



## **Statistics Netherlands**

Division of Methodology and Quality  
Department of Methodology The Hague

*P.O.Box 24500  
2490 HA Den Haag  
The Netherlands*

---

# **Measuring Business Cycles with Rapid Estimates**

**Pieter Vlag, Symon Algra, Ben van Cleef**

Remarks:

The views expressed in this paper are those of the author and do not necessarily reflect the policies of Statistics Netherlands.

---

*Project number:* DMK-207487  
*BPA number:* -DMV  
*Date:* 22 June 2009

## MEASURING BUSINESS CYCLES WITH RAPID ESTIMATES

*Summary: Statistics Netherlands developed a factsheet containing several indicators measuring conjunctural change. This factsheet can be divided into three parts. The first part is based on 15 macro-economic indicators. These indicators are summarised in the Business Cycle Tracer (BCT). The BCT visualises the state and course of the Dutch economy and is basically an overall portrait of these macro-economic indicators.*

*The second part consists of the export condition monitor (ECM). The ECM, which is based on six short-term indicators, shows whether the conditions for export are favourable or not. The ECM is important for the Netherlands as export plays a major role in Dutch economy.*

*The third part consists of 10 rapid indicators. Principal aim of these additional indicators is to put the BCT and ECM in a more general context. For example, the additional indicators reveal relationships between the 15 macro-economic indicators of the BCT and developments in 1) prices of raw materials, 2) the financial sector, 3) the real estate market and 4) important business sectors.*

*Until now this research was mainly focussed on collecting existing statistical data and putting it in a general context. When collecting data some methodological issues raised. These issues are discussed in the last part of this paper and are challenges for further research.*

*Keywords: rapid estimates, Business Cycle Tracer, export, GDP*

### 1. Introduction

Since the fall of 2008 there has been criticism from inside as well as outside statistical agencies: how is it possible that official statistics did not signal that a financial and economic crisis of this magnitude was forthcoming? In analysing this question we found that measuring conjunctural change indeed can be improved.

It is no core-business for statistical agencies to analyse the causes of the financial crisis on its own. However the sequence of a financial crisis followed by a deep and rapid economic decline revealed issues in our current system which can be improved. More specifically,

- 1) the link between financial statistics and business statistics needs to be improved. The current economic decline shows that the relationships between financial markets and 'real economy' are stronger than previously thought.
- 2) More rapid indicators are needed. These indicators can be divided into two groups. The first group describes the state of the economy (and puts macro-

economic indicators in a more general context). The second group is indicative for changes in the state of the economy.

- 3) A compelling need is timeliness: the most important trends have to be available on a monthly basis and 30 days after the end of the month.

To address this question, Statistics Netherlands developed a factsheet. Although this factsheet is not perfect, it addresses at least some of the questions above. In this paper, we present the results obtained so far. Possibilities for further research are also mentioned.

The factsheet can be divided into three parts. The first part consists of the Business Cycle Tracer (BCT). In the second part contains a tool for analysing export conditions, the Export Condition Monitor (ECM). Ten short-term indicators, showing the link between the BCT and recent developments in prices, the financial sector and the real estate market, make up the third part. The paper ends with a short list of points for discussion.

## 2. Factsheet part A: Business Cycle Tracer

The BCT is a tool to assist in the analysis of the state and the course of the Dutch economy (van Ruth, Schouten and Wekker, 2005). Like its name suggests, the BCT traces the cyclical nature of economic developments. Periods of high growth alternate with periods of slow growth or even decline.

The state of the business cycle is described by a selection of 15 key macro-economic indicators. The selection of these indicators is based on the following criteria.

- All major aspects of the economy should be represented (i.e. production, consumption, trade, labour markets, confidence indicators).
- The set should be balanced, the Business Cycle Tracer may not be dominated by one aspect of the economy or one type of indicator.
- Major turning points in economic cycles must be detected timely and reliably.
- For each indicator strong theoretical grounds for inclusion must be available.
- Each indicator should have a strong and timely relation with economic cycles. This is operationalised as possessing a minimum correlation of  $\pm 0.5$  with the reference GDP-cycle at a maximum lead or lag of about six months.
- A sufficiently long time-series should be available for each indicator
- Preferably indicators are derived from monthly estimates and available within 30 days after the end of the month.

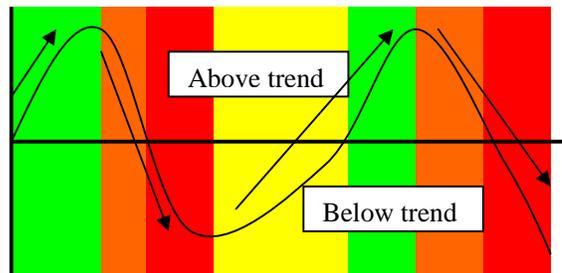
By using these criteria four **sentiment indicators** (producer confidence, orders received, consumer confidence, large purchases), six **economic indicators** (GDP, fixed capital formation, manufacturing, consumption, exports, capital market rate) and **five labour market indicators** (jobs, temporary jobs, unemployment, vacancies, bankruptcies) were selected. Some of these 15 indicators are considered

as leading (the sentiment indicators), some of these indicators are considered as lagging (some labour market indicators, like unemployment).

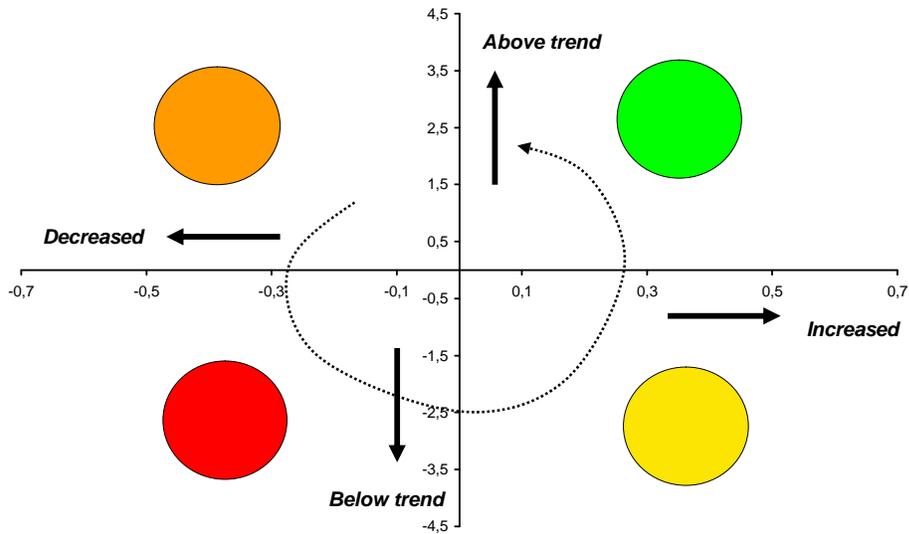
When compiling the BCT, the long-term trend and the cycle-trend of each indicator are determined in a first step. The deviation of the cycle-trend from the long-term trend is defined as the cycle. The cycle is standardised in a second step. This step is necessary to compare the cycles of the separate indicators in the BCT. This standardisation is according to:

$$\text{Standardised value}_t = (\text{original value}_t - \text{average}_{\text{time-series}}) / (\text{standard deviation}_{\text{time-series}})$$

In a third step, it is determined whether the cycle is above or below the long-term trend and whether it is increasing or decreasing (fig. 1a). Four possible classifications result: 1) above trend and increasing, 2) above trend and decreasing, 3) below trend and decreasing, 4) below trend and increasing. These classifications are visualised by the colours green, orange, red and yellow respectively. Finally these four classifications are presented in a quadrant (fig. 1b).



**Figure 1a.** An illustration of the concept the BCT. The four classifications of a business cycle

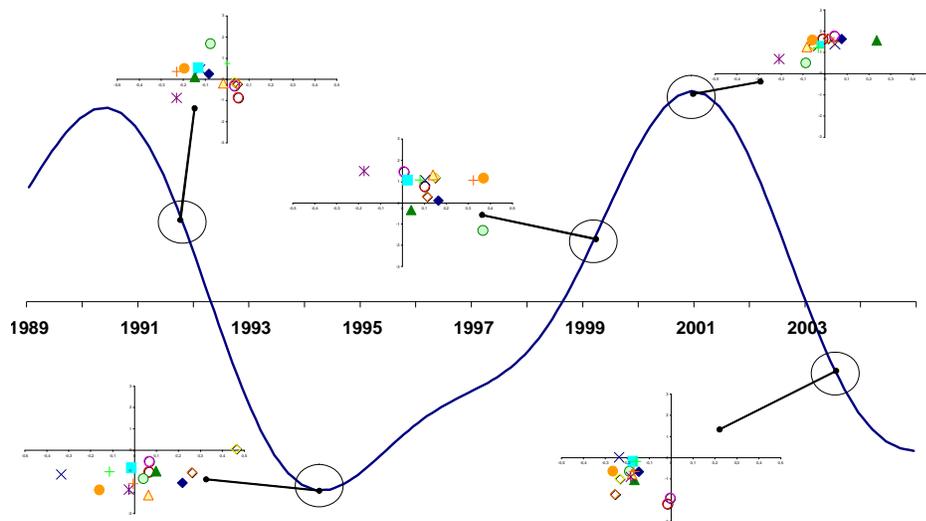


**Figure 1b.** An illustration of the concept the BCT. The four cycle- classifications presented in a quadrant to visualise the position of each indicator within the business cycle.

The BCT is constructed by repeating this procedure for each indicator. The distribution of the various indicators across the quadrants of the BCT visualises the state and course of the business cycle. In a period of economic growth most indicators will be above the trend. In a period of economic decline they will be below the trend. Indicators move counter-clockwise in time. The concept of the BCT has been empirically proven by comparing trends in the BCT with developments in GDP (fig. 2). This has been tested on long time-series.

When constructing time-series, the BCT can be summarised by a core-indicator. The core-indicator for period  $t$  is defined as the unweighted mean of the 15 standardised cycle-trends (which are derived from the original 15 macro-economic indicators). The core-indicator can only be interpreted qualitatively, i.e. in terms of “economic growth is high/low” or “economic situation is better/worse compared to previous periods”. It cannot be interpreted quantitatively, because the core-indicator is based on

- 1) an unweighted mean of 15 indicators
- 2) a set of normalised indicators
- 3) an indicator set, which does not describe 15 independent contributions to GDP growth rates (an overlap between the separate indicators is possible)



**Figure 2.** Cycles in GDP (line) and corresponding patterns in the Business Cycle Tracer

### 3. Factsheet part B: Export condition monitor

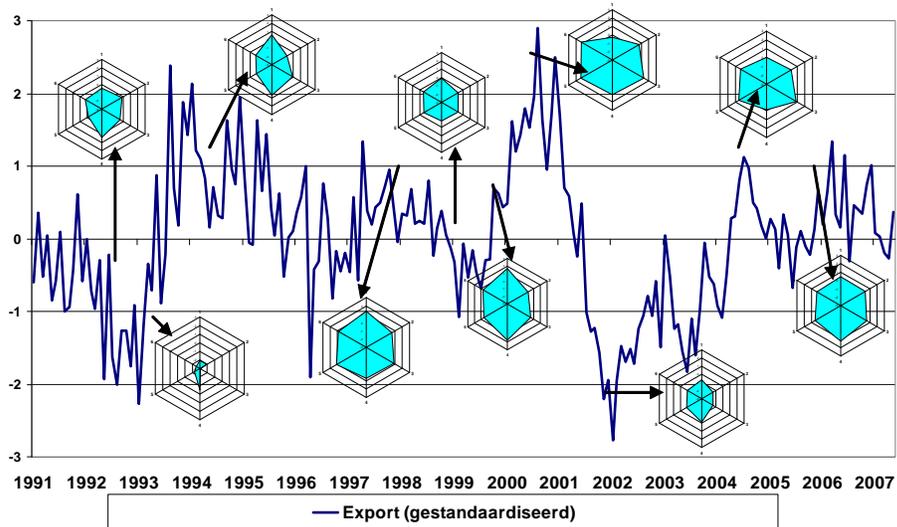
The Netherlands is historically a trading nation. It has big transportation hubs (harbours and a relatively big airport) and – as the Dutch market is relatively small – production of large industrial companies is largely for export. Hence, export is an important factor in Dutch economy. Basically it reflects the state and course of the Dutch economy. Based on factor analyses on long time-series, Van Ruth (2007) showed that six factors determine the export conditions. These indicators are: 1) the exchange rate of the EURO, 2) international order position of the Dutch industry, 3) business confidence in Germany, 4) output manufacturing in Germany, 5) business confidence in the EuroZone (European countries using the EURO), 6) order position of industry in the EuroZone.

Like the BCT, these indicators are standardised according to

$$\text{Standardised value}_t = (\text{original value}_t - \text{average}_{\text{time-series}}) / (\text{standard deviation}_{\text{time-series}})$$

After standardisation the six indicators are plotted in a spider-diagram (fig. 3). When the indicators cover a large surface of the diagram, export conditions are favourable. When a small surface is covered, export conditions are unfavourable. This system is called the export condition monitor (ECM). Its concept has been empirically proven by comparing changes in the ECM with ‘measured’ changes in export growth rates. This comparison has been made on long time-series from 1991 until 2007 (fig. 3).

The ECM helps to understand the underlying mechanisms for changes in export growth rates. It is latently a leading indicator for changes in export.



**Figure 3.** Comparison of the ECM with realisations of the export growth rate

#### 4. Factsheet part C: Additional indicators

The BCT and ECM followed the rapid economic decline in the last quarter of 2008 quite well (see factsheet – parts A + B). However, essential factors were missed to estimate the rate and magnitude of the decline at an early stage. When analysing this, we noted the following aspects:

- a) Relationships between the state of the real economy (represented by the BCT) and the unrest of the financial markets were missed. It is important to have indicators about financial markets as unrest on the stock market and in the financial sector affects confidence of producers and consumers. Furthermore, the real economy is affected if supplies of loans to non-financial corporations and supplies of mortgages to households are hampered by financial unrest.
- b) Prices of raw materials strongly fluctuated in 2008. These fluctuations were missed in the BCT and ECM. Although difficult to interpret and possibly influenced by speculation and changes in production, fluctuations in prices of raw materials might portend an economic change under the assumption that prices of raw materials are determined by demand from industry.
- c) The industrial sector dominates both the sentiment as well as the economic indicators of the BCT (factsheet – part A). However, the largest business sector in the Netherlands is commercial services. Furthermore, some parts of this sector are sensitive to conjunctural change (like employment agencies). Therefore, rapid indicators are needed to show effects of economic changes on commercial

services (and indirectly jobs, wages and consumption patterns of many employees).

- d) As Dutch economy largely depends on export, it is crucial to observe changes in export growth rates as early as possible. Measuring freight transport at major transportation hubs might be a useful tool for this purpose.
- e) Finally, the unrest on the real estate market was missed. The real estate market can be considered as a confidence indicator. Moreover, this market also affects the capital position of consumers. It may, for example, directly affect large purchases as many large purchases used to be financed by second mortgages. Furthermore, information of the real estate market is useful when presenting the BCT and ECM in a broader context.

It is emphasized that – unlike the 15 macro-economic indicators – most additional indicators are not considered as a leading or lagging indicator for a particular economic aspect. They are only meant 1) to relate changes in the BCT to an underlying mechanism, 2) to provide independent information when the BCT suggests changes in the course of the Dutch economy.

The following criteria were used when selecting the additional indicators in the five domains mentioned above.

- Indicators should be available within 30 days after the end of the month or based on daily or weekly data.
- Availability of underlying data (in terms of quality and time) must be guaranteed.
- Selected indicators preferably provide time-series from at least 1-1-2007.
- The indicator is not dominated by seasonal or working day patterns.
- The selected indicators should preferably reflect volumes instead of values of goods.
- For each indicator theoretical grounds for inclusion should be available.

The number of possible additional indicators drastically decreased after using these criteria. Finally a set of ten indicators was developed. This set consists of

- a) two indicators in the field of financials: Amsterdam stock exchange index and loans of Dutch banks to non-financial corporations. The first one is considered as a sentiment indicator and a measure for capital position. The second one is used to investigate the relationship between the economic decline and the (possible) lack of financing.
- b) two indicators in field of raw materials: oil price and aluminium (Al) price. The latter is related to steel prices. Both indicators are derived from day markets in London.
- c) two indicators in the field of industry and construction: industrial orders and a sentiment indicator for the construction sector. Both indicators are considered as supportive to the BCT when the state and course of Dutch economy changes.
- d) two indicators in the field of commercial services: a sentiment indicator and supply of temporary workers by employment agencies. Both indicators are

indicative for the effects of a growing or declining economy on the commercial services sector.

- e) two indicators for the real estate market: number of houses sold, house price index.

The factsheet can be updated bi-weekly or monthly. To show the latest developments, the additional indicators are – in contrast to the BCT – presented in their original form. Freight transport at transportation hubs is not included in the first version of the factsheet. The availability of the underlying data could not be guaranteed yet. Inflation was not considered as an additional indicator. This is because inflation is difficult to interpret as it depends on several factors.

## **5. Factsheet: an useful tool for measuring the recent economic decline**

Analysing the factsheet reveals that the rapid economic decline during the last months of 2008 was measured with the BCT, demonstrating that the BCT can indeed measure a rapid and exceptional economic decline. The core-indicator of the BCT shows that the economic decline started end 2007, strengthened in July 2008 and accelerated during the last quarter of 2008. Problem is, however, that the core-indicator cannot be interpreted qualitatively. This might explain that the strengthening of the economic decline in July and October 2008 did not lead to alarming signals.

Not surprisingly, the ECM shows that conditions for export are less favourable in May 2009 than one year ago. It shows nicely that – apart from the EURO exchange rate – all conditions for export are unfavourable right now.

The additional indicators show an interesting feature. Industrial orders and prices of raw materials (oil and aluminium) already started to collapse in summer 2008. The growth of loans to non-financial corporations also ends in this period. This is more or less two months before the financial unrest transformed into a financial crisis with the fall of Lehman Brothers. As noted before, the BCT also shows a stronger economic slowdown from July 2008. However, no alarming signal was given at that moment. The added value of the factsheet is that the combination of 1) falling prices of raw materials, 2) decreasing industrial orders and 3) changes in the state of the economy as suggested by the BCT might have led to other conclusions. Especially, because the information (BCT + additional indicators) was available within 30 days after the end of the month.

Similarly, it is an interesting question whether especially the recovery of prices of raw materials and the stabilisation of industrial orders are the first signals of a stabilisation of the economic situation.

## 6. Methodological issues and further research

### *GDP*

It has been proven that a rapid economic decline can be measured with the BCT. Weak point is, however, that the core-indicator cannot be interpreted quantitatively. Three approaches may fill this gap

- a) constructing a core-indicator from the BCT by selecting one indicator per GDP-contribution. In a next step, these (remaining) indicators should be weighted by estimated GDP-contribution. When choosing this option, the indicators of the BCT are explicitly meant as predictors for (trends in) GDP. In this case GDP itself should possibly be removed from the BCT.
- b) developing a monthly GDP estimate.
- c) if a monthly GDP estimate is not possible (or only possible with large estimation errors), one might consider developing a “GDP-trend” indicator. This indicator can be based on extrapolation of the most recent quarterly GDP-estimate with rapid estimators. This extrapolation may be restricted to those parts of the GDP-estimate, which are sensitive to economic change.

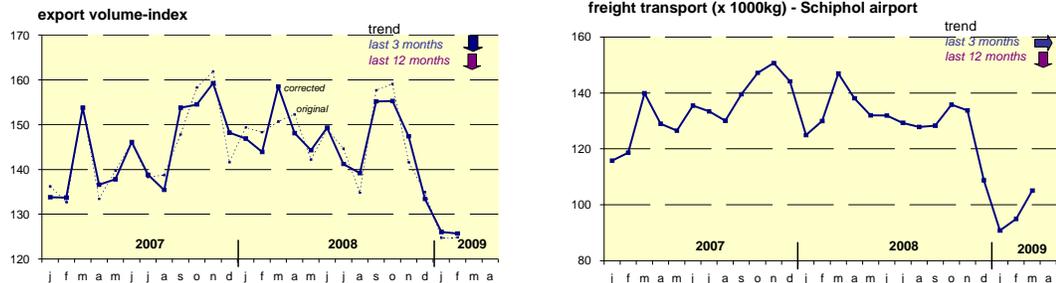
Methodologically approach b. and approach c. might be quite similar. Approach a. might be more arbitrary from an economic and methodological point of view, but can be updated more frequently and seems easier to implement.

### *Expanding the factsheet*

Statistics Netherlands is studying whether the factsheet can be expanded. Firstly, it is checked whether the factsheet may include more financial indicators, like loans and mortgages to households. Secondly, we are studying whether freight transport at transportation hubs can be used as a first proxy for changes in export growth rates. Advantage of measuring freight transport is that the underlying data are quickly available (daily, weekly or monthly). Although the first results are promising (fig. 4), further research is needed about data quality.

## Current research: measuring freight transport at transportation hubs

### Export (estimate Statistics Netherlands vs. freight transport Schiphol)



**Figure 4.** Relationship between freight transport at Amsterdam airport and changes in total export volume. Note that freight data of Amsterdam airport are available much earlier.

### *Prices of raw materials*

Prices of raw materials are included in the factsheet as they reflect a change in demand from industry. However, especially oil prices are affected by speculation and changes in production, too. More statistical data sources need to be explored to reveal relationships between oil price and demand from industry (and the transport sector) better. From a methodological point of view, it is worth considering to present prices in EURO when relating oil and aluminium prices to Dutch economy.

### *Confidence indicators*

It has been proven that confidence indicators can be used as early indicators for changes in business cycles. For example, within the BCT consumer confidence was the first one to decline. From all additional indicators, the sentiment indicator for services was the first one to decline. However it is difficult to draw firm conclusions from sentiments indicators as the underlying mechanisms are unknown. More research on this subject might be useful.

### *Rapid estimates and regular output from statistical offices*

Most important selection criteria for rapid indicators are 1) timeliness and 2) straightforward or empirically proven relationships with business cycles. Most regular output from national statistical offices is characterised by complete coverage and accuracy. From this perspective, rapid estimates should be considered as a

separate group. It is a matter of debate whether this difference should be emphasized in publications and implemented in statistical process.

## **7. Conclusions**

The BCT is a useful tool to measure the state and course of the Dutch economy. The BCT did measure the recent rapid and sharp economic decline. Weak point is, however, that the BCT cannot be interpreted quantitatively. This gap may be filled by either a monthly GDP estimate or an improved core-indicator.

The ECM explains the conditions for export, an important factor for economic growth in the Netherlands.

Combining the BCT with the ECM and 10 additional indicators is a nice method to present the macro-economic indicators in a general context. The selection of additional indicators is complex and in some cases even arbitrarily as they may be influenced by several economic factors. Nevertheless, a combined presentation of BCT, ECM and additional indicators in a factsheet has an added value, because the additional indicators may provide independent information when the BCT suggests changes in the course of the Dutch economy. Recently, this has been the case in July 2008. It might be the case right now.

When constructing the factsheet some methodological issues raised. One of them was whether a GDP estimate should be developed or a “core” indicator can be used to measure actual trends in business cycles. This issue is one challenge for further research.

## **8. Acknowledgements**

We would like to thank the Dutch National Bank for their help with the selection of short-terms indicators about the financial market.

## **Literature**

Van Ruth, 2007, A conditions monitor for exports, *internal report*

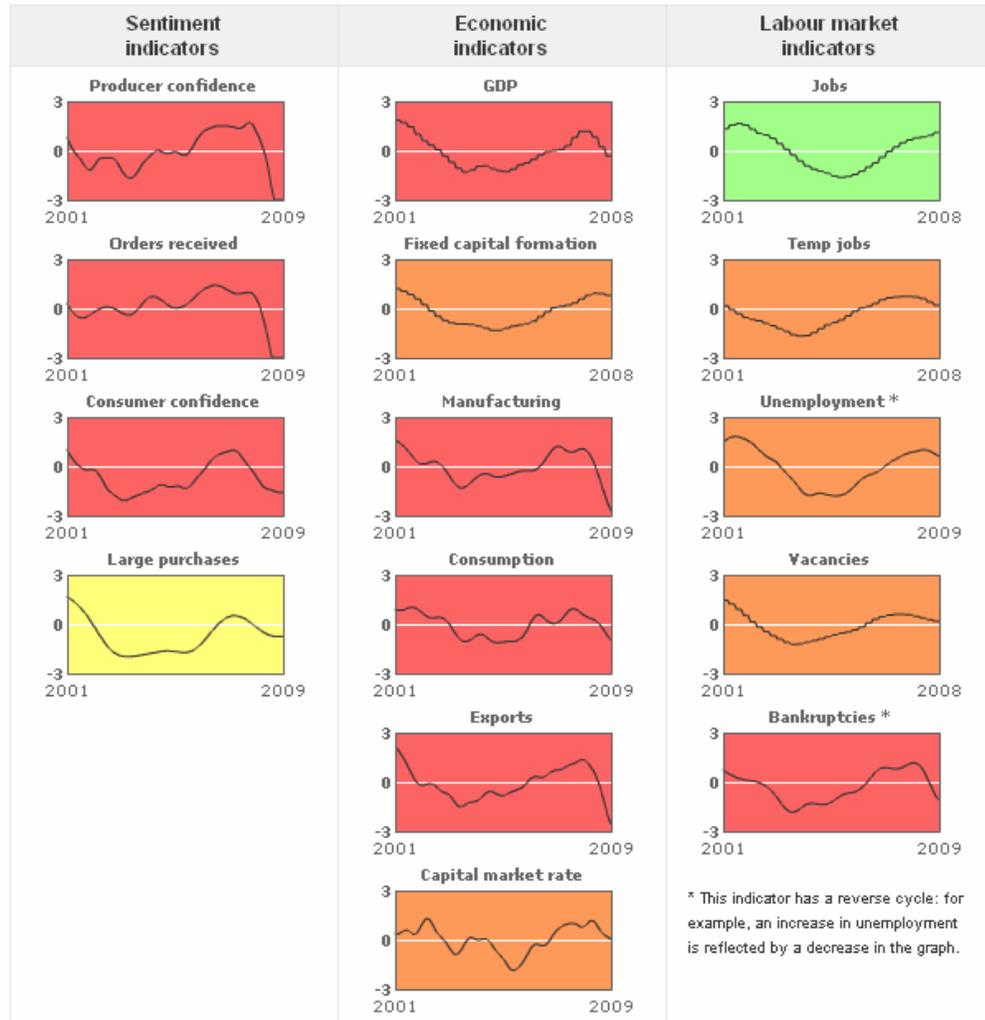
Van Ruth, Schouten and Wekker, 2006, The Statistics Netherlands Business Cycle Tracer, Methodological Aspects; Concept, Cycle Computation and Indicator Selection, *internal report*

**FACTSHEET: April 2009**

**PART A1: standardised cycle-trends of 15 macro-economic indicators**

<http://www.cbs.nl/en-GB/menu/themas/dossiers/conjunctuur/publicaties/conjunctuurbericht/inhoud/conjunctuurklok/toelichtingen/conjunctuurdashboard.htm>

**Business Cycle Dashboard April 2009**

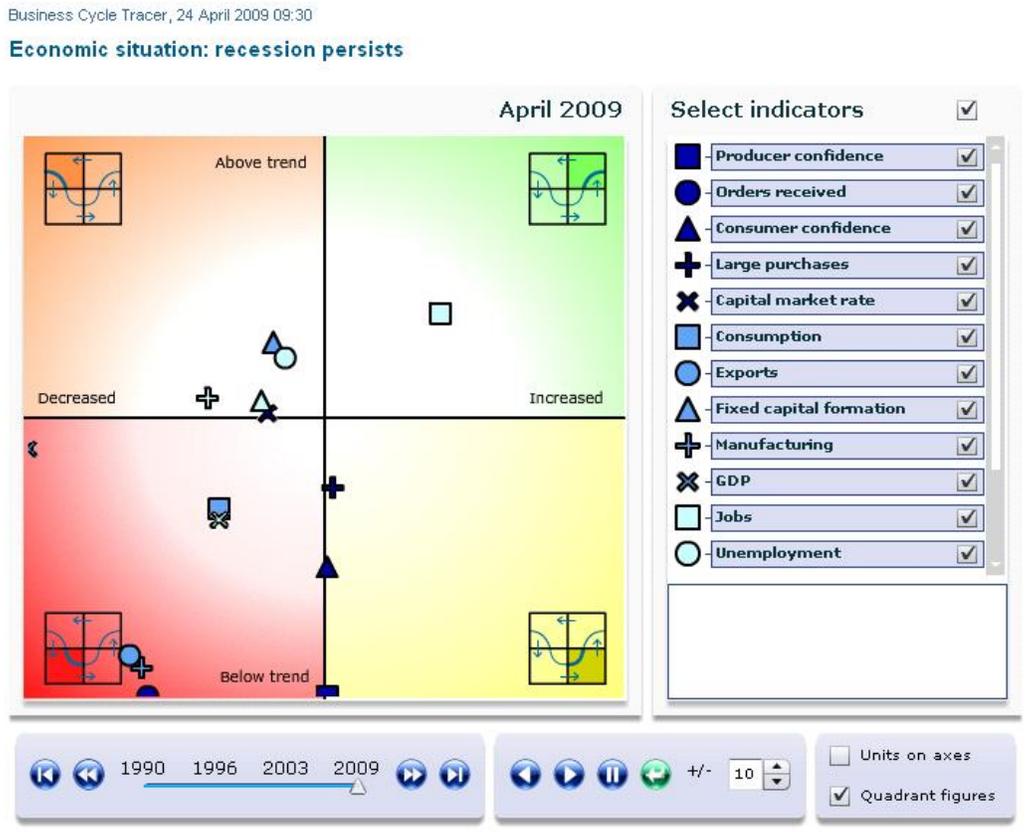


Click on a graph for more details.

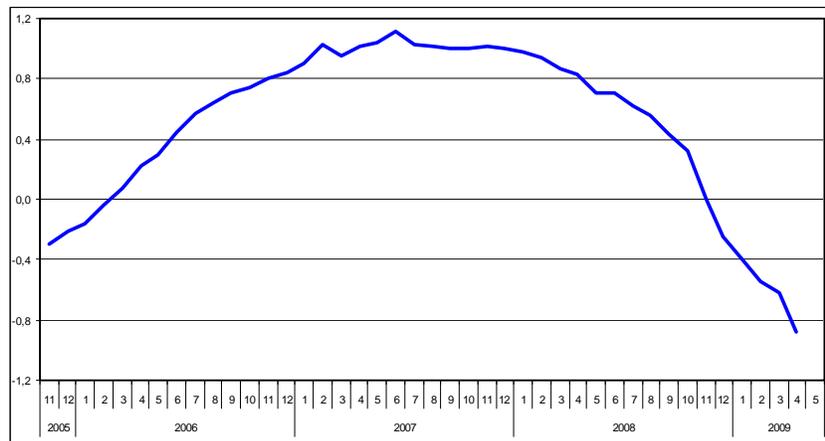


**Part A2: Business Cycle Tracer: A visualisation of the 15 macro-economic indicators**

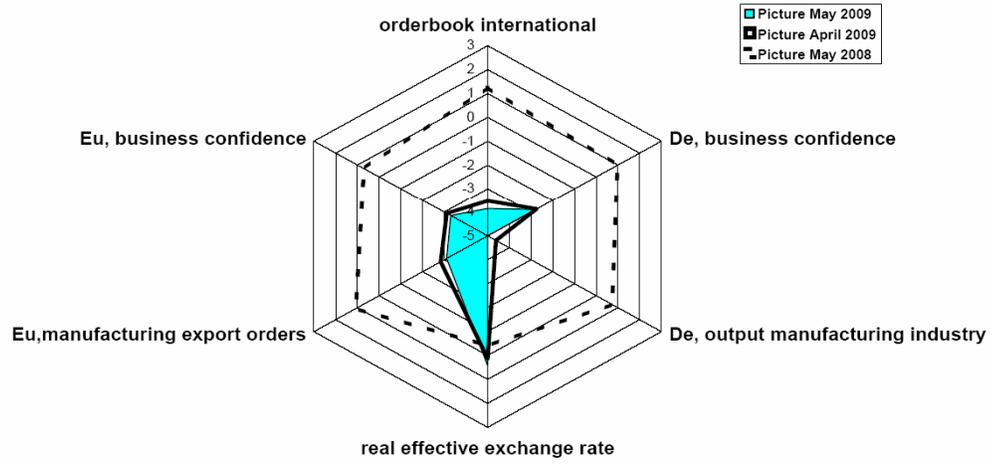
<http://www.cbs.nl/en-GB/menu/themas/dossiers/conjunctuur/publicaties/conjunctuurbericht/inhoud/conjunctuurklok/conjunctuurklok2.htm?Languageswitch=on>



**Part A3: Core-indicator of the BCT: summarising the movement of the BCT in time**

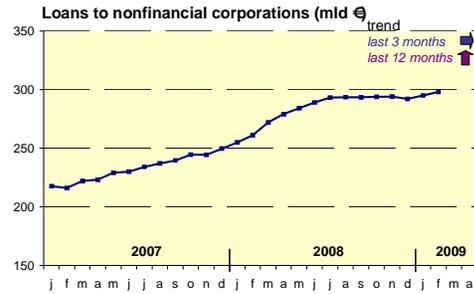


**Part B: Export condition monitor (ECM)**

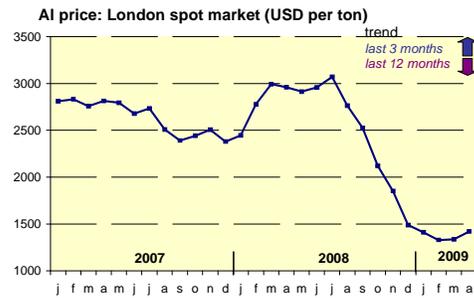
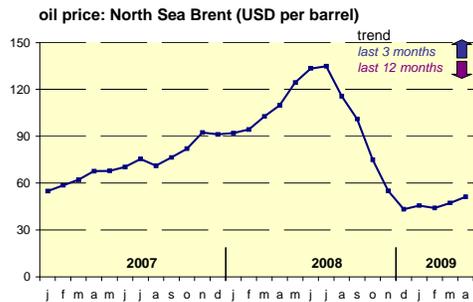


## PART C: Additional indicators

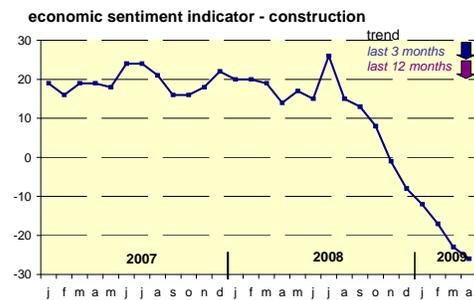
### A. Financial markets



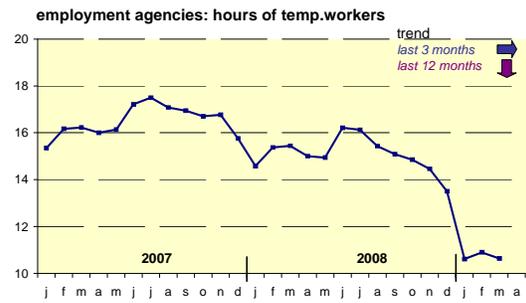
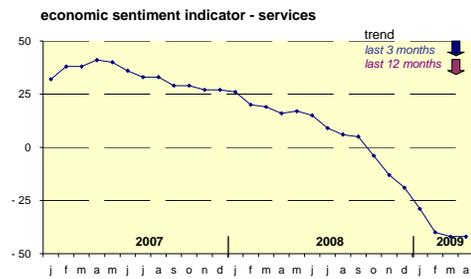
### B. Prices of raw materials



### C. Industry and construction



## D. Services



## E. Housing

