Forecasting business cycles: a leading indicator for the Netherlands

Policy planning requires an insight into the current and future state of the business cycle. Traditionally, leading indicators have been among the instruments used to gain this insight. The article below, by J.A. Bikker and L. de Haan, presents a new leading indicator for the Netherlands. The indicator describes cyclical fluctuations during the past twenty years. By way of experiment, the indicator is currently used to predict cyclical fluctuations in the months ahead.

1 Introduction

Most macro-economic variables exhibit a mutually related oscillating pattern, representing the upswings and downswings of general economic activity, known as the business cycle. However, the multiformity of, and the timing differences between, the movements in the individual economic variables hamper a clear insight into the current state of the cycle. This problem is complicated even further by the fact that frequently the difference between the trend and the cyclical fluctuations, which are departures from the trend, is not immediately evident. Moreover, in most cases economic key data become available only with a delay of some months.

A diagnostic instrument which meets these problems is the leading indicator. The method underlying the construction of such an indicator is based on the phenomenon that cyclical fluctuations in certain macro-economic variables systematically pre-date those in other variables. Variables whose fluctuations systematically pre-date the movements in general economic activity provide the building blocks for business cycle forecasting. Combining a number of these leading variables into a single indicator provides a one-dimensional representation of cyclical fluctuations. The indicator may serve not only as a tool for diagnosing but also as an aid in forecasting business cycles. In this sense, a leading indicator constitutes an alternative to business cycle analysis using macro-economic structural models such as those of the Bank and the Dutch Central Planning Bureau. For purposes of policy analysis, insight into current and future cyclical fluctuations is of major importance. In this respect, indicators with predictive ability are tools of long standing.

Since the second half of the 1970s, in the wake of the US National Bureau of Economic Research (NBER), various authors have attempted a number of methods for constructing a suitable leading indicator for the Netherlands. At present, at least five such indicators are being used. However, during the past few years most of them have been less successful than before in providing reliable predictions of cyclical fluctuations. The leading indicator presented in this article has also proved reliable for recent years.

The article has been organized as follows. After a general introduction on forecasting cyclical fluctuations, section 3 presents the new indicator. Section 4 discusses its composition and the method of calculation. Finally, summarizing conclusions are presented.

2 Leading indicators and business cycle forecasting

The use of leading indicators for predicting cyclical movements reflects a time-honoured tradition. The methods used go back to the NBER's pioneering work (Burns and Mitchell, 1938, 1946; Moore, 1961). The combination of leading time series into a composite indicator is of more recent origin. Van Duijn (1978) was among those who constructed such an indicator for the Netherlands. However, his aim was not so much forecasting as dating historical cyclical patterns. One cyclical indicator which does seek to provide forecasts is that of the daily Economisch Dagblad (1982) constructed by Van Duijn and Post. Regularly published indicators for the Netherlands are the short and the long-leading indicator of Algemene Bank Nederland (Klene and Lenselink, 1983, 1985), the indicator of the weekly Financieel Economisch Magazine (Keiser, 1982) and indicators of international organizations such as the EC (1982) and the OECD (1987). Finally, indicators for the Netherlands have been published in the NBER study of Klein and Moore (1985) and by Post (1987). A few years ago, Fase and Bikker (1985) also designed an indicator for the Netherlands. They aimed at dating historical cyclical patterns rather than at forecasting cyclical fluctuations, as reflected in their use of a sophisticated technique of estimating past trends (the phase-average-trend method) and in their use of quarterly series. The cyclical indicator presented in this article is an extension of the work of Fase and Bikker but is on a monthly basis.

The leading indicator is a synthetic variable; its content is governed by the choice and the combination of leading time series and by the manner of calculating the cyclical component of the series. For this purpose, thirty potentially leading series have been subjected to a strict selection procedure. The procedure focused on statistical reliability as well as on economic plausibility of the leading character. Only five series met all the selection criteria. In calculating the cyclical component, more than the usual weight was given to the elimination of the irregular component from the series. Existing business cycle indicators usually exhibit considerable volatility, hampering the prediction of turning points.

Forecasting cyclical movements by means of indicators is usually denoted as a non-causal method – characterized pithily by Koopmans (1947) as 'measurement without theory' – in contrast to causal methods such as forecasting cyclical movements with macro-economic models (Driehuis, 1973). The non-causal nature of the indicator does not imply that forecasting is performed in a purely mechanical way. In the course of time, components of the indicator may lose their significance as predictors. A recent example is the share price index. For the period 1965-1985 this index proved to give reliable and early indications of cyclical fluctuations. During this period, share prices apparently reflected expectations about economic developments. However, at the moment when it became evident that the stock exchange crisis around 19 October 1987 mainly constituted a technical correction of a speculative movement rather than a reflection of changed views about future economic developments, the share price index could no longer be maintained as an indicator. As in forecasting with econometric models, it is essential that the quality of the indicator be monitored closely at all times and that new external information be taken into account.

3 Predicted and actual cyclical fluctuations

Before dealing with the construction of the leading indicator, this section discusses the indicator, its economic interpretation and its forecasting ability.

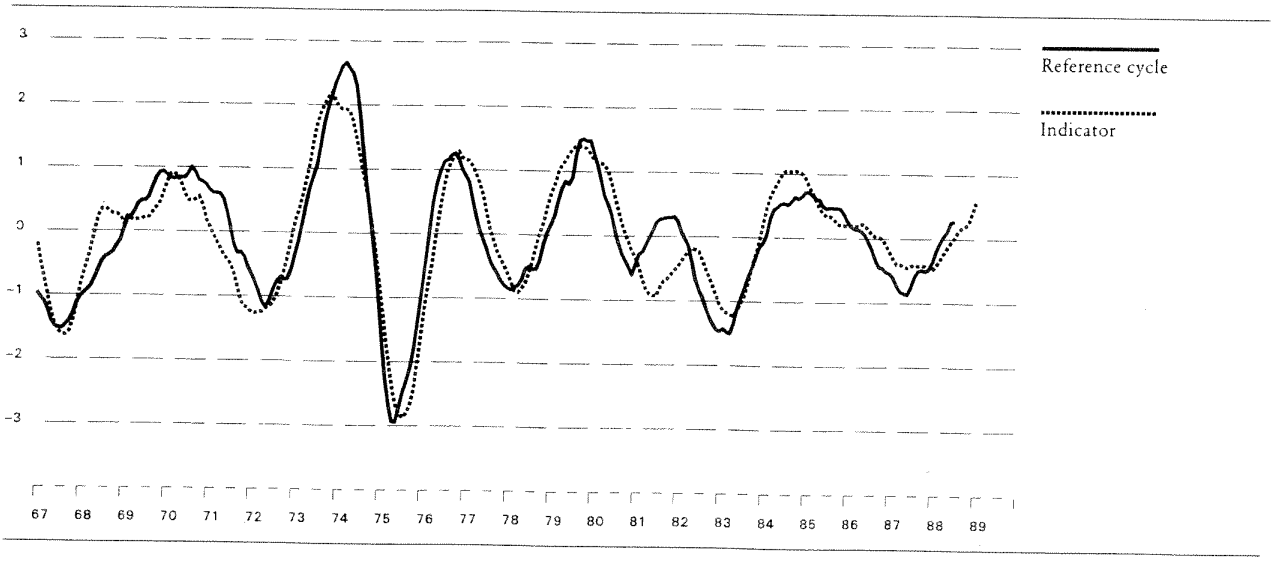
3.1 *The leading indicator*

Chart 1 shows the indicator which predicts cyclical movements five months ahead. For an assessment of its forecasting ability, actual cyclical fluctuations are also shown. In the Chart, cyclical fluctuations are represented as deviations from the trend, which coincides with the zero axis. The cyclical fluctuations' amplitude is shown in standard deviations. In most cases the leading indicator moves within a bandwidth of minus two to plus two times this standard deviation. Only in a few cases, such as in 1975 as a consequence of the first oil crisis, did the cyclical amplitude exceed this bandwidth. Measuring cyclical fluctuations as differences from the trend, the so-called deviation cycle, may generate results seemingly in conflict with those of business cycle analysis based on both cyclical and long-term economic trends combined. In the event of a high growth trend, economic developments may be described as 'a continuing upward movement' whereas, contrary to the trend, the cyclical movement may be downward. This was the case in the periods 1970-1972, 1976-1978 and 1985-1987.

The reference series chosen for the Chart is that of manufacturing output, for which new figures become available monthly with only brief delays. Activity in manufacturing industry may be viewed as an early and sensitive thermometer of cyclical fluctuations, due to the high share of exports in this sector's sales which causes external influences to dominate. The fact is that the Netherlands cycle is to a considerable extent determined by economic developments in the major industrialized countries.

In the Chart, the indicator and the reference series have been so synchronized that, on average, the turning points coincide. The indicator's forecasting ability is reflected in its further continuation over

Chart 1 The indicator



time. The Chart also shows the cyclical pattern until February 1989 as anticipated by the indicator.

3.2 *Assessment of the indicator*

The leading indicator's forecasting ability has been evaluated by comparing its movements with those in the reference series described above. Chart 1 shows that actual cyclical movements in the past – measured by manufacturing output – are described fairly well by the leading indicator. The reference series' cyclical pattern is nearly always equal to that of the indicator, while in most cases the turning points are indicated fairly accurately, that is, within an average margin of a few months. The only exception is the minor cycle of 1980-1981, where the indicator predicts the turning points too late. It might be noted, though, that this minor cycle, which was mainly generated by the United States, had a limited impact on the business cycle in Europe (OECD, 1987, section 13). The turning-point dates are listed in Table 1. Their chronology corresponds broadly with that of Fase and Bikker (1985), Klein and Moore (1985) and the OECD (1987).

A striking feature is the smooth pattern of the leading indicator. As noted above, the erratic movements of some existing indicators hamper precise identification of cyclical turning points. Apart from the strict selection of the series, the smooth pattern is notably a consequence of the forceful manner in which the component series have been smoothed.

3.3 *Recent cyclical fluctuations*

April 1983 witnessed a cyclical turning point. For the subsequent period, both the reference series and the indicator show an upswing lasting until the 1984/1985 turn of the year. This is followed by 2,5 years of hesitant cyclical conditions. In most discussions about cyclical conditions, this hesitancy has received little attention because of its minor intensity, notably when compared with the prevailing growth trend

Table 1 Turning-point dates

Chronology as indicated by manufacturing output		Number of months earlier (–) or later (+) according to the indicator	
Trough	Peak	Trough	Peak
July 1967	August 1970	+2	–5
May 1972	March 1974	–3	–4
June 1975	October 1976	+2	+1
February 1978	October 1979	+2	–2
December 1980	*December 1981*	*+7*	*+5*
April 1983	January 1985	+1	–3
June 1987		+7	

Explanatory note: Turning points of the minor cycle in italics.

during the period. The fact was that the economic expansion continued, albeit less forcefully than in the early stages of the upswing in 1983 and 1984. The upswing from June 1987 onwards, on the other hand, has been a major focus of attention, not least because after the stock exchange crash of October last year many had predicted a recession. For the near future, the indicator forecasts a continuation of the upward movement.

The OECD and EC indicators of last August also indicate a cyclical upswing since the end of 1987. However, the OECD indicator fails to show the preceding cyclical hesitancy, while the EC indicator puts this hesitancy eighteen months late. The short-leading indicator of Algemene Bank Nederland of last October indicates a continuation of the growth trend, without any significant cyclical fluctuations. The indicator of Financieel Economisch Magazine of last November indicates a downward cyclical movement until August 1988 followed by some recovery starting only in September 1988.

4 The construction of the composite indicator

The indicator presented above was constructed in four successive stages. First, potentially leading series were selected. Subsequently, for each series the cyclical component was calculated by elimination of trend and of seasonal and irregular components, after which the series with the best predictive ability were selected. Finally, the selected predictors were combined into a single indicator.

These steps are explained in more detail below. The method of eliminating the trend and the seasonal and irregular components from the series and the method for combining the selected series into a single indicator have been discussed extensively in Fase and Bikker (1985), so that these two methods are only dealt with briefly in this article.

4.1 *Selection of potentially leading series*

The selection of the series was based on the economic plausibility of their leading characteristics and on the likelihood of the continuation of these characteristics in the future. Preference was given to monthly series, since these permit rapid incorporation of recent information. Other practical requirements were rapid availability and few data revisions.

One category of leading series is formed by economic variables which are directly related to the level of economic activity. An increase in new orders and insufficient stocks of finished product lead to increased production. More indirect determinants are the availability of credit and the monetary policy pursued. Another indication is provided by interest rates because of their effect on consumption and investment. The price ratio of raw materials and semi-manufactures to manufacturing industry's sales may be seen as an indicator of changes in the terms of trade or in profits. The latter two are potential incentives to spend. Moreover, the terms of trade themselves have also been considered. Confidence is conducive to a revival of economic activity. In this respect, the share price index is often seen as a suitable indicator. The number of applications to the Nederlandsche Credietverzekering Maatschappij (NCM) for insurance of lending risks in respect of future domestic sales constitutes an indicator of confidence or, rather, lack of confidence, an indicator which, to the authors' knowledge, has never been used before for purposes of forecasting cyclical movements.

Another category consists of actually leading activities. Examples are administrative acts, such as the issue of building permits and the registration of housing starts. Furthermore, the changes in supply and demand in the labour market have been considered. These changes are observed from the movements in short-time working consequent on reduced business activity and from the movements in the number of employers' applications for dismissals. They are also evident from new registrations of job-seekers, representing the inflow into unemployment. Other series which usually react promptly to cyclical fluctuations are imports of raw materials and semi-manufactures and exports.

Yet another category is formed by series which relate specifically to the future. Examples are certain results of business surveys in manufacturing industry and the answers to the NCM's questions to holders of new policies as to the expected volume of sales to be insured in the year ahead.

The series mentioned above have been supplemented with series used for the Netherlands by other authors or institutions.[1] A commonly used series is the IFO business climate indicator of German manufacturing. Furthermore, for the sake of completeness, series for bankruptcies, retail sales and savings have been considered as well.

4.2 *Calculation of cyclical variation*

Since the investigation focused on cyclical fluctuations, the trend, the seasonal effects and the irregular component were eliminated from each of the series. The analogy with seasonal adjustment and with the identification of seasonal fluctuations is striking, and the procedure bears a certain resemblance.[2] For trend estimation, the NBER method was chosen, which employs a centred moving average of the average length of the cycle. For seasonal adjustment, the Census X-11 method was used. The irregular component was reduced by a centred 12 month moving average. The loss of the last six observations was prevented by using a weighting schedule truncated to the right.

4.3 *Selection of series with the best forecasting ability*

The selection criteria used were the reliability and plausibility of the leading characteristics. The leading characteristics for the full period covered were determined on the basis of a weighted average of two criteria:

- the average lead of the potential component series over the reference series at turning points;
- the degree of lead at which correlation with the reference series is highest.

The requirement set was a minimum lead of five months.

For the assessment of the reliability as a predictor of turning points, the requirements applied were the same as those used by Fase and Bikker (1985). They are based on the standard deviation of the average lead, the number of cycles missed and the number of extra cycles. An additional yardstick used was the x-month up-or-down criterion (Yeats, 1973, and Stekler and Schepsman, 1973).

1 Table 1.1 of the Annex presents a survey of the potential component series considered; the Table also shows which of these series were used for the Netherlands by other authors or institutions. Full descriptions and sources of series are given in Table 1.2 of the Annex.

2 For an extensive discussion of seasonal adjustment for policy diagnosis the reader is referred to Den Butter and Fase (1988).

Table 2 Selected component series

	Lead, months
Money stock (M1), in real terms	17
Manufacturing production: future tendency	5
Manufacturing order inflow: tendency	7
IFO business climate indicator, German manufacturing	6
Expected sales of new NCM policy holders	7

The series which remained after this selection process are listed in Table 2. They are depicted in Chart 2. The money stock is a long-leading indicator. The others are short-leading (5-7 months). The money stock has been deflated by the cost-of-living index, as Fase and Bikker (1985) showed that real variables are better leading indicators than nominal ones. The money stock in real terms predicts cyclical fluctuations fairly far ahead. This finding is not implausible and is well in line with the results of research in this area (see, for instance, Fase, 1987). Algemene Bank Nederland and the OECD have found a lead for M1 of 15 months. For other countries, too, M1 is among the very long-leading indicators (OECD, 1987). Economic theory does not provide an adequate basis for determining the precise lead of the money stock. Incidentally, for purposes of forecasting cyclical movements, there need not be a direct causal relationship between the money stock and, say, national income. It is sufficient if a third factor influences the money stock first and national income later.

4.4 *Construction of the composite indicator*

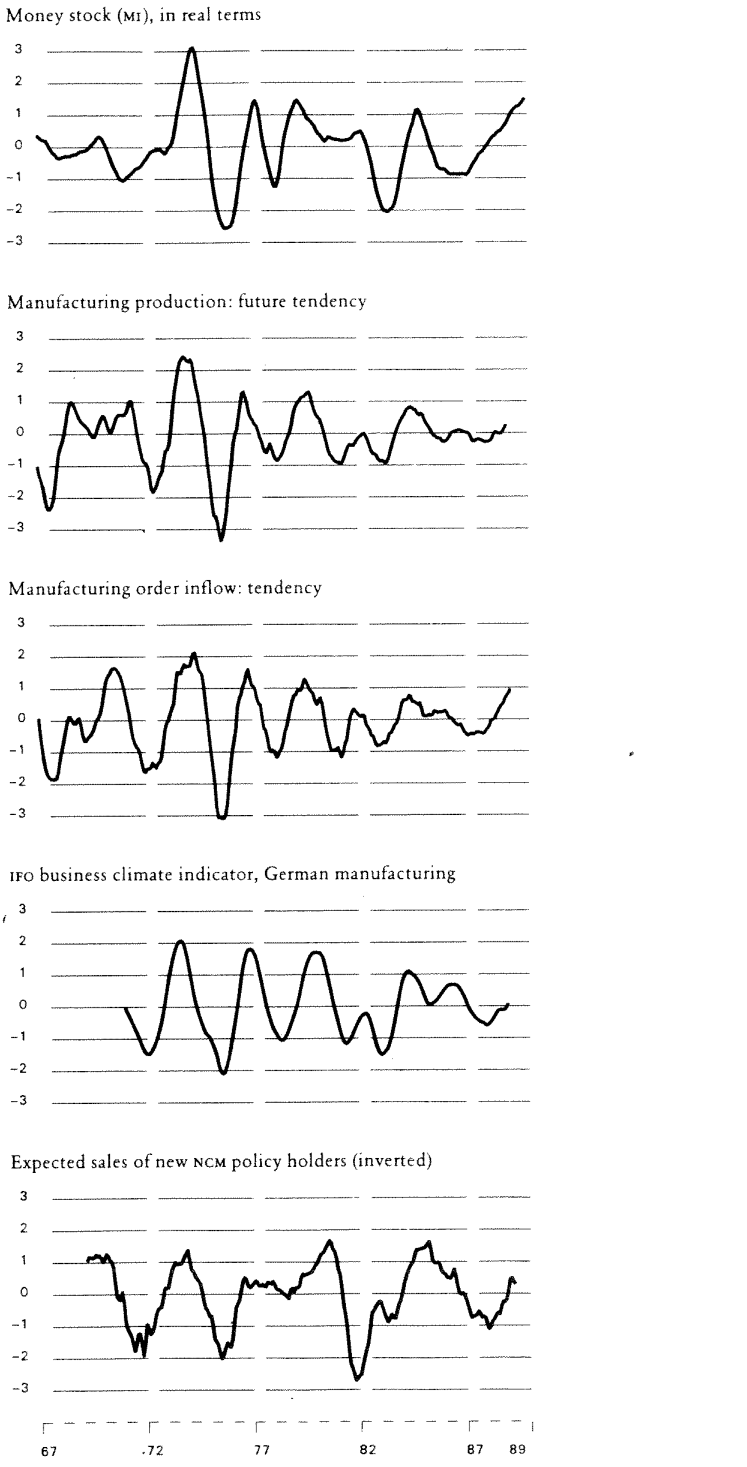
Finally, using the method of principal component analysis proposed for this purpose by Fase and Bikker (1985), the five series selected were combined into a composite leading indicator. In fact, this results in a weighted average of the cyclical patterns of the individual series. The weights depend on the extent to which the individual series exhibit a cyclical pattern corresponding to the common cyclical fluctuation of the series. The component series were normalized to ensure comparability of their cyclical amplitude. Furthermore, by leading and lagging, they were synchronized so as to ensure, on average, coinciding turning points.

5 Summarizing conclusion

In this article a leading indicator was presented which forecasts cyclical movements about five months ahead. The indicator is based on five selected component series. Unlike the other indicators currently used, it also adequately represents cyclical fluctuations in recent years, a period in which forecasting by means of indicators proved more difficult than before. It has another advantage in that it exhibits a distinct pattern owing to the absence of erratic movements. The indicator meets the need for early and reliable one-dimensional information on the state of the business cycle, which is in reality a multiform and hence multi-dimensional phenomenon.

The indicator and the reference series show that the last few months of 1987 saw the end to a period of about 2,5 years of cyclical hesitancy. Since then, cyclical conditions have improved. On the basis of the indicator presented in this article, the upswing is expected to continue in the near future.

Chart 2 Components of the leading indicator



Annex

Table 1.1 Comparison of analysed series with those used by other authors

		EC	Van Duijn	ABN [1]	OECD	ED [2]	FEM [3]	Fase and Bikker	Klein and Moore	Present article
1	Manufacturing output	x	x	x	x	x	x	x	x	x
2	ANP/CBS share price index, domestic			x						
3	Ditto, general	x	x				x	x	x	
4	Manufacturing finished goods stocks: level	x		x	x				x	
5	Manufacturing production: future tendency	x			x					x
6	Manufacturing order inflow: tendency				x		x		x	x
7	IFO business climate indicator, German manufacturing			x	x	x				x
8	Registrations of job-seekers							x		
9	Short-time working		x						x	
10	Bankruptcies		x					x	x	
11	Employers' applications for dismissals									
12	Permits issued, dwellings									
13	Construction started, residential								x	
14	Volume of building permits for industrial buildings								x	
15	Orders for sales insurance policies									
16	Expected sales of new NCM policy holders									x
17	Prices of raw materials and semi-manufactures			x	x				x	
18	Ditto, in real terms									
19	World market prices for raw materials									
20	Terms of trade				x					
21	Money stock (M1), in real terms			x	x					x
22	Money stock (M2), in real terms									
23	Short-term lending to private sector		x							
24	Long-term interest rate, nominal				x					
25	Ditto, in real terms									
26	Savings deposits, in real terms				x					
27	Retail sales, in real terms				x				x	
28	Imports of raw materials and semi-manufactures		x							
29	Exports, excluding energy		x					x		

Explanatory note to Table 1.1: An x indicates that a similar series was used by the author or institution for representing current or forecasting future cyclical fluctuations.

1 ABN = Algemene Bank Nederland.
2 ED = Economisch Dagblad.
3 FEM = Financieel Economisch Magazine.

Explanatory note to Table 1.2:
CBS = Central Bureau of Statistics.
NCM = Nederlandsche Credietverzekering Maatschappij.
DNB = De Nederlandsche Bank NV.

Table 1.2 Sources of data

	Series	Source
1	Volume of manufacturing output	CBS, Maandstatistiek van de Industrie
2	ANP/CBS share price index, domestic	CBS, Maandschrift (Part 0)
3	ANP/CBS share price index, general	CBS, Maandschrift (Part 0)
4	Manufacturing finished goods stocks: level	CBS, Conjunctuurtest
5	Manufacturing production: future tendency	CBS, Conjunctuurtest
6	Manufacturing order inflow: tendency	CBS, Conjunctuurtest
7	IFO business climate indicator, German manufacturing	OECD, Main Economic Indicators
8	Registrations of job-seekers	Ministry of Social Affairs and Employment
9	Short-time working (logarithmic)	CBS, Sociaal-economische Maandstatistiek
10	Bankruptcies	CBS, Maandschrift (Part W)
11	Employers' applications for dismissals	CBS, Sociaal-economische Maandstatistiek
12	Permits issued, dwellings	CBS, Maandstatistiek van de Bouwnijverheid
13	Construction started, residential	CBS, Maandstatistiek van de Bouwnijverheid
14	Contract price volume of building permits granted for buildings for agriculture, production industries and trade	CBS, Maandstatistiek van de Bouwnijverheid
15	Orders for sales insurance policies, domestic	NCM
16	Expected sales of new NCM policy holders, domestic	NCM
17	Producer prices of raw materials and semi-manufactures used in the production industries	CBS, Maandstatistiek van de Prijzen
18	Ditto, deflated by producer prices of final domestic sales of production industries	see 17
19	World market prices of raw materials, excluding energy (in guilders), deflated by producer prices of final domestic sales of production industries	Hamburgisches Welt Wirtschafts Archiv and CBS, Maandstatistiek van de Prijzen
20	Terms of trade	DNB, Quarterly Bulletin (Statistical Annex, Table 10)
21	Money stock (M1), deflated by cost-of-living index	DNB, Quarterly Bulletin (Statistical Annex, Table 3.1) and CBS, Maandstatistiek van de Prijzen
22	Money stock (M2), deflated by cost-of-living index	see 21
23	Universal banks' short-term lending to private sector, deflated by cost-of-living index	DNB and CBS, Maandstatistiek van de Prijzen
24	Interest rate on five longest-term central government loans (until December 1984 latest three long-term)	CBS, Maandstatistiek Financiewezen
25	Ditto, deflated by cost-of-living index	see 24 and CBS, Maandstatistiek van de Prijzen
26	Savings deposits, deflated by cost-of-living index	DNB, Quarterly Bulletin (Statistical Annex, Table 3.2) and CBS, Maandstatistiek van de Prijzen
27	Retail sales, deflated by price index of personal consumption	CBS, Maandstatistiek van de Binnenlandse Handel en Dienstverlening
28	Volume of imports of raw materials	CBS, Maandstatistiek van de Buitenlandse Handel, per goederensoort
29	Volume of goods exports, excluding energy, ships and aircraft	Based on CBS data

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