

A conditions monitor for exports

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Floris van Ruth

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Discussion paper (09007)



Explanation of symbols

| | |
|-------------------|--|
| . | = data not available |
| * | = provisional figure |
| x | = publication prohibited (confidential figure) |
| – | = nil or less than half of unit concerned |
| – | = (between two figures) inclusive |
| 0 (0,0) | = less than half of unit concerned |
| blank | = not applicable |
| 2005-2006 | = 2005 to 2006 inclusive |
| 2005/2006 | = average of 2005 up to and including 2006 |
| 2005/'06 | = crop year, financial year, school year etc. beginning in 2005 and ending in 2006 |
| 2003/'04–2005/'06 | = crop year, financial year, etc. 2003/'04 to 2005/'06 inclusive |

Due to rounding, some totals may not correspond with the sum of the separate figures.

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A conditions monitor for exports

Floris van Ruth

Summary: A system is proposed to monitor economic conditions relevant for the export of goods. By tracking the development of a coherent set of related indicators, export development realisations can be analysed and underlying trends made visible. It is shown that by using a careful selection process, an indicator set can be constructed which can communicate a lot of relevant information in a concise manner. The indicators are presented in a graphic form, for easy and quick interpretation by the users. A time function and other functionalities should be added to a web-based application to further enhance the utility of the product.

Keywords: Business cycle, short term economic indicators, exports, indicator sets, data visualization

1. Introduction

The economy is characterized by many cross-relationships between economic indicators. This can both be bewildering and useful. The diversity of economic phenomena is reflected in the wide array of economic statistics published by various agencies. This paper proposes a method which will show important relations in the economy and at the same time introduce a measure of structure into the broad supply of statistical indicators. The basic idea is to take three core indicators of the economy and using economic relations, construct around each of them a system of related statistical indicators. This system then functions as an analytical tool, putting the reported statistics into context and allowing for more in-dept analysis of the realisations. The core indicators selected for monitoring are consumption, exports and fixed capital formation, which together largely describe the expenditure side of the economy. Together they drive medium term economic developments, if not the structural ones. This paper concerns the construction of a conditions monitor for the development of the volume of exports of goods. It is part of a set of three papers, one for each of the core economic indicators singled out here. A consequence of this separated approach is that there is considerable overlap in the general sections of the three papers.

The related indicators will assist in analyzing and interpreting realisations of the core indicators, showing the influences working at any given time. Given the observed conditions, smaller or larger realisations of the growth rate of exports will be more likely. Thus, one can assess whether an observed development is normal or abnormal and likely to persist. A somewhat more advanced, and interesting, application is to use the conditions monitor to analyze how the developments in the different factors underpin the observed realisations of the target indicator. This allows a more structured and objective analysis of the developments in household consumption, and give insight in the underlying trends. The concept of publishing statistical indicators in coherent sets is not only useful because it helps structuring statistical dissemination via the explicit ordering of statistical information. Important is also that showing indicators in context of other statistics adds value to the individual indicators by demonstrating that developments are not random but part of a larger system. This makes it easier to interpret the developments of individual indicators and displays the underlying trends.

The actual form of the monitoring system is a separate issue from the fundamental concept of using a coherent group of indicators to track certain developments, and from the selection of these indicators. Having obtained a functioning indicator set, there are numerous methods for displaying them and communicating the information they contain. One could for example opt for computing a form of aggregate indicator, or for displaying the indicators separately either in graphs or symbols. Here, it is required that the conditions monitor should be easy and quick to interpret, show the maximum amount of information while still being comprehensible and it should be possible to ad interactive feature to increase its utility for the users. Therefore, it is proposed to use a graphic approach, constructing a diagram which jointly shows the development of the selected indicators.

2. Methodology

The aim is to construct a tool for analyzing and visualizing the conditions for the development of the volume of the export of goods. The development of an economic quantity such as exports is usually influenced by a number of different factors. Generally, this is a complex process and which factors are most important at a certain time tends to be uncertain. However, together these factors will broadly account for the observed behaviour of the target variable, here exports. The basic idea here is to jointly show the development of these factors, thus giving an indication of what conditions are like for exports. This requires some clarification as to what is meant by conditions and how these are to be measured. Broadly speaking it means the aggregate development of those economic quantities which have a strong influence on the development of exports. In general all economic variables are connected, directly and indirectly influencing each other. This means that the majority of the economic indicators tend to develop broadly in line most of the time. This is not very helpful, as monitoring all economic indicators or general economic conditions will only result in confusion or very unspecific, bland analysis. The key words are “broadly” and “most of the time”, for there are of course economic variables which are directly or causally connected, and much more which are connected only by the general development of the economy. Another way of looking at this is that the development of a specific indicator is the net result of the combined influence of a number of relevant other economic quantities. But the importance and timing the influence of each quantity will vary in time. On the other hand, macro-economic models used for forecasting tend to need a surprising small number of variables to predict the development of quantities such as exports. This is not very helpful in constructing a conditions monitor for two reasons. The modelling environment is required to add additional information to the raw indicators, just publishing these indicators will give an imperfect reflection of the conditions for the target indicator. And the goal is a system which will show the developments in the whole relevant economic environment, not just the two or so most important indicators. This will allow for a richer analysis and lessen the chance of missing an important development.

It should now be emphasized that the aim is not to construct a prediction model, or even a behavioural one. The conditions monitor will not be able to give a quantitative explanation of certain realisation of the target indicator, nor is it designed to do that. The start of this approach is the identification of (general) factors which are important for the development of the target indicators. The key step is finding indicators which reflect these factors. These will form the backbone of the monitoring system. As we are not trying to model or forecast the target indicator, the related indicators need not be leading or be jointly significant. The main conditions are a clear link with one of the underlying factors, a significant individual relationship with the target indicator and being able to give relevant current information. This last condition means that even if a related indicator is lagging, it still can be included if the coincident realisation contains enough relevant information. Thus, the selection process can be summarised as follows:

- Use theory and existing knowledge to identify factors which are relevant for the target indicator, here exports of goods.
 - Make a first selection of indicators which are connected to or representative of the identified underlying factors
 - Test the candidate related indicators for their connection with the target indicator.
- This is a multi-step process:

- Compute the maximum correlation of the candidate related indicator with the target indicator.
- Estimate whether the candidate indicator is significant in an ARMAX-model (an ARMA model with exogenous variables) of the target indicator. This is the crucial step in the selection process, as it tests whether the related indicator has a non-spurious link with the target indicator. The ARMA-component of the model will use the information available in the past development of the target indicator itself. Thus, if the related indicator is significant in the ARMAX-formulation, this means it contains new information and the identified relationship is unlikely to be caused by general co-movement. Another way of looking at this is that the related indicator is a source of impulses to the target indicator.
- Compute out-of-sample forecast errors to test the strength of the relationship
- Jointly evaluate the selected indicators to test how well the whole represents the target indicator and the identified factors. There are several ways to do this; e.g. principal component analysis, computing the average of standardized realisations, multivariate regressions or ARMAX.

When this process is completed, the result will be a *diverse* set of indicators with a proven and substantial link with the target indicator. The next step is how to construct a conditions monitor from this. There is no one superior method to do this. Together, the related indicators should reflect all important factors influencing the target indicator. How to extract and present this information is separate from the concept and selection of this group of related indicators. One could chose from different types of disaggregated graphical presentations, or compute an aggregated index, or give a “conditions score”. It depends on what one wishes to achieve. Our approach and the thoughts behind it will be presented in section 4, after the results of the selection process.

3. Indicator selection

3.1 Factor identification

It is somewhat more difficult to identify underlying factors for export development than for the other two core economic indicators. An important one is of course international competitiveness, usually approximated by the development of the prices on the international market of a country's goods. This points to two important quantities; the exchange rate and production costs. There are some complications concerning these statistics. The exchange rate has of course become less important for the Netherlands since the inception of the Euro. As far as production costs are concerned, there is a different issue. The best single competitiveness indicator concerning production costs is unit labour costs. But these can only be calculated on a quarterly basis, and all other indicators considered here are published on a monthly basis, including the target indicator. Also, it is not a regularly published statistic. Therefore, it was decided not to consider unit labour costs for the conditions monitors. Instead, producer and consumer prices are studied which can serve as a proxy for costs developments.

Another important factor is that trade of course entails trading partners. Therefore, next to competitiveness considerations, export development is also strongly dependent on demand developments, i.e. the state of the trading partner's economy. Thus monitoring export conditions also means monitoring developments in the economies of the most important trading partners. In 2005, the most important trading partner for the Netherlands was still Germany. Though its share of Dutch exports has been steadily diminishing, it still took 24% of total exports. Overall, the lion's share of Dutch exports, 82%, go to the European Union, and 76% to the Eurozone alone. Therefore, it is important to find indicators for import demand for Germany and the EU/Eurozone. An important consumer of imports is the industry, and in most countries the developments in industry have a strong link with the general business cycle. Monitoring the industry should therefore give a good indication for the demand for imports of a country.

3.2 Correlation analysis

The next step in the selection process is identifying indicators which are connected to the fundamental factors mentioned above. These are shown in table 3.1, consisting mainly of business survey indicators, indicators concerning orders, indicators of economic conditions (confidence, production, sales) in Germany and the EU, and indicators of the relative development of production costs. A more detailed description of the statistics used can be found in appendix I.

Table 3.1; potential indicators and their correlation with the growth rate of the volume index of the exports of goods.

| <i>Indicator</i> | <i>Level/ growth rate</i> | <i>Maximum correlation</i> | <i>Lag (minus is leading, plus is lagging)</i> | <i>Expected sign</i> | <i>Correlation at lag 0 (coincident)</i> |
|--|-----------------------------------|--------------------------------|--|--------------------------|--|
| Index production | industrial rate | 0.668 | -2 | + | 0.648 |
| Business survey; Order inflow | level | 0.582 | -4 | + | 0.414 |
| Business survey; Order inflow | rate | 0.481 | -8 | + | 0.151 |
| Business survey; foreign order inflow | level | 0.545 | -2 | + | 0.511 |
| Business survey; foreign order inflow | rate | 0.425 | -8 | + | 0.266 |
| Business survey; order book | level | 0.567 | +1 | + | 0.560 |
| Business survey; order book | rate | 0.624 | 0 | + | |
| Business survey; foreign order book | level | 0.587 | +1 | + | 0.586 |
| Business survey; foreign order book | rate | 0.596 | 0 | + | |
| Producer confidence | level | 0.722 | 0 | + | |
| Producer confidence | rate | 0.691 | -3 | + | 0.580 |
| Real effective exchange rate | level | -0.674 | -3 | - | -0.597 |

Table 3.1(Continued); potential indicators and their correlation with the growth rate of the volume index of the export of goods, .

| <i>Indicator</i> | <i>Level/ growth rate</i> | <i>Maximum correlation</i> | <i>Lag (minus is leading, plus is lagging)</i> | <i>Expected sign</i> | <i>Correlation at lag 0 (coincident)</i> |
|---|-----------------------------------|--------------------------------|--|--------------------------|--|
| Difference Dutch HICP- German HICP | rates | -0.533 | -6 | - | -0.398 |
| Difference Dutch PPI- German PPI (output) | rates | 0.605 | -2 | + | 0.667 |
| Germany; Manufacturing production | rate | 0.735 | 0 | + | |
| Germany; retail sales | rate | 0.289 | 0 | + | |
| Germany; exports | rate | 0.726 | 0 | + | |
| Germany; imports | rate | 0.767 | 0 | + | |
| Germany; business survey new orders | level | 0.596 | 0 | + | |
| Germany; business survey new orders | rate | 0.700 | -3 | + | 0.639 |
| Germany; business survey economic sentiment | level | 0.487 | +3 | + | 0.429 |
| Germany; business survey economic sentiment | rate | 0.557 | 0 | + | |
| Germany; Producer Confidence | level | 0.684 | -2 | + | 0.640 |
| Germany; Producer Confidence | rate | 0.599 | -3 | + | 0.450 |
| Eurozone; Export orders manufacturing | level | 0.696 | 0 | + | |
| Eurozone; Export orders manufacturing | rate | 0.631 | -1 | + | 0.620 |

Table 3.1(Continued); potential indicators and their correlation with the growth rate of the volume index of the export of goods, .

| <i>Indicator</i> | <i>Level/ growth rate</i> | <i>Maximum correlation</i> | <i>Lag (minus is leading, plus is lagging)</i> | <i>Expected sign</i> | <i>Correlation at lag 0 (coincident)</i> |
|--|-----------------------------------|--------------------------------|--|--------------------------|--|
| Eurozone; confidence manufacturing | Producer level | 0.745 | -1 | + | 0.739 |
| Eurozone; confidence manufacturing | Producer rate | 0.618 | -3 | + | 0.501 |
| Eurozone; manufacturing production | rate | 0.786 | 0 | + | |

Lags and leads in months

Virtually all correlations have the expected sign, except for the difference in PPI growth rates between Germany and the Netherlands. It is notable that the growth rates of the sentiment indicators again have a longer lead than the corresponding levels. Also remarkable is that developments of the indicators reflecting German demand conditions (producer confidence, manufacturing production) are coincident with developments in Dutch exports, possibly indicating very efficient logistics. Dutch export growth has the highest correlations with German and Eurozone business survey indicators and manufacturing development. On the whole, the band of observed leads and lags is quite narrow, mostly between +3 and -3 months. This indicates that it will probably be possible to enter all indicators without lead or lag in the monitoring system. Based on these results, a first selection was made, with the remaining indicators going through to the modelling stage. For the sentiment indicators, both the levels and growth rates were kept.

3.3 ARMA model testing

In this stage the indicators were tested for their significance in an ARMAX-model of export growth. This will show whether these indicators have a real connection with exports, and at what lead or lag. Initially, the variables were entered at the lag or lead of maximum correlation found in the previous stage. From this starting point, the lag or lead with maximum significance was sought. This is henceforth considered to be the relevant lead or lag for this indicator. Finally, the predictive power of the indicator was tested in a rolling regression, out-of-sample forecasting

simulation. The forecasting error gives another measure by which to compare the importance of the different indicators.

First, it is necessary to formulate an ARMA-model for the relative year-on-year growth rate of exports. The optimal formulation proved to be:

$$\text{Exports} = 0.07 + 0.44 \cdot \text{AR}(1) + 0.24 \cdot \text{AR}(2) + 0.27 \cdot \text{AR}(3) - 0.94 \cdot \text{MA}(12)$$

(0.000) (0.000) (0.0017) (0.0001) (0.000)

$R^2=0.80$, $AIC=-4.74$, out-of-sample forecast error = 1.5%-point, Q-stat 0.380, Jarque-Bera probability = 0.492, LM-test probability = 0.473

The model statistics show that this formulation performs satisfactorily. In table 3.2, the results of the ARMAX-modelling are presented; some goodness-of-fit statistics, the out-of-sample forecast error, the lag or lead at which the indicator was most significant, and the estimated coefficient and its significance. Again, it is stressed that this exercise is not undertaken to forecast exports, but to test the strength of the link between the candidate indicators and export development. Therefore, all test statistics are important and not just the forecast error.

Table 3.2; Significance of potential indicators in ARMAX model for exports.

| <i>Indicator</i> | R^2 | <i>AIC</i> | <i>RMSE</i> <i>forecast</i> <i>(%-points)</i> | <i>Lag</i> <i>in</i> <i>model</i> | <i>Coefficient</i> <i>(significance)</i> |
|---|-------|------------|---|---|---|
| Index industrial production (rate) | 0.808 | -4.78 | 1.55% | -2 | 0.355 (0.0053) |
| Business survey; Order inflow (level) | 0.805 | -4.76 | 1.43% | -2 | 0.0005 (0.0035) |
| Business survey; Order inflow (rate) | 0.805 | -4.76 | 1.46% | -2 | 0.0003 (0.0035) |
| Business survey; foreign order inflow (level) | 0.807 | -4.77 | 1.35% | -8 | 0.0014 (0.0131) |
| Business survey; foreign order inflow (rate) | 0.813 | -4.8 | 1.41% | -8 | 0.0017 (0.0004) |
| Business survey; order book (level) | 0.806 | -4.76 | 1.46% | -2 | 0.0014 (0.027) |
| Business survey; order book (rate) | 0.819 | -4.84 | 1.66% | 0 | 0.0028 (0.0000) |

Table 3.2 (continued); Significance of potential indicators in ARMAX model for exports.

| <i>Indicator</i> | <i>R</i> ² | <i>AIC</i> | <i>RMSE</i> <i>forecast</i> <i>(%-points)</i> | <i>Lag</i> <i>in</i> <i>model</i> | <i>Coefficient</i> <i>(significance)</i> |
|--|-----------------------|------------|---|---|---|
| Business survey; foreign order book (level) | 0.813 | -4.8 | 1.49% | 1 | 0.0019 (0.0004) |
| Business survey; foreign order book (rate) | 0.82 | -4.84 | 1.4% | 0 | 0.0023 (0.000) |
| Producer confidence (level) | 0.805 | -4.76 | 1.47% | 0 | 0.0017 (0.035) |
| Producer confidence (rate) | 0.804 | -4.76 | 1.53% | -4 | 0.0011 (0.048) |
| Real effective exchange rate (level) | 0.813 | -4.8 | 1.36% | -1 | -0.485 (0.0003) |
| Difference Dutch HICP- German HICP (rates) | 0.86 | -5 | 1.57% | -6 | -1.327 (0.0058) |
| Difference Dutch PPI- German PPI (output, rates) | 0.82 | -4.78 | 1.9% | -24 | -0.787 (0.0037) |
| Germany; Manufacturing production (rate) | 0.817 | -4.82 | 1.39% | 0 | 0.462 (0.0001) |
| Germany; retail sales (rate) | ns | | | | |
| Germany; exports (rate) | 0.807 | -4.77 | 1.44% | -2 | 0.139 (0.011) |
| Germany; imports (rate) | ns | | | | |
| Germany; business survey new orders (level) | 0.806 | -4.77 | 1.69% | 0 | 0.165 (0.015) |
| Germany; business survey new orders (rate) | 0.806 | -4.77 | 1.55% | 0 | 0.117 (0.022) |

Table 3.2 (continued); Significance of potential indicators in ARMAX model for exports.

| <i>Indicator</i> | <i>R</i> ² | <i>AIC</i> | <i>RMSE</i> <i>forecast</i> <i>(%points)</i> | <i>Lag</i> <i>in</i> <i>model</i> | <i>Coefficient</i> <i>(significance)</i> |
|---|-----------------------|------------|--|---|---|
| Germany; business survey economic sentiment (level) | 0.809 | -4.78 | 1.59 (lag 0) | % 5 | 0.0015 (0.0115) |
| Germany; business survey economic sentiment (rate) | 0.808 | -4.79 | 1.63% | 0 | 0.0022 (0.0003) |
| Germany; Producer Confidence (level) | 0.802 | -4.76 | 1.52% | 1 | 0.0016 (0.0084) |
| Germany; Producer Confidence (rate) | 0.809 | -4.8 | 1.49% | -1 | 0.002 (0.0002) |
| Eurozone; Export orders manufacturing (level) | 0.817 | -4.82 | 1.46 (lag 0) | % 2 | 0.002 (0.0000) |
| Eurozone; Export orders manufacturing (rate) | 0.814 | -4.81 | 1.46 (lag 0) | % 2 | 0.0014 (0.0002) |
| Eurozone; Producer confidence (level)manufacturing | 0.819 | -4.8 | 1.52 (lag 0) | % 1 | 0.0028 (0.0005) |
| Eurozone; Producer confidence (rate)manufacturing | 0.819 | -4.8 | 1.48 (lag 0) | % 1 | 0.0024 (0.000) |
| Eurozone; manufacturing production (rate) | 0.829 | -4.89 | 1.32% | 0 | 0.863 (0.000) |

Forecast errors for lagging indicators have been calculated at lag 0.

The value of the coefficients cannot be translated into the strength of the link as the indicators were not standardized. Almost all indicators are significant and possess coefficients of the expected sign. This makes the selection somewhat more difficult, and more importance was attached to the forecast errors. Indicators which yield smaller errors than the basic ARMA-model were given preference. This was especially so for the new foreign orders and the foreign order book from the Dutch business survey, the real effective exchange rate, and for German and Eurozone

manufacturing production. Other indicators were included in the next stage of the development process because they are very relevant for the underlying factors discussed in section 3.1. It concerns German and Eurozone confidence indicators and differences in price development.

A straightforward and therefore desirable option for the construction of a monitoring system is to use the most recent realisations of the chosen indicators. Given the generally short leads and lags identified here, this should cause no problems. Also, the year-on-year growth rates of the sentiment indicators did not exhibit a stronger link than the level with the target indicator (exports), though they sometimes did possess longer leads. Therefore it was decided to use only the level of the sentiment indicators from here on. As mentioned, the goal is not to model exports, but to find a set of indicators with strong links with export development, which represent the basic factors set out above. Therefore, in the final selection stage, the indicators were evaluated as a whole. This means that the overall stance of the indicator set should reflect export conditions, but it should also be possible to analysing underlying trends from the indicator set.

3.4 Analysis of aggregate performance

Based on this analysis and the results reported earlier, this final indicator set was selected:

Real effective exchange rate

Difference Dutch-German HICP growth rates

Producer survey; International Order book

Eurozone business confidence

Eurozone manufacturing production

Eurozone; new orders export manufacturing

Germany business confidence

Germany manufacturing production

A functioning monitoring system does not require all these indicators to be included; one or two could be dropped without serious consequences. But this set does reflect very relevant developments for exports. The underlying factors mentioned in section 3.1 are well represented, and therefore the set yields much valuable information and insight into the underlying developments influencing Dutch exports. All indicators

are published on a monthly basis, as desired.. The performance of the system as a whole is analyzed in two different ways which summarize what the overall message of the conditions monitor would be at every point in time.

It is important to keep in mind that this stage does not yet concern the construction of the monitoring system itself. This is still the stage of indicator selection, which is a separate issue. What system or method is to be used to communicate the information contained in the selected indicators is a development issue in itself, which will be addressed in the final section of this paper.

The first method for assessing the overall message of the indicator set is by simply taking the average of all indicators. This average approximates the overall impression the monitor would give of the conditions at each point in time. Thus, this summarization can be compared to the actual export realisations, to assess how well the monitor functions. In order for this to be possible, the indicators do need to be standardized according to:

$$\text{Standardized value}_t = (\text{original value}_t - \text{average}) / (\text{standard deviation})$$

This ensures that all indicators have roughly the same minimum and maximum value, and average zero, and can thus be shown on equal terms.

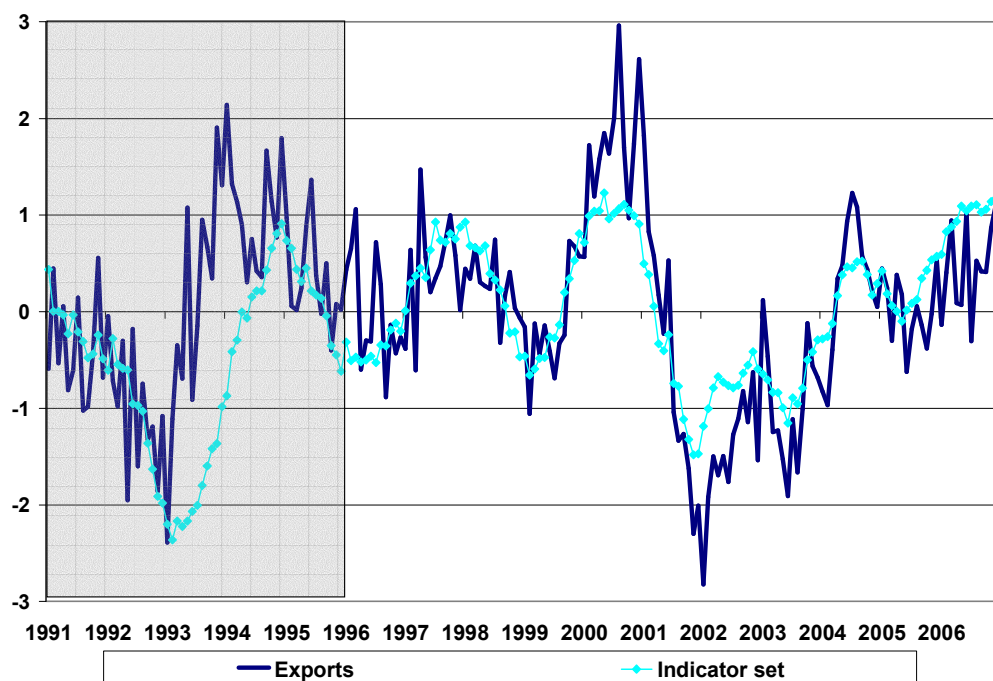
A different method for evaluating the joint development of the selected indicators is by using factor analysis. This technique is based on the extraction of common components or factors from groups of variables. It seeks to describe complex dataset by identifying relatively few underlying factors, which together can explain the observed behaviour. Usually, many factors can be extracted, but they differ in importance. The first factor, or principal component, extracted is the most important one, and will in a coherent indicator set explain a significant part of the behaviour of the individual series. How important a factor is, is measured by the percentage of the total variance of the series it explains. The hypothesis here is that the most important component will be related to exports, as the first principal component is supposed to measure that what the individual series have most in common. As these indicators have been based on the strength of their relationship with exports, it is likely that this represents their strongest common component. As said, the percentage of total variance explained indicates how strong the communality is. Another measure of this are the factor loadings. These indicate how each individual indicator is related to the common component. High factor loadings mean a strong link. Therefore, if all or most individual indicators have a high factor loading on the common component, this means both that the indicators have much in common and that the common component gives a good representation of the indicator set as a whole

In this study, really only option for entering the indicators is relevant:

- ① - All indicators in their normal form; levels for sentiment indicators; growth rates for the others.
- Only current values are used, i.e. no leads or lags

The overall picture of this option is shown in graph 3.1, compared to the standardized year-on-year growth rate in the volume of exported goods..

Graph 3.1; Simple average of standardized indicator set compared with standardized growth rate of volume of exports of goods.



The area before 1996 is shaded, as the dataset is only complete from then onwards. Therefore, the realisations before 1996 do not give an accurate reflection of the system as a whole, but are still informative. Especially after 1996, the resemblance between the development of exports and that of the indicator set is remarkable. Both show the same phases of downturn and recovery, with acceptable identification of peaks and troughs. Even the more short-term developments are identified with reasonable accuracy. Overall, the stance of the monitoring set is much less volatile than the export realisations themselves. This is very satisfactory, as one of the aims is, as the aim is to place the exports realisations into perspective, offering a way to distinguish between unimportant short-term fluctuations and more fundamental developments.

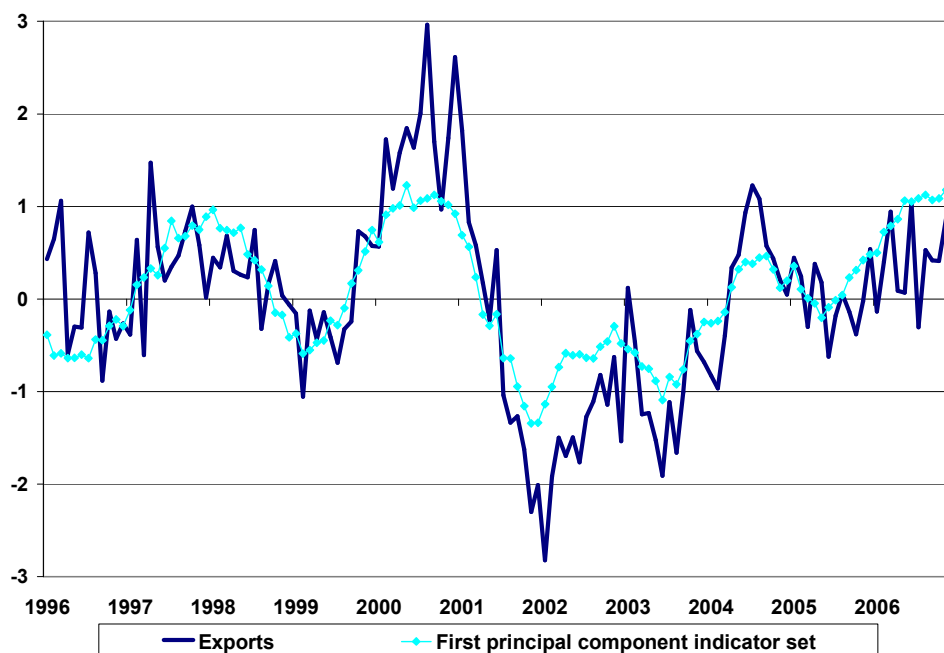
The next step is to use factor analysis to further analyse the behaviour of the indicator set and to test its coherence with exports. In table 3.3 the extraction and factor loadings for each of the three options described above can be found.

Table 3.3; Results of factor analysis for three different formulations of the indicator set.

| <i>First principal component</i> | <i>Indicator set</i> |
|---|---------------------------------------|
| | <i>Total variance explained: 71 %</i> |
| <i>Indicator</i> | <i>Factor loading</i> |
| Real effective exchange rate | 0.545 |
| Difference Dutch-German HICP growth rates | 0.420 |
| Producer survey; International Order book | 0.924 |
| Eurozone business confidence | 0.943 |
| Eurozone manufacturing production | 0.916 |
| Eurozone; new export orders manufacturing | 0.939 |
| Germany business confidence | 0.941 |
| Germany manufacturing production | 0.920 |

The first important aspect is that the first principal component extracted is able to explain alone 71% of the total variance present. This means that the common component is very strong indeed, indicating among other things strong links between exports and production in the Eurozone. This is reflected in the factor loadings which are very high for the majority of the indicators. The real effective exchange rate and the difference in HICP score somewhat lower, but this is only to be expected as there are multiple factors apart from export and production developments influencing these variables. Considering this, their influence is still clear. In graph 3.2 the computed first principal component is shown.

Graph 3.2; First principal component extracted from standardized indicator set compared with standardized growth rate of the volume of the export of goods. Complete set only 1996-2006.



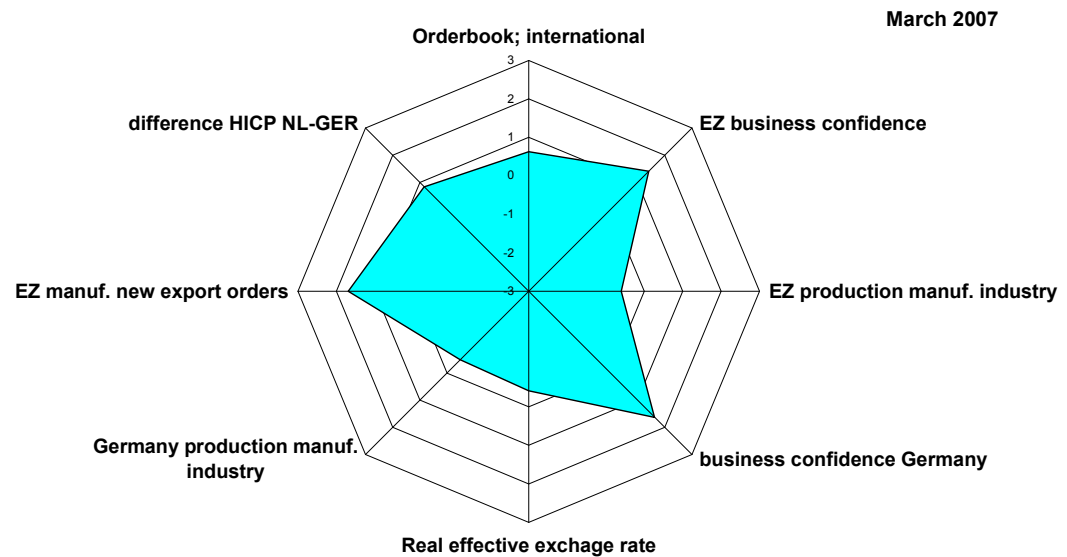
As before, the computed common development of the indicator set reflect exports development quite well. This indicates that the monitoring set will be able to reflect current conditions for exports, yielding credible information. There is actually not much difference between the simple average of the standardized indicators and the computed principal component. If anything, the latter develops somewhat more smoothly. All these results are only relevant for the indicator selection.

The common indicators computed in this section are not meant for publication, and are not in any way the final goal. On the contrary, it is best to show the development of the related indicators individually, as then they yield the most information. How this is to be done is the next step, the design of the actual monitoring system itself. This is the subject of the next section.

4. A graphic conditions monitor

The most important aspect of the monitoring system is that it should be able to transfer in simple and easily comprehensible manner information on developments relevant for exports. Its very structure should make available implicit knowledge on underlying factors which influence exports. This might sound somewhat abstract, but it leads to a surprisingly simple practical form. The indicators selected above should be shown individually, thus indicating by their presence what kind of factors are relevant for exports. Furthermore, the monitoring system should be graphic, as this means that it will be quick and easy to read and interpret. It should be constructed in such a manner that the overall picture represents the “strength” of the exports conditions. For these reasons I propose the spider-diagram, see graph 4.1.

Graph 4.1; Proposed graphic conditions monitor for exports.

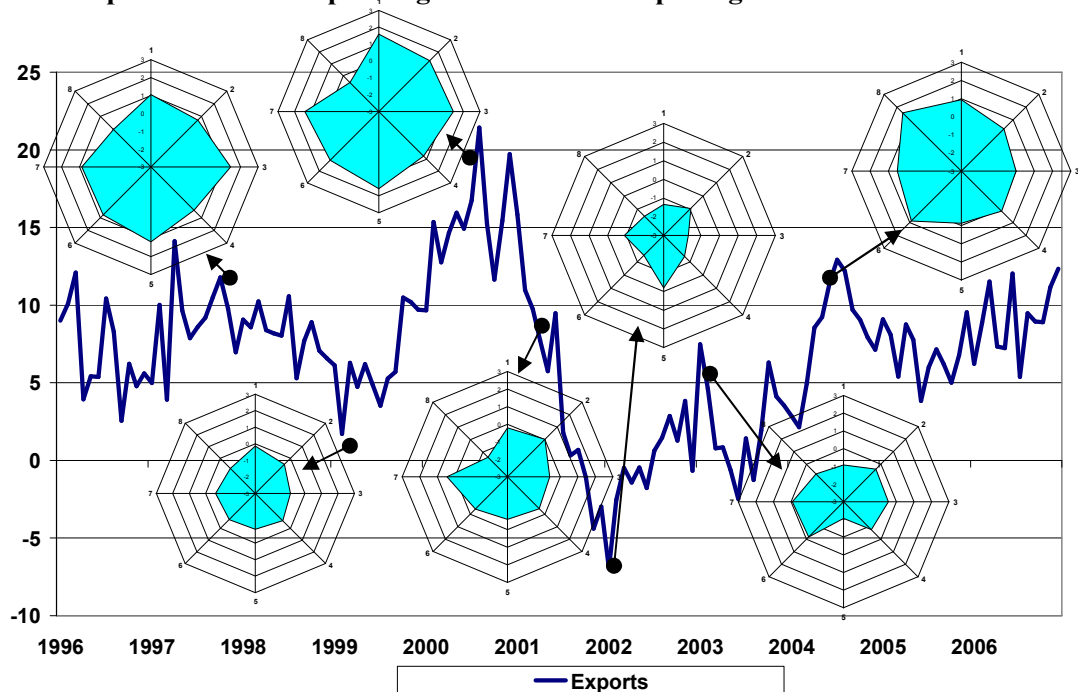


EZ = Eurozone

This functions well for two main reasons; the surface covered is a direct and easily interpreted measure of the current level of conditions. And it is quite clear that the whole is constructed from individual indicators, which can be immediately identified and analysed separately. The values of the indicators are entered in a standardized fashion, as described in section 3 (The real effective exchange rate and the difference between Dutch en German HICP have been inverted). This allows

them to be shown in one figure at the same scale. Other methods for weighing the data are possible, but this one is the most straightforward. As mentioned before, this indicator set is only a proposal. Using less indicators or making all or some of these optional is a distinct possibility. In diagram 4.1 the situation in March 2007 is shown, when the realisation of the monthly index of the volume of exports was +8.2% year-on-year. Indicator behaviour is consistent. Most indicators are developing above average, indicating that conditions are good for Dutch exports. Confidence in both Germany and the Eurozone are developing more strongly than industrial production realisations, possibly indicating that conditions will remain favourable across the board in the immediate future. In graph 4.2, the monitor diagram can be compared to the realisations at several other moments in time.

Graph 4.2; Evolution in time of Proposed graphic conditions monitor, compared with corresponding realisations of exports growth rate.



What graph 4.2 shows is that the monitor contracts and expands as export development is weaker or stronger, as it was designed to do. At any one time one or two indicators can exhibit deviant behaviour, but this is not a problem as one indicator can not disturb the overall picture.

Graph 4.2 also points to interesting animation possibilities. If a time function is added to the diagram, the development of these factors can be followed. For full effect it should be combined with a corresponding concurrent diagram of the development of exports.

Appendix I; Data description

| <i>Indicator</i> | |
|--|--|
| Index industrial production (rate) | Volume index of industrial production (Statistics Netherlands) |
| Business survey; Order inflow (level) | Assessment of the inflow of new orders (Statistics Netherlands) |
| Business survey; Order inflow (rate) | Realisation _t -realisation _{t-12} |
| Business survey; foreign order inflow (level) | Assessment of the inflow of new foreign orders (Statistics Netherlands) |
| Business survey; foreign order inflow (rate) | Realisation _t -realisation _{t-12} |
| Business survey; order book (level) | Assessment of the total order book (Statistics Netherlands) |
| Business survey; order book (rate) | Realisation _t -realisation _{t-12} |
| Business survey; foreign order book (level) | Assessment of the foreign order book (Statistics Netherlands) |
| Business survey; foreign order book (rate) | Realisation _t -realisation _{t-12} |
| Producer confidence (level) | Composite indicator of producer confidence (Statistics Netherlands) |
| Producer confidence (rate) | Realisation _t -realisation _{t-12} |
| Real effective exchange rate (level) | Trade weighted exchange rate, corrected for inflation differences (OECD) |
| Difference Dutch HICP- German HICP (rates) | Difference in HICP-inflation rates (OECD) |
| Difference Dutch PPI- German PPI (output, rates) | Difference in PPI-total output growth rates (OECD) |
| Germany; | Volume index of German manufacturing production (OECD) |

| | |
|---|---|
| Manufacturing production (rate) | |
| Germany; retail sales (rate) | Volume index of German retail sales (OECD) |
| Germany; exports (rate) | Total exports Germany, current prices, seasonally adjusted (OECD) |
| Germany; imports (rate) | Total imports Germany, current prices, seasonally adjusted (OECD) |
| Germany; business survey new orders (level) | Germany, total new orders manufacturing, from OECD CLI |
| Germany; business survey new orders (rate) | Realisation _t -realisation _{t-12} |
| Germany; business survey economic sentiment (level) | Germany, Economic sentiment indicator - Index Eurostat |
| Germany; business survey economic sentiment (rate) | Realisation _t -realisation _{t-12} |
| Germany; Producer Confidence (level) | Germany industrial confidence indicator Eurostat |
| Germany; Producer Confidence (rate) | Realisation _t -realisation _{t-12} |
| Eurozone; Export orders manufacturing (level) | Eurozone manufacturing export order book (OECD) |
| Eurozone; Export orders manufacturing (rate) | Realisation _t -realisation _{t-12} |
| Eurozone; Producer confidence (level)manufacturing | E15 Manufacturing - Industrial confidence indicator (OECD) |
| Eurozone; Producer confidence (rate)manufacturing | Realisation _t -realisation _{t-12} |
| Eurozone; manufacturing production (rate) | EMU Production in total manufacturing, volume index (OECD) |

Appendix II; Graph of indicators and exports

All indicators standardized, sentiment indicators in levels, others in growth rates. Real effective exchange rate and inflation differential inverted.

