The KOF Economic Barometer - What Does It Tell Us And When?

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Abstract

The KOF barometer is an instrument widely used by Swiss business cycle analysts. It aims to provide information about the short term economic perspectives. However, a major drawback of the KOF barometer is the way in which the addition of new values results in substantial retrospective revisions to the data. In this paper we perform a real-time analysis of the predictive ability of the KOF barometer. We investigate the successive monthly releases of this indicator between February 2000 and May 2005 and their relationship to year-on-year GDP growth. Moreover, we discuss the way in which the KOF barometer is constructed and identify the main sources of its instability.

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1 Introduction

The KOF barometer is probably the most widely used Swiss leading indicator. According to the KOF, the barometer has a lead of approximately six months with respect to year-on-year GDP growth. However, this information is only qualitative in nature; that is to say, changes in the KOF barometer make it possible to predict future increases or decreases in year-on-year GDP growth rates. By contrast, it is not an appropriate tool for quantitative forecasts. In other words, it does not provide information about the magnitude of future GDP growth rates.[1]

Zanetti and Wey (2005) investigated the statistical properties of different leading indicators, amongst them the KOF barometer. Based on a classical correlation and turning point analysis of quarterly data, they observed that the lead of the KOF barometer relative to year-on-year GDP growth is unstable. It generally varies between zero and two quarters. Sometimes it also provides misleading information in the form of delayed signals. In addition, they point to data revisions as a further source of uncertainty in the interpretation of the KOF barometer.

In this paper, we analyse this specific issue in more detail by focussing on the real-time properties of the KOF barometer. At the margin, its values are always provisional and therefore subject to revision, which can be substantial. Our goal is to gauge the significance of data revisions for the interpretability of the KOF barometer and its predictive ability for Swiss GDP growth. Furthermore we discuss the technical reasons why the KOF barometer is so sensitive to data revisions.

The paper is structured as follows. Section 2 discusses the real-time behaviour of the KOF barometer at several points in time. We focus on the behaviour of the series at and between turning points. In section 3 we discuss the main technical construction features of the KOF barometer and indicate three potential sources of data revisions. Furthermore we assess the practical relevance of each of these sources. Section 4 summarizes the results and provides a conclusion.

[1] See for instance KOF (2005).

2 Real-time evaluation

The KOF barometer is released on a monthly basis. At the moment, the KOF barometer covers the time span between February 1984 and Mai 2005. In the subsequent analysis we will refer to this complete time series as "historical series". The features of the KOF barometer, like those of other leading indicators, are generally evaluated on the basis of the relationship between this historical series and the series it is intended to predict (for example GDP growth). This kind of analysis, however, neglects the fact that, due to data revisions, the historical series does not reflect the real-time information content of the indicator. This paper compares the information resulting from the KOF barometer historical series with the information provided by the real-time series. For this purpose, we have a real-time database of the KOF barometer at our disposal, which includes 64 successive real-time series covering sample periods from 1984.02 to 2000.02+i, with i = 0,....63. These are the series as published every month between February 2000 and May 2005 in KOF press releases.

2.1 Information content of the historical time series

Figure 1 plots the KOF barometer historical series together with GDP growth for the time period covered by our real-time database. GDP growth is plotted with blue bars. The turning points of the business cycle are marked by black bars, with turning points taken from Zanetti and Wey (2005). During the period under consideration we observe five turning points in the GDP growth cycle (three peaks and two troughs). The red line represents the KOF barometer historical series. The turning points, referred to as "historical turning points", are marked by red dots. Note that the KOF barometer data are monthly, whereas GDP data are quarterly. To make the two series comparable, the turning points in GDP growth are always assigned to the second month of the corresponding quarter. This rule applies throughout the rest of this paper.

Looking at figure 1, we see that the KOF barometer leads GDP growth at three out of five turning points. At one turning point the indicator is

coincident with GDP growth, and in one case we even note a lag. The length of the lead is unstable. It varies between a five-month lead for the peak in GDP growth which occurred in late 2002 and a lag of three months with respect to the peak in early 2000. Detailed figures for the historical leads and lags at turning points are given in the first line of table 1 on page 9.

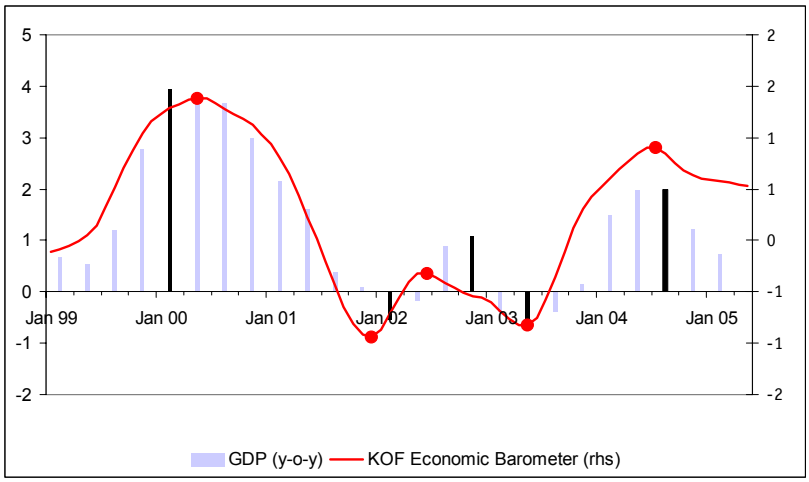

Figure 1: KOF economic barometer and GDP

2.2 Magnitude of data revisions

Before looking at the real-time predictive abilities of the KOF barometer, we wanted to investigate the extent to which this indicator is sensitive to data revisions. In particular, we examined whether there is a difference in the sensitivity to data revisions at and between turning points. As a measure for the magnitude of revisions we calculated the variance of the real-time series according to the following formula:

$$Var5_t = Var\left\{x_{j,t}; x_{j+1,t}; x_{j+2,t}; x_{j+3,t}; x_{j+4,t}\right\} \tag{1}$$

with $x_{j,t}$ being the value of the real-time KOF barometer series j at time t. The choice of j ensures that the final value in the real-time KOF barometer series j is situated exactly at time t. The inclusion of five values

$x_{j,t}$ to $x_{j+4,t}$ allows us to evaluate the magnitude of the data revisions for time t by considering five subsequent releases of the KOF barometer.

The results are shown in figure 2 below. The vertical lines mark the turning points as they appear in the KOF barometer historical series. We note that there is indeed evidence for larger data revisions at turning points than between them. Generally speaking, the closer we get to turning points, the higher the variance is. The variance usually reaches its maximum several months after the individual turning points. If we interpret the variance as a measure of uncertainty, we can conclude that the information content of the KOF barometer is less reliable at, and in particular shortly after turning points than in periods of a continued upswing or downturn. Furthermore we notice that the variance around the two troughs in December 2001 and May 2003 is significantly higher than around the peaks in May 2000, June 2002 and July 2004 respectively. This suggests that the KOF barometer might encounter bigger difficulties in identifying troughs than peaks.

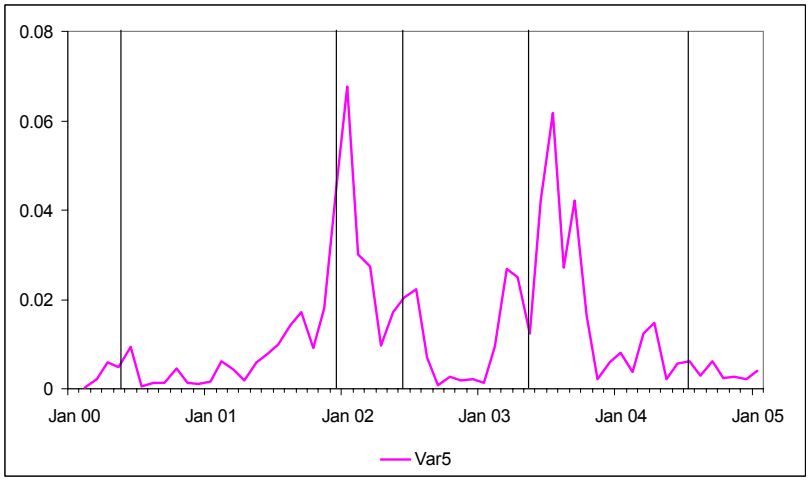

Figure 2: Real time variance of the KOF economic barometer

2.3 Real-time information at turning points

The KOF barometer is prone to data revisions when new values are added. Hence, the lead and lag analysis based on the KOF barometer historical series (historical leads/lags) does not reflect the information the KOF barom-

eter actually provided in real-time. In order to get a more appropriate picture of the actual leading properties of the indicator, we perform a real-time analysis. We consider different points in time and investigate how the information content of the KOF barometer changed when new releases were made available. Since data revisions are more substantial at turning points than between them (see Section 2.2), we first focus on the real-time properties of the KOF barometer at turning points.

Figures 3.1 through 3.5 show the real-time information provided by the KOF barometer at the five turning points under review. To keep the paper short, we confine ourselves to a description of the real-time behaviour of the KOF barometer at the 2002 downturn (Figure 3.2). Note that the argumentation would be basically the same for all other turning points.

The solid vertical line in figure 3.2 marks the turning point in the GDP growth cycle, while the dotted vertical line signals the turning point in the KOF barometer historical series. The two-month lead observed between the two lines is the historical lead discussed above. The real-time development of the indicator, however, provides a different picture. At the time of the turning point in the KOF barometer historical series (December 2001), the real-time series was still clearly pointing downwards (dark blue line in figure 3.2). The same was true for the next series in January 2002 (pink line). In February the KOF barometer turned flat (orange line) and it was not until March that the trough became evident (light blue line). Hence, although the KOF barometer historical series displays a turning point in December 2001, this information was not actually available until three months later. The discrepancy between the signals of the historical series and those of real-time data is measured by the horizontal arrow in figure 3.2. Instead of a historical lead of two months we observe a real-time lag of one month against GDP growth.

Figures 3.1 - 3.5: Real time evidence at turning points

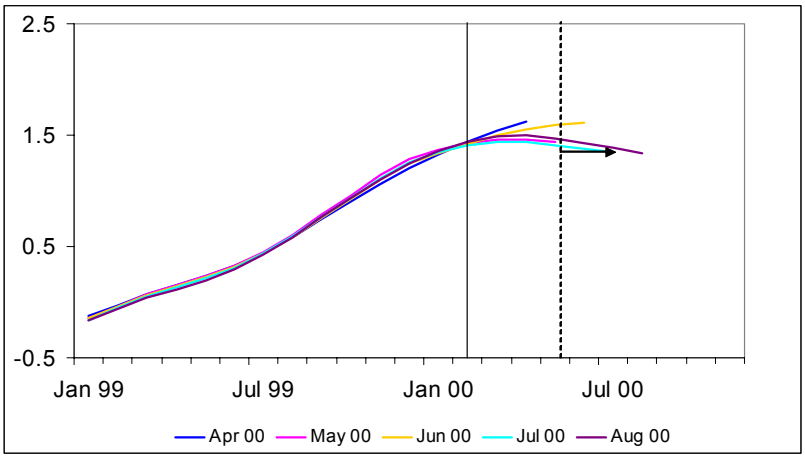

Figure 3.1: KOF barometer at the 2000 upswing

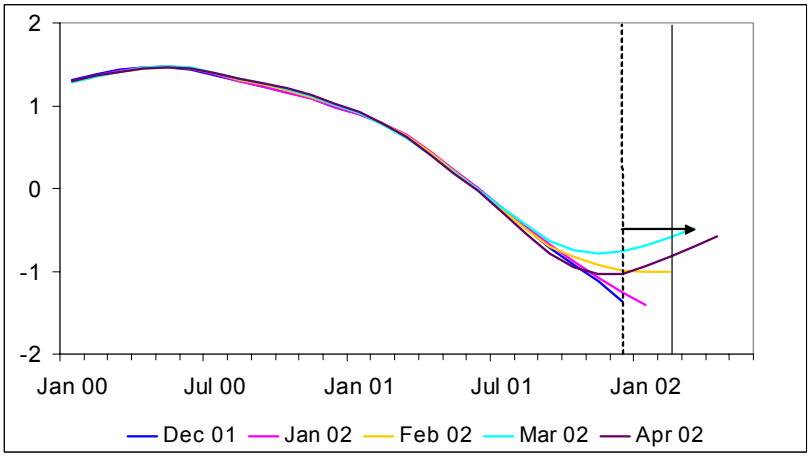

Figure 3.2: KOF barometer at the 2002 downturn

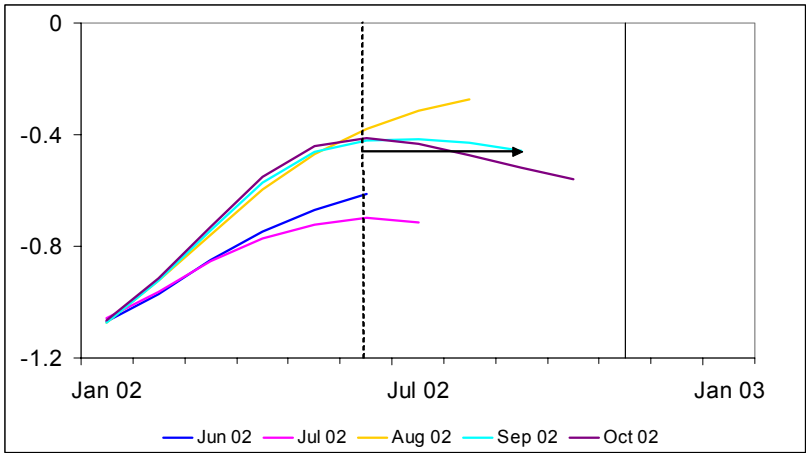

Figure 3.3: KOF barometer at the 2002 upswing

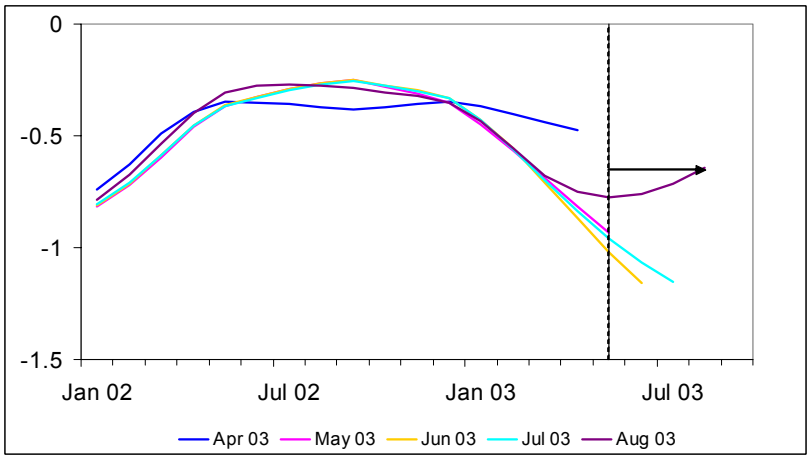

Figure 3.4: KOF barometer at the 2003 downturn

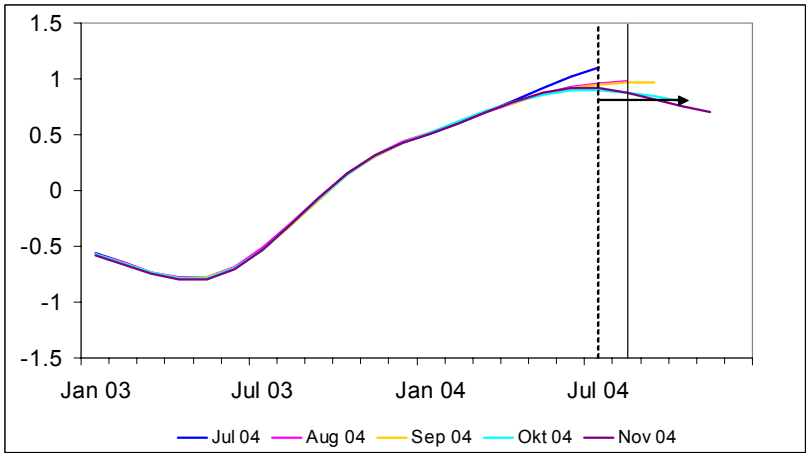

Figure 3.5: KOF barometer at the 2004 upswing

The real-time leads and lags for all turning points are given in the second line of table 1 below. In all cases the real-time turning points follow those of the historical series with a two to three-month delay. As a consequence, in real-time, the KOF barometer lags behind GDP growth in four out of five cases.

	Peak Feb 00	Trough Feb 02	Peak Nov 02	Trough May 03	Peak Aug 04
Historical lead/lag	+3	-2	-5	0	-1
Real-time lead/lag	+5	+1	-2	+3	+2
Actual lead/lag	-1	-5	-8	-3	-4

Table 1: Leads and lags at turning points in months (negative sign = lead)

These results must be treated with caution, however, as we examine only five turning points in our analysis. By investigating a longer time period between 1984 and 2004, Zanetti and Wey (2005) observed that the KOF barometer historical series leads year-on-year GDP growth by an average of 1.4 and 1.0 quarters for peaks and troughs respectively. If we assume the

two to three-month delay in the real-time series relative to the historical series to be valid for this entire period, we can conclude that, in real time, the KOF barometer is more or less coincident with GDP growth.

Moreover, for a complete evaluation of the information content of the KOF barometer, another element must be taken into account: the delay in the publication of GDP figures. Quarterly GDP figures are usually published by the State Secretariat for Economic Affairs (Seco) about two months after the end of the corresponding quarter. Furthermore, a turning point in GDP growth in period t cannot be detected until the announcement of the GDP figure for period t+1. For instance, the trough in GDP growth in the first quarter 2002 did not become evident until the publication of GDP estimates for the second quarter 2002, which occurred in August 2002. If we take this date as our reference point, the one-month real-time lag observed at this turning point turns out to be an actual lead of five months, since the KOF barometer indicated the turning point in GDP growth five months before the latter was confirmed by official GDP figures.

The same analysis has been carried out for all other turning points as well. Details are given in the last line of table 1 on page 9. From this perspective, the KOF barometer is a leading indicator at all turning points under observation. Nevertheless, its usefulness as a leading indicator is reduced, given that at that point in time business cycle analysts already has access to important information on real activity.

We summarize the results presented in this section in the following two findings. Note, however, that regardless of which definition of the lead we apply, the lead-structure is very unstable. Therefore, these findings should be seen rather as general guidelines than as strict rules.

Finding 1: *In real-time, the KOF barometer is a* ***coincident indicator*** *for year-on-year GDP growth: a turning point in the GDP growth cycle in a certain quarter is likely to become apparent in a KOF barometer series released in one of the months in the same quarter.*

Finding 2: *The KOF barometer is released monthly, whereas GDP figures are quarterly. Moreover, GDP is published with a substantial delay. Thus, although turning points in the two series are likely to be detected in*

the same quarter, the information from the KOF barometer is available much earlier. From this point of view, the KOF barometer is a ***leading indicator****.*

2.4 Real-time information between turning points

Although revisions carried out between turning points are smaller than those made close to such turning points, they can still be substantial. In figure 4 below we see an example of such a revision. This graph traces six successive real-time series of the KOF barometer in the time span between September 2003 and February 2004, when GDP growth was clearly trending upwards. The slope of the indicator changed considerably as new values were added. This is further evidence that the KOF barometer contains only qualitative information: the slope of the indicator does not tell us anything about the magnitude of future GDP growth rates.

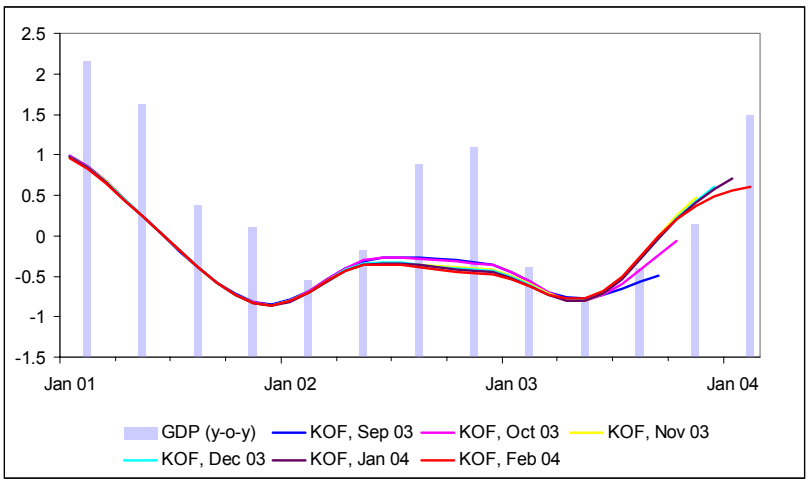

Figure 4: Real time evidence between turning points

3 Sources of data revisions

In this section we investigate the sources of data revisions. This requires us to look at the way in which the KOF barometer is constructed. Our goal is to provide an overview and a ranking of the practical relevance of different sources of data revisions.

3.1 Smoothing by Census-X11

The KOF barometer is a "composite indicator", i.e. it is constructed by collecting information from six component series. Three of these series are taken from the monthly KOF industry survey (*orders inflow*, *backlog of orders* and *expected primary product purchases*). In addition, the KOF uses three quarterly series from the KOF wholesale survey (*wholesale inventory evaluation*), the KOF construction survey (*order backlog duration*) and the Seco consumer survey (*expected financial conditions of households*). All component series are smoothed by means of the Census-X11 procedure. This method can give rise to substantial data revisions when new values are added to the series. In figures 5.1 through 5.4 we reproduced the real-time realizations of two of the six component series in the KOF barometer: the *expected primary product purchases* and the *backlog of orders*, both from the monthly KOF industry survey. We chose to emphasize their real-time behaviour close to the peak of the KOF barometer historical series in June 2002 and the trough in May 2003. This choice is rather arbitrary. Roughly the same evidence would be found if other component series of the KOF barometer or other time periods were considered. The peak and trough of the KOF barometer historical series are marked by the solid vertical lines in figures 5.1 through 5.4. As can be observed, the real-time component series suffer from the same problems at turning points as the KOF barometer (see figures 3.3 and 3.4). At the historical peak and trough the series are still pointing clearly upwards (downwards) from a real-time point of view, and the turning points do not become evident until several months later. Hence, the data revisions to the KOF barometer are largely due to the smoothing procedures in its component series.[2]

[2]Note that the KOF is also aware of this problem. As a consequence, the KOF is currently examining alternative seasonal adjustment methods which might replace the Census-X11 procedure in the future.

Figure 5.1 - 5.4: Smoothed real-time component series (KOF industry survey)

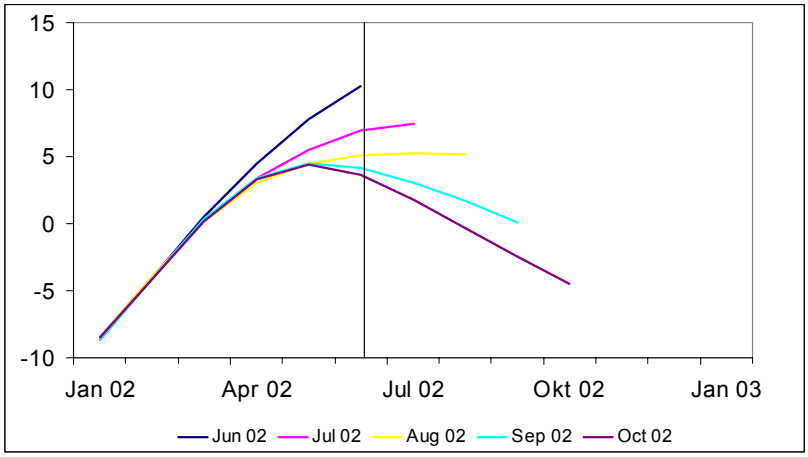

Figure 5.1: Expected primary product purchases at the 2002 upswing

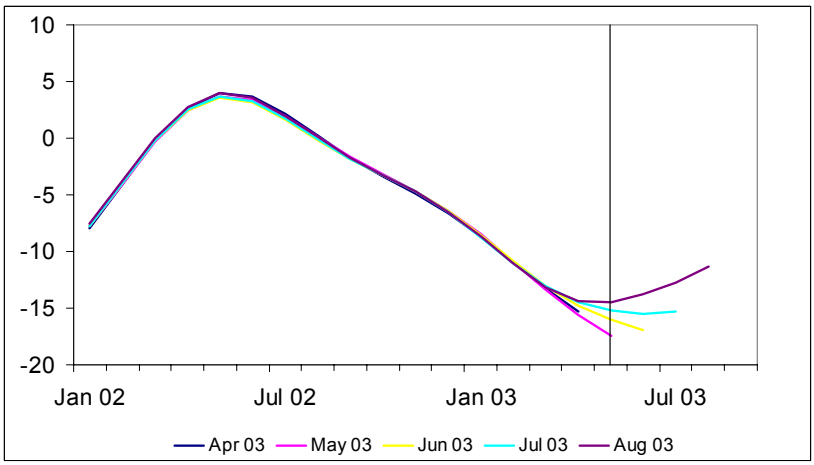

Figure 5.2: Expected primary product purchases at the 2003 downturn

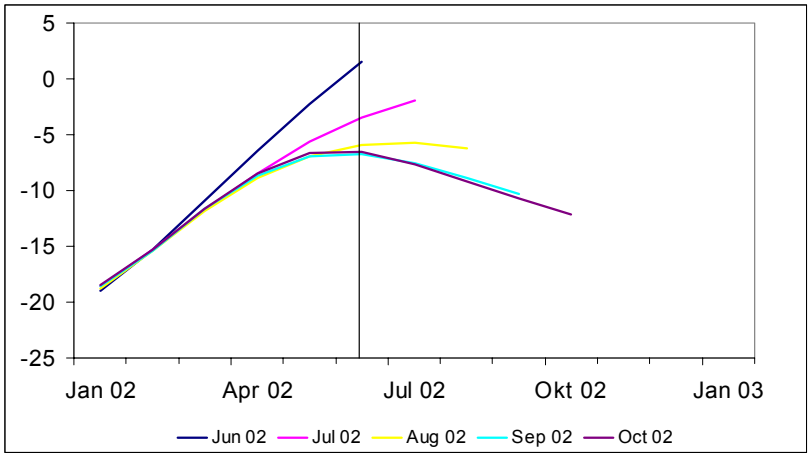

Figure 5.3: Backlog of orders at the 2002 upswing

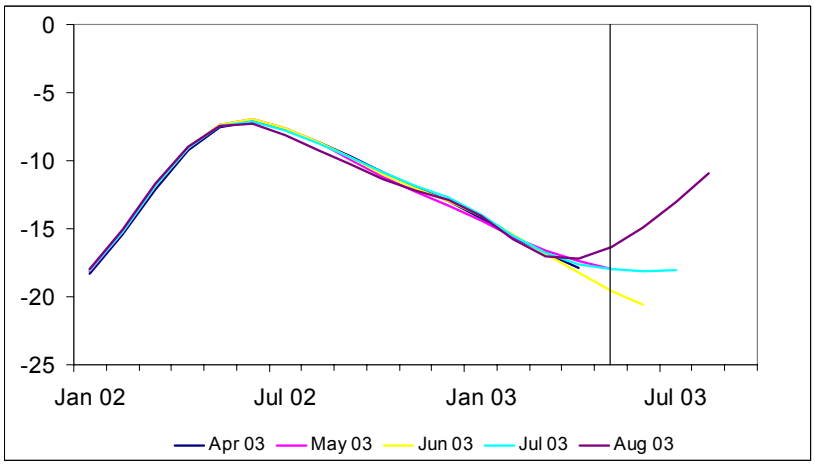

Figure 5.4: Backlog of orders at the 2003 downturn

3.2 Principal component approach

The idea behind aggregating several component series into one composite indicator is to extract information common to all components and at the same time reduce the impact of erratic short-term movements in the components. In the case of the KOF barometer the aggregation is carried out by applying the principal component method. Generally speaking, the first principal component of a certain number of series is derived by finding a linear combination of these series that incorporates as much of their variance as possible. Hence, the KOF barometer, being the first principal component Y_1 of six time series, can be written as

$$Y_1 = a_{11}X_1 + a_{21}X_2 + a_{31}X_3 + a_{41}X_4 + a_{51}X_5 + a_{61}X_6 = \mathbf{a}_1^{'}\mathbf{X} \qquad (2)$$

with X_j being the j = 1 to 6 component indicators and a_{j1} their correspondent weights in the linear combination. The vector of weights $\mathbf{a}_1$ is recalculated whenever the sample of observations is extended, i.e. every month. In other words, the weights a_{j1} may change over time and may therefore be another source of revisions to the KOF barometer. Using data simulations, we investigated the degree to which the principal component procedure makes the KOF barometer prone to revision. We calculated $\mathbf{a}_1$ and the KOF barometer recursively on the basis of the smoothed historical component series.

Figure 6 shows the recursively estimated weights a_{j1} of each of the six component series. The weights are indeed subject to changes over time. However, the size of these changes is very small and we can conclude that the principal component method does not cause substantial data revisions in the KOF barometer series.

3.3 Incomplete information

The monthly computation of the KOF barometer is always based on the latest information from the monthly KOF industry survey. However, besides

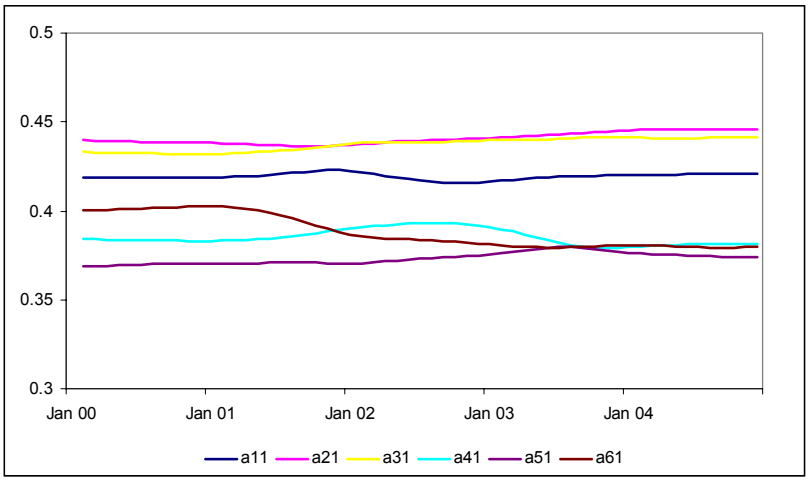

Figure 6: Recursive principal component weights

the three indicators from this survey the KOF barometer also includes three quarterly component series. These series have to be converted into monthly data in order to be integrated in the principal component calculations. In addition, as long as the quarterly observations are not yet available, the component series have to be extended, using forecast values. The KOF uses a double exponential smoothing procedure (Brown Model) to build these forecasts. Basically, this method simply extrapolates the current trend in the series. This causes revisions in the KOF barometer series whenever the forecast values of the component series do not fit the future data. The series is particularly prone to revisions at turning points, where forecasts based on trend extrapolation produce very poor results. Hence, the forecasting method applied in cases where information is incomplete must be seen as another important source of revisions in the KOF barometer series.

4 Conclusion

In this paper, we have investigated the quality of the KOF barometer as a leading indicator in a real-time perspective. A real-time analysis is useful, since the KOF barometer is prone to substantial data revisions. These revisions are mainly due to two factors: the successive smoothing of the component series and the forecasting procedure applied when information

is incomplete. By contrast, the aggregation of the component series via the principal component method proved insignificant in this context.

Due to the frequent data revisions, the real-time predictive abilities of the KOF barometer with regard to GDP growth are less impressive than the leading properties suggested by a standard ex-post analysis. This is true especially at turning points. We show that in a real-time perspective the turning points in the KOF barometer do not usually become apparent until two to three months after their historical point in time. This means that the real-time signals provided by the indicator are substantially delayed as compared to the signals provided by the historical series. As a consequence, in a real-time perspective the KOF barometer is shown to be a coincident, or sometimes even lagged, indicator for year-on-year GDP growth. Nonetheless, taking into account the substantial publication delay in Seco's quarterly GDP estimates, the KOF barometer still provides important information about the current economic situation. For a correct interpretation it is, however, important to be aware of the barometer's real-time properties and the impact of data revisions on its predictive ability.

References

[1] Zanetti and Wey, A. (2005), Swiss Composite Leading Indicators: An Appraisal, Konjunktur Online (Studies/Special Topics Papers)

[2] KOF Pressemitteilung vom 27.05.2005, KOF Konjunkturbarometer, http://www.kof.ethz.ch