

2. Computation of leading indicators

In this chapter the general methodology of constructing leading indicators will be presented.

2.1. Basic assumptions

In order to define the turning points of a specific time series, we assume that this time series consists of four components:

$$y_t = T_t + S_t + C_t + I_t \qquad /1/$$

where y_t is the original value of the time series, and T_t, S_t, C_t, I_t are the trend, seasonal, cycle and irregular components of the time series, respectively. (In equation /1/, the relationship between the different parts is not necessarily additive: in fact it can be multiplicative or quasi-additive etc. We used this formulation only to define the different parts of the series.)

To define the cycles, we have to extract the seasonal and the trend components from the original series. The deduction of the seasonal component can be made by any of the well-known seasonal adjustment methods. As for the trend component, we can not give any exact definition for it. In the mentioned OECD study there is a summary of the properties we expect from a long-term trend. These include that 'the resultant trend should be a real 'long-term trend' and should not itself be too flexible'.[10] In fact we are looking for a trend that 'in some sense 'goes through' the appropriate major cyclical fluctuations in the series'.[11]

After the extraction of the seasonal and the trend components, we will only have the cycle and the irregular terms. It is not possible to derive the pure cycle component by getting rid of the irregular component, but we can reduce its likely effects by computing a moving average of the seasonally adjusted and de-trended data. The length of the moving average can be determined as the Month of Cyclical Dominance (MCD): this is the time-span upon which the cyclical components dominate the irregular components. The turning points of the time series will be the turning points of this MCD moving average of the seasonally adjusted and de-trended series.

Further on we summarise the alternative methods that can be followed when we use seasonal adjustments and de-trending; we also discuss the method for turning point determination.

[10] See *OECD* (1987) p. 33.
[11] See *OECD* (op. cit.) p. 33.

2.2. Seasonal adjustment[12]

In traditional theory, different mechanisms are responsible for the growth and business cycles, and the seasonal movements are regarded as noises contaminating the data; therefore seasonal factors need to be adjusted. This view is widely accepted among the experts of the topic.[13]

The summary of the different seasonal adjustment methods is out of the scope of the present paper. It has a wide literature and all steps of the different methods can be followed. So at this point it is enough to note that we have tried two types of seasonal adjustments, namely the X-12-ARIMA and the SEATS/TRAMO (in what follows, simply SEATS). The results can be seen in *Reiff*, *Sugár* and *Surányi* (1999), which states that the two methods lead to very similar outcomes, and the choice between them does not affect the cyclical patterns of the seasonally adjusted series considerably. Therefore we decided that during our future calculations of the leading indicators we would use only one of them. For this purpose we selected SEATS, which we consider to be more reliable. (Again, for a much more detailed analysis of this topic we refer to *Sugár*, 1999 and to *Reiff*, *Sugár* and *Surányi*, 1999).

2.3. De-trending

There are two well-known, alternative de-trending methods. One of them, the Phase-Average-Trend (PAT) method has been developed in the United States by the National Bureau of Economic Research (NBER), and this method was also adapted by the OECD for their leading indicators. This is the traditional de-trending method, which is virtually used in all indicator computations. The other method is the Hodrick-Prescott filter, available in most econometric software.

The phase-average trend method

As an overview, let us discuss the main steps of the PAT method (the description is based on *Nillson*, 1987 and *Kudrycka*, 1995).

1. Determination of an initial trend; calculation of the ratio to initial trend.

2. Determination of the turning points of the ratio to initial trend; these initial turning points determine the initial phases.

3. Calculation of the initial phase averages, then the 3-month moving average of the phase averages.

4. Connecting the phase averages, then forming a 12-month moving average we obtain the final trend.

It has to be noted that the PAT method uses a turning point determination (Step 2), namely the Bry-Boschan procedure; this will be discussed in the next section. The steps

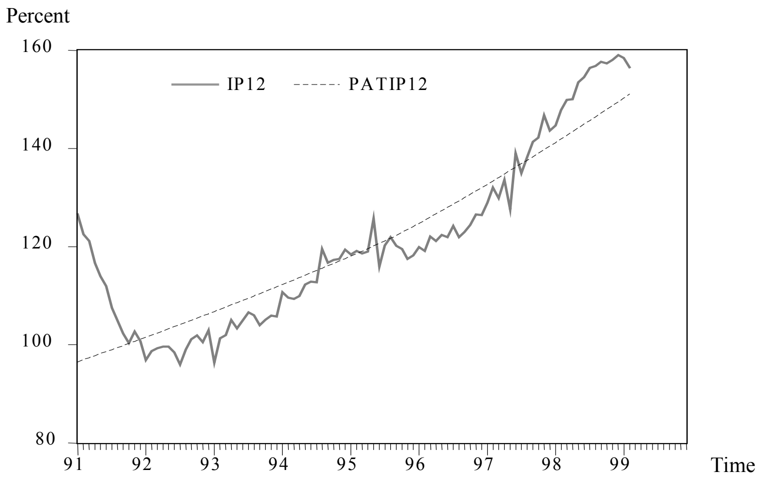
[12] Sugár studied extensively the seasonal adjustment methods. A much more detailed description is provided in *Sugár* (1999).

[13] However, *John Wells* found that in most cases the seasonally unadjusted indicators perform much better than the seasonally adjusted ones. For more on this, see *Wells* (1999).

are discussed in details in *Nilsson* (1987), *Kudrycka* (1995), and also in the initial version of this paper (*Reiff – Sugár – Surányi*, 1999).

As an illustration let us consider Figure 1.

Figure 1. The phase-average trend (PATIP12)
of the seasonally adjusted industrial production



In this figure we can see the seasonally adjusted Hungarian industrial production, IP12 (in 1992 prices, monthly average 1992=100, the seasonal adjustment has been made by X-12-ARIMA), and the phase-average trend of this series (PATIP12):

The Hodrick-Prescott filter

The Hodrick-Prescott filter is a well-known de-trending method, and it is available in the latest econometric softwares. The method was developed by *R. J. Hodrick* and *E. C. Prescott* to analyse the post-war US business cycles.

Let us denote again the original, seasonally adjusted time series by y_t, and the smoothed series by s_t. The Hodrick-Prescott smoothing of a time series tries to minimise the deviation of the smoothed series from the original one under the constraint that the smoothed series should be 'sufficiently smooth', which means that the fluctuation in the first differences of the smoothed series should be sufficiently small. The loss function to be minimised is

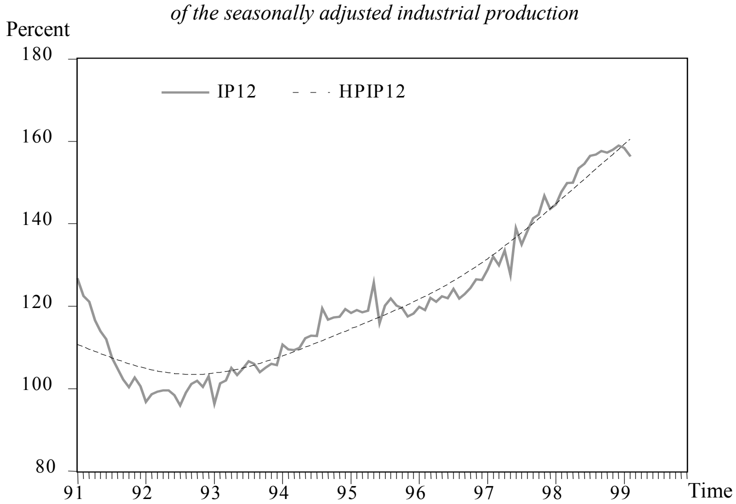
$$\sum_{t=1}^{T}(y_t - s_t)^2 + \lambda \sum_{t=2}^{T-1}\left((s_{t+1} - s_t) - (s_t - s_{t-1})\right)^2 \to \min. \qquad /2/$$

Parameter λ is the weight of the smoothness in our objective function; the higher λ is, the higher importance we put on the smoothness of the resulting series. If λ goes to infinity, we end up with the linear trend.

The main disadvantage of this method is that the choice of the λ parameter is arbitrary. Hodrick and Prescott suggested that λ should be 100 for annual data, 1 600 for quarterly data and 14 400 for monthly data. Of course, any other value can be chosen, and in the case of leading indicators, the final results depend on the choice of λ at the de-trending section.

In Figure 2 we can have a look at the Hodrick-Prescott trend (HPIP12) of the same series (IP12) examined for the phase-average trend. The value of parameter λ was 14 400, according to the recommendations.

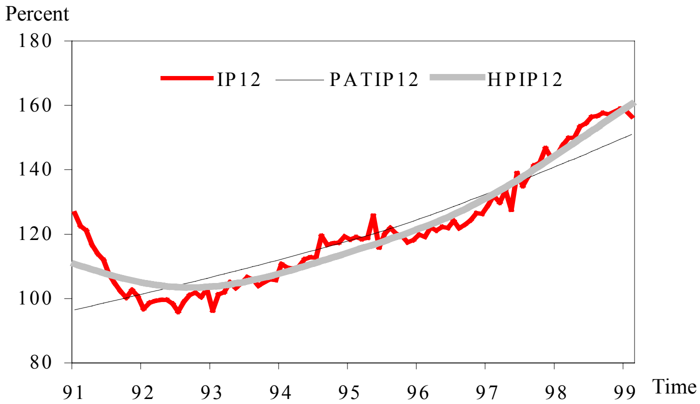
Figure 2. The Hodrick-Prescott trend (HPIP12) of the seasonally adjusted industrial production



Comparison of the de-trending methods

As a comparison, it is worth having a look at the alternative de-trending methods jointly.

Figure 3. Comparison of the alternative de-trending methods



We can see substantial differences between the two long-term trends. The phase-average trend is much smoother, it is almost a linear trend, while the Hodrick-Prescott trend is much 'closer' to the original series. If we chose a much higher λ, the two methods would produce very similar results.

So the difference between the alternative de-trending methods is mainly caused by the choice of parameter λ for the Hodrick-Prescott filter. If we use the conventional value of 14 400, then it leads to a non-linear trend, at least relative to the phase-average method. This means that the de-trended series are of smaller amplitude, and may also lead to differences in the final turning points (see Figure 4. in Section 4.).

The similarity of the phase-average method and the Hodrick-Prescott filter with a high λ put serious questions about the phase-average method. It may well be that the phase-average method can be approximated by a suitable Hodrick-Prescott filter, and therefore it is not necessary to deal with the phase-average method at all. To verify this claim, however, longer time series should be examined as well, which unfortunately are not yet available for Hungary.

As a summary we can say that the Hodrick-Prescott method seems to be less controversial for us. The reason for this is that it is computed in the same way at the whole range of the time series, while the phase-average method uses regression at the beginning and at the end and moving averages in between. As a consequence, the Hodrick-Prescott filter looks much more reliable where it is crucial to be reliable, i.e. at the end of the series. Another argument supporting the Hodrick-Prescott filter is that the number of arbitrary choices necessary to make during the computations is only one, namely the choice of parameter λ (but, on the other hand, it is a crucial one), while at the phase-average method we have much more freedom at each steps.

2.4. Turning point determination: the Bry-Boschan procedure

Sometimes it is quite easy to determine the turning points of a given series: one has to look at the graph and mark the peaks and the troughs. There are some cases, however, when this method does not work, as it is not quite obvious which of the consecutive peaks or troughs should be regarded as real turns, and there may be a question about minor cycles: when a cycle of relatively short length should be regarded as a cycle itself, and when it is only a small fluctuation inside a longer cycle.

It is very important therefore, to have some basic principles for the identification of turning points, and to use them consistently. These principles were laid down by *Gerhard Bry* and *Charlotte Boschan* in 1971 (*Bry – Boschan*, 1971). According to their arguments, in the turning point determination 'the programmed approach differs substantially from previously used techniques, which rely heavily on impressionistic judgements and are subject to a number of procedural constraints'. It is desirable, therefore, to exclude the possibility of any subjective decision about turning points.

We used this pre-programmed method for the turning point determination.[14] The description of the procedure along with a short evaluation can be found in *Bry* and *Boschan* (1971) and in *Nilsson* (1987).

[14] We are grateful to *György Muszély*, member of the leading indicator research group of the Hungarian Ministry of Finance for providing us with the program.

3. Constructing a composite leading indicator for Hungary

Although some economic reforms were implemented during the 1980s, Hungary operated as a socialist economy until the beginning of the 1990s. The process of the transition into a market economy began only in 1989 or 1990; a newly elected government in 1990 initiated an institutional reform.

These facts mean that the reliability of the long time series is highly questionable in Hungary. Any series can only be used from 1991 at best, as the data before and after the transition cannot be compared. During our research, we decided to concentrate only on the data of the 1990s. This may be problematic because of the shortage of the time series, but this cannot be resolved. However, an eight and a half year time span is sufficient to make at least initial computations.

3.1. The data

We collected data from three different sources. Most of the 'natural' time series are taken from the monthly reports of the HCSO and some monetary time series could be found in the monthly reports of the National Bank of Hungary. We had some difficulties at the beginning of the 1990s: as the transition into market economy required major changes in the statistical system as well, some of the series were not reported at the beginning of the decade. Therefore some of the time series started only in 1992, 1993 or 1994, and the cyclical properties of these series could only be examined in these periods. (The names and the starting dates of the series are reported in Tables 2-4.)

The third source of our data are the business survey series by the Hungarian research institute, KOPINT-DATORG. This institution has conducted business surveys from the 1980s, and we used some selected business survey data from 1990. The incorporation of business survey data represented some technical difficulties for us, as these surveys are made only quarterly. We decided to transform these series to monthly ones for the sake of comparability with the other series. The method of the transformation was the simplest one: we used linear approximation between the data points. The reason for this is that we did not want to make any initial assumptions and did not want to add any extra information to the original data that could have affected the final results.

3.2. The reference series[15]

One of the most important steps in the construction of a composite leading indicator is the choice of the reference series. Hopefully, we wish to forecast the turning points in GDP, so this is a natural candidate to be the reference series. In Hungary, however, GDP-calculations were made only on an annual basis until 1994; from that time quarterly GDP-data are available. This means that we could not make any approximations for the monthly Hungarian GDP in any way, therefore this possibility was excluded.

Another possibility is to use a composite coinciding index as a reference series. But we had no such index as we have a limited number of initial researches from this area.

[15] See Section 1. for the definition of the reference series.

We do not know whether the natural candidates (capacity utilisation, number of hours worked, industrial energy consumption etc.) as coincident indicators, perform well or not.

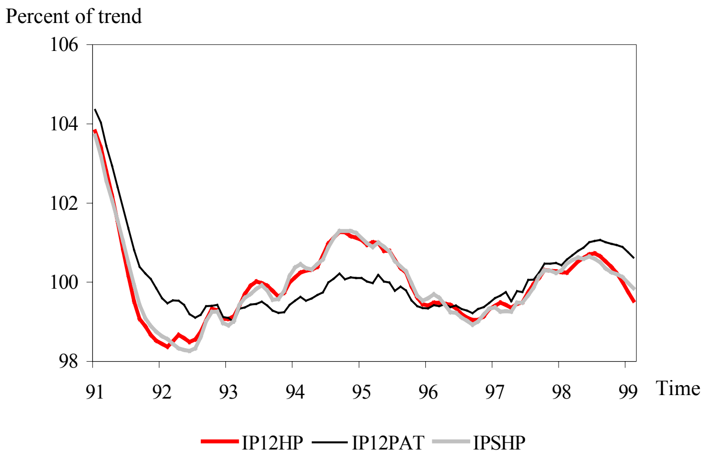
There is one more possibility which is often used in other countries: the data of industrial production. Although this represents only a part of the GDP, it can be regarded as a reliable indicator of the state of the economy; it can therefore be a good proxy for the whole GDP. Furthermore, many countries and also the OECD use the industrial production as a reference series, and this will allow the comparison of the results.[16]

Industrial production data in Hungary are available monthly; we used a base index of industrial production where the average of 1992 is 100.

After choosing the reference series, it is important to determine its turning points; these will serve as a basis for the comparison of the cyclical behaviour of the different series. In some countries (in the United States, for example) there are officially announced turning points of the economy; in this case these official turning points can be used in the analysis. In Hungary, however, there are no such turning point dates, so we had to calculate them ourselves.

During the computations, we used all the available methods for seasonal adjustment and de-trending: the X-12-ARIMA and SEATS, and the Hodrick-Prescott filter as well as the phase-average method. Due to the short series, however, we faced some difficulties in computing the phase-average trend for most of the series; for the industrial production, only three combinations of these methods have led to turning point determination: no phase-average trend could be prepared for the SEATS seasonal adjustment.

Figure 4. Cycles of industrial production in Hungary after seasonal adjustment, de-trending, smoothing and normalising



In an ideal situation all of the three available methods should give the same turning points; these could then be used as reliable ones. But this was not the case: the methods reported similar, but not identical turning point dates. In all cases we experienced four turning points, out of which the two in the middle seemed to be stable. But the turning

[16] As noted before, the research group in the Hungarian Ministry of Finance also used the industrial production data as a reference series.

points at the end, and especially at the beginning proved to be very uncertain (this observation may be in line with the fact that the phase-average method is very unreliable at the end and at the beginning; for more on this, see *Reiff*, *Sugár* and *Surányi*, 1999). The seasonally adjusted and de-trended series (after normalisation) are plotted in Figure 4.

We can see that the main difference is caused by the different de-trending method. The IP12HP and IPSHP exhibit only minor differences, while the IP12HP and IP12PAT differ substantially. The turning points of each series are listed in Table 1.

Table 1

The turning points of the Hungarian industrial production according to the alternative seasonal adjustment and de-trending methods

Series	Trough	Peak	Trough	Peak
IP12HP*	92 Feb	94 Oct	96 Oct	98 Jul
IP12PAT**	93 Feb	94 Sep	96 Sep	98 Aug
IPSHP***	92 Jun	94 Nov	96 Sep	98 Jun

* IP12HP: Industrial Production after X-12-ARIMA seasonal adjustment and Hodrick-Prescott filter de-trending.
**IP12PAT: Industrial Production after X-12-ARIMA seasonal adjustment and Phase-Average Trend method de-trending.
***IPSHP: Industrial Production after SEATS seasonal adjustment and Hodrick-Prescott filter de-trending.

Although the turning points were not identical, they exhibit a similar pattern, they seem to be plausible and matching our intuition about the economic processes in the decade.

As the exact dates of the turning points are unclear, we decided not to choose from the alternative dates but to leave them as they were. We decided that we would make calculations with all of them, with the two de-trending methods and the two seasonal adjustment methods, and evaluate each result on the basis of the turning points in the industrial production series that had been calculated with the same pair of methods.

3.3. The cyclical indicators

We examined the cyclical pattern of the following series.

Interest rates. We had five types of nominal interest rates available from 1991: these are very short-term (less than one month) deposit rate, short-term (less than one year) deposit rates, long-term deposit rates, short-term credit rates and long-term credit rates. All interest rates were published monthly, and they represent weighted average rates (including the contracts at all financial institutions).

We could have considered the incorporation of real interest rates as well, but in this case we should have had data about the inflationary expectations. This is problematic, however, and since that the correlation between the nominal and real interest rates is likely to be positive as higher nominal interest rates indicate higher risk (this will not necessarily be true in the future, as Hungary is likely to experience much shorter inflationary period than before). Therefore we decided to use the easily available nominal interest rates.

Exchange rates. Hungary is highly dependent on foreign trade, and this is greatly influenced by the exchange rates. We examined nominal exchange rates (the HUF to USD, DEM and Euro). Again, we could have examined real exchange rates or real exchange rate indices, but this would have required further computations as well. For the sake of simplicity we used these nominal rates.

Productions of specific industries. There are data available about the production in real terms (tons, pieces etc.) of selected industries. It may well be the case that some industries have stimulating effects to the whole industry, or there may be some influential industries that are in close correlation with the overall production of the whole industry. These were the reasons why we tried the coal, electric energy, fertilisers, cement and bony raw meat productions as leading or coincident indicators.

Budget. The monthly income of the budget may indicate the state of the economy through the tax revenues, for example; conversely, monthly expenditures can stimulate the industrial production. We therefore tried these series.

Unemployment. According to international experiences, both the number of the unemployed and the unemployment ratio can be useful coinciding or lagging indicators.

Price indices. We had six price index series available on a monthly basis, and most of them were natural candidates to be leading indicators. We examined base price indices (January 1992=100): food prices, energy prices (as the price of a main input of the industry), consumer prices, producer prices, foreign sales prices and domestic sales prices.

Working hours and employment. We could collect data about employment and working hours from the HCSO. We used the monthly data of the number of hours worked in industry, the number of the employed in industry, and the number of the blue-collars in industry. These series are likely to be moving along with the reference series.

Earnings. It is natural that the earnings should influence industrial production in either way. On the one hand, they are indicators of input prices, and on the other hand they represent the productivity of the industry. We used the monthly data of gross nominal average earnings in industry and gross nominal average earnings in construction (in HUF per month).

Money supply. From 1994 the National Bank of Hungary has been publishing consistent and comparable data about the M3. We chose M3 because this is the only money supply data that is available directly, and further, we think that money supply aggregates are closely linked.

Current account balance. The export and import performance of the industry and services, and the capital account may indicate the actual state of the economy. The current account balance has been available monthly in USD since 1991.

Business survey series. We had great expectations as regards the business survey series; international experience and tendencies showed that they play a more and more important role in composite leading indicators. The Polish example also suggested that these series have relatively high explanatory power (in Poland the calculations showed much higher correlation coefficients in case of business survey series, see *Kudrycka*, 1995).

We had some data from the KOPINT-DATORG; the answers to the following questions have been classified as better/improving, same/not changing, and worse/deteriorating.

1. What is your opinion about the current situation of your company?
2. What is the current production of your firm compared to the previous year?

3. What is the current production of your firm compared to the previous quarter?

4. What is the current capacity utilisation of your firm?

5. What is the current stock level of your firm (final product)?

6. How will the situation of your firm change during the next 6 months?

7. What is your prognosis about the future sales of your firm?

8. What is the capacity level of your firm compared to the prognosed needs during the next 12 months?

9. What is your prognosis about the domestic demand during the next 12 months?

10. What is your prognosis about the number of the employed at your firm during the next 6 months?

11. What is your prognosis about the sales prices of your firm during the next 12 months?

12. What is your opinion about the current state of the Hungarian economy?

13. What is your prognosis about the future tendencies in the Hungarian economy?

As we can see, all answers to these questions represent changes; these changes in opinions can influence industrial production in the future.

We transformed the balances into numbers by giving 1 point to the worse/deteriorating answer, 2 points to the same/not changing answer, and 3 points to the better/improving answers. (As originally we had only the relative frequencies of the answers in hand, this way we obtained a number between 100 and 300.)

It is a delicate issue among researchers whether these business survey series should or should not be de-trended. Some experts argue that these data cannot exhibit long-term trends as they are bounded. We, however, chose de-trending as our series were quite short, and most of them exhibited a clear rising trend during the 9 year span of available data. There is no unique view at international level in this question, however.

3.4. Methods of evaluation of the cyclical indicators

In the evaluation step we followed the practice of the OECD (see for example *Kudrycka*, 1995). We applied the peak and trough analysis and the cross-correlation method.

At the peak and trough analysis we counted the number of turns in each series, then checked whether any peak or trough may be matched to a peak or trough in the reference series. Therefore we could count the number of missing, and the number of extra turns.[17] Then we computed the mean lag at turning points (that gives a positive number if the series lags, and negative number if the series leads the reference series), and we also computed the median lag at turning points. These numbers however are not too reliable, as they are computed from three or four data points at most. Nevertheless, if they are close to each other, that can be regarded as a positive sign about their reliability. Finally, we computed the mean deviation of the lags at turning points from their mean, as an indicator of the variability of the lags. The smaller this number is, the more reliable the cyclical indicator is.

[17] We say that a specific turn in an indicator series is extra, if no matching turn can be identified in the reference series. And we say that we have a missing turn if a specific turn in the reference series does not have a corresponding turn in the indicator series.

In the cross-correlation method, we computed correlation coefficients if the cyclical indicator series were lagged by different numbers of months relative to the reference series. We determined the lag of each cyclical indicator for which the correlation coefficient was the highest (in absolute value). This lag can be regarded as the time span at which the cyclical indicator has the highest explanatory power (in linear relationship) for the reference series.

A cyclical indicator was selected as a reliable one if the peak and trough analysis did not show too many extra or missing turns, if the mean lag, the median lag and the lag giving the highest correlation coefficient were consistent, and if the mean deviation of the lags at turning points was small. The results of the two evaluation methods are shown in Tables 2-4.

3.5. Final selection of cyclical indicators

In Tables 2-3 the de-trending method is the Hodrick-Prescott filter; the seasonal adjustment method is X-12-ARIMA in Table 2, and SEATS in Table 3. As the results are quite similar, we selected the same series as leading indicators in these instances. The selected series for leading indicators are shaded in the tables.

The first selected time series is the long-term credit rate. All interest rates seem to behave well, with similar mean, median and cross-correlation lags. However, we decided to select only one of them as they are likely to represent the same information set. Probably the best among them is the long-term credit rate with the most consistent mean, median and cross-correlation lags, and with the lowest mean deviation value. Also, the credit rates may directly influence the investment decisions of the firm and it is very intuitive that they have quite a long lead compared to the industrial production. An alternative reasoning that connect interest rates to industrial production can stress the importance of the inflation; during the first half of the decade Hungary experienced high inflation rates (20-35%), in which case a decline in the inflation (and in the interest rates) could lead to an upswing in the industrial production through the reduced uncertainty about future prices.

The second selected series is the exchange rate of the Euro (to HUF). It is quite intuitive that the USD exchange rate has much lower predicting power to the industrial production turning points, as the Hungarian economy is integrated mainly into the European Union (with approximately 70 percent of its foreign trade going to the Euro-zone). It is not clear, however, why the inverse of the Euro rate should have such a long lead; this means that if the Euro is strong, then a trough can be expected in the Hungarian economy and vice versa. However, this can be in connection with the import sensitivity of the Hungarian industry. Also, we can stress here the role of inflation: when the Euro is strong, then the HUF is weak (which in fact can be caused by inflation), and this hurts the Hungarian economy.

The third selected series is gross nominal earning in industry. Although there is a missing turn in this case, we have consistent mean, median and cross-correlation lags and a very small mean deviation value. The economic rationale behind this series can be that firm owners, seeing the extended possibilities in the future offer higher wages to employ more people in their companies.

Table 2

The evaluation of the cyclical indicators in the X-12-ARIMA, HP filter case

	Start date	MCD	No. of turns	Extra turns	Missing turns	Lag at turning points			Cross correlation	
						Mean	Median	Mean dev	Lag	Coeff
NATURAL TIME SERIES										
Interest Rates										
Within 1 month deposit rate (inv)	1991	3	6	2		-14,50	-18,5	6,750	-13	0,724
Short term deposit rate (inv)	1991	3	4			-13,00	-16,5	6,500	-13	0,763
Long term deposit rate (inv)	1991	4	5	1		-10,00	-12,0	5,000	-12	0,776
Short term credit rates (inv)	1991	3	4			-10,75	-14,5	6,375	-11	0,766
Long term credit rates (inv)	*1991*	*4*	*4*			*-10,75*	*-13,5*	*4,875*	*-10*	*0,767*
Exchange Rates										
USD	1991	3	7	3		-3,00	-4,0	7,500	5	0,368
DEM (inv)	1991	3	5	1		-6,75	-8,0	7,250	-7	0,888
Euro (inv)	*1992*	*3*	*4*			*-6,25*	*-7,5*	*7,250*	*-6*	*0,865*
Industry Productions										
Coal (inv)	1991	6	8	4		-0,50	-1,0	3,500	0	0,617
Electric Energy	1991	6	8	4		7,00	8,0	8,500	10	0,460
Fertilizers (inv)	1992	6	6	3	1	8,67	7,0	10,222	4	0,555
Cement	1991	4	7	3		-0,75	-1,5	6,250	-4	0,555
Bony Raw Meat (inv)	1991	3	6	2		-0,75	-1,5	3,875	1	0,865
Budget										
Monthly Income (inv)	1992	6	6	2		-3,25	-3,0	6,250	-2	0,613
Monthly Expenditure	1992	6	NO SIGNIFICANT RELATIONSHIP							
Monthly Balance (inv)	1992	6	6	4	2	-3,50	-3,5	6,500	-8	0,423
Unemployment										
Number of Unemployed (inv)	1991	3	4			8,25	8,5	3,250	7	0,807
Unemployment Ratio (inv)	1991	3	6	2		6,75	5,5	5,250	7	0,700
Price Indices										
Food Prices (inv)	1991	3	6	3	1	-12,67	-15,0	4,444	-11	0,457
Energy Prices (inv)	1991	3	5	2	1	4,33	2,0	7,778	-3	0,517
Consumer Price Index (inv)	1991	3	7	4	1	-5,67	-5,0	1,556	-4	0,674
Producer Price Index (inv)	1992	3	5	2	1	8,00	10,0	4,667	-3	0,569
Sales Prices of Foreign Trade (inv)	1992	3	4	2	2	-10,00	-10,0	6,000	-5	0,584
Sales Prices of Domestic Trade (inv)	1991	3	5	2	1	-0,33	1,0	3,778	-2	0,572
Working Hours										
Working Hours in Industry	1994	6	3	1	1	-3,00	-3,0	4,000	-1	0,882
Number of Employed in Industry	1994	3	3	1	1	-2,50	-2,5	6,500	0	0,794
Number of Manual Workers in Industry	1994	3	4	1		-1,33	0,0	5,111	0	0,803
Earnings										
Gross Earnings in Industry	*1994*	*6*	*2*		*1*	*-7,00*	*-7,0*	*1,000*	*-8*	*0,784*
Gross Earnings in Construction	1994	6	2		1	-8,50	-8,5	0,500	-7	0,768
Money Supply										
M3	1994	3	2		1	-16,50	-16,5	5,500	-10	0,705
Current Account Balance										
Monthly Current Account Bal. (inv)	1991	6	7	4	1	-2,67	2,0	6,889	-2	0,683
Economic Situation in Germany										
Industrial Production in Germany	1990	3	5	1		6,50	4,5	4,750	12	0,624

(Continued on the next page.)

(Continuation.)

	Start date	MCD	No. of turns	Extra turns	Missing turns	Lag at turning points			Cross correlation	
						Mean	Median	Mean dev	Lag	Coeff
BUSINESS SURVEY SERIES										
Firm's Current Situation	*1990*	*3*	*6*	*2*		*-5,25*	*-5,5*	*0,750*	*-6*	*0,754*
Current Prod. Compared to Prev. Year	*1990*	*3*	*4*			*-5,25*	*-5,0*	*0,375*	*-4*	*0,707*
Current Prod. Compared to Prev. Quart.	1990	3	6	2		-6,75	-7,5	1,375	-5	0,667
Current Capacity Utilisation	1990	3	6	2		1,25	0,0	6,750	-2	0,585
Current Stock Level	1990	3	6	3	1	5,33	7,0	5,556	7	0,743
Prognosis of Firm's Future Situation	*1990*	*3*	*4*			*-11,75*	*-12,0*	*4,250*	*-12*	*0,796*
Prognosis of Firm's Future Sales	1900	3	6	2		-12,50	-10,5	6,000	-13	0,691
Capacity Level Comp. to the Needs (inv)	*1990*	*3*	*4*			*-3,50*	*-3,0*	*6,000*	*-6*	*0,662*
Prognosis of Firm's Domestic Demand	*1990*	*3*	*4*			*-5,25*	*-5,5*	*2,250*	*-10*	*0,715*
Prognosis of the Number of Workers	1990	3	6	2		-8,75	-5,5	5,625	-13	0,769
Prognosis of Own Dom. Sales Prices	1990	3	8	4		-3,00	-1,5	4,500	0	0,560
Country's Current Situation	1990	3	NO SIGNIFICANT RELATIONSHIP							
Prognose of Country's Future Situation	1990	3	NO SIGNIFICANT RELATIONSHIP							

Table 3

The evaluation of the cyclical indicators in the SEATS, HP-filter case

	Start date	MCD	No. of turns	Extra turns	Missing turns	Lag at turning points			Cross correlation	
						Mean	Median	Mean dev	Lag	Coeff
NATURAL TIME SERIES										
Interest Rates										
Within 1 month deposit rate (inv)	1991	3	6	2		-15,25	-18,5	5,125	-14	0,718
Short term deposit rate (inv)	1991	3	4			-13,75	-16,5	4,875	-13	0,760
Long term deposit rate (inv)	1991	4	5	1		-10,75	-11,0	4,250	-12	0,760
Short term credit rates (inv)	1991	3	4			-11,50	-14,0	4,750	-12	0,767
Long term credit rates (inv)	*1991*	*4*	*4*			*-11,50*	*-13,0*	*3,250*	*-11*	*0,763*
Exchange Rates										
USD	1991	3	7	3		-3,75	-3,5	6,750	-18	0,308
DEM (inv)	1991	3	5	1		-7,50	-8,0	5,500	-7	0,881
Euro (inv)	*1992*	*3*	*4*			*-7,00*	*-7,5*	*5,500*	*-7*	*0,851*
Industry Productions										
Coal (inv)	1991	6	8	4		-0,50	-1,0	6,000	0	0,597
Electric Energy	1991	6	6	2		6,00	8,0	9,500	10	0,460
Fertilizers (inv)	1992	6	7	4	1	7,33	6,0	8,444	3	0,753
Cement	1991	4	7	3		-1,25	-1,0	3,250	-3	0,466
Bony Raw Meat (inv)	1991	3	6	2		-2,50	-1,5	4,500	2	0,880

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(Continuation.)

	Start date	MCD	No. of turns	Extra turns	Missing turns	Lag at turning points			Cross correlation	
						Mean	Median	Mean dev	Lag	Coeff
Budget										
Monthly Income (inv)	*1992*	*6*	*4*			*-3,25*	*-3,5*	*3,250*	*-5*	*0,701*
Monthly Expenditure	1992	6	3	1		-16,33	-16,0	3,778	-15	0,494
Monthly Balance (inv)	1992	6	5	2	1	-5,33	-9,0	4,889	-7	0,497
Unemployment										
Number of Unemployed (inv)	1991	3	4			7,50	6,0	3,750	6	0,818
Unemployment Ratio (inv)	1991	3	6	2		6,25	5,0	4,750	4	0,688
Price Indices										
Food Prices (inv)	1991	3	6	3	1	-12,67	-15,0	3,778	-12	0,486
Energy Prices (inv)	1991	3	5	3	1	3,00	1,0	9,333	-3	0,510
Consumer Price Index (inv)	1991	3	7	4	1	-6,33	-5,0	3,111	-5	0,698
Producer Price Index (inv)	1992	3	5	3	1	7,00	6,0	5,333	-1	0,581
Sales Prices of Foreign Trade (inv)	1992	3	4	2	2	-10,00	-10,0	5,000	-6	0,569
Sales Prices of Domestic Trade (inv)	1991	3	5	3	1	-1,33	0,0	5,778	0	0,610
Working Hours										
Working Hours in Industry	1994	6	3	1	1	2,00	2,0	2,000	-1	0,858
Number of Employed in Industry	1994	3	3	1	1	-3,00	-3,0	5,000	0	0,810
Number of Manual Workers in Industry	1994	3	4	1		-1,00	1,0	4,667	0	0,816
Earnings										
Gross Earnings in Industry	*1994*	*3*	*2*		*1*	*-8,50*	*-8,5*	*4,500*	*-7*	*0,886*
Gross Earnings in Construction	1994	3	2		1	-6,50	-6,5	0,500	-6	0,864
Money Supply										
M3	1994	3	3	1	1	-17,50	-17,5	3,500	-10	0,692
Current Account Balance										
Monthly Current Account Bal. (inv)	1991	6	7	4	1	-5,67	-3,0	4,222	-1	0,548
Economic Situation in Germany										
Industrial Production in Germany	1990	3	5	1		5,75	5,5	3,750	11	0,639
BUSINESS SURVEY SERIES										
Firm's Current Situation	*1990*	*3*	*6*	*2*		*-4,75*	*-5,0*	*1,250*	*-6*	*0,755*
Current Prod. Compared to Prev. Year	*1990*	*3*	*4*			*-4,25*	*-4,0*	*2,750*	*-5*	*0,754*
Current Prod. Compared to Prev. Quart.	1990	3	6	2		-5,25	-4,5	3,250	-6	0,641
Current Capacity Utilisation	1990	3	4			-0,50	1,0	7,500	-2	0,614
Current Stock Level	1990	3	7	4	1	4,00	3,0	4,667	7	0,718
Prognosis of Firm's Future Situation	*1990*	*3*	*4*			*-13,00*	*-13,0*	*5,000*	*-12*	*0,777*
Prognosis of Firm's Future Sales	1900	3	6	2		-15,50	-12,5	7,750	-13	0,697
Capacity Level Comp. to the Needs (inv)	*1990*	*3*	*4*			*-4,25*	*-4,0*	*6,750*	*-6*	*0,680*
Prognosis of Firm's Domestic Demand	*1990*	*3*	*4*			*-6,00*	*-5,5*	*3,500*	*-11*	*0,716*
Prognosis of the Number of Workers	1990	3	6	2		-9,50	-5,5	7,250	-13	0,734
Prognosis of Own Dom. Sales Prices	1990	3	7	3		-2,75	-3,0	2,750	-3	0,590
Country's Current Situation	1990	3	NO SIGNIFICANT RELATIONSHIP							
Prognose of Country's Future Situation	1990	3	NO SIGNIFICANT RELATIONSHIP							

Table 4

The evaluation of the cyclical indicators in the X-12-ARIMA, phase-average trend method case

	Start date	MCD	No. of turns	Extra turns	Missing turns	Lag at turning points			Cross correlation	
						Mean	Median	Mean dev	Lag	Coeff
NATURAL TIME SERIES										
Exchange Rates										
USD	1991	3	5	1		-11,50	-11,0	4,000	2	0,556
Industry Productions										
Cement	1991	5	5	1		-3,50	-5,5	3,750	0	0,673
Bony Raw Meat (inv)	1991	3	7	3		2,00	0,5	4,000	9	0,293
Price Indices										
Consumer Price Index (inv)	1991	3	5	3	1	-9,00	-4,0	6,667	0	0,373
Current Account Balance										
Monthly Current Account Balance	1991	3	5	3	1	-1,67	0,0	6,889	11	0,567
BUSINESS SURVEY SERIES										
Firm's Current Situation	1990	3	6	2		-8,00	-5,5	4,500	-6	0,339
Current Prod. Compared to Prev. Year	1990	3	4			-7,75	-5,0	4,625	-7	0,168
Current Prod. Compared to Prev. Quart.	1990	3	4			-9,75	-6,5	5,125	-7	0,168
Current Capacity Utilisation	1990	3	4			-2,00	-4,0	4,000	-5	0,153
Current Stock Level	1990	3	5	1		-2,75	-3,0	8,750	3	0,655
Prognosis of Firm's Future Situation	1990	3	4			-14,75	-13,5	6,750	-12	0,268
Prognosis of Firm's Future Sales	1990	3	6	2		-15,00	-16,0	6,000	-18	0,197
Capacity Level Comp. to the Needs (inv)	1990	3	4			-6,25	-4,5	9,750	-9	0,202
Prognosis of Firm's Domestic Demand	1990	3	4			-8,00	-5,5	6,500	-9	0,210
Prognosis of the Number of Workers	1990	3	4			-7,50	-4,0	6,250	-10	0,242
Prognosis of Own Dom. Sales Prices	1990	3	8	4		-6,75	-7,0	7,250	0	0,419
Country's Current Situation	1990	3	NO SIGNIFICANT RELATIONSHIP							
Prognosis of Country's Future Situation	1990	3	NO SIGNIFICANT RELATIONSHIP							

The remaining five selected series are all business survey data. The first one of them is the firm's current situation; though we have two extra turns (corresponding to a minor cycle) again, the correlation coefficient is very high and the mean deviation is small.

The fifth leading indicator is the firm's current production compared to that of the previous year. Again, the selection of this needs no further explanation once we have a look at the business cycle properties of this series.

Next we have chosen the prognosis about the firm's future situation. This series has a longer lead than the evaluation of the current situation, representing the longer time span in the question. The business cycle properties of this series are excellent.

The seventh selected series is the current capacity level compared to needs. The answer to this question indicates whether the firm plans new investments or not, and therefore influences future industrial production.

The last selected series is the prognosis about the firm's domestic demand (this means expected investments and raw material buyings etc.). Although the mean and median lags are much smaller than the cross-correlation lag, the correlation coefficient is relatively high and we have no extra or missing turns. And again, we can give clear economic justification for the selection of this business survey series.

The graphs of the selected series as leading indicators can be seen in Figures 5-12. All series are displayed in seasonally adjusted, de-trended, smoothed (by MCD-smoothing) and normalised form. Where necessary, for presentation purposes, the inverse of the series was also taken.

At this point it is worth mentioning one of the series that was not selected: namely the price index. In fact any of the price indices have low explanatory power for the industrial production. The reason behind this can be that the nature of the Hungarian inflation changed substantially during the 1990s: during the first half of the decade we had a relatively high inflation level (between 15 and 35 percent), and in these circumstances any decrease in the inflation can be regarded as a positive sign for the economy. In this period, therefore, an inverse relationship between prices and economic activity could be observed.

During the second half of the decade, however, the inflation decreased substantially, and nowadays it is approximately 10 percent (relative to the same period of previous year). In such circumstances any further decrease in the inflation rate can reduce the industrial production, as this decrease is not necessarily a good news for the companies. During this period, therefore, the relationship between the inflation and the economic activity is not an inverse one any more.

Figure 5. The inverse of the long-term credit rate (CRRLHPINV) as a leading indicator

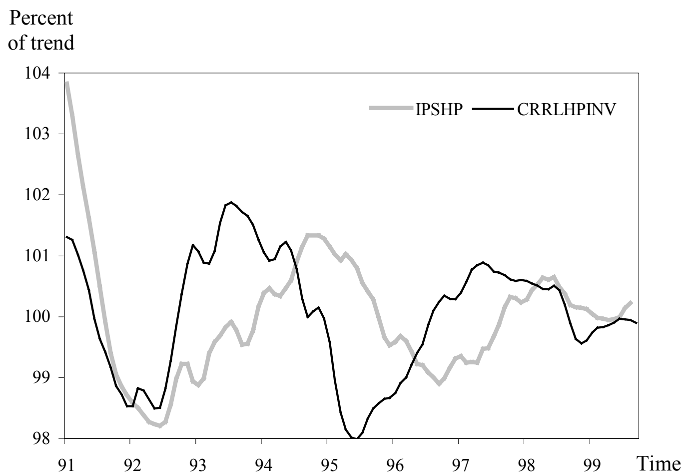


Figure 6. The inverse of the Euro exchange rate (EUROHPINV) as a leading indicator

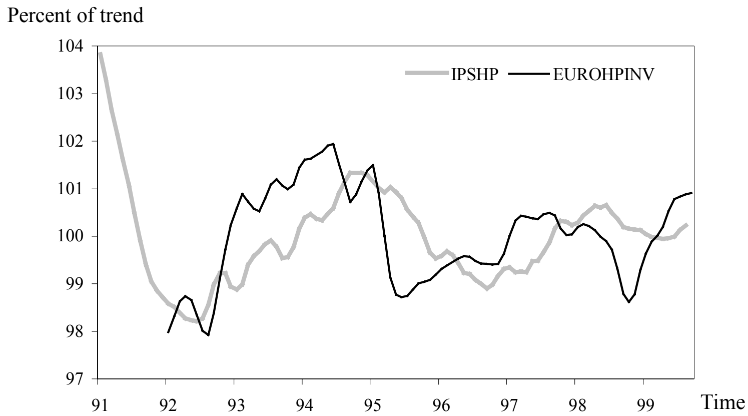


Figure 7. The gross earnings in the industry (EARNINDSHP) as a leading indicator

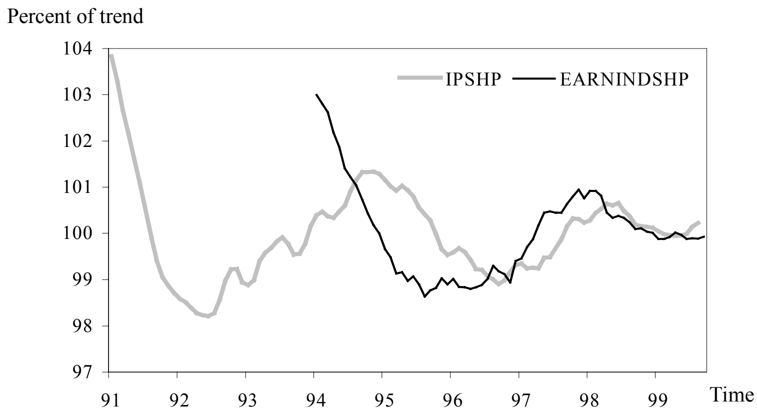


Figure 8. The current situation of the firm (CSSHP) as a leading indicator

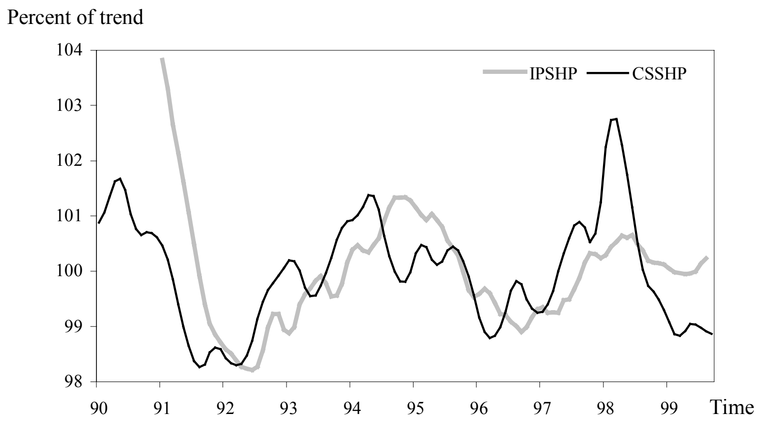


Figure 9. The current production compared to that of the previous year (CPYSHP) as a leading indicator

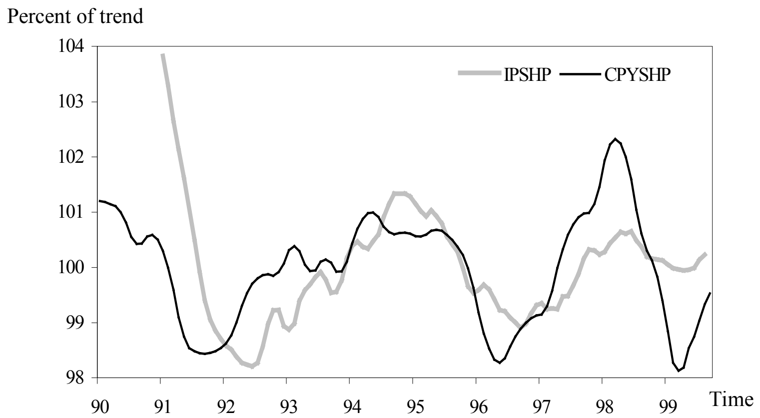


Figure 10. The prognosis of the future situation of the firm (PRSITSHP) as a leading indicator

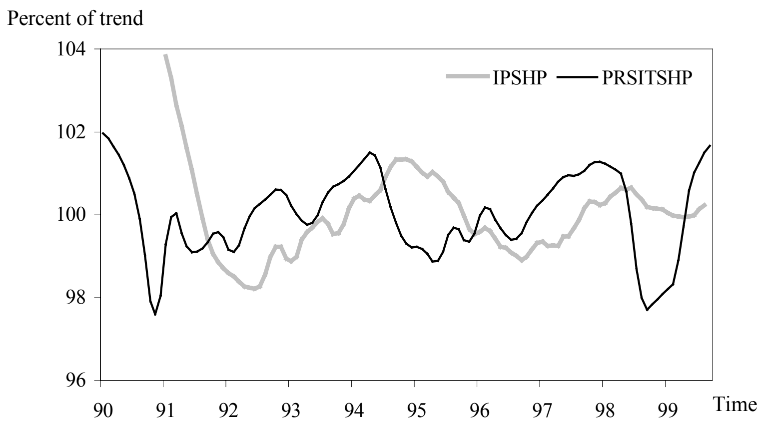


Figure 11. The inverse of the capacity level compared to the needs (PRCAPHPINV) as a leading indicator

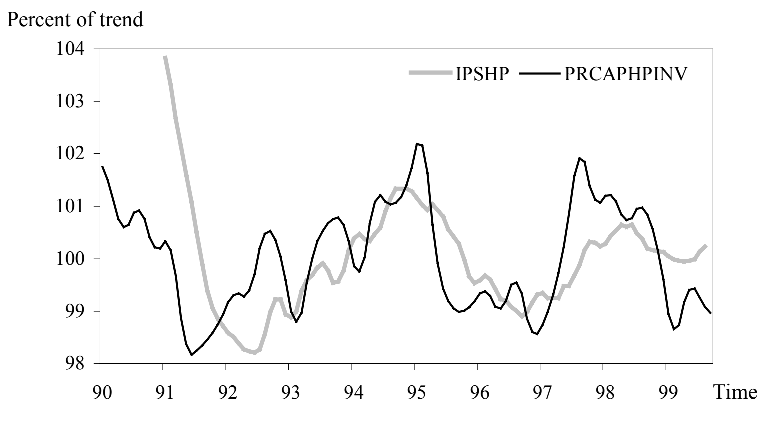
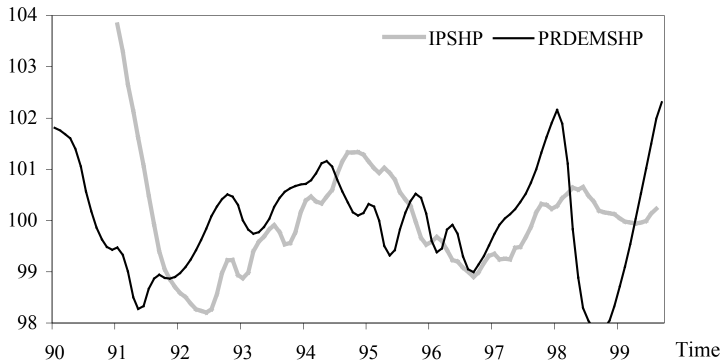


Figure 12. The prognosis of the domestic demand of the firm (PRDEMSHP) as a leading indicator



Finally in Table 4, as there were only limited number of series that could be de-trended by the phase-average trend method and the maximum correlation coefficients were relatively low (compared to the other cases), we decided not to form a composite leading indicator from these data. Perhaps later, when longer time series will be available, it will be possible to construct a leading indicator using this method as well.

3.6. Construction of composite leading indicators

From the series that we have chosen we constructed composite leading indicators. During the computations we used the seasonally adjusted, de-trended, smoothed and normalised data (normalisation is essential here as the elements of the composite indicator must be comparable to each other).

Generally the composite indicators are simply the average of the component series. We thought, however, that the series that have higher correlation coefficients with industrial production should be incorporated with a higher weight to the composite indicator. Therefore, we used the correlation coefficients as weights during our computations.[18]

We computed three different composite indicators. First, we constructed an indicator (LCOMP) from all the selected series.[19] All the series were lagged according to their cross-correlation lag; the reason for this is that it contains more information relative to the mean and median lags at the turning points. (This is obvious: the mean and median

[18] This choice was arbitrary. We could have used the square of the correlation coefficients as weights; the purpose was only to represent the relative weights of the different series. (This does not make too much difference, anyway, as all the correlation coefficients of the selected series were between 0.66 and 0.88).

[19] This type of construction of the composite leading indicator is different from the international practice. In business cycle analysis, researchers generally compute the weighted sum of the latest data points of the indicator series. The advantage of this method is that all the latest data can be used in the calculations. However, as the lags of the component series are typically not identical, this method does not give the 'best' estimate for the future cycles. If we use the exact lags, we can eliminate this problem at the cost that we do not make use of all the latest data.

We computed the short-term and the long-term indicators exactly for this reason: when computing them, we used identical lags; and therefore all the latest data are contained in them. So our 'composite' indicator and the short-term and long-term indicators are not comparable to each other in a strict sense: the former uses the exact lags but does not incorporate all the latest data, while the latters use all the latest data but not the exact lags. According to our experience so far (from May 1999 onwards), the forecasts of the two alternative methods are quite similar.

lags compare the data points at turning points only, while the cross-correlation lag compares all the data points.) For example, the long-term credit rates showed an 11-month lead relative to the industrial production, therefore the data point in September 1999 is assigned to the August 2000 data point in the composite leading indicator. The lags are summarised in Table 5 for all composite indicators.

The second indicator that we computed is a short-term leading indicator (L-6). During its computations we used the indicator series that showed an approximately 6-month lead relative to the reference series. These are: Euro exchange rate, gross earnings in industry, firm's current situation, current production compared to that of the previous year, capacity level compared to the needs. In this case we also used weighted averages and we lagged all the series by 6 months (irrespective of their cross-correlation lags). The rationale behind the same lags is that the leading indicator is available in this way exactly 6 months in advance, and all the latest data can be incorporated; this is not true to the first type of composite indicators as one of its elements has only a five-month lead.

Finally, we also computed a long-term leading indicator (L-12) from the long-term credit rates, prognosis of firm's future situation and prognosis of firm's domestic demand. In this case we lagged all the series by 12 months, and again we used weighted averages.

Table 5

The composition of different indicators, the lags of their components and their weights

Indicator series	X-12-ARIMA, Hodrick-Prescott filter			SEATS, Hodrick-Prescott filter		
	LCOMP	L-6	L-12	LCOMP	L-6	L-12
Long-term credit rates (inv)	10 (12.68%)	- (-)	12 (33.67%)	11 (12.34%)	- (-)	12 (33.82%)
Euro (inv)	6 (14.30%)	6 (22.93%)	- (-)	7 (13.77%)	6 (21.68%)	- (-)
Gross earnings in industry	8 (12.96%)	6 (20.78%)	- (-)	7 (14.33%)	6 (22.57%)	- (-)
Firm's current situation	6 (12.46%)	6 (19.99%)	- (-)	6 (12.21%)	6 (19.23%)	- (-)
Current prod. compared to previous year	4 (11.69%)	6 (18.74%)	- (-)	5 (12.20%)	6 (19.21%)	- (-)
Prognosis of the future situation of the firm	12 (13.16%)	- (-)	12 (34.94%)	12 (12.57%)	- (-)	12 (34.44%)
Capacity level compared to the needs	6 (10.94%)	6 (17.55%)	- (-)	6 (11.00%)	6 (17.32%)	- (-)
Prognosis of the domestic demand of the firm	10 (11.82%)	- (-)	12 (31.39%)	11 (11.58%)	- (-)	12 (31.74%)

It may be instructive to have a look at how these leading indicators performed in the past, and what they tell us about the future. The graphs of the different leading indicators can be seen in Figures 13-15.

It is obvious from the graphs that the composite indicators performed quite well in the past. However, it is questionable, how they will behave in the future; we will have to wait for some time until we can be confident about their ex ante explanatory power as well.

Figure 13. The composite leading indicator (LCOMPSHP) in the SEATS, Hodrick-Prescott filter case

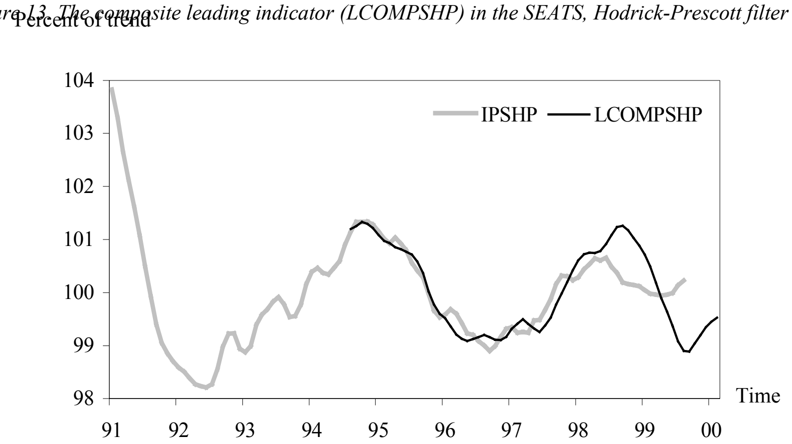


Figure 14. The short-term leading indicator (L6SHP) in the SEATS, Hodrick-Prescott filter case

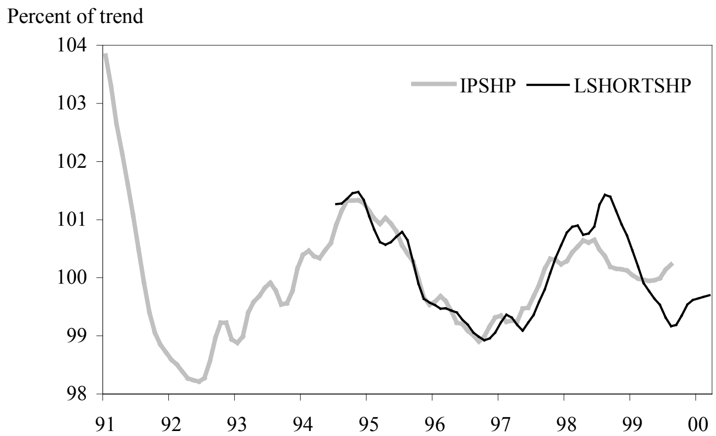
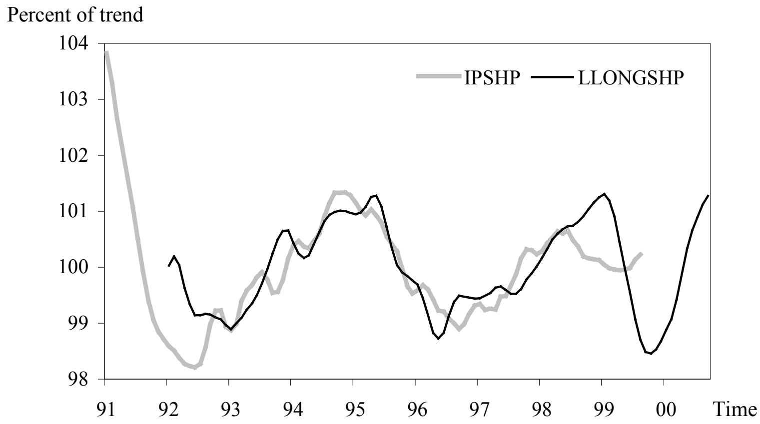


Figure 15. The long-term leading indicator (L12SHP) in the SEATS, Hodrick-Prescott filter case



4. The current state of the Hungarian economy

We can see the present forecasts[20] for the Hungarian industrial production on the graphs in Section 3 (we have a 5-month forecast by the composite indicator, a 6-month forecast by the short-term leading indicator and a 12-month forecast by the long-term leading indicator). We interpreted these results as follows.

1. Probably the most important factor is, that our long-term indicators show that Hungary is likely to experience a continuing expansionary phase during the first half of the year 2000. We have three components in our long-term indicator: the long-term credit rates, the prognosis about the firm's future situation and the prognosis about the firm's domestic demand. From among these two forecast strong expansions (relative to trend): according to Figures 10 and 12, the prognosis of the firms' future situation and domestic demand have increased steadily, which indicates that the industrial production is likely to increase in the next 10 months. The third long-term indicator, the long-term credit rates is also rising (Figure 5) but this increase in not as reliable as the increase of the two other long-term indicators. In the light of this, it is not surprising that our long-term leading indicator forecasts a steady expansion (relative to trend, see Figure 15).

2. As for the short-term indicators, the Euro exchange rate (Figure 6), the current production compared to the previous year (Figure 9) clearly indicate an expansionary phase, while the others (gross nominal earnings in industry at Figure 7, firms' current situation at Figure 8 and capacity levels compared to the needs at Figure 11) seem to be bottoming out. Quite in line with this, our short-term indicator (Figure 14) indicates that we have just entered an expansionary phase (relative to trend), which is likely to continue (especially if we have a look at the long-term indicators).

3. Our composite leading indicator (Figure 13) yields forecasts until February 2000. As five of its components are increasing, three of them seem to bottom out, this composite indicator also shows that we have just entered into an expansionary phase.

[20] Based on the data available in November 1999.

Finally, let us say a few words about the experiences, obtained from the application of our leading indicators so far. We first calculated them in May 1999, then in August, and now the calculation presented here is based on the data available in November 1999.

In May, the general forecast indicated that the recessionary phase was likely to end in short: two of the long-term indicators and one of the short-term indicators forecasted a turning point. In August, all the long-term indicators and some short-term indicators were rising, but on the other hand we had some short-term indicators declining. In November, as we could see, five of our indicators are increasing steadily, and no indicator is declining.

This process seems to be quite intuitive: during our first three calculations we experienced an upward turning point. The first signs came through the long-term indicators in May, then some short-term indicators also indicated a turning point in the near future in August. Finally, in November we can say confidently that we are already in an expansionary phase (relative to the trend).

In the future, we will compute the leading indicators continuously. This way we will be able to say more about the ex ante explanatory power of our indicators.

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